Name	Kok Chen Mun
Matrix Number	WEK 000052
Majoring	Networking
Project Supervisor	Pn. Hannyzzurra
Project Moderator	Encik Amirrudin bin Kamsin
Course	WXES 3182 Projek Ilmiah Tahap Akhir II
Project Name	Online Sales Management System for Computer Store

Online Sales Management System for Computer Store

Abstract

This project report is the documentation of the Online Sales Management System, which will be implement on a computer store that has several branches.

In the first chapter, project overview and scope are discussed. This system is comprised of four modules, which are Manager Module, Administrator Module, Staff Module, and Customer Module. Generally, this system allows the employees to manage stock, update information of the products, take orders from customer, view summary, etc. Meanwhile, customer can orders computer from the system, browse the products category and become registered user.

Following is the literature review of the project that compare existing systems of the computer store in Malaysia with the system, which will be developed. Besides that, review of the related development tools and web architectures are also carried out.

Then, Waterfall Model has been chosen as the system development methodology for Online Sales Management System. In system analysis the functional requirement and non-functional requirement are stated. Meanwhile, the development tools for this system are Windows 2000 as application platform, MySQL as the database server, Java Server Pages (JSP) as the scripting language, Apache as the web server, Tomcat as the Servlet Container and Multi Tier Architecture as the web architecture.

Next, the data flow diagrams is used to illustrate data sources, destinations, flows, stores, and transformations of the system. Also in this chapter are the graphic user interface design and database design.

Finally, the thesis project report will end with conclusion, appendix and references.

Acknowledgment

The success completion of this project is related to the contributions of many people. I would like to take this opportunity to thank some of the key people.

First of all, I would like to thank Puan Hannyzzurra, my supervisor for giving me this opportunity to develop this project. Secondly, I would like to thank her for her constructive advice, generous guidance, encouragement, support, dedication and supervision along the process of this project. Her diligence and kindness in helping me throughout the project is deeply appreciated.

I also would like to acknowledge Miss Laiha as the project moderator who contributed comments, suggestion and ideas to further enhance value of this project.

Lastly, the appreciation is also dedicated to the other who have giving me valuable supports and encouragement and provide important information for the project. Thank you very much.

Table of Contents

Page

Chapter 3 Methodology

Chapter 4 System Analysis

List of Tables

List of Figures

Chapter 1 Introduction

1.1 Project Overview

This very first chapter covers the system definition as view from an overall perspective. It touches about the modules and specification of the system followed by objective and scope.

Recently there are a lot of the computer stores in Malaysia still using the traditional commerce to conduct their daily business operations. It is a waste that traditional business trend needs a lot paper work on data keeping and time consuming while searching records.

Since the late of 1990's, companies have increasingly turned to Internet and web based technologies to accomplish this.

Information system on sales is designed to function as an online catalogue system, which display all the products that are currently available on the computer stores. They can views or browse by category. Besides that, customers also can get the detail information.

In the meantime, this system let the customer to make an order online. Before they can do that, they should fill in they details and choosing whether they want to register as member or they are just want to be occasional buyer. The visitor without login can still make browsing, viewing on the product. It is easy way in their daily work and does have much time for shopping at business hours.

A simple registration procedure is required for the customers to get an account from the system. It is such a number registration, the customer needs to fill in their details and the customer can modify the profile if there are any changes.

Shopping cart is offered and it is a wonderful feature that may help and ease customer in ordering process. Once the users select an item, they can add the item in this shopping cart, which is similar to the physical shopping. The product information will be keep until an order is made.

Besides that, the customer can change the quantity or remove the product from their shopping cart. The total of the amount will be recalculate after the conformation of the customer in their changes.

The system will emphasize that data and info can be receives from customer through Internet into the web-based database. All information from customer can be captures and saved into the database correctly, efficiently and immediately.

1.2 Project Objectives

The objectives of this project are:

i) Computerize the management and sales routine in a computer store that have several branches

ii) Enable the store routine to be done any time anyway, as long as their have a web browser with internet connection

iii) Manage stock of the store more effectively

iv) Improve capacity of the growing data and search a record much faster

v) Enable data mining at lower cost and more effectively

vi) Expands the traditional way of commerce, enable the customer to order a computer through internet

vii) Enable the customer to order computer before and after the business hours

1.3 Project Significance

Improving customer service

- Making business information available is one of the important ways to serve customer. It allows customer to browse the database that show the detail information of products that are available

- The customer will get the latest products information interactively. On the other hand, the system developed is to provide comfortable and easy shopping environment to its customer

Market Expansion

- To create a 24 hours service, web pages serve the client, customer 24 hours a day without overtime work for the staff. It is intends to create company awareness and enhance company image with a client and interactive media such as Internet.
- Enable customer to shopping at home and do less traveling for shopping
- Allows some merchandise to be sold at a lower price benefiting the customer
- Analyze of Customer behavior
- With the web base application, the profiles of the customer and sales order are stored in the database for each transaction. Following the customer product preference, buying behavior can be obtained. The result will help on catering customers' need and making the marketing decision.

1.4 Project Scope

The scope of this project is divided to four module which will be describe in the figures at below:

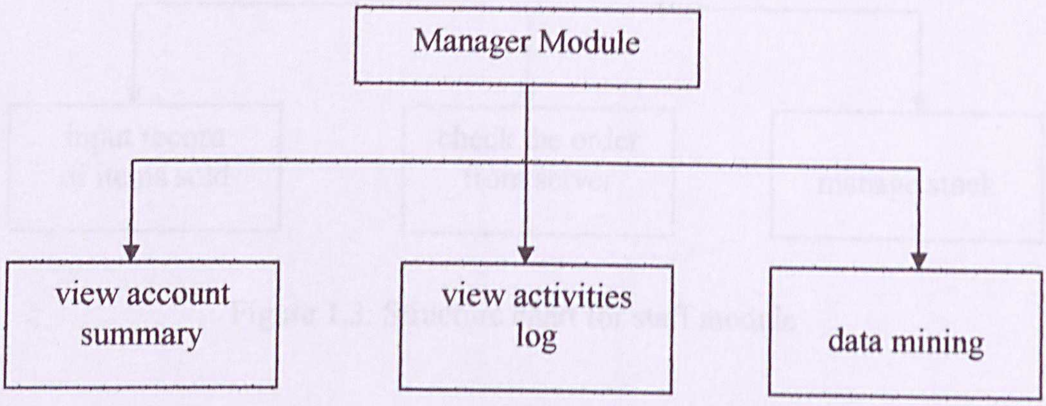


Figure 1.1: Structure chart for manager module

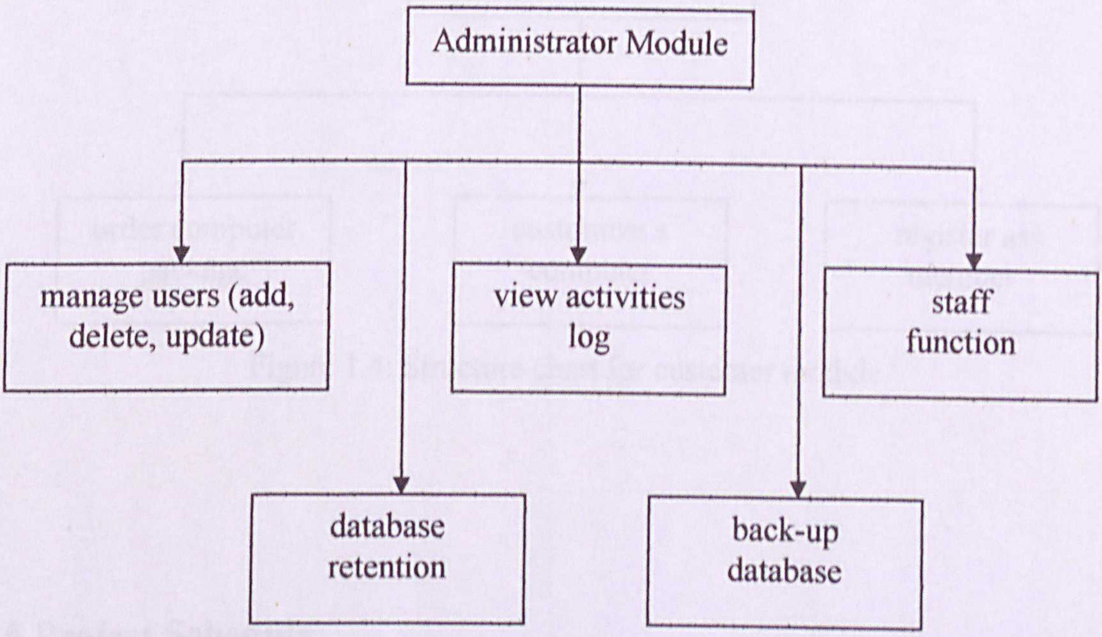


Figure 1.2: Structure chart for administrator module

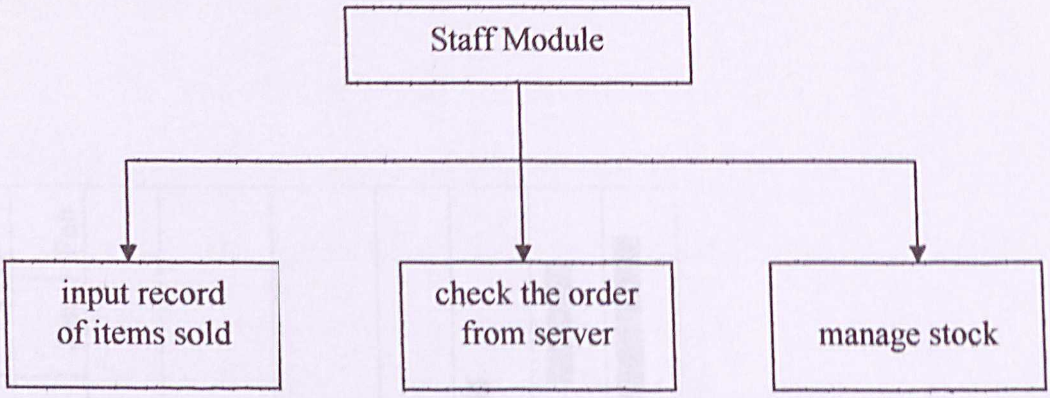


Figure 1.3: Structure chart for staff module

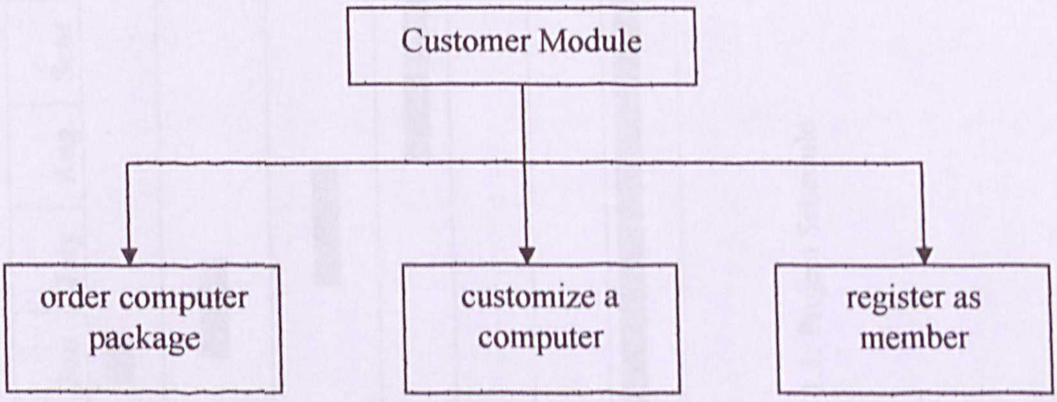


Figure 1.4: Structure chart for customer module

1.5 Project Schedule

A project schedule that consist of the whole development activities is carefully planned out to achieve a systematic progress and ensure on-time delivery of the system. It is important to have a project schedule as it acts as a time management and control to the developer making sure he is in route of the direction of the project.

No	Task	Start Date	Finish Date	Duration	2002							2003	
					Jun	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
1	Preliminary investigation	15/6/02	24/6/02	10 Days	■								
2	Problems and Objectives analysis	18/6/02	15/7/02	28 Days	■	■							
3	System requirement analysis	9/7/02	5/8/02	28 Days		■	■						
4	Decision analysis	6/8/02	30/9/02	56 Days			■	■					
5	System design	1/10/02	31/12/02	92 Days					■	■	■		
6	Construction	1/1/03	1/2/03	42 Days								■	■
7	System implementation	18/6/02	11/2/03	239 Days	■	■	■	■	■	■	■	■	■

Table 1.1: Project Schedule

1.6 Project Limitations

Below are some of the limitations of the system:

i) The limitation of this project are shown as below:

ii) This project only support single communication language which is English

iii) There is no currency conversion service in this project

iv) There is no linking to the web site that are related to the product in this project

v) Here only provides one type of layout in the template for maintain the main body of the web page

vi) SQL server and web server will perform into a same computer

vii) This site did not provide credit card payment or any other on line payment, this site only receive order form from customer and the payment will be settle after their computers have been delivered.

1.7 Expected Outcomes

This project focuses on developing a system that can be used in several branches of computer store. At the end of the project, the system is expected to have following outcomes:

i) Implementation of a password protected system for authorized users to access it

ii) Automate most of the business routine in computer stores such as generate account summary, activities summary and ordering details

iii) Simplify records searching task, short response time

iv) Perform all the calculation work without error

v) Almost real time update for the stocks in the computer store

Chapter 2 Literature Review

2.1 Introduction

2.1.1 What Is Data Management System?

A database management system (DBMS), sometimes just called a database manager is a program that lets one or more computer users create and access data in a database.

The DBMS manages user requests (and requests from other programs) so that users and other programs are free from having to understand where the data is physically located on storage media and, in a multi-user system, who else may also be accessing the data. In handling user requests, the DBMS ensures the integrity of the data (that is, making sure it continues to be accessible and is consistently organized as intended) and security (making sure only those with access privileges can access the data).

The most typical DBMS is a relational database management system (RDBMS). A standard user and program interface is the Structured Query Language (SQL). A newer kind of DBMS is the object-oriented database management system (ODBMS). A DBMS can be thought of as a file manager that manages data in databases rather than files in file systems.

2.1.2 What Is Data Mining?

Data Mining is the process of extracting knowledge hidden from large volumes of raw data. Human analysts with no special tools can no longer make sense of enormous volumes of data that require processing in order to make informed business decisions.

Data mining automates the process of finding relationships and patterns in raw data and delivers results that can be either utilized in an automated decision support system or assessed by a human analyst.

Modeling the investigated system, discovering relations that connect variables in a database are the subjects of data mining. Modern computer data mining systems self learn from the previous history of the investigated system, formulating and testing hypotheses about the rules, which this system obeys.

When concise and valuable knowledge about the system of interest had been discovered, it can and should be incorporated into some decision support system, which helps the manager to make wise and informed business decisions.

Some reasons for the growing popularity of Data Mining are:

- ❑ Growing Data Volume

The main reason for necessity of automated computer systems for intelligent data analysis is the enormous volume of data that require processing. It becomes impossible for human analysts to cope with such overwhelming amounts of data.

□ Limitations of Human Analysis

Two other problems that surface when human analysts process data are the inadequacy of the human brain when searching for complex multi factor dependencies in data, and the lack of objectiveness in such an analysis.

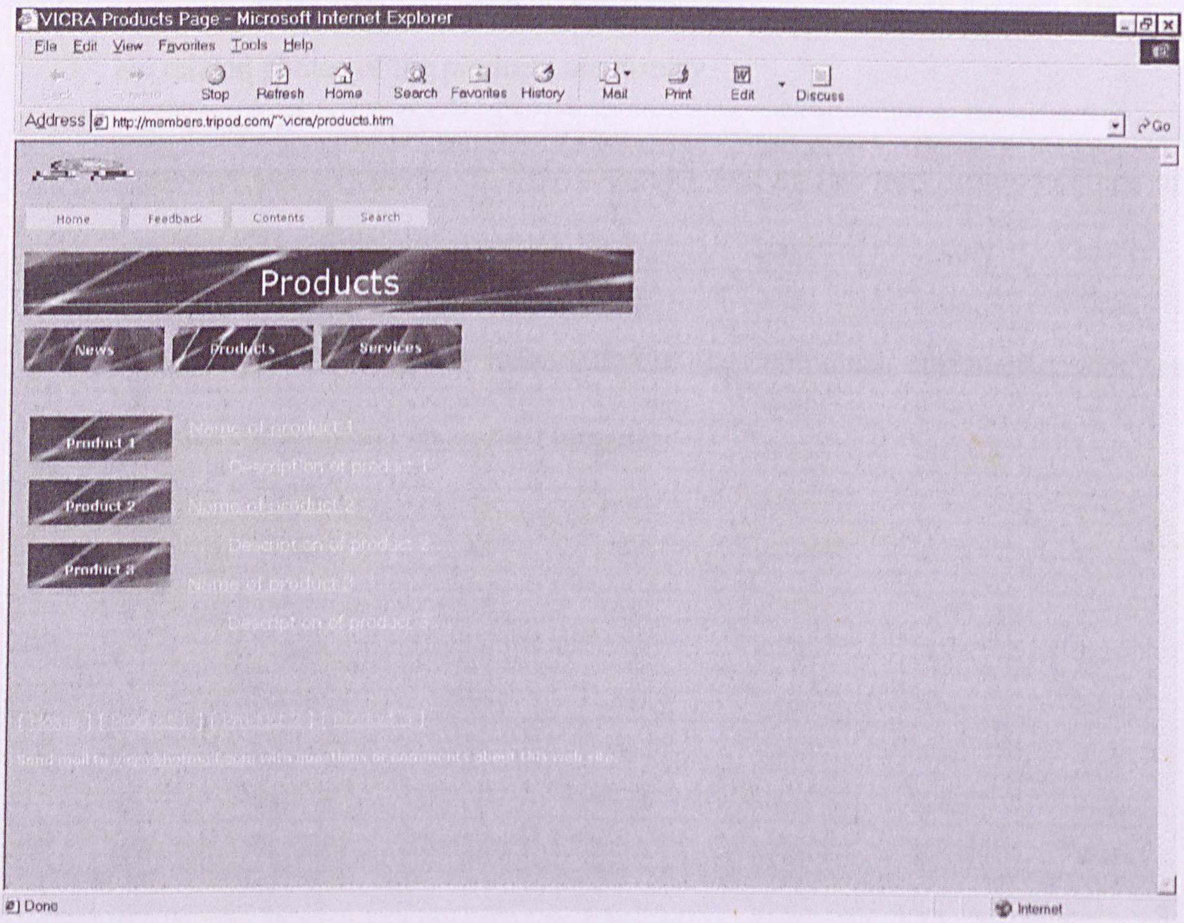
□ Low Cost of Machine Learning

One additional benefit of using automated data mining systems is that this process has a much lower cost than hiring an army of highly trained professional statisticians.

2.2 Existing System Comparison

Research had been conducted through some of the online computer store web site that is currently available on the Internet. Many sites have been visited and analyzed to get a better view and understanding of how online sales web site are currently implement. Besides that, the advantages and disadvantages of those web sites are compared as well. Listed below are some of the web sites that had been visited:

i) **http://members.tripod.com/~vicra/products.htm**



Send mail to vicra@hotmail.com with questions or comments about this web site.

Figure 2.1: VICRA Products Page

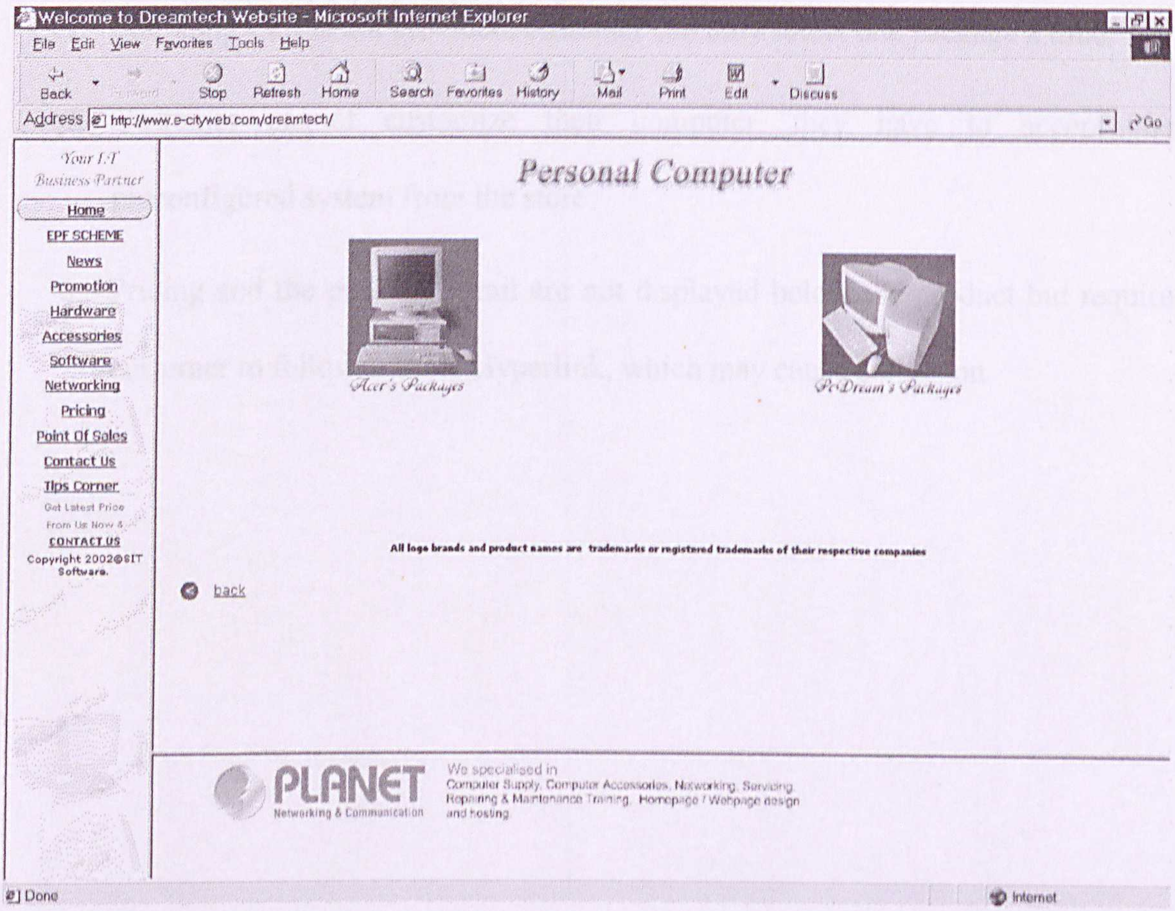
Company Info

Postal address	3A, Jalan Perdana 3/3, Puchong Perdana, 47100 Selangor, Malaysia.
Telephone	603-5717525, 603-7939121
Email	vicra@usa.net

Weakness:

1. Poor graphic design, this site fail to attract customer's interest to buy computer from the store.
2. Customers cannot order their computer from the web site.
3. No related photos of the products are display.
4. Customer cannot customize their computer and he has very limited choice of purchasing the computer.
5. This site provide very few information of the computers, customer cannot get sufficient information about the computer.

ii) http://www.e-cityweb.com/dreamtech/



Get Latest Price From Us Now & CONTACT US

Copyright 2002@SIT Software.

Personal Computer

All logo brands and product names are trademarks or registered trademarks of their respective companies

We specialised in Computer Supply, Computer Accessories, Networking, Servicing Repairing & Maintenance Training, Homepage / Webpage design and hosting

Figure 2.2: Dreamtech Webpage

Company Info

Postal address	Address 6A, Jalan Melaka Raya 15, Taman Melaka Raya, 75000 Melaka, Malaysia.
Telephone	606-2839602
Email	dreamtech@pd.jaring.my

Strength:

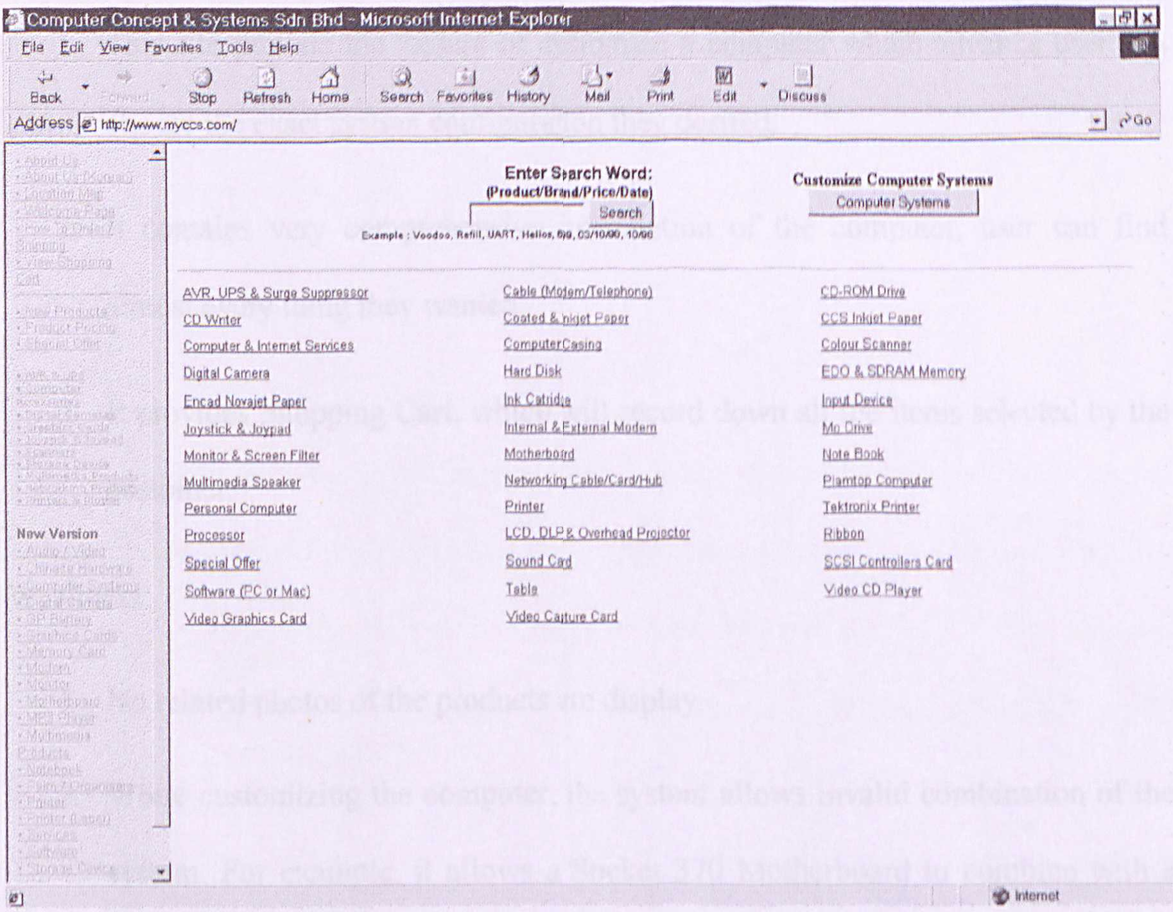
1. This system is very informative and do not cloud by Hyperlinks.

2. Nice graphic design, it provides related photos of the products.

Weakness:

1. Shopping Cart is not provided, customer can only select one package a time.
2. Customer cannot customize their computer, they have to accept the preconfigured system from the store.
3. Pricing and the package detail are not displayed below the product but require customer to follow another Hyperlink, which may cause confusion.

iii) http://www.myccs.com/



Computer Concept & Systems Sdn Bhd - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss
Address http://www.myccs.com/
Go
Internet

- About Us
- About Us (Korean)
- Location Map
- Welcome Page
- How To Order / Shipping
- View Shopping Cart
- New Products
- Product Pricing
- Special Offer
- AVR & UPS
- Computer Accessories
- Digital Cameras
- Graphics Cards
- Joystick & Joypad
- Scanners
- Storage Device
- Multimedia Products
- Networking Products
- Printers & Plotter

New Version

- Audio / Video
- Chinese Hardware
- Computer Systems
- Digital Camera
- GP Battery
- Graphics Cards
- Memory Card
- Modem
- Monitor
- Motherboard
- MP3 Player
- Multimedia Products
- Notebook
- Palm / Organizers
- Printer
- Printer (Laser)
- Services
- Software
- Storage Device

Enter Search Word:
(Product/Brand/Price/Date)
Search
Example : Voodoo, Refill, UART, Helios, 6/9, 03/10/00, 10/00

Customize Computer Systems
Computer Systems

AVR, UPS & Surge Suppressor
CD Writer
Computer & Internet Services
Digital Camera
Encad Novajet Paper
Joystick & Joypad
Monitor & Screen Filter
Multimedia Speaker
Personal Computer
Processor
Special Offer
Software (PC or Mac)
Video Graphics Card

Cable (Modem/Telephone)
Coated & Inkjet Paper
ComputerCasing
Hard Disk
Ink Catridge
Internal & External Modem
Motherboard
Networking Cable/Card/Hub
Printer
LCD, DLP & Overhead Projector
Sound Card
Table
Video Capture Card

CD-ROM Drive
CCS Inkjet Paper
Colour Scanner
EDO & SDRAM Memory
Input Device
Mo Drive
Note Book
Plamtop Computer
Tektronix Printer
Ribbon
SCSI Controllers Card
Video CD Player

Figure 2.3: Computer Concept & Systems Sdn Bhd

Company Info

Name	COMPUTER CONCEPT & SYSTEMS SDN. BHD.
Postal address	2-5-5 Habour Trade Center, Gat Lebuh Macallum, 10300 Penang, Malaysia.
Telephone	604-2692341
Email	sales@myccs.com

Strength:

1. This site provide the feature of customize a computer which advance user can choose the exact system configuration they desired.
2. It contains very comprehensive information of the computer, user can find almost every thing they wanted.
3. It provides Shopping Cart, which will record down all the items selected by the customer.

Weakness:

1. No related photos of the products are display.
2. While customizing the computer, the system allows invalid combination of the system. For example, it allows a Socket 370 Motherboard to combine with a Intel Pentium 4 1.7GB Processor which is obviously wrong.
3. This system provides too many Hyperlinks on the left frame, which may cause the customer lost they way on the site.
4. This system did not register the customer, they need to fill in their details every time they want to purchase a computer.

2.3 Web Architecture Review

Application architecture can be described in term or 'tiers'. Tiers are the logical partitioning of an application across clients and servers. For this project three-tier architecture is selected. Following is a brief description of the tiers architecture.

2.3.1 Two-Tier Architecture

Two tier software architecture were developed in the 1980s from the file server software architecture design. The two tier architecture is intended to improve usability by supporting a form based, user-friendly interface. The two tier architecture improve scalability by accommodating up to 100 users (file server architecture only accommodate a dozen users) and improve flexibility by allowing data to be shared, usually within a homogeneous environment. Two tier architecture requires minimal operator intervention and is frequently used in non-complex, non-time critical information processing systems.

The two tier design allocates the user system interface exclusively to the client. It place database management the server and splits the processing management between client and server, creating two layers.

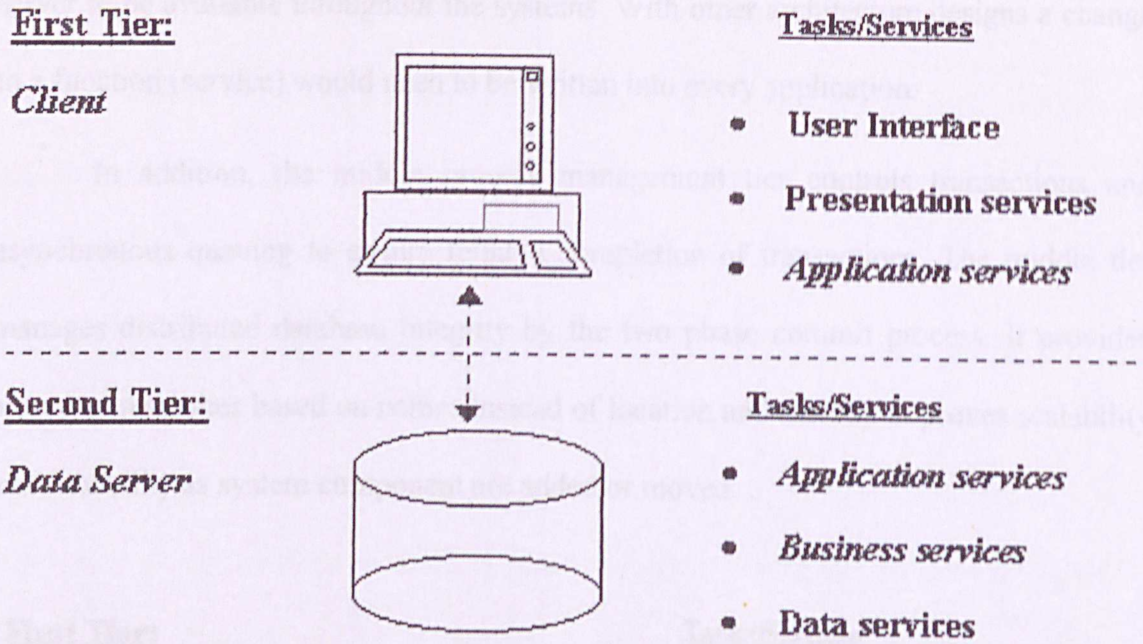


Figure 2.4: Two Tier Architecture

2.3.2 Three Tier Architecture

The three tier software architecture emerged in 19990s to overcome the limitation of the two tier architecture. The three tier (middle tier server) is between the user interface (client) and the data management (server) components. The middle tier provides process management service (such as process enactment, process monitoring and process resourcing) that are shared by multiple application.

The middle tier server (also referred as the application server) improve performance, flexibility, maintainability, reusability and scalability by centralizing process logic. Centralized process logic make administration easier by locating system functionality so that changes must only be written once and place on the middle tier server to be available throughout the systems. With other architecture designs a change to a function (service) would need to be written into every application.

In addition, the middle process management tier controls transactions and asynchronous queuing to ensure reliable completion of transactions. The middle tier manages distributed database integrity by the two phase commit process. It provides access to resources based on names instead of location and thereby improves scalability and flexibility as system component are added or moved.

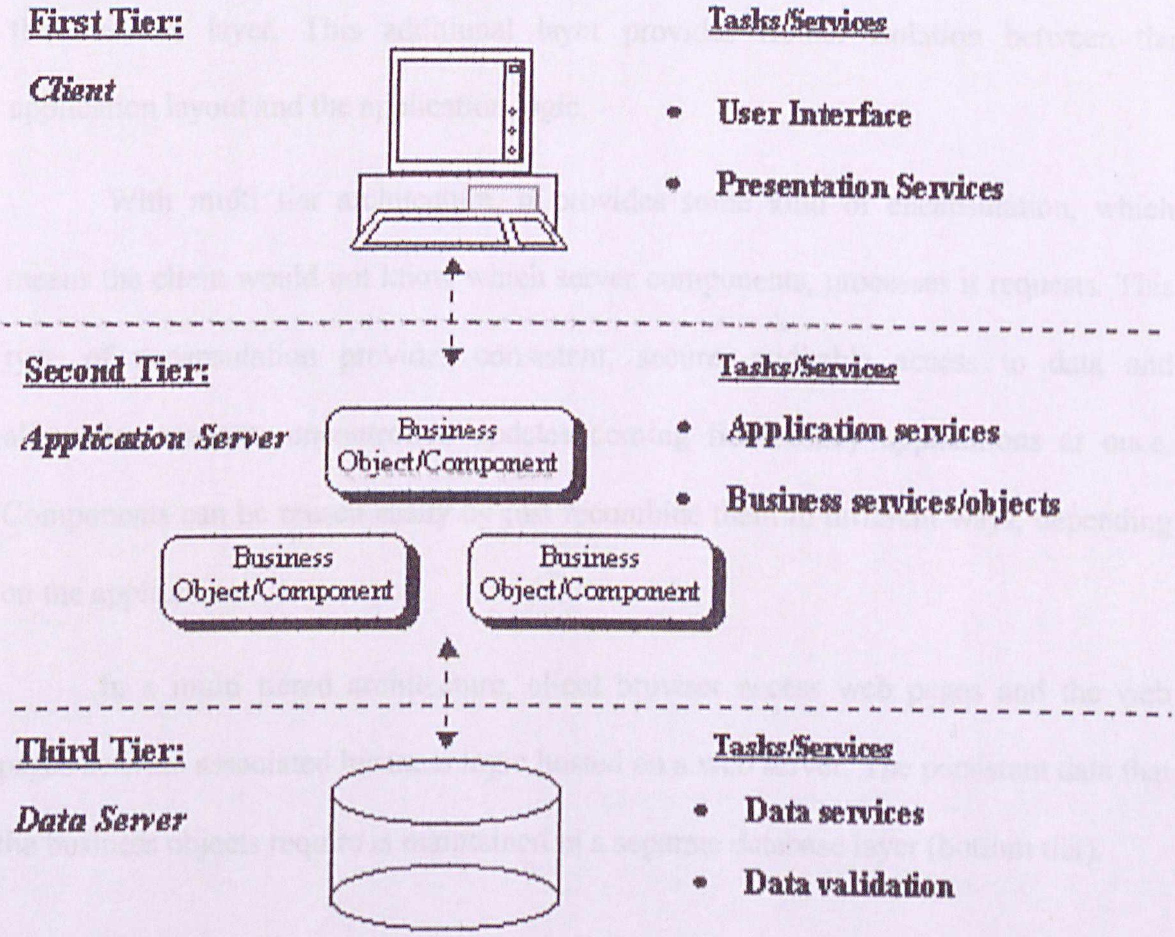


Figure 2.5: Three Tier Architecture

2.3.3 Multi Tier (N Tier) Architecture

Sometimes, the middle tier is divided in two or more unit or components with different functions, in these cases the architecture is often referred as multi tier or n tier. This is the case, for example, of some Internet applications. These applications typically have light clients written in HTML and application servers written in C++ or Java, the gap between these two layers is too big to link them together. Instead, there is an intermediate layer (web server) implemented in a scripting language. This layer receives requests from the Internet clients and generates HTML using the services provided by the business layer. This additional layer provides further isolation between the application layout and the application logic.

With multi tier architecture, it provides some kind of encapsulation, which means the client would not know which server components, processes it requests. This type of encapsulation provides consistent, secure, auditable access to data and eliminates random, uncontrolled updates coming from many applications at once. Components can be reused easily by just recombine them in different ways, depending on the application.

In a multi tiered architecture, client browser access web pages and the web pages activate associated business logic hosted on a web server. The persistent data that the business objects require is maintained in a separate database layer (bottom tier).

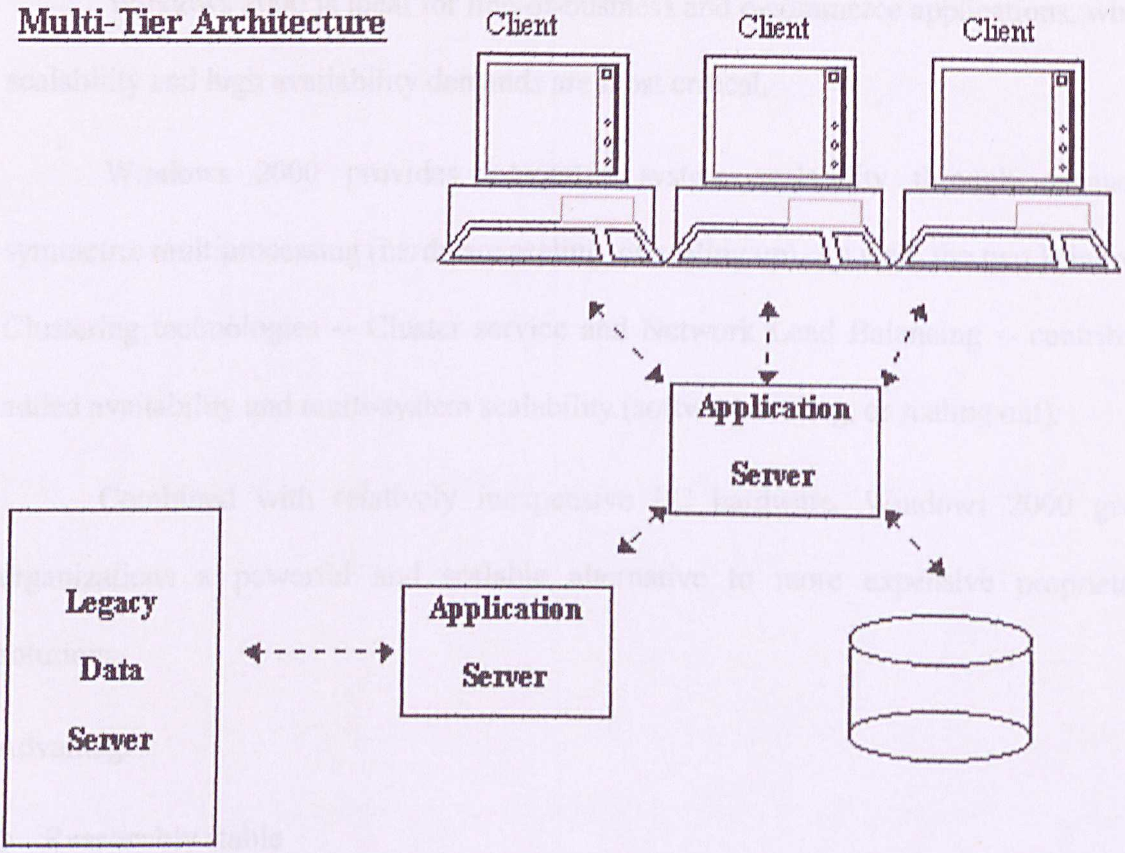


Figure 2.6: Multi Tier Architecture

2.4 Development Tools Review

2.4.1 Platform

2.4.1.1 Windows 2000

Windows 2000 is a fully 32-bit, preemptively multitasking OS that runs on Intel 80x86 and Alpha-based systems. Previously, it ran on several different architectures, including MIPS and PowerPC. Windows 2000 was designed with stability in mind, with concern for performance.

Windows 2000 is ideal for line-of-business and e-commerce applications, where scalability and high availability demands are most critical.

Windows 2000 provides integrated system scalability through enhanced symmetric multiprocessing (hardware scaling, or scaling up). As well, the two Windows Clustering technologies -- Cluster service and Network Load Balancing -- contribute added availability and multi-system scalability (software scaling, or scaling out).

Combined with relatively inexpensive PC hardware, Windows 2000 gives organizations a powerful and scalable alternative to more expensive proprietary solutions.

Advantages:

- □ Reasonably stable
- □ Implements basic security
- □ Easy to use for beginner

Disadvantages:

- □ Poor command-line

2.4.1.2 Linux

Linux is an operating system that was initially created as a hobby by a young student, Linus Torvalds, at the University of Helsinki in Finland. Linus had an interest in Minix, a small UNIX system, and decided to develop a system that exceeded the Minix standards. He began his work in 1991 when he released version 0.02 and worked steadily until 1994 when version 1.0 of the Linux Kernel was released. The current full-featured version is 2.4 (released January 2001) and development continues.

Linux is developed under the GNU General Public License and its source code is freely available to everyone. This however, doesn't mean that Linux and its assorted distributions are free -- companies and developers may charge money for it as long as the source code remains available. Linux may be used for a wide variety of purposes including networking, software development, and as an end-user platform. Linux is often considered an excellent, low-cost alternative to other more expensive operating systems.

Due to the very nature of Linux's functionality and availability, it has become quite popular worldwide and a vast number of software programmers have taken Linux's source code and adapted it to meet their individual needs. At this time, there are dozens of ongoing projects for porting Linux to various hardware configurations and purposes.

Advantages:

- □ Fast
- □ Stable
- □ Very powerful command-line
- □ Flexible and easy to troubleshoot
- □ Cross-Platform, nonproprietary

Disadvantages:

- □ Steep learning curve

2.4.1.3 Unix

Unix is a family of operating systems made by several different vendors. All members of the Unix family share certain traits, and porting software between the different Unixes is usually fairly simple.

The Unix family is subdivided into 2 major families, each representing a different development path. The BSD family has its origin in the academic roots of Unix, having descended from source that AT&T made available to Universities during Unix's formative years. The SysV family is the other main branch of Unix, descended from the Unix that remained under AT&T's control for a longer period of time.

The X Window system is the GUI that is on most Unix systems today. X has the benefit of being extremely configurable, and can look and act like almost anything, due to the magic of window managers. Additionally, it has network transparency, allowing programs running on one system to have their interface running elsewhere, connected by a network pipe. The downside of X is that it is extremely configurable (i.e. lacks a standard look to train for), can be clumsy, and has a complex API.

Advantages:

- ❑ Fast
- ❑ Stable
- ❑ Very powerful command-line
- ❑ Well-documented and non-monolithic

Disadvantages:

- ❑ Unix often have a terrible default configuration, with poor default security and a terrible interface
- ❑ Steep learning curve

2.4.2 Web Server

2.4.2.1 Apache and Tomcat

Apache lends itself particularly well to projects that are heavily Java based. It offers superior handling of the Java Database Connectivity (JDBC) application program interface (a program which allows Java-based services to access information stored in SQL-compliant databases).

Apache, like Linux, is a piece of open-source software. It's maintained by a group of programmers who create the software for the thrill of it - not for any expected financial gain. Apache was born in early 1995, as free Web server software, which was the most popular Web server of the day, and a bunch of software patches. From that it earned it's moniker, which stands for "A PAtCHY server." Since then, it has been completely re-written, and has become the most popular WWW server on the Internet.

Tomcat is the servlet container that is used for the Java Servlet and JavaServer Pages technologies). Tomcat is developed in an open and participatory environment and released under the Apache Software License.

Tomcat has been developed from the ground up for flexibility and performance. Version 4.0 implements the final released versions of the Servlet 2.3 and JSP 1.2

specifications. As required by the specifications, Tomcat 4.0 also supports web applications built for the Servlet 2.2 and JSP 1.1 specifications with no changes. Please refer appendix on page 83 to see how Apache & Tomcat interoperate.

Advantages:

□ Open source updates. It’s constantly being updated and user can add functionality as it becomes available.

□ Free. The software is free. It's hard to beat that price.

□ Multi-platform support. Apache can be used on systems that have 80x86-series (i.e. Intel) processors running either Linux or Microsoft Windows as an OS, or on other computers running a Unix-type OS on a different processor.

□ Popular. Apache is the most-used Web server software package in the world. As such, it's unlikely that further development of the software will ever cease.

Disadvantages:

□ There are third-party companies that provide Apache support but users have to pay for it.

2.4.2.2 Microsoft Internet Information Server (IIS)

Essentially, IIS is the server software of choice if we want to run an ASP-based site. IIS is Microsoft's main business offering in the Web server software market. Billed as more of an extension of the operating system, it is included on the Windows 2000.

As a Windows-based application, it offers the same ease of use as many other Windows applications, including "Wizards" that assist with setup and maintenance of the software. It should be easy for anyone familiar with the Windows 2000.

IIS really shines when it comes to the handling of Active Server Pages (ASPs), pages that are generated by the Web server software using Active X scripting - usually Visual Basic Script or JavaScript code. IIS offers superior ASP-based interface to ODBC sources like Access and SQL-Server.

Advantages:

- □ Microsoft product. Since IIS is a Microsoft product, it not only has the same heavy backing as other Microsoft products, but is integrated seamlessly into the OS itself. This means we can do things like drag and drop files into the software for instant availability on the Web with a minimum of hassle.
- □ Comes free with Windows 2000. If we do decide that Windows 2000 is the best OS to use, IIS is included in the box.
- □ Crash protection. If one application running on the server crashes, the Web server and other applications continue to run, and the failed application restarts the next time a user requests it.

Disadvantages:

- □ Limited to Windows 2000-based systems. IIS is not available for use on non-Windows 2000 systems.
- □ Closed source. As with Windows 2000, the source code to IIS is

□ Microsoft's proprietary information - we can't get access to it to make changes. This also means that there aren't many third-party developers working on improving the core software.

2.4.3 Scripting Languages

2.4.3.1 PHP

PHP - http://www.php.net/ starting as a simple scripting language for adding basic dynamic content to websites, it has grown into a major project. PHP is free for download and works very well on all of the Unix-like, Linux and Windows platforms.

Since PHP pages work well on all of those platforms, a particular strength is that it can be used to develop websites on a desktop system and then deployed on industrial-strength and secure servers such as those found commonly only running Unix or Linux.

Since none of Apache, MySQL or PHP requires any form of commercial license and all are battle-prove on high volume websites, these are very attractive options for those who come from the world of highly priced proprietary packages.

PHP has a thriving developer community, numerous contributors, a wide range of features (extensible through plug-ins) and is used in thousands of websites around the world. The range of back-end databases supported by PHP meets all but the most unusual need.

PHP has proved itself easy to learn and tends to be particularly popular with those who have to deliver results rapidly and who aren't necessarily committed to taking advanced courses in programming and languages.

The world-leading Apache web server is usually shipped with a built-in interpreter for PHP (a module called mod_php) .

The PHP drawbacks that we have found are predominantly in its weak abstraction for databases (each database back-end is accessed through a different interface), underdeveloped library mechanism (lacking Perl's true "module" concept) and occasional linguistic quirks.

Its benefits are its ease of deployment, ease of use and huge body of support in the industry.

2.4.3.2 Perl

Perl - http://www.perl.org/ has quietly and without much hype, provided a better case study of extensible and reusable software design than almost anything that has gone before it. It is very hard to find a computer system that hasn't some form of support for Perl available.

The database-independent library for Perl (DBI) is simply one example; programs which take advantage of this are largely independent of the underlying database engine; which is hidden by database-specific drivers all working transparently throught the DBI interface.

The Perl interperter for Apache (mod_perl) was one of the first plugins for Apache to become widely used.

Whilst it is hard to find bad things to say about Perl, it probably presents a more daunting challenge for non-programmers who want to complete simple tasks with active websites, requiring rather more learning before starting than say ASP or PHP.

It is, however, likely to be one of the best choices in the long run, especially where a considerable volume of software development and site maintenance is required, i.e. for large, complex sites subject to many and radical changes.

2.4.3.3 ASP/VBscript

ASP - http://www.microsoft.com/ (Active Server Pages) is a proprietary product from Microsoft. Although ASP is really a framework into which various languages can plug, most people consider it implies using VB Script language (JavaScript can also be used out-of-the-box).

It is only properly supported on Microsoft's IIS platform thus ruling it out of contention for serious commercial users who care about security and reliability (IIS is, in most expert opinion, not fit for use outside an Intranet).

VB Script is a version of Visual Basic (without the visuals) and with features tailored to make it suitable for use for building websites on Microsoft platforms. Since ASP and VB Script are closed-source, any bugs or security advisories that are discovered linger at the whim of the Microsoft until they are fixed.

Because it uses ActiveX controls for its components, ASP technology is basically restricted to Microsoft Windows-based platforms. Offered primarily as a feature of Microsoft IIS, ASP technology does not work easily on a broader range of Web servers because ActiveX objects are platform specific.

VB Script uses Active Data Objects and (typically) the ODBC interface to provide good database independence. It is an adequate programming language, but is liked even less than PHP. Simple websites are easy to build and there is a range of supporting tools to help beginners. Unfortunately, since it isn't really cross-platform.

2.4.3.4 ASP.NET

ASP.NET - http://www.microsoft.com/ (formerly referred to as ASP+) is more than the next version of Active Server Pages (ASP); it is a unified Web development platform that provides the services necessary for developers to build enterprise-class Web applications. While ASP.NET is largely syntax-compatible with ASP, it also provides a new programming model and infrastructure that enables a powerful new class of applications. Existing ASP applications can be augment by incrementally adding ASP.NET functionality to them.

ASP.NET is a compiled .NET Framework-based environment; we can author applications in any .NET Framework compatible language, including Visual Basic, C#, and JScript. Additionally, the entire .NET Framework platform is available to any ASP.NET application. Benefits of the .NET Framework include a fully managed, protected, and feature-rich application execution environment, simplified development and deployment, and seamless integration with a wide variety of languages.

2.4.3.5 Java Server Pages (JSP)

Java Server Pages (JSP)- http://www.sun.com/ technology provides an easy and powerful way to build web pages with dynamically-generated content. JSP technology is created using HTML-like tags and scriptlets written in Java. Standard HTML or XML commands handle formatting and design.

Java Server Pages (JSP) and Microsoft Active Server Pages (ASP) technologies have many similarities. Both are designed to create interactive pages as part of a Web-based application. To a degree, both enable developers to separate programming logic from page design through the use of components that are called from the page itself. And both provide an alternative to creating CGI scripts that makes page development and deployment easier and faster.

In many ways, the biggest difference between JSP and ASP technologies lies in the approach to the software design itself. JSP technology is designed to be both platform and server independent, created with input from a broader community of tool, server, and database vendors. In contrast, ASP is a Microsoft technology that relies primarily on Microsoft technologies.

JSP technology adheres to the "Write Once, Run Anywhere" philosophy of the Java architecture. Instead of being tied to a single platform or vendor, JSP technology can run on any Web server and is supported by a wide variety of tools from multiple vendors.

JSP it helps protect against system crashes, while ASP applications on Windows 2000 systems are susceptible to crashing.

The JSP application programming interface (API) has undoubtedly benefited - and will continue to benefit - from the input of this extended community. In contrast, ASP technology is a specifically Microsoft initiative, developed in a proprietary process.

2.4.4 Databases Server

2.4.4.1 Microsoft Access 2002

Microsoft Access 2002 offers a set of tools rich enough for the most database developer, yet accessible enough for first-time users.

Access 2002 provides the tools to build solutions that integrate and leverage Internet standards to better allow for the sharing and presentation of data across the Internet and intranet.

One of the key goals of Access 2002 is to provide an integrated application environment, which enables users to perform query and analysis of enterprise data sources from the familiar, easy-to-use Office interface.

However, Access 2002 performs poorly while come to the large database. It is useful for some prototyping work, but not seriously used for web deployment. The main benefit of Access is that it makes it very easy for people to create easy to use simple databases, without really having to know anything about databases.

2.4.4.2 Microsoft SQL Server 2000

Microsoft SQL Server is based on code licensed from Sybase. It comes with a reasonable set of UI tools for manipulating it.

SQL Server 2000 use Extensible Markup Language (XML) to exchange data between loosely coupled systems. Access data easily and securely from a browser, through firewalls, and perform fast full-text searches of formatted documents.

SQL Server has been developed specifically to take advantage of the best features Microsoft Windows 2000 has to offer. It is optimized for the multithreaded, preemptive multiprocessing kernel of Windows 2000. The many features and options in SQL Server are geared toward multiple users who need concurrent access to high volumes of data.

SQL Server uses its own databases to manage the user databases, which means that the same tools and techniques can be used to manage SQL Server as well as all the databases on the system.

However, SQL Server is portable only to the platforms supported by Windows 2000.

2.4.4.3 MySQL

MySQL is a DataBase Management System (DBMS) designed for use on small to large sized Web sites. MySQL is one of the most popular open source multi-user rational database servers in the world.

MySQL is an implementation of the SQL language developed by TcX. It is robust, quick, and very flexible. It provides all of the standard SQL datatypes and commands. MySQL is provided as part of the web site account at no additional charge. MySQL can be run on most of the platforms such as, Linux, AIX, SunOS, and Windows.

It is used for over two million websites, data-warehouses, and business applications examples are Yahoo! Finance, MP3.com, Motorola, NASA, Silicon Graphics, and Texas Instruments

MySQL is developed by David Axmark, Allan Larsson and Michael "Monty" Widenius Their goal is to make a superior DBMS available and affordable for all.

2.4.4.4 Oracle

Oracle is a multi-user database management system - A software package specializing in managing a single, shared set of information among many concurrent users. Oracle is one of many database servers that can be plugged into a client/server equation. Oracle works to efficiently manage its resource, a database of information, among the multiple clients requesting and sending data in the network.

Oracle has many important features that make it not only an exceptional database management system, but also an excellent database server choice for client/server computing. Oracle supports all major operating systems for both clients and servers, including MSDOS, NetWare, UnixWare, OS/2 and most Unix flavors.

Oracle networking software, SQL*Net, also supports all major network communication protocols, including TCP/IP, SPX/IPX, Named Pipes and DEC-Net. Therefore, Oracle can be the link, which joins the many data stores and networks throughout the heterogeneous computing systems prevalent in most corporations.

2.4.5 Database connectors

2.4.5.1 Java Database Connectivity (JDBC)

JDBC is the Sun Database Application Programmer Interface, a library of components and classes developed by Sun to access remote data sources. The components are collected in the java.sql package and represent a generic, low-level SQL database access framework.

The JDBC API defines Java classes to represent database connections, SQL statements, result sets, database metadata, etc. It allows a Java programmer to issue SQL statements and process the results. JDBC is the primary API for database access in Java. The JDBC API is implemented via a driver manager that can support multiple drivers connecting to different databases.

2.4.5.2 Open Database connectivity (ODBC)

ODBC is a Microsoft standard for connecting to databases. All major database vendors provide ODBC libraries on Windows 2000. Some provide ODBC drivers for the Mac. On Linux there are ODBC drivers for Oracle and Sybase, connecting to other databases is more problematic.

Probably the most common solution is a proxy driver (available from a third party). It takes database requests on the Linux box and sends them to the other half of the code on the Windows 2000 machine, where they are then translated into native ODBC calls on that machine.

2.4.5.3 Perl-based

Over time people have written several database-specific drivers for Perl, however the most common interface is through the DBI API. This is a database-neutral API (like ODBC, but simpler and more SQL oriented) that allows vendor-specific extensions. There are drivers for everything from comma-separated text files (handy for testing things out) to all the major vendors. The only vendor missing from the equation is Microsoft. Fortunately we can usually use Sybase-based drivers to access MS SQL, although we may not have access to the latest functionality. However if we want a 100% reliable solution we will probably want to use a commercial third-party driver. On Windows 2000, Perl can also use any ODBC database.

2.5 Synthesis

Throughout the process of literature study, information has been collected from various sources to different aspects of the system. Thorough study is performed which covered various part of the system to make sure the feasibility of the system in real world and the logic of its implementation.

Firstly, the project title and the areas covered were dissected whereby all the related field were defined to provide a picture of what the project is all about. Later, the features and concepts of the system were studied. Their advantages and weaknesses were analyzed, serve as the basic concept or how or what should be included in the system that is worked on. Solutions to the weaknesses were also identified, where additional features that are essential is added to make sure that the system will provides a complete and first class services that cater each and every need of its users.

Besides that, research has been conducted to gather information on available selection of hardware and software that most suits the development process of the system to make sure that the goal and objectives of the system can be meet.

This research is done on various types of operating system, database managers system, development tool, web server and others. Through the research, a decision is made on the combination of tool and platform, which can achieve the goal of cost efficiency and system reliability that were outlined earlier.

Although the platform and tool chosen for the system are rather new in the technology world but its popularity and support from major technology companies, programmers and academician proves its reliability and ability to offer the best and convenient development environment. The system will also benefits from its life span as the tools and platform are widely acceptable in the world and thus support the easy enhancement o the system features and also minimize the risk of being out thrown.

Chapter 3 Methodology

After analyzing the survey and findings from the literature review in the previous chapter, this chapter will specify the justification for the chosen methodology for the project.

The development methodology that I intend to use for the system is Waterfall Model. It offered a means of making the development process more visible.

3.1 Waterfall Model

Development Strategy

This model stated that stages are depicted cascading from one to another. One development stage will be complete before next begins. Thus, when all the requirements are elicited from analysis, the development team can go on to system design activities.

The waterfall model presents a very high level view of what goes on during development and it suggests to developers the sequence of events they should expect to encounter.

The waterfall model can be very useful in helping developers lay out what they need to do. Its simplicity makes it easy to explain to customer who are not familiar with software development; it makes explicit which intermediate product are necessarily in order to begin the next stage of development.

Linear cycle phases or waterfall model cycles are chosen to encounter top-down problem solving. Designer must first define the problem to be solved and then use and ordered set of steps to reach a resolution. The linear cycle gives the project direction and provides guidance on what should be done as the project proceeds. It is integrated with the management process through report on project status and keeping track of resource needs.

Benefits of waterfall methodology includes:

i) Structured – logical flow of system design

ii) Repeatable – Consistent throughout the organization

iii) Predictable – Allow estimation of output

iv) Involve user participation – Gathering user requirement

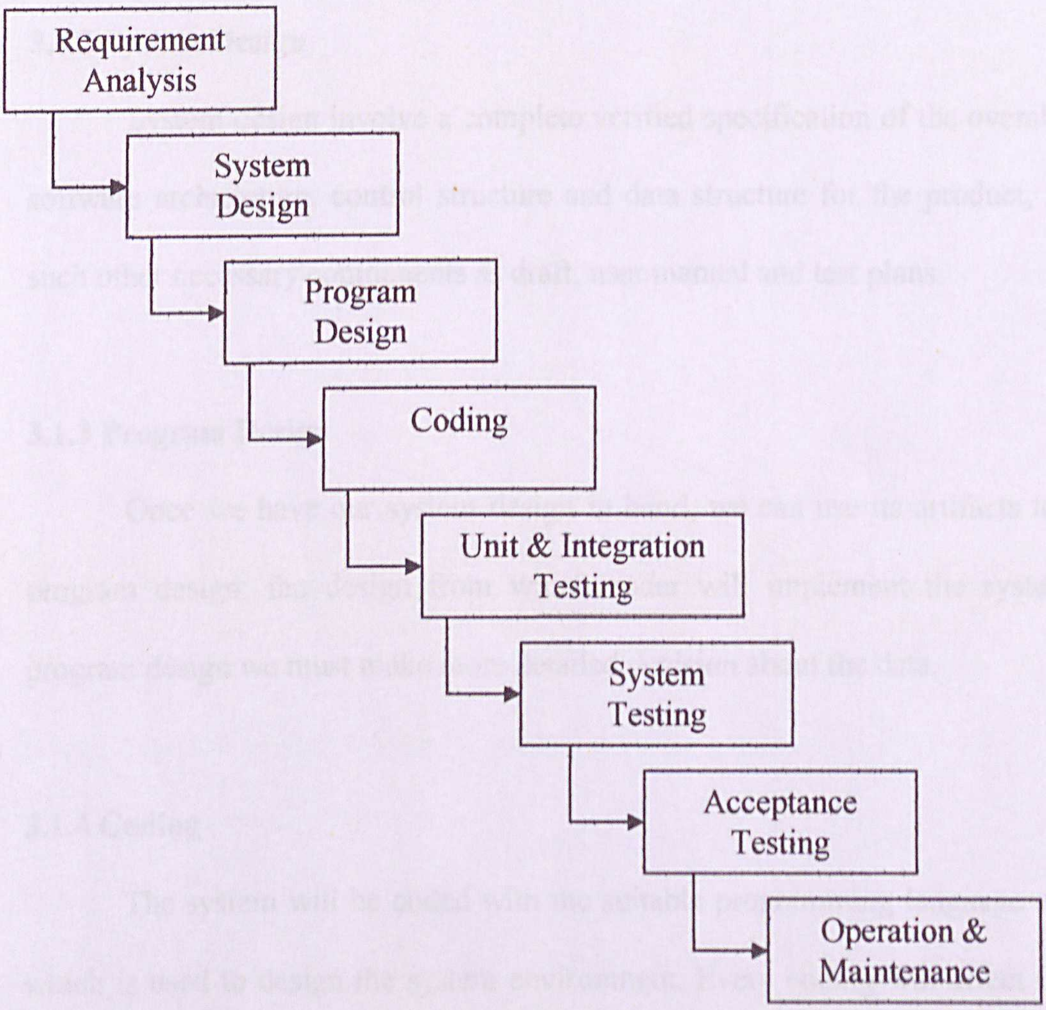


Figure 3.1: Waterfall Model

3.1.1 Requirements Analysis

The first process in the entire methodology process is requirement analysis. It mentions about verified specification of the required functions, interfaces and performance for the software product. For determine the requirement of the system, gathering information is important.

There are variety of technique can be used, this includes sampling and investigation hard data and observing decision maker behavior. However not all the techniques can be used on the same time, it depends on the situation.

3.1.2 System Design

System design involve a complete verified specification of the overall hardware software architecture, control structure and data structure for the product, along with such other necessary components as draft, user manual and test plans.

3.1.3 Program Design

Once we have our system design in hand, we can use its artifacts to build our program design: the design from which coder will implement the system. During program design we must make more detailed decision about the data.

3.1.4 Coding

The system will be coded with the suitable programming language of software, which is used to design the system environment. Every coding will affect the success, throughput and maintenance job, so this phase is very important. Therefore, suitable development tools should be chosen properly to enable system designed successfully.

3.1.5 Unit and integration testing

During this stage, the system modules are realized as a set of program units. Unit testing involves verifying that each unit testing involves verifying that each unit meets its specification. If the unit testing was fail, the system prototype is redefined again or the system and software design stage is reprocessed again.

3.1.6 System Testing

If unit testing is success, the individual program units or program which had been developed are integrated and tested as a complete system to ensure that the system requirement have been met. After testing, the software is available for the user.

3.1.7 Operational and maintenance

Normally (although not necessarily) this is the largest life cycle phase. The Online Sales Management System is installed and put into practical use. Maintenance involves correcting errors, which were not discovered in earlier stage of the life cycle, improving the implementation of system units and enhancing the system's services as now requirements are discovered.

3.2 Techniques of Information Gathering

Information gathering play an important part of this system development. System analysis is a process of finding out what a system does and what its needs are. The process involved understanding the requirements of the system that is going to be developed, collecting alternative solution and to solve the problem within the constraint & flexibility of the solution. The techniques involved are discussed below:

- **Surfing the internet**

  Nowadays, Internet is the largest knowledge and information repository in the world. Various information can be gathered from the internet such as overview the existing system, web programming language, etc by using web portals and search engines, such as Google, Amazon, Yahoo! and many more. This is the most popular way of retrieving information and provides with the more related information. The important context is to specify the keywords correctly and narrowed up each search results.

- **Research**

  This technique is used to find related books, journals, documents, etc about the basic knowledge of development tools, database design and system architectures. Besides that, study on the techniques that are available to built the proposed system can be done.

- **Document Room**

There are a lot of previous thesis from seniors stored in the document room of Faculty Computer Science and Information Technology (FSKTM). The sample documents provide the basic guideline & idea on how to generate a good report, by evaluating the strength, and weakness of their work.

Chapter 4 System Analysis

System analysis covers the area of function and non-functional requirement of the Online Sales Management System. Anyway, this phase needs proposed users as well as the outline and the technology to be used in the system development are defined. It is indeed an important feature of the system or a description of something that makes the system capable to proceed while fulfilling the system intention.

4.1 Functional Requirement

Functional requirement are statement of services the system should provide, how the system should react to particular inputs and how the system should behave in particular situation. In some cases, the functional requirement may also explicitly state what the system should not do.

4.1.1 Login Page

All users except the new customer must have authority for login into the system. New customer without login ID and password still can browse the product catalogue.

4.1.2 Manager Module

Once login successfully, manager can:

- ❑ View account summary according to the selected date range
- ❑ Data mining function which can expect future sales performance
- ❑ View the activity of the users performed to the system

4.1.3 Administrator Module

Once login successfully, administrator can:

- Add user, delete user and update user's info of the system
- View the activity of the users performed to the system
- Back-up database to avoid any disaster happen to the system
- Make database retention to handle growing size of the database
- Receive customer order from Internet
- Store records of the items sold
- Manage the records of the stocks

4.1.4 Staff Module

Once login successfully, administrator can:

- Receive customer order by Internet
- Store records of the items sold
- Manage the records of the stocks

4.1.5 Customer Module

There are two type of customer on this system, registered customer or new customer, below are functions of the module:

- New customers can register as member
- Only registered customers are allowed to do online ordering
- All customers can view product detail

- ❑ All customers can use the Shopping Cart. If new customer intended to order the product in the Shopping Cart, they are required to register.
- ❑ All customers can customize a computer and add it into the Shopping Cart

4.2 Non-functional Requirement

A non- functional requirement or constraint describes a restriction on the system that limits one choice for constructing a solution to the problem, below stated some of the non-functional requirement for the system.

a) Reliability

Reliability is extends which a system can be expected to perform its intended function with required precision and accuracy. Reliability is also responsible to convince the users that the system developed will make the correct respond and provide error-handling ability. Thus, the system should be reliable in performing it daily function and operation. For example, whenever a button is clicked, the system should be able to perform some functionality or generate some message to inform the user what is happening.

b) Usability

The system should be developed in such a way that is easy to use. It will enhance and support rather than limit or restrict the original process. Human interface need to be designed as intuitive and consistence as it could be with other modules in the environment and within themselves.

c) Consistency

The universal commands were designed to have the same function throughout all the modules. This strategy used to prevent the possible of the function confusing in system when shifting among different modules. It also enhances the simplicity of the system.

d) Security

The system should be equipped with sufficient security. Each access by the user should be authenticated and validated by the system. The system should not show any potential of leakage of information.

e) Manageability

The modules within the system should be easy to manage. This will make the maintenance and enhancement works simpler and not time consuming.

f) User Friendliness

The system is required to have a very friendly interface because most of the users are computer illiterate. The usage of suitable and meaningful captions and icons will help the user to consume the system with more confidence, easy and save time. An attractive and easily understand user interface is needed in a system. It should be a neutral design based on the level of all Internet users.

g) Fast response time

A reasonable interval time should be taken while retrieving the desires information such as computer profile, customer profile, related product and shopping cart. Users should not be keep waiting for a long time for the result.

4.3 System Development Tools Analysis

After several literature researches done in chapter 2, some system development tools have been selected based on their features and capacities. The remainder wrote-up describes the types or model chosen in term of platform, web server, database server, web application technology and programming language.

4.3.1 Platform

Microsoft Windows 2000 Professional is chosen as the platform. The following are the reasons:

1. With Microsoft Management Console in Windows 2000, the administrator could easily manage and configure the server using the standard graphical user interface.
2. Windows 2000 works with the newest peripherals such as storage management hardware, USB printers, network adapters, keyboards and mice. It delivers advanced printer driver support, as well as support for infra-red and digital devices.
3. Take advantage of larger amounts of memory to improve performance and handle the most demanding applications, with support for up to 8 gigabytes (GB) of RAM.

4. Support for up to 1 GB networks, Windows 2000 delivers high performance processing on high performance networks. Increased throughput increases performance without having too increase network bandwidth.
5. Increased security for intranet and Internet sites using the latest standards, including: 56-bit and 128-bit SSL/TLS, IPSec, Server Gated Cryptography; Digest Authentication, Kerberos v5 authentication, and Fortezza.
6. Backup and recovery features make us easier to backup data and then recover data in the event of a hard disk failure. Windows 2000 allows back up to a single file on a hard disk and tape media.

4.3.2 Web Server

Apache is selected as the web server because:

1. Apache has various useful features, including implementation of the latest protocols.
2. Apache's modular architecture allows users to build a server that they desired.
3. Apache configuration files are in ASCII, have a simple format, and can be edited using any text editor. They are transferable, so one can effectively clone a server. One can control the server from command line, which makes remote administration very convenient.
4. Apache server and API source code are open to public. If there is any feature that users want but does not exist in Apache, they can write their own server module to implement it.

5. A lot of effort has been put into optimizing the Apache's C code for performance. As a result, it runs faster and consumes less systems resources than many other servers.
6. Apache runs on a wide variety of operating systems, including all variants of UNIX, Windows 9x/NT, MacOS (on PowerPC), and various others.
7. Apache's source code is open to public. When any bugs are found, they are often quickly communicated, and rapidly fixed. Updates are made and announced thereafter. This has resulted in Apache becoming more and more stable, and hence reliable, server over the time.
8. Apache is supported by the Apache Group, a large number of dedicated users (many of whom can often be found in the Usenet newsgroup comp.infosystems.www.servers.unix or comp.infosystems.www.servers.ms-windows), and by companies who market commercial versions of Apache.

4.3.3 Language

Java Server Pages (JSP) is chosen as the main language for develop this system because:

1. JSP can run on any Web server and is supported by a wide variety of tools from multiple vendors.
2. The JSP components (Enterprise JavaBeansTM, JavaBeans, or custom JSP tags) are reusable across platforms.
3. JSP provides the robust exception handling necessary for real-world applications.

4. JSP emphasis on components over scripting makes it easier to revise content without affecting logic, or revise logic without changing content.
5. JSP is an open, cross-platform architecture, Web servers, platforms, and other components can be easily upgraded or switched without affecting JSP-based applications. This makes JSP suitable for real-world Web applications, where constant change and growth is the norm.

4.3.4 Database

MySQL is chosen as the database application because of the following reasons:

1. MySQL Supports secure traffic between the client and the server.
2. MySQL is designed specifically for Web database use.
3. MySQL's source code is open to public. When any bugs are found, they are often quickly communicated, and rapidly fixed.
4. MySQL's API source codes are open to public. If there is any feature that we want but does not exist in MySQL, we can write our own server module to implement it.

4.3.5 Database Connector

JDBC is chosen as the database connector because:

1. JDBC is an all Java API that is truly cross platform. ODBC is a C language interface that must be implemented natively. Most implementations run only on Microsoft platforms.
2. JDBC-ODBC bridge is not an ideal solution since it requires the installation of ODBC drivers and registry entries.

3. JDBC is an all Java implementation that can be executed directly from a local or centralized remote server. JDBC allows for much simpler maintenance and deployment than ODBC.

4.4 Web Architectures Analysis

Multi Tier Architecture is chosen as the web architecture for the system because:

- ❑ Isolation of concerns

  The major advantage is that the front-end clients are clearly separated from the back end data manipulation facilities. This allows details of the data storage mechanisms such as which database is used, record structure and field names to be abstracted away from the client processes. All the front end sees is an abstract operation request which takes input and output parameters.

- ❑ Enabling database migration

  Database restructuring, upgrades, migration or other changes can be performed without the necessity to stop or alter the client programs.

- ❑ Front end modifications

  Similarly, new front-end clients can be introduced or old ones removed without any need to modify the databases or provide new access mechanisms.

- ❑ Data from multiple sources

A client may require data from a number of servers. This can be handled easily because by splits the data operation request into several sub-operations. The appropriate agent then performs each sub-operation and the combined results forwarded to the calling client.

- Local caching of data

  Common look-up operations can be handled locally without data server access ensuring the data is available more quickly. This caching is controlled dynamically and shifting work patterns may result in different data being cached. Client programs have the option of forcing a refresh of any cached data. Data update operations are typically not cached.

- Reduced database loading

  In Multi Tier Architecture, not only does the database machine benefit from fewer connections but also any data caching operations result in fewer data operations and therefore fewer throughputs. In addition, this saving is concentrated on those very queries that are most commonly performed, thus reducing the potential for conflict on any hot spots in the data.

- Local data

  The storage at the cluster may also be used for storing local information that need not be stored in any of the data servers.

4.5 Software Requirement

4.5.1 Design Time Environment

Below are the software requirement for develop the web application:

- ❑ Platform: Windows 2000
- ❑ Database: MySQL 3.23
- ❑ Web Server: Apache 1.3.6
- ❑ Servlet Container: Tomcat 4.0
- ❑ Java Server Pages IDE: JBuilder 6.0
- ❑ Java Compiler: Java Development kit 1.4.0
- ❑ HTML Editor: DreamWeaver 4.0
- ❑ Web Browser: Internet Explorer 5.0 or above, Netscape 4.7 or above

4.5.2 Run Time Environment

Below are the software requirements for running the web application:

- ❑ Platform: Windows 2000
- ❑ Database: MySQL 3.23
- ❑ Web Server: Apache 1.3.6
- ❑ Servlet Containers: Tomcat 4.0
- ❑ Web Browser: Internet Explorer 5.0 or above, Netscape 4.7 or above

4.6 Hardware Requirements

4.6.1 Design Time Environment

Below are the hardware requirements when developing the web application:

- ❑ Processor

  Pentium II 233 MHz or greater, other x86 compatible processors AMD and Cyrix also can be use.

- ❑ Ram

  The minimum requirement for design time is 64 MB and it is just enough for a small database to run and to out the web application. However, higher memory is recommended when the database is to be put into production for running multiple services.

- ❑ Hard Disk

  A minimum of 2.5 GB disk space is required for installation of all the development software.

- ❑ Others

  Other computer peripheral is being used such as keyboards, mouse, monitor and SVGA card.

4.6.2 Run Time Environment

The hardware requirements during run time environment usually higher than the design time environment because the number of the users have increased, concurrent connection also increased and the size of database will grow, which required more processing ability.

Below are the hardware requirements when running the web application:

- ❑ Processor

  Pentium II 450 MHz or greater, other x86 compatible processors AMD and Cyrix also can be use.

- ❑ Ram

  A minimum of 128 MB memory is required, however 256 MB of memory is recommended

- ❑ Hard Disk

  A minimum of 4.3 GB disk space is required

- ❑ Others

  Other computer peripherals being used such as keyboards, mouse, monitor, SVGA card, network cards etc.

Chapter 5 System Design

System design is a creative of transforming the problem into solution and description of the solution. System design involves designing of program, form of input, user interfaces and database. User requirement and requests will be transforming into a working model that can be used as guidance in system design.

System design has to go through modification and testing before coming to a complete system. Amendment has to be done on every occurrence of mistakes especially in coding, user interface and database design. Under this chapter, the system design will be discuss into following few components:

- System functionality design
- Graphical user interface design
- Database design

5.1 System Functionality Design

The following are data flow diagrams for Online Sales Management System, which will be discussed under the system functionality design.

5.1.1 Context Diagram

The Context Diagram is the most general diagram, a bird-eye's view of data movement in the Online Sales Management System module and the broadest possible conceptualization of the system. It shows the basic inputs, the general module and outputs. Figure 5.1 is the Context Diagram of the system.

5.1.2 Zero Diagram

Zero Diagram of the Online Sales Management System shown in Figure 5.2 is the explosion of the Context Diagram.

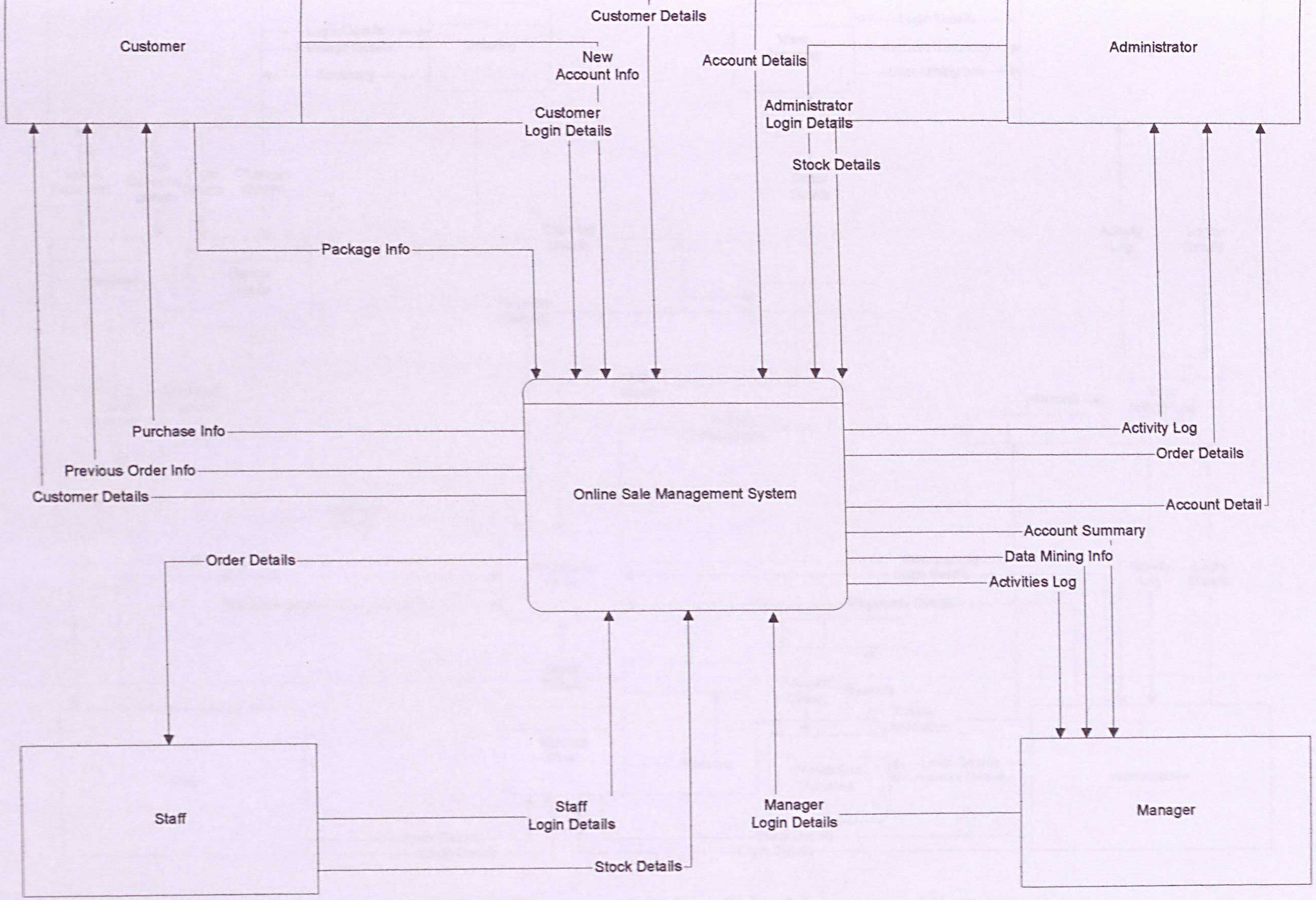


Figure 5.1: Context Diagram of Online Sales Management System

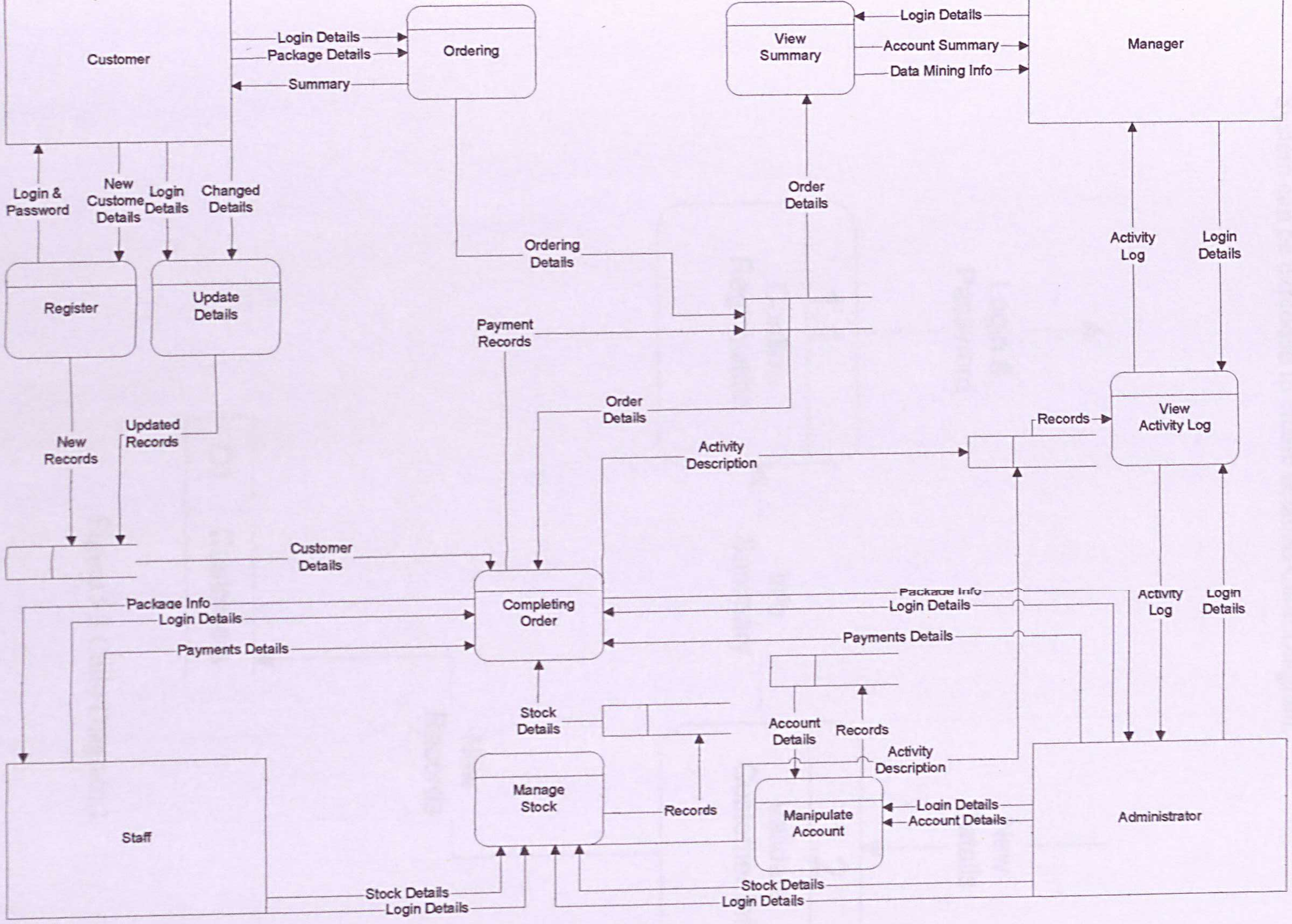


Figure 5.2: Zero Diagram of Online Sales Management System

5.1.3 Child Diagram

Each of the major process in the Zero Diagram of the Online Sales Management System can be exploded to create detailed Child Diagram:

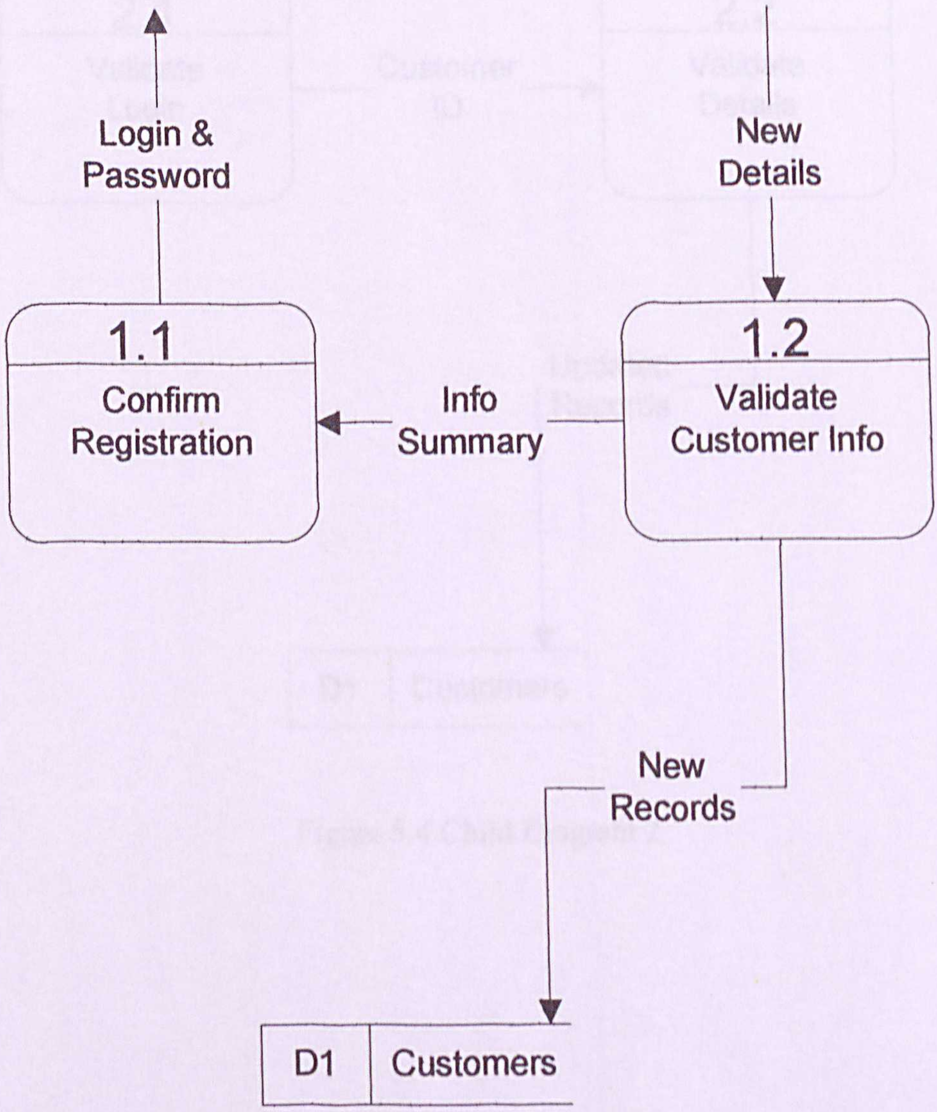


Figure 5.3 Child Diagram 1

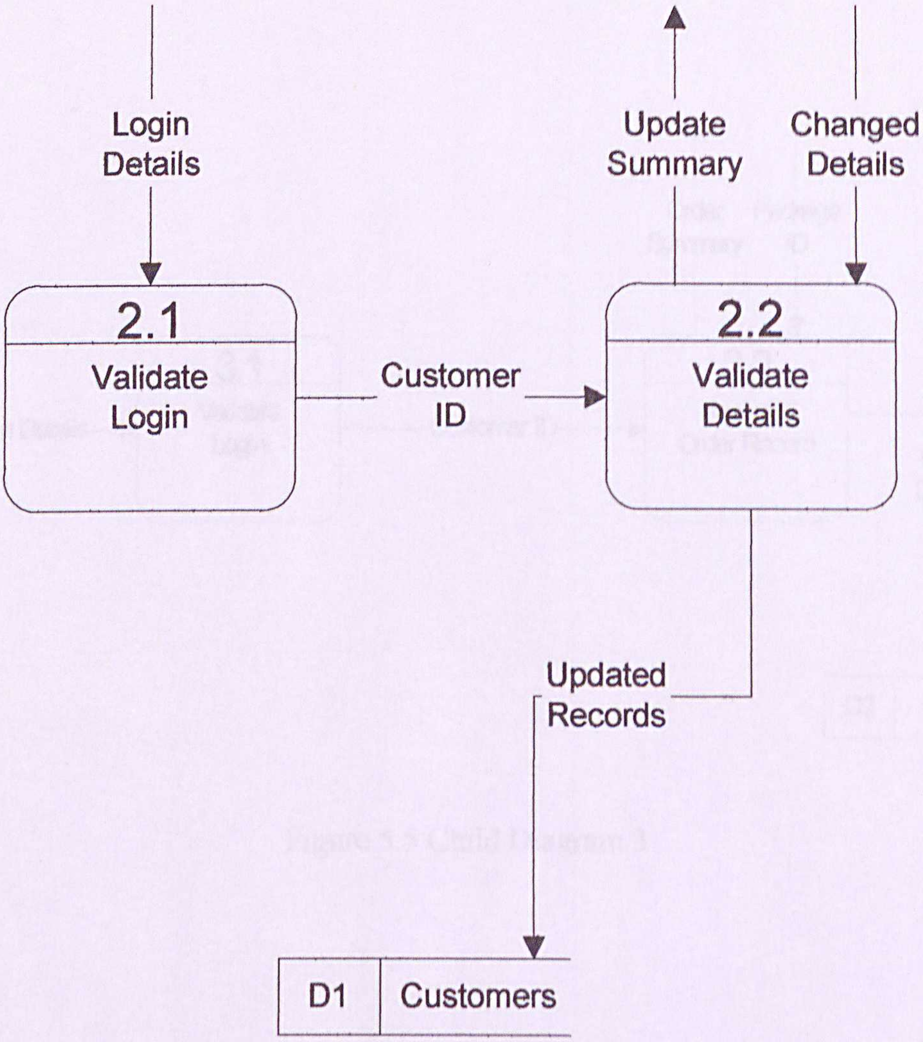


Figure 5.4 Child Diagram 2

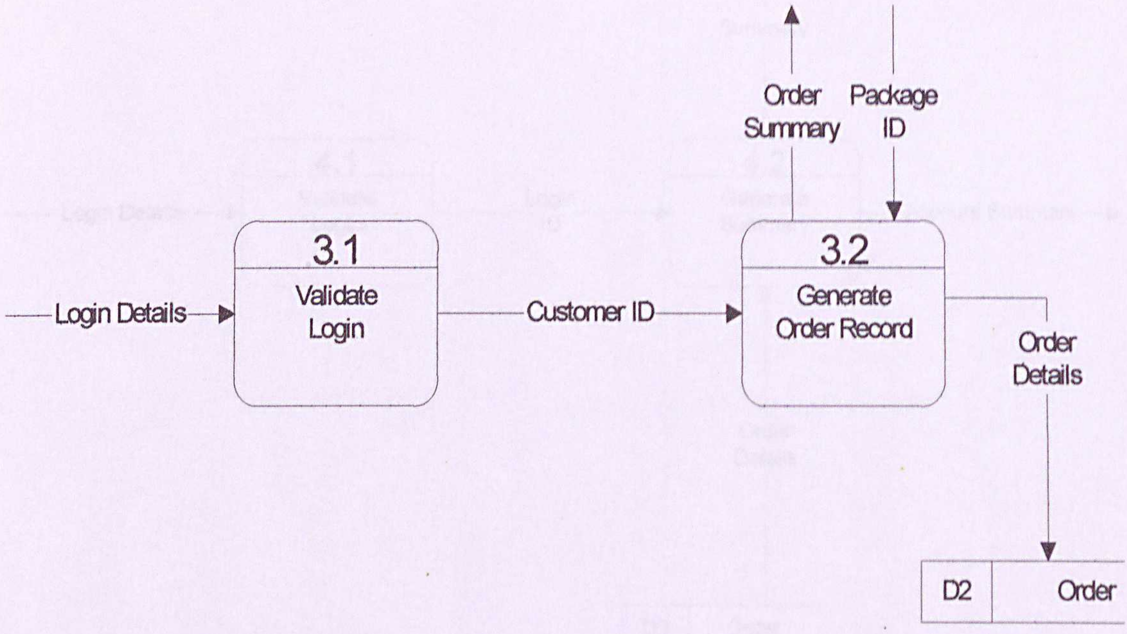


Figure 5.5 Child Diagram 3

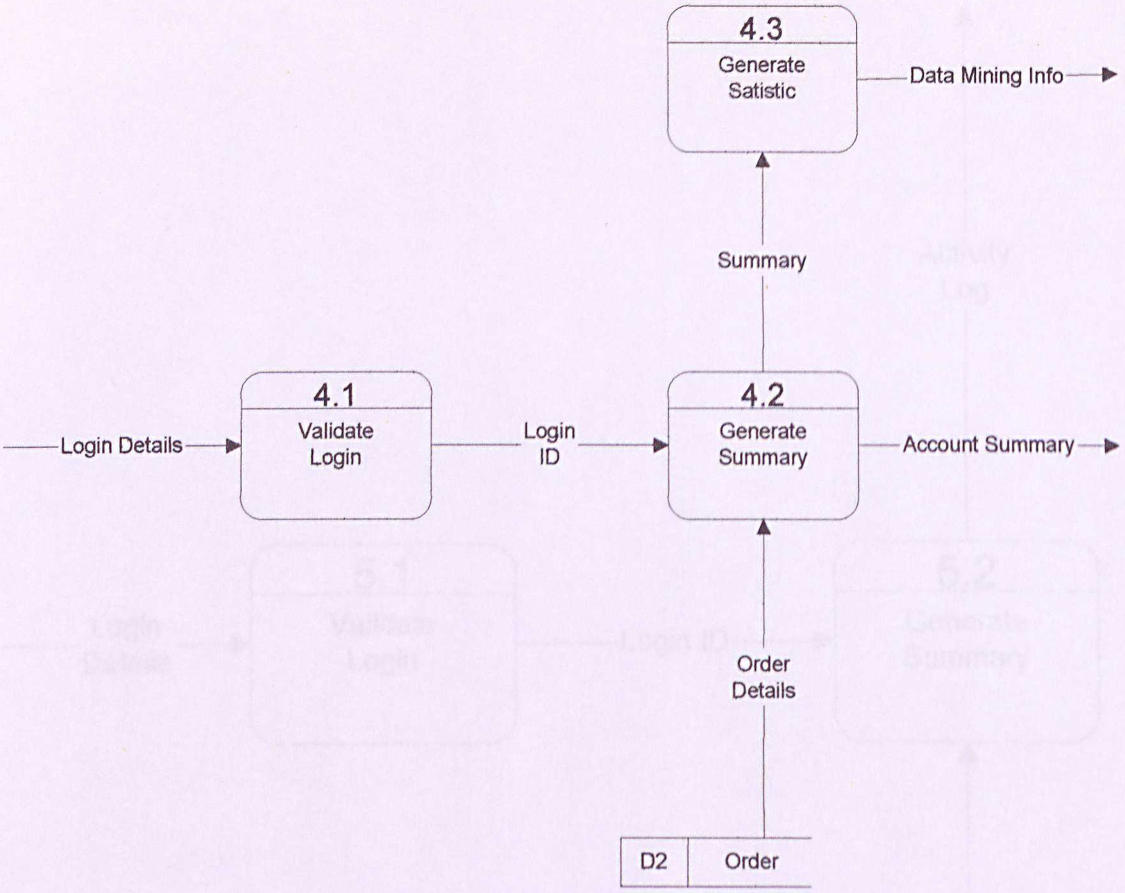


Figure 5.6 Child Diagram 4

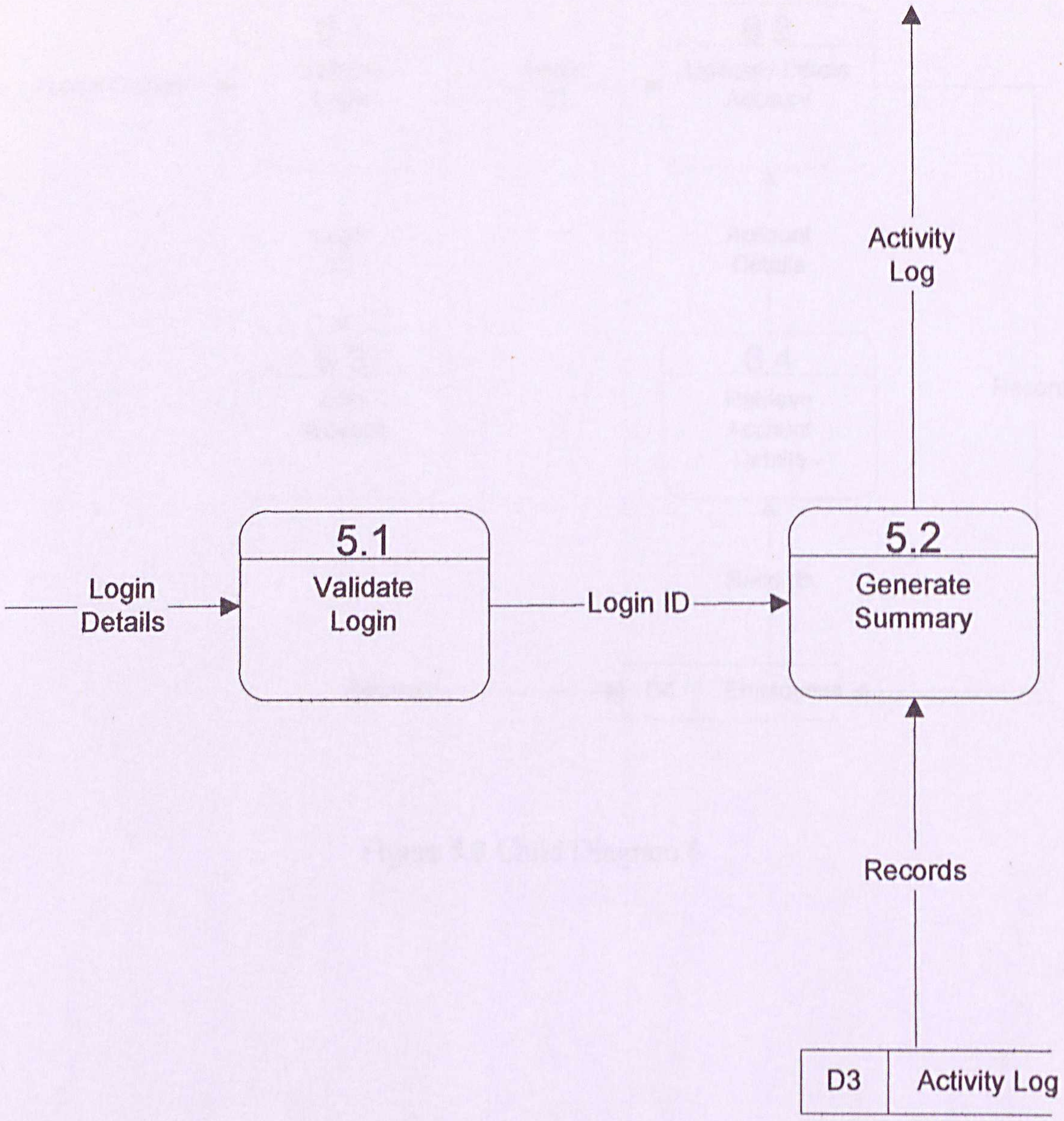


Figure 5.7 Child Diagram 5

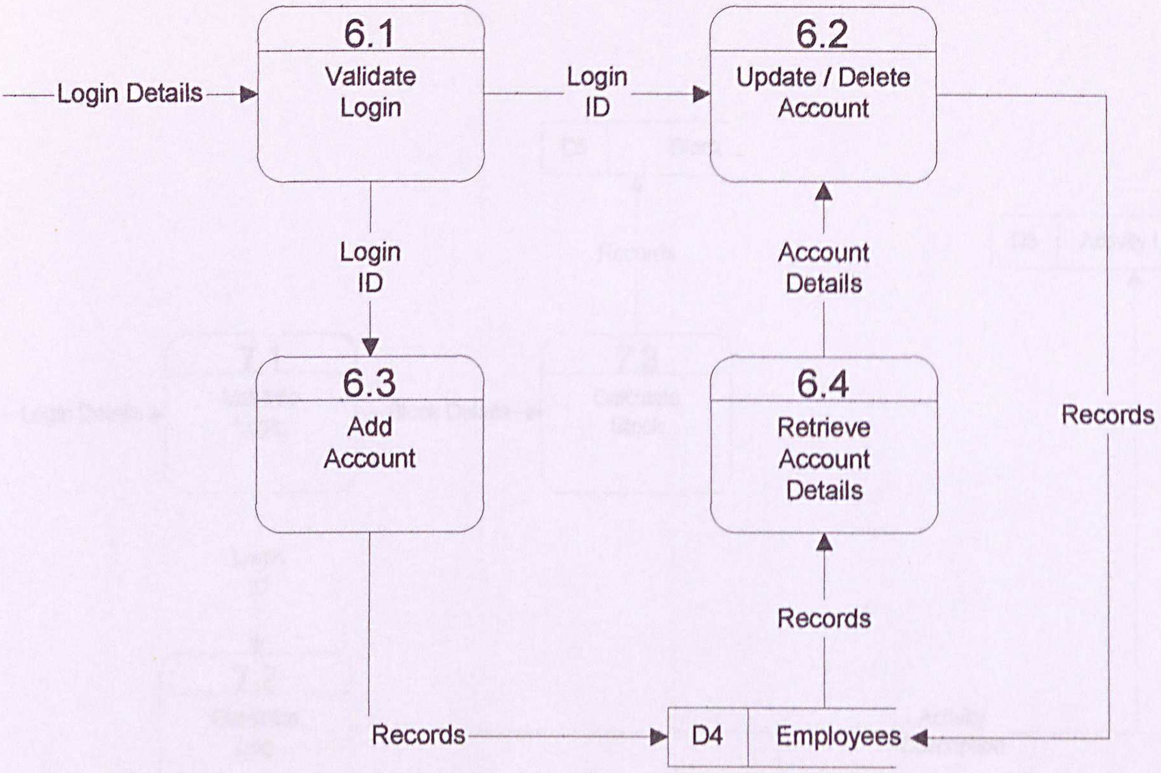


Figure 5.8 Child Diagram 6

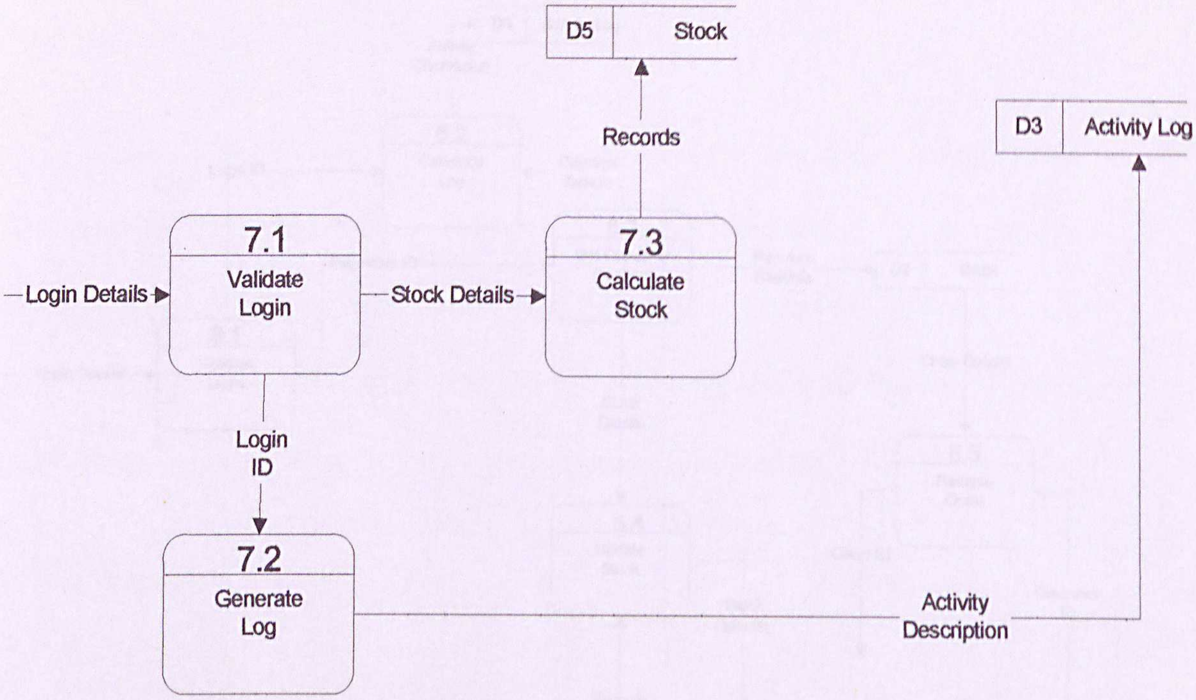


Figure 5.9 Child Diagram 7

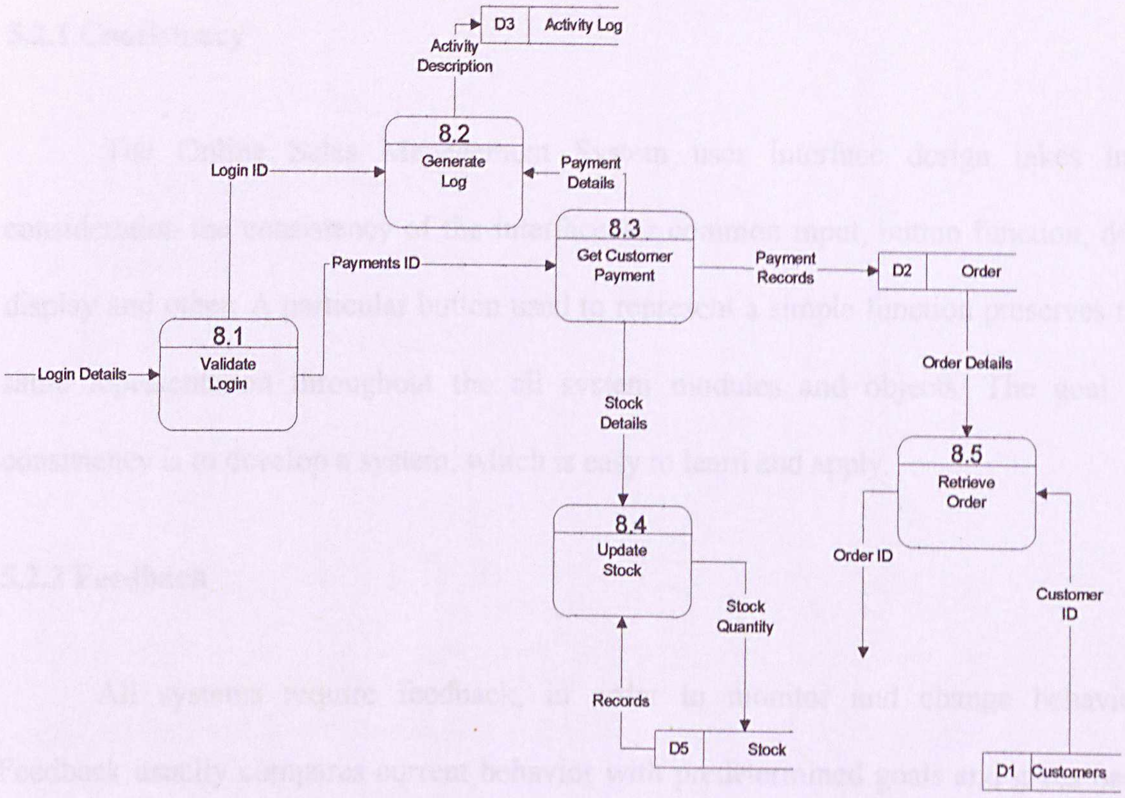


Figure 5.10 Child Diagram 8

5.2 Graphical User Interface Design

5.2.1 Consistency

The Online Sales Management System user interface design takes into consideration the consistency of the interface for common input, button function, data display and other. A particular button used to represent a simple function preserves the same representation throughout the all system modules and objects. The goal of consistency is to develop a system, which is easy to learn and apply.

5.2.2 Feedback

All systems require feedback, in order to monitor and change behavior. Feedback usually compares current behavior with predetermined goals and gives back information describing the gap between actual and intended performance. The system provides feedback to its users after a process is either successfully or unsuccessfully performed. Feedback is vital to inform users the status and achievement of particular process.

When human users interface with machines, they still need feedback about how their work is progressing. As designer of the user interfaces, system developers need to be aware of the human need for feedback and build it into the system. Although text is typically referred to as online system feedback, standardized icons can often be used to supply feedback. For example, displaying status bar under the web browser while the web pages is loading encourage the users to wait for some time rather than repeatedly hitting keys to try and invoke another screen or response.

Feedback is basically need to:

- Acknowledge acceptance of input
- Recognize that input is in correct form
- Explain a delay in processing
- Acknowledge that a request s completed
- Notify that a request was failed

5.2.3 Error Checking and Handling

The system protects itself from the erroneous operation that may cause fatal failures. The system provides substantial error checking on the user input level and further actions which may cause errors. Error messages will be displayed whenever an error has been detected.

The design also focuses on providing meaningful error message, which describe problems in plain English so that non-technology savvy users may comprehend and understand. In additional, error message are not just informative but are also designed to provide constructive advises for error recovery.

5.2.4 Minimize of The Number of Input Actions

Minimum amount of typing and data entry can be accomplished by exploiting the functions of the mouse to select from predefined sets of inputs and providing default entry values from frequently used data sets.

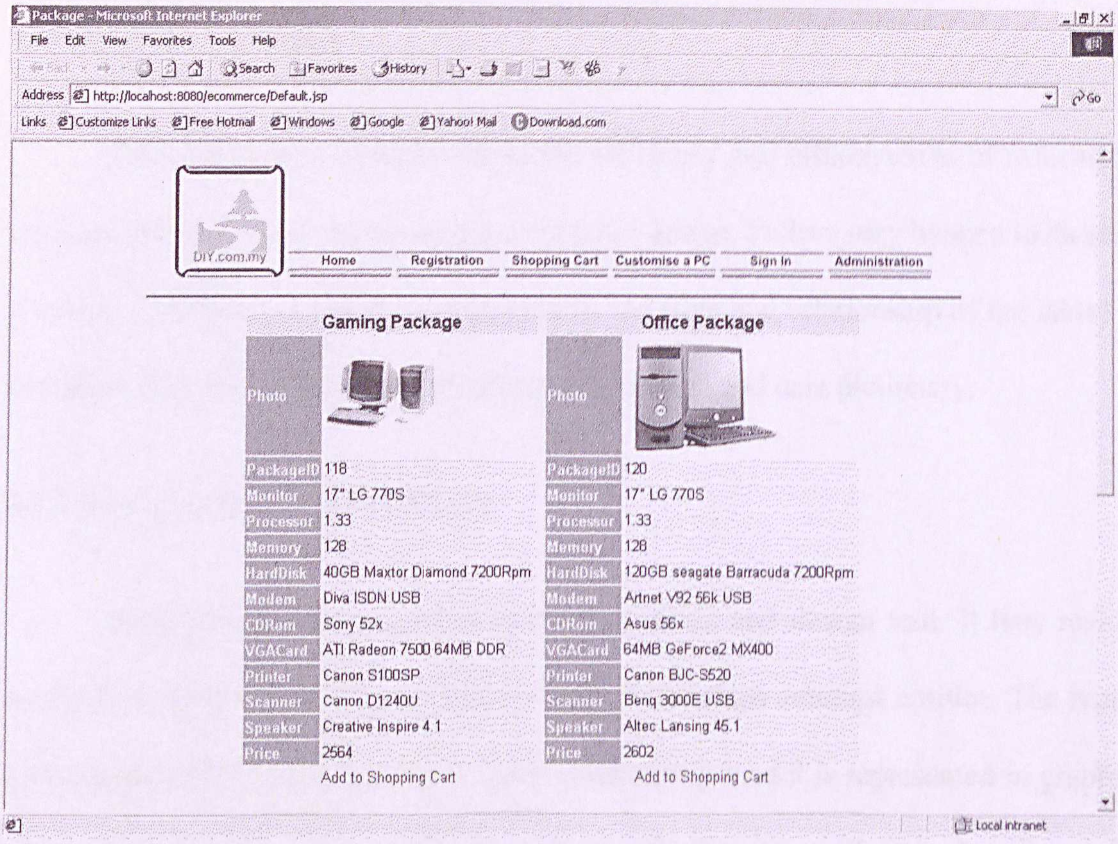
5.2.5 Type of user interface in Online Sales Management System

The type user interface employed in the development of this system is he form fill interface. Form fill interfaces consist of web-based forms displaying fields containing data items or parameters that need to be communicated to the user. The form often is a facsimile of the paper forms which familiar to the user. This interface technique is also know as a form-based method and input / output forms.

On screen forms are set up to show what and where information should be input. Blank fields requiring information can be highlighted with red font. The users move the cursor from field to field by single stroke of the tab or arrow key, for instance. This arrangement allows movement one field backwards and one field forward by hitting the arrow key.

Form input for screens can be simplified by applying default values for fields and allowing users to modify default information if necessary.

Figure 5.11 shows sample of the user interfaces design for Online Sales Management System:


Package - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Search Favorites History
Address http://localhost:8080/ecommerce/Default.jsp
Go
Links Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
DIY.com.my
Home
Registration
Shopping Cart
Customise a PC
Sign In
Administration
Local intranet

Gaming Package		Office Package	
Photo		Photo	
PackageID	118	PackageID	120
Monitor	17" LG 770S	Monitor	17" LG 770S
Processor	1.33	Processor	1.33
Memory	128	Memory	128
HardDisk	40GB Maxtor Diamond 7200Rpm	HardDisk	120GB seagate Barracuda 7200Rpm
Modem	Diva ISDN USB	Modem	Artnet V92 56k USB
CDRom	Sony 52x	CDRom	Asus 56x
VGACard	ATI Radeon 7500 64MB DDR	VGACard	64MB GeForce2 MX400
Printer	Canon S100SP	Printer	Canon BJC-S520
Scanner	Canon D1240U	Scanner	Benq 3000E USB
Speaker	Creative Inspire 4.1	Speaker	Altec Lansing 45.1
Price	2564	Price	2602
	Add to Shopping Cart		Add to Shopping Cart

Figure 5.11 Sample screen of the Online Sales Management System

5.3 Database Design

Database design is important as the efficiency and effectiveness of information retrieval and storage are based on good database design. Failure may happen to database if earlier considerations (size of each field in the table and relationship of the table) are not taken. The following are entity relationship model and data dictionary.

5.3.1 Entity Relational (ER) Model

Entity-relationship model is database analysis and design tool. It lists real-life application entities, attributes of entities and relationships amongst entities. The type of each relationship is also indicated. Entity-relationship model is represented in graphical form. Figure 5.12 is the relationship of the database that illustrated with an E-R Diagram.

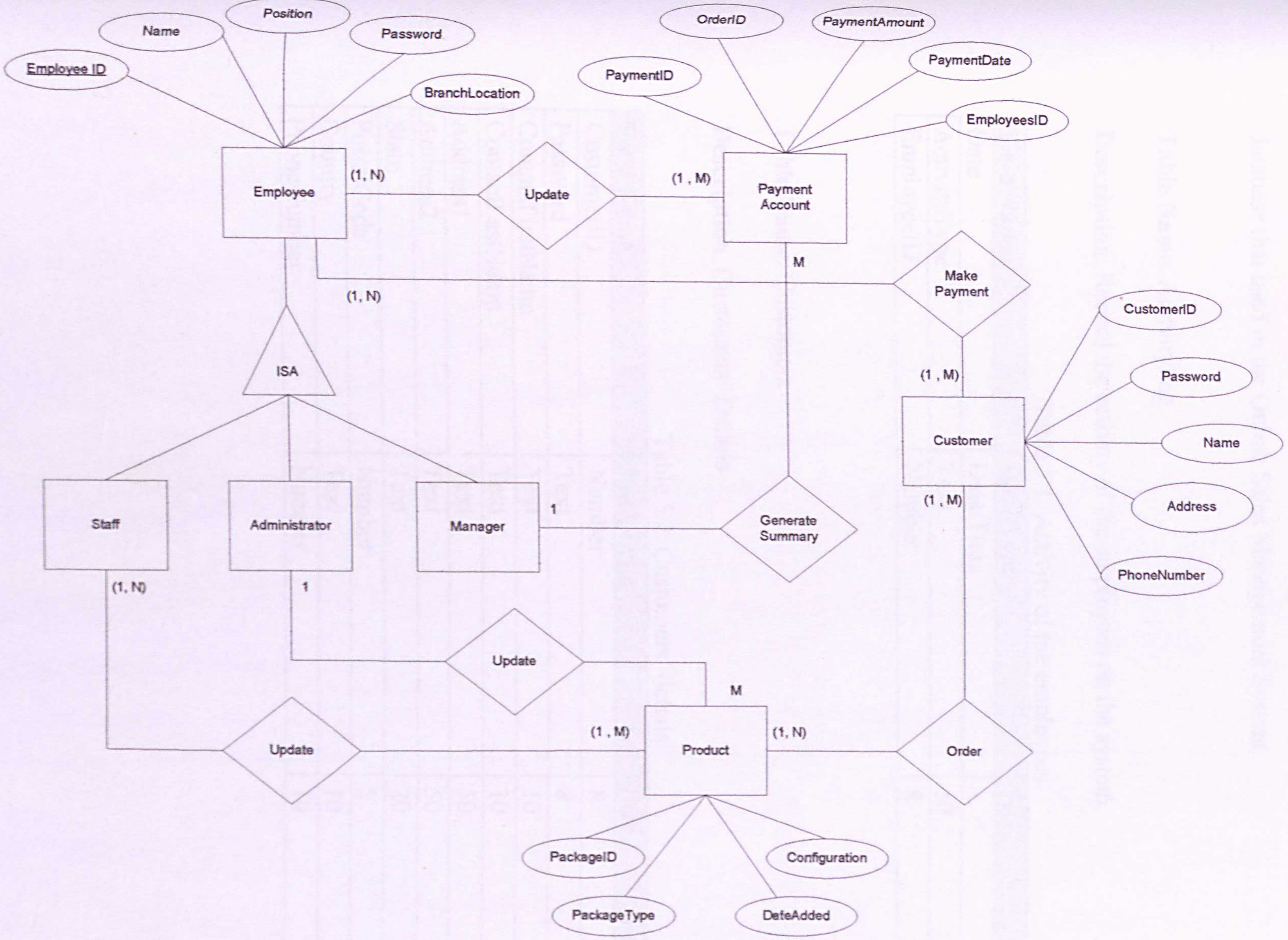


Figure 5.12: Entity Relation (ER) Diagram for the Online Sales Management System

5.3.2 Data Dictionary

The following are the data dictionary that explains the items and fields of the database that used in the Online Sales Management System.

Table Name: ActivityLog

Description: Record the activity of the employees on the system

Table 5.1: Activity of the employees

Field Name	Data Type	Size
Date	Date/Time	-
ActivityType	Text	50
EmployeeID	Number	8

Table Name: Customers

Description: Customers' Details

Table 5.2: Customers' details

Field Name	Data Type	Size
CustomerID	Number	8
Password	Text	8
ContactFirstName	Text	10
ContactLastName	Text	10
Address1	Text	50
Address2	Text	50
State	Text	20
PostalCode	Number	5
Country	Text	10
PhoneNumber	Number	10

Table Name: Employees

Description: Employees' Details

Table 5.3: Employees' details

Field Name	Data Type	Size
EmployeeID	Number	8
FirstName	Text	10
LastName	Text	10
Position	Text	10
Password	Text	8
Branch	Text	20

Table Name: MainBoard

Description: Details of the main board

Table 5.4: Details of the main board

Field Name	Data Type	Size
MainBoardID	Number	8
ProcessorType	Text	10
MinProcFreq	Number	8
MaxProcFreq	Number	8
FBS	Number	8
MemoryType	Text	10
MaxMemory	Number	8
RamClock	Number	8
BranchAQuantity	Number	8
BranchBQuantity	Number	8
BranchCQuantity	Number	8
PricePerUnit	Number	8
Description	Text	50

Table Name: Memory

Description: Details of the memory

Table 5.5: Details of the memory

Field Name	Data Type	Size
MemoryID	Number	8
MemoryType	Text	10
MemorySize	Number	8
RamClock	Number	8
BranchAQuantity	Number	8
BranchBQuantity	Number	8
BranchCQuantity	Number	8
PricePerUnit	Number	8
Description	Text	50

Table Name: Order

Description: Details of the order from customer

Table 5.6: Details of the order from customer

Field Name	Data Type	Size
OrderID	Number	8
CustomerID	Number	8
OrderDate	Date/Time	-
PackageID	Number	8
Quantity	Number	8
Sum	Number	8
Status	Text	10
NearestBranch	Text	20

Table Name: Package

Description: Details of the package

Table 5.7: Details of the package

Field Name	Data Type	Size
PackageID	Number	8
PackageType	Text	10
DateAdded	Date/Time	-
Processor	Number	8
Memory	Number	8
HardDisk	Number	8
MainBoard	Number	8
Modem	Number	8
CDRom	Number	8
Floppy	Number	8
VGACard	Number	8
SoundCard	Number	8
Printer	Number	8
Scanner	Number	8
OS	Number	8
CDRW	Number	8
Speaker	Number	8
Casing	Number	8

Table Name: Payments

Description: Details of the payments

Table 5.8: Details of the payments

Field Name	Data Type	Size
PaymentID	Number	8
OrderID	Number	8
PaymentAmount	Number	8
PaymentDate	Date/Time	-
EmployeesID	Number	8

Table Name: Processor

Description: Details of the processor

Table 5.9: Details of the processor

Field Name	Data Type	Size
ProcessorID	Number	8
ProcessorType	Text	10
Frequency	Number	8
BranchAQuantity	Number	8
BranchBQuantity	Number	8
BranchCQuantity	Number	8
PricePerUnit	Number	8
Description	Text	50
FBS	Number	8

Table Name: Stock

Description: Details of the stock

Table 5.10: Details of the stock

Field Name	Data Type	Size
StockID	Number	8
Description	Text	50
Category	Text	10
BranchAQuantity	Number	8
BranchBQuantity	Number	8
BranchCQuantity	Number	8
PricePerUnit	Number	8

Chapter 6 System Implementation

System implementation is a process that takes place after the design phase. It will convert the system requirement to the programming codes. This phase wills describes how the initial and revised process design put into the real work. Therefore, system development and coding methodology are included in this phase.

6.1 Development Environment

Development environment has certain impact on the development of a system. Using the suitable hardware and software will speed up the system development and it performance. The hardware and software tools used to develop the entire system are as follow:

6.1.1 Operating System Implementation

The hardware used to develop the system are as listed:

- 900 MHz AMD Processor
- 256 MB SDRAM
- 40 GB Hard Disk
- 1.44 Floppy Disk
- Other standard desktop PC components

6.1.2 Software Tools Requirements

Software	Purpose	Descriptions
Microsoft Windows 2000 Server	System requirement	Operating system
Apache Tomcat 4.1	System requirement	System design and coding
MySQL 3.23.51	System requirement	Database design
JBuilder 6	Coding	Coding JSP

Table 6.1 Summaries of Software Tools Used

6.2 System Development

This section explained the development of system, which focuses on the analysis of usage of the technology and development tools that had been used.

6.2.1 Database development

The first step in the system development is to develop the system database based on the logical data model for system created during the system design phase.

Creating an empty database called ecommerce started the database development. All the tables are then created by specify all the fields for each table and the field properties. A primary key is allocated for each table in the database.

After all tables being created, relationships between the tables are established to enforce referential integrity. The referential integrity is an important constraint on a relationship that ensures consistency between related tables.

6.2.2 User Interface Development

The user interface for system was developed using Macromedia Dreamweaver MX. Macromedia Dreamweaver MX is the web page editor program that allows the user to edit HTML files. The system interface is basically consists of three zones, which are Header Zone, Main Body Zone and Footer Zone. Below is a figure describing the layout of the interface.

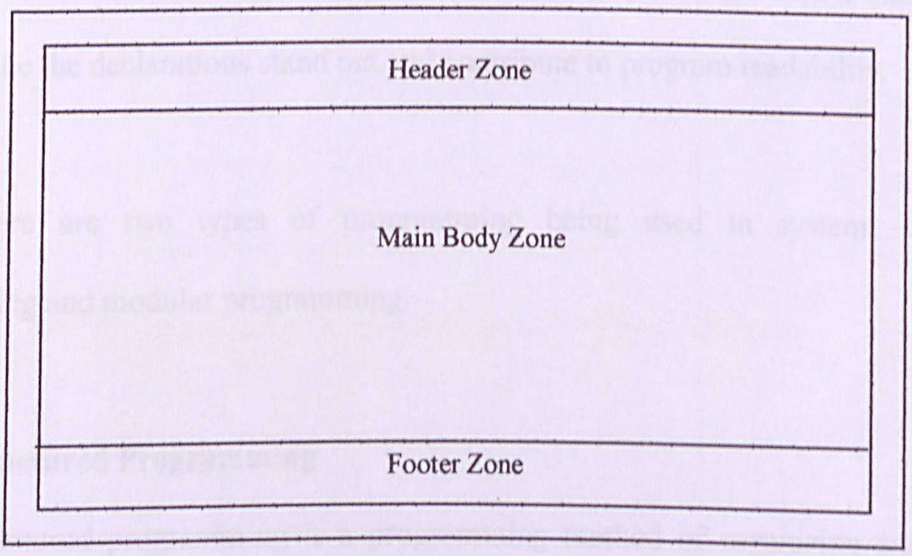


Figure 6.1 System Interface Layout

6.2.3 Application development

The system application development involves code generation that translates all the algorithms into JSP programming language instructions. A few programming principles have been employed in coding the program to ensure the system consistency, maintainability and readability. The programming principles being followed in the development of system are as following:

a) Choosing meaningful variable names, procedure names and parameter variable names helps a program to be "self-documenting" without excessive use of comments.

b) All declarations are placed at the beginning of procedure and declarations are separated from the executable statements in that procedure with a blank line to make the declarations stand out and contribute to program readability.

There are two types of programming being used in system, structured programming and modular programming.

6.2.3.1 Structured Programming

Structured programming is a programming method of organizing and coding programs that aims to simplify control paths so that the program can be easily understood and modified. Structured programming reduces the complexity created when programs jump forward and backward to other parts of the program, obscuring the logic and flow of the program.

JSP (JavaServer Pages) supports structured programming by providing sequential and iteration (FOR and WHILE statements) in the coding of system.

6.2.3.2 Modular Programming

Modular programming is defined as breaking an application into small programming units that perform a single task. In JSP, using the function and sub function based on the events can do this. When an application is composed of small functions that perform a single task, maintenance is much easier. Functions can be shared among forms by coding the functions into JSP file. The other files of system can share these functions by include that file in the header.

6.2.4 Accessing Database Programmatically

Before use the data in a database, we must be able to establish a connection. This can be accomplished with a variety of methods, including JDBC and connection String, where we provide enough information in our code to connect a database.

We apply the below code in JSP as a connection to the database.

```
static final String DBDriver  ="org.gjt.mm.mysql.Driver";

static final String strConn   ="jdbc:mysql://localhost:3306/ecommerce";

static final String DBusername="";

static final String DBpassword="";


public static String loadDriver () {

 String sErr = "";
```

```
  try {
    java.sql.DriverManager.registerDriver((java.sql.Driver)(Class.forName(DBDriver).newInstance()));
  }
  catch (Exception e) {
    sErr = e.toString();
  }
  return (sErr);
 }

java.sql.Connection cn() throws java.sql.SQLException {
  return java.sql.DriverManager.getConnection(strConn , DBusername, DBpassword);
}

java.sql.ResultSet openrs(java.sql.Statement stat, String sql) throws java.sql.SQLException {
  java.sql.ResultSet rs = stat.executeQuery(sql);
  return (rs);
}

java.sql.ResultSet openStaticRS(java.sql.Statement stat, String sql) throws java.sql.SQLException {
  return openrs (stat, sql);
}
```

Figure 6.2 The code of connection to database

6.2.5 Programming Language Used

6.2.5.1 HTML

In this system, the Web-based interfaces are created using HTML. HTML is the lingua franca for publishing hypertext on the World Wide Web. It uses tags like <A> and </A> to structure text into tables, hypertext links interactive forms, headings, paragraphs, lists, and more. HTML is useful to create form based data entry for this application.

6.2.5.2 SQL

After establishing a connection with database, SQL (Structured Query Language) statements is used to insert, delete, update and retrieve information from database. The following SQL statement is to retrieve customer's information from table "customers" in database.

```
SELECT CustomerID, Pwd FROM customers WHERE CustomerID = \"" + sLogin +
"\" AND Pwd = \"" + sPassword + "\"" ;
```

Figure 6.3 SQL Statement for retrieving data from database

6.2.5.3 Using Built-In Server Object

There are several useful built-in server objects provided by JSP that will help the application read requests form HTML forms, post results to the web browser, control the server, etc. It is easy to include these server-side objects within the JSP scripts and there is not need to declare them or initialize them. These server-side objects are Request, Response, and Session.

Request Object

When client browsers contact a server via HTTP, they pass values to the server that include server and state information. This object allows an application to request that information and bring it into the application.

Response Object

This object is used to send data to the client. For example, it can be used to specify a cookie's value at the client.

Session Object

Use this to store information needed for a particular user-session. Variables stored in the session object are not discarded when the user jumps between pages in the application; instead, these variables persist for the entire user-session. JSP automatically creates a Session object when a web page form the application is requested by a user who does not already have a session. The server destroys the Session object when the user closes the browser or the when session expires or is abandoned.

6.3 Program Documentation

6.3.1 Internal Documentation

Internal comments provide a clear guide during the maintenance phase of the system. Comments provide the developer with a means of communicating with other readers of the source code. Statements of purpose indicating the function of the module and a descriptive comment that is embedded within the body of the source code is needed to describe processing functions.

The name of the component will figure prominently in the documentation. Tracking components that are updated and revised is important, so program documentation should keep a log of changes made and who made it. The block should indicate how it fits in the component hierarchy.

Additional program comments help the reader to understand how the intentions are implemented in the code. Besides providing a line by line explanation of what the program is doing, the comments can also break the code into phases that represent major activities.

6.3.2 External Documentation

External documentation is all other documentation. It is intended to be read by those who may never look at the actual code. Designers may review the external documentation when considering modifications or enhancements. In addition, it also gives designer a chance to explain things more broadly than might be reasonable within program's comments. The external documentation is the full-blown report. It answers the same question – who, what, why, when, where and how – using a system, rather than a component perspective.

6.4 Summary

The most important things in the system implementation are development environment and system development. The development environment consists of hardware and software requirements. And the system development consists of database development, user interface development and application development. By using several guidelines in implementing and coding programs as discussed above does the system implementation of system.

Chapter 7 System Testing

Testing is focused on finding faults, and there are many ways we can make our testing effort more efficient and effective. It is an essential series of steps that helps assure the quality of the eventual system. It is far less disruptive to test beforehand than to have a poorly tested system fail after installation.

Testing provides a method to uncover logical error and to test the system reliability. In developing a system, testing should involve several stages:

7.1 Unit Testing

Testing is carries out during development of units in the modules and component. With using certain data, concern units in the system were been tested and expected outputs were analyzed. This type of testing is most frequently use because units are the basis of system.

7.1.1 Examining source code

Examining the source code is a method used to test the modules in the system. This is to identify faults or inefficiency in source code.

First of all, procedure of the source code in each module was compared to the original design of the module process flow to determine the correctness of the source code. In comparing this module, comments were inserted in the coding so that it will be easily traced in the future.

Besides that, it is important to trace the flow and logic of the code and debugged to discover if any fault occur in the coding. In JBuilder 6, they are several of debugger to examine the correctness of the coding. For example, Step Over, Step Into, Toggle Break Point and Add Watch. This debugger is useful in determining the faults that occurred in our coding.

In accessing database, one of the possible faults in our source code is trying to access an empty record set. An empty record set will generate error when it is processed. Checking statement is written to test the record set such as If (Recordset.EOF) is true, then the record set is empty.

7.1.2 Test cases

Test cases were design to test the modules which consists of structural data in various range. Modules were tested with all possibility input data so that possible situation and data that could cause error or fault could be detected.

Example of test case testing:

Testing of input and output of data was carried out on modules. These modules that were involved in input and output of data were tested in order to ensure integrity of data. Example of testing:

1. One of the modules tested was employeesRecord Module
2. All the input data required by the insert form were enter and submit. All the inputted data in database were checked and verified. The data was same as the input data.
3. The data is then output in the table of the employeesRecord and all data enter earlier is displayed correctly.

4. The input data were again entered into the application but deliberately left out some field required field empty. As a result, the program was able to detect the empty field and display the error.

7.1.3 White Box Testing

White box testing is a test case design method that uses the control structure of the procedural design to derive test cases in the system. The following test cases were being derived in the system by using white box testing.

- Guarantee that all independent path within a module have been exercised at least once.
- Exercise all logical decisions on their true and false sides.
- Exercise all loops at their boundaries and within their operational bounds.
- Exercise internal data structures to assure their validity.

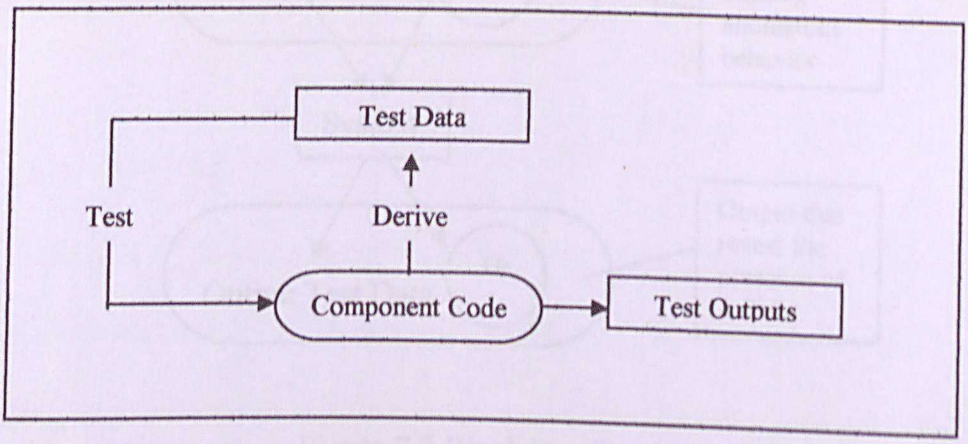


Figure 7.1 White Box Testing

7.1.4 Black Box Testing

Black box testing derives sets of input conditions in the system that will fully exercise all functional requirements for the program. It is not an alternative to white box technique, rather a complementary approach that is likely to uncover a different class of errors.

Black box testing attempts to look for errors in the system in the following categories.

- Incorrect or missing functions
- Interface errors
- Errors in data structures or external database access
- Performance errors
- Initialization and termination errors

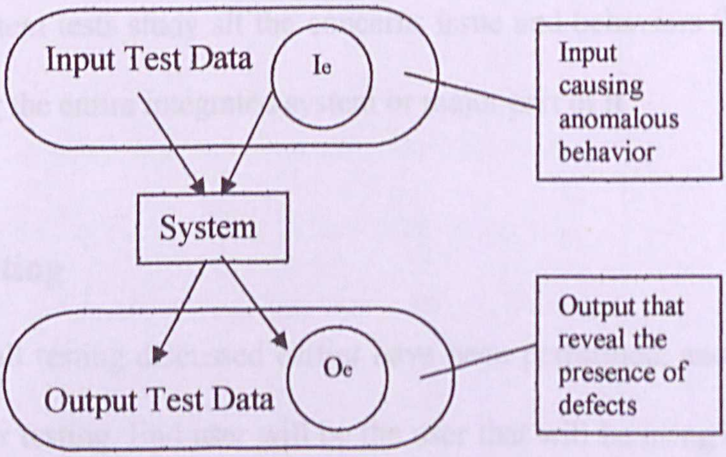

Input Test Data
Ie
Input causing anomalous behavior
System
Output that reveal the presence of defects
Oe
Output Test Data

Figure 7.2 Black Box Testing

7.2 Integration Testing

This type of testing is a test between two or more modules. It is to make sure that each module of the system can integrate with each other. This integration is planned and coordinated so that when a failure occurs, we have some idea of what caused it.

The development of the sytem is divided into modules and then all the modules are integrated as one main system. Therefore the bottom up approach is the most suitable integration testing method. Each module was tested individually. Then each module was tested together. And finally the whole system was tested as a whole.

7.3 System Testing

The last testing procedure is system testing. Testing the system is different from unit testing and integration testing. System testing is designed to reveal bugs that cannot be attributed to individual component, or to the interaction among components and other objects. 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

7.4 User Testing

Although all testing discussed earlier have been performed, another important testing will be user testing. End user will be the user that will be using our system. So, user testing is important to get a view of our system and any comment from them is useful to enhance our system based on their requirement.

With user testing method, user is involved in testing the system. The users involved in testing my system include some people with and without computer background to test my program to broaden the range of users testing my system. With this, testing the effectiveness of the system in improving user learning curve was also tested.

Some of the comments that are given by the user are as below :

1. The system is easy to understand and have a short learning curve
2. All the necessary function for the system is included
3. The user interface is nice but can do some enhancement to it to give a more user friendly look

7.5 FUNDAMENTAL TESTS

There are other tests fundamental to all software. Certain of these are difficult to measure accurately. Four of these fundamental tests are:

- **Usability**

The usability should be based in building user interfaces that have patterns already familiar to the typical user. The user then learns to use the software through pattern matching and paradigm shifts, exactly as they do in mastering any product.

- **Performance Testing**

Performance tests are conducted to ensure that the system response time meet user expectations and does not exceed the specified performance criteria under heavy stress or volume. During these tests, response time and the transaction rate are measured, the purpose of performance tests is to test-run the performance of various functions of the software within a specified hardware configuration. The performance tests can couple this test with stress testing.

- **Reliability**

Reliability tests are conducted, according to mathematical models of software reliability, to ensure that the system can be probability of some function of the system failing within a specified time. Reliability testing is monitoring the mean time between failures. Reliability and consistency testing go hand in hand where the system behavior (inputs, outputs, response time) is measured for consistency.

- **Acceptance Testing**

Function and performance testing is done by the system developer. Before the system is fully ready to roll out, it is a best thing if the system is also tested by the end-user. This test, called an acceptance test, assures the end-users that the system they requested is built for them. The end-user testers are selected specially to test out the application.

In conclusion, the testing steps are shown as below.

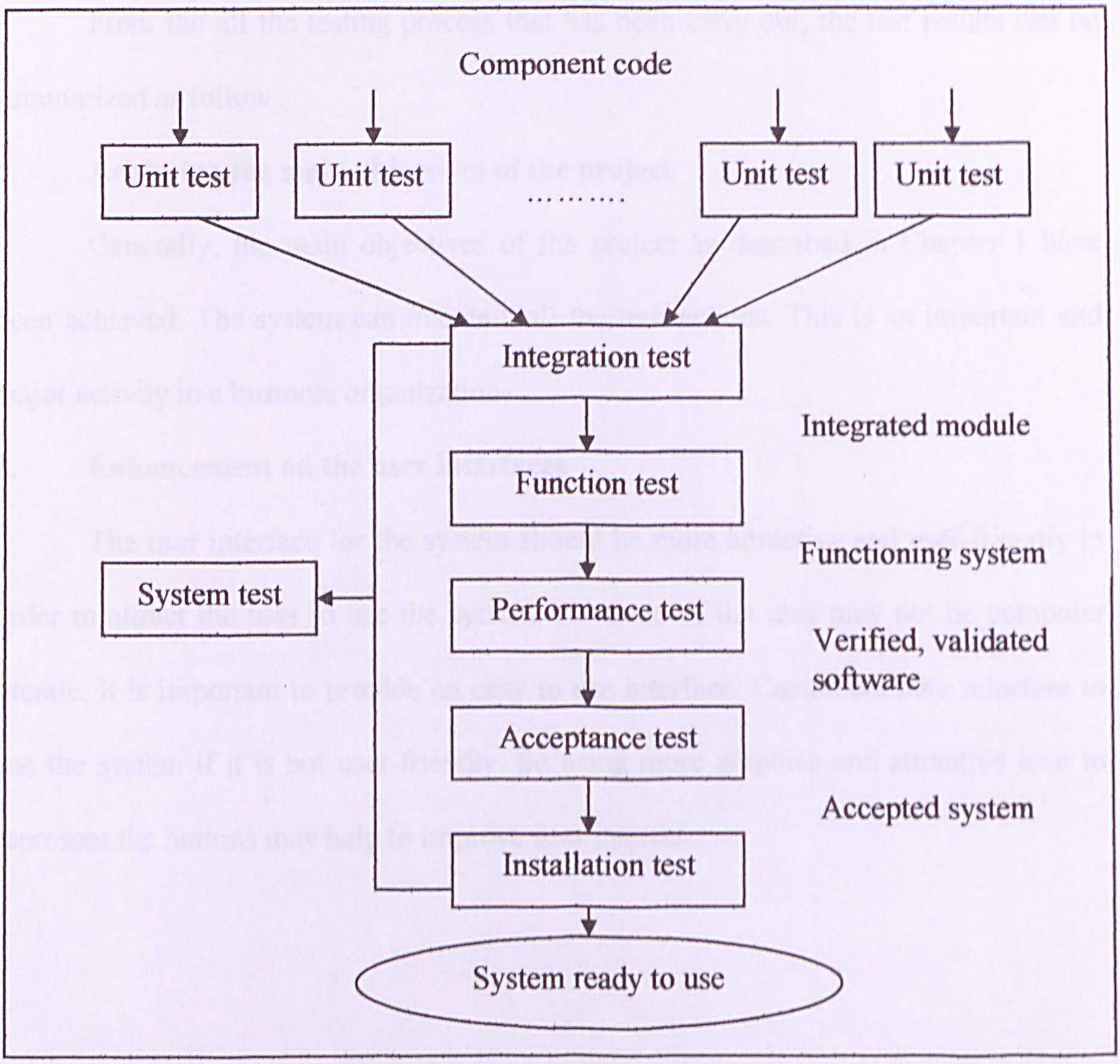


Figure 7.3 Testing Steps

7.6 Analysis of Test Results

From the all the testing process that has been carry out, the test results can be summarized as follow :

1. Achieving the main objectives of the project

Generally, the main objectives of the project as described in Chapter 1 have been achieved. The system can maintain all the transactions. This is an important and major activity in a business organization.

2. Enhancement on the user interfaces

The user interface for the system should be more attractive and user-friendly in order to attract the user to use the system. As some of the user may not be computer literate, it is important to provide an easy to use interface. Customers may reluctant to use the system if it is not user-friendly. So using more graphics and attractive icon to represent the buttons may help to improve user interface.

Chapter 8 System Evaluation and Conclusion

System evaluation is the post-implementation review to determine strengths and limitations/constraints of the system. The appraisal will provide feasible information to enhance the future project. It also highlights on the knowledge obtained and identifies shortcoming encountered in the system development and steps to be taken in solving problems.

8.1 Problems encountered and their solutions

8.1.1 Difficulties in choosing a Programming Language and tools

There is some well-known software tools available in the market that can be use to develop a database system as stated in the previous chapter. Choosing a suitable tool was a critical process as all tools have their strengths and weaknesses. In addition, the availability of the required tool for the development was also a major consideration.

In order to solve this problem, seeking advises and a view from ex-supervisor during industrial training, course mates and even seniors engaging in similar project has been carried out. This has given me a view for some programming languages because my course mates have experienced various programming languages during their industrial training.

8.1.2 Determining Scope of the System

It's quite hard for me to determine the scope of the system. The detail that involved in some process is unclear because of the inexperience in the topic. Finally, many discussions with course mates help me to outline the scope of the project to be build in the initial stages. Although the scope has been define, but I found that it's relatively wide in order to make it fully successful within the time frame given.

8.1.3 Inexperience in using Programming Language

Since my knowledge of programming in JSP is quite low, there was an uncertainty on how to organize the structure and codes during the coding process. Although it took some time for me to learn the new language, choosing to program in JSP proved to be a wise move. Most of the problems faced were manageable through the surfing the Internet for related materials (source code) and referring to the reference books. Discussion with course mates especially those who have used the same programming language was a great help. A more efficient method was through trial and error during the coding phase.

8.1.4 Time Constraint

During the design phase, there was not enough time to study and produce the best solution of design in Semester 1. Two of the main programming language I have to study is JSP. Mainly, this was due to inexperience and insufficient knowledge of designing a system. The best way to learn is to read as many approaches used in previous year students' report documentation

8.2 System Strengths

8.2.1 Security

Like most other systems, security is one of the most important aspects in the system. System security is implemented using login ID and password. A valid login ID and password are required to access and make changes in the system database. The system provides four levels of user login controls that are administrator, manager, staff and customer. Every login has its own privilege and the privilege will determine the task that the user can handle in the system.

8.2.2 Friendly User Interface

The system is considered to have a friendly user interface. An authorized user is able to access, especially system administrators is able to access all the functions in the system. Graphic User Interface (GUI) components such as command buttons, list box and navigation button are used to minimize the user actions while performing certain task. The learning curve is short and a user should be able to use the system within minutes.

8.2.3 System Transparency

System transparency refers to the condition where the users do not need to know where the database resides, how is its structure, its database management system and anything related to the system. This feature is very important to avoid confusion that could lead to destruction of the important data.

8.3 System Limitation

8.3.1 Password Encryption

Password is not encrypted and this result in high vulnerability of password.

8.3.2 Database Security

All the information in the database is not secures enough although login ID are required before the user entry the system. This because it is not being encrypted. Therefore, the secrecy or integrity threats still exist.

8.4 Future Enhancement

8.4.1 Error Detection Features

More comprehensive error detection feature can be implemented in the future. This is important to maintain a robust and reliability of the system.

8.4.2 Password Encryption

There is no password encryption used in the system. Passwords are stored directly into the database. If password can be encrypted, then the system will be much secured.

8.4.3 More standardize GUI

The interface of system can be designed in a more standardized way, which shows the professional of designing a system.

8.5 Conclusion

As a conclusion, this project has achieved to deliver the system in time and fulfilled most of the objectives and requirements as determined during system analysis phase.

Throughout this project, there were a lot of knowledge and experience gained. As the project progressed, so did the number of clearer views on how Internet technologies work, JSP concepts and maintaining and configuring SQL server. Learning to program in JSP, HTML, SQL statments and so on proved to be a valuable experience and knowledge. Besides, skills in using software such as Macromedia Dreamweaver MX, MySQL and Apache Tomcat have been acquired.

While programming skills are essential, good practice on software engineering techniques must also be applied efficiently. This project has provided the golden chance to experience using the techniques, paradigms, and approaches learned from System Analysis & Design and Software Engineering courses in the second year and third year study respectively.

The system is still expandable in terms of functionality. Enhancement could still made to the system with more features added. Although not a very complex system, nevertheless the successful development of the system is the first step towards the future development of system definitely. The problems and experiences gained during the system development should be useful in my future tasks.

Appendix A

Web Server Components

How Apache & Tomcat Interoperate

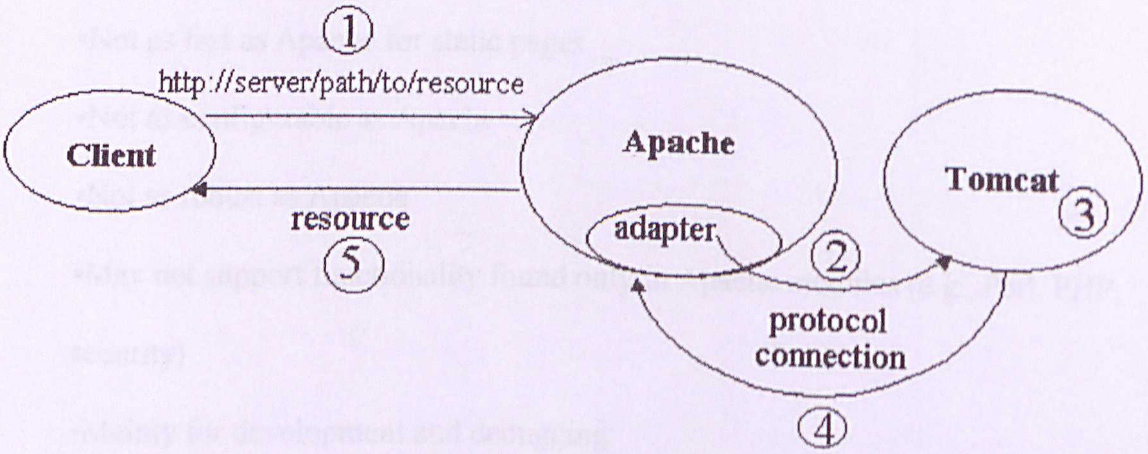


Figure A1: Apache and Tomcat

Web server: application that responds to HTTP requests by returning 'web' resources (e.g., HTML files, images, applets, CGI output ...) over the Internet

- □ Apache: "Industrial strength" HTTP compliant web server

Servlet container (or servlet engine): runtime shell that invokes servlets on behalf of clients; software that runs servlets and manages them

- □ Tomcat: Java-based servlet container with JSP environment

Servlet containers can be partitioned as:

- Standalone: Integral part of web server (as when using a Java-based web server)
- Add-on component to web server: Java container implementation + web server plugin

Standalone

•Not as fast as Apache for static pages

•Not as configurable as Apache

•Not as robust as Apache

•May not support functionality found only in Apache modules (e.g., Perl, PHP, security)

•Mainly for development and debugging

In-process add-on

•Suitable for multi-threaded single-process servers

•Provides good performance

•Limited in scalability

Out-of-process add-on

•Poorer response time than for in-process servlet container

•Better scalability

•Better stability

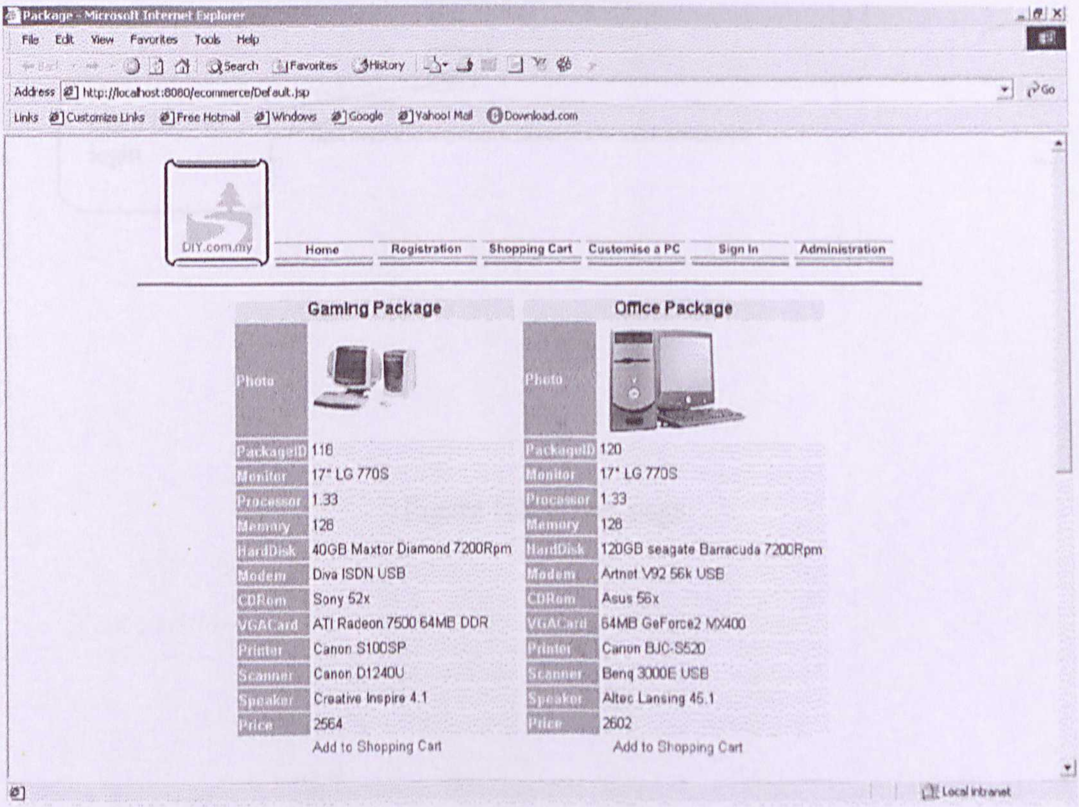
Appendix B

How to Access the DIY.com.my

Before entering the Internet browser, users are advised to use Internet Explorer 5.0 or greater browser. It is best viewed with 800 X 600 pixels resolution with 16 bit colors. User can access to DIY.com.my by entering the following URL in text area of "Address" in the browser.

http://localhost:8080/ecommerce/Default.jsp

(In this case localhost address was used)


Package - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Links Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
Go
DIY.com.my
Home
Registration
Shopping Cart
Customise a PC
Sign In
Administration
Add to Shopping Cart
Add to Shopping Cart
Local intranet

Address http://localhost:8080/ecommerce/Default.jsp

Gaming Package

Photo	
PackageID	118
Monitor	17" LG 770S
Processor	1.33
Memory	128
HardDisk	40GB Maxtor Diamond 7200Rpm
Modem	Diva ISDN USB
CDRom	Sony 52x
VGACard	ATI Radeon 7500 64MB DDR
Printer	Canon S100SP
Scanner	Canon D1240U
Speaker	Creative Inspire 4.1
Price	2564

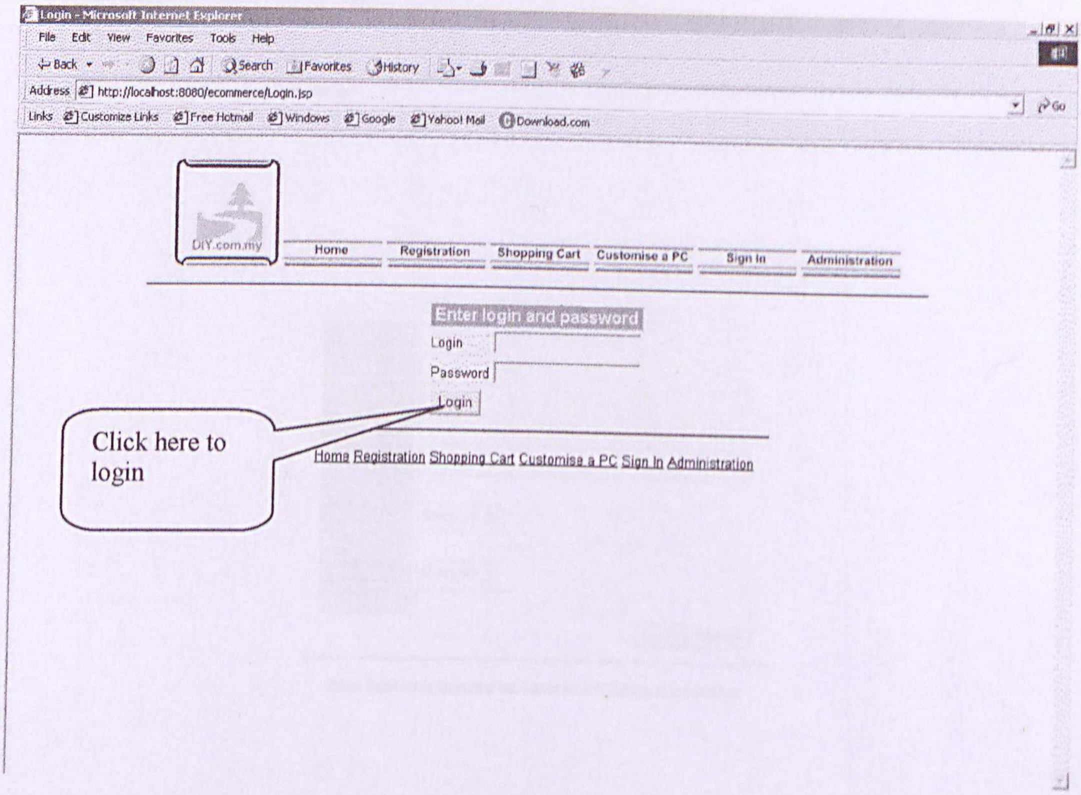
Office Package

Photo	
PackageID	120
Monitor	17" LG 770S
Processor	1.33
Memory	128
HardDisk	120GB seagate Barracuda 7200Rpm
Modem	Artnet V92 56k USB
CDRom	Asus 56x
VGACard	64MB GeForce2 MX400
Printer	Canon BJC-S520
Scanner	Benq 3000E USB
Speaker	Altec Lansing 45.1
Price	2602

Figure B1: Default page

Login Page

To login into system, user is required to enter the correct login and password. An error message will be prompted out if the login or password is invalid.


Login - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Links Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
Go
DIY.com.my
Home Registration Shopping Cart Customise a PC Sign In Administration

Address http://localhost:8080/ecommerce/Login.jsp

Enter login and password

Login

Password

Login

Home Registration Shopping Cart Customise a PC Sign In Administration

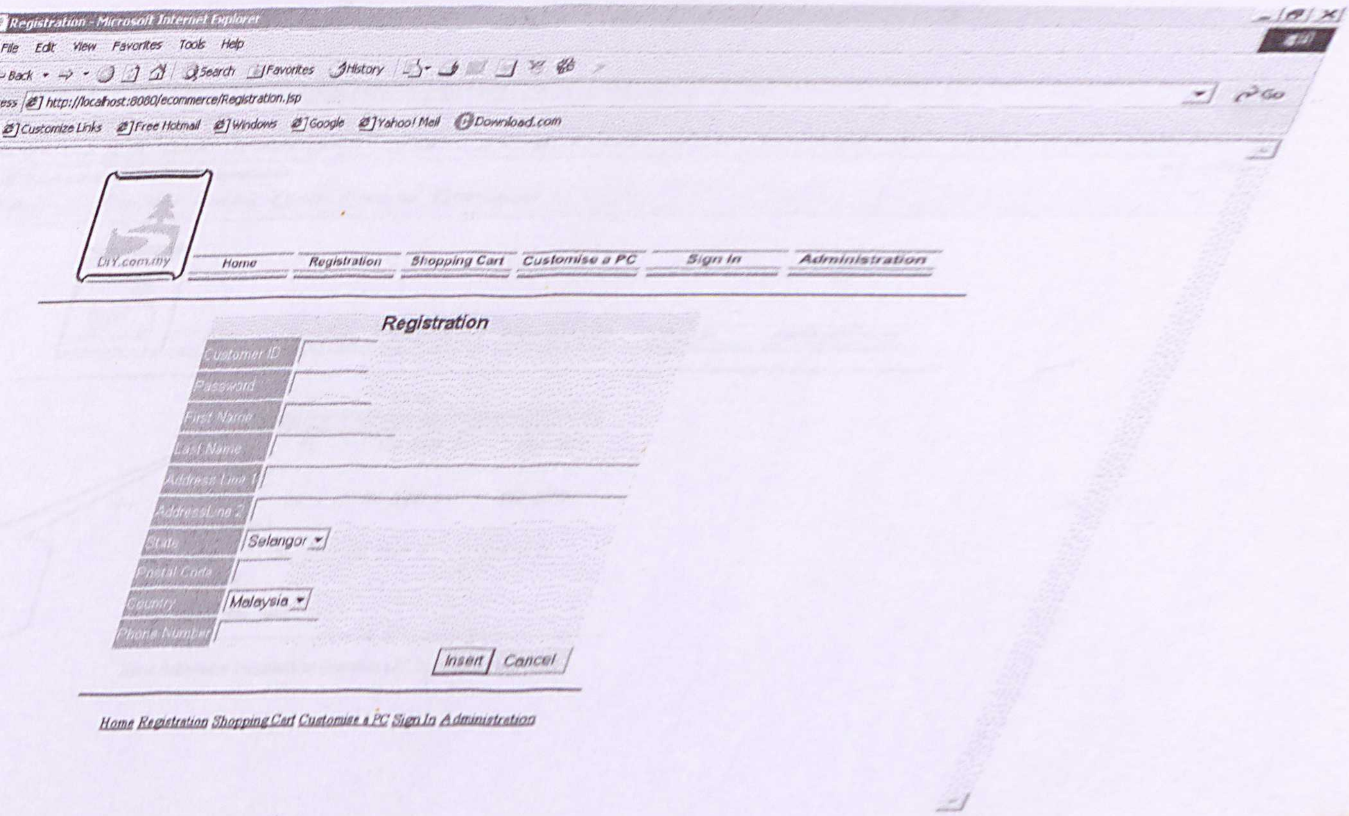
Click here to login

Figure B2: Login page

Registration

New customer will access to Registration page after they click 'Registration

page header. The Registration page as shown below:


Registration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
http://localhost:8080/ecommerce/Registration.jsp
Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
DIY.com.my
Home Registration Shopping Cart Customise a PC Sign In Administration
Insert Cancel
Home Registration Shopping Cart Customise a PC Sign In Administration

Registration

Customer ID

Password

First Name

Last Name

Address Line 1

AddressLine 2

State Selangor

Postal Code

Country Malaysia

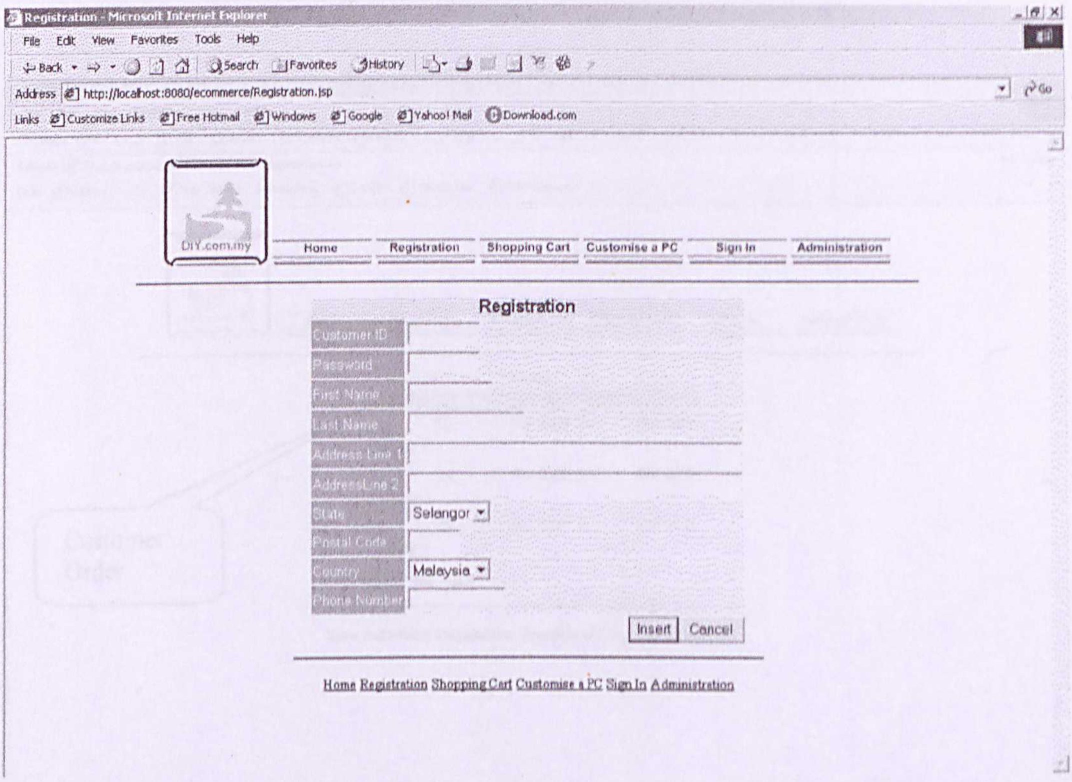
Phone Number

Figure B3: Registration Page

to enter all the needed information to achieve a successful

Registration

New customer will access to Registration page after they click '*Registration*" at the page header. The Registration page as shown below:


Registration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://localhost:8080/ecommerce/Registration.jsp
Go
Links Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
DIY.com.my
Home Registration Shopping Cart Customise a PC Sign In Administration

Registration

Customer ID	
Password	
First Name	
Last Name	
Address Line 1	
AddressLine 2	
State	Selangor
Postal Code	
Country	Malaysia
Phone Number	

Insert Cancel

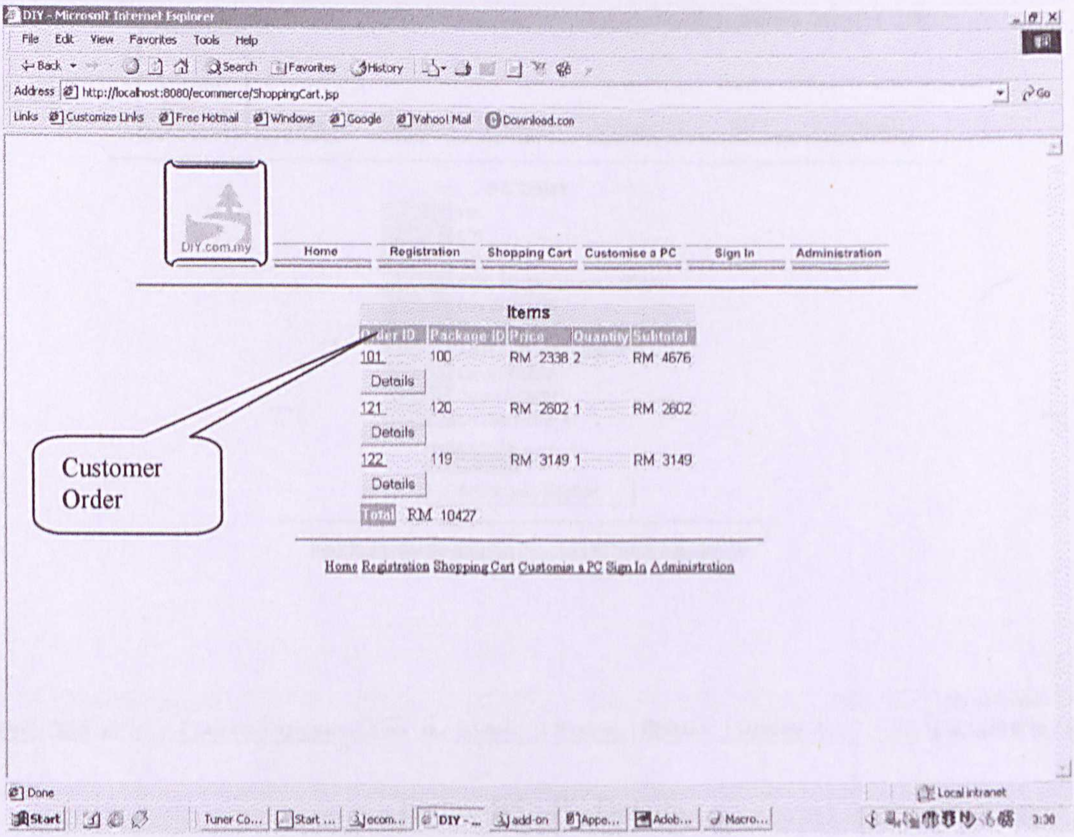
Home Registration Shopping Cart Customise a PC Sign In Administration

Figure B3: Registration Page

New customer need to enter all the needed information to achieve a successful registration.

Shopping Cart

After successful login to system, the shopping cart page will be displayed as below: The page show customer the package they have ordered recently, customer can change the order by click the hyperlink on the left.


DIY - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://localhost:8080/ecommerce/ShoppingCart.jsp
Go
Links Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
DIY.com.my
Home Registration Shopping Cart Customise a PC Sign In Administration
Done
Local intranet
Start Tuner Co... Start ... ecom... DIY - ... add-on Appe... Adob... Macro...
3:30

Items

Order ID	Package ID	Price	Quantity	Subtotal
101 Details	100	RM 2338	2	RM 4676
121 Details	120	RM 2602	1	RM 2602
122 Details	119	RM 3149	1	RM 3149

Total RM 10427

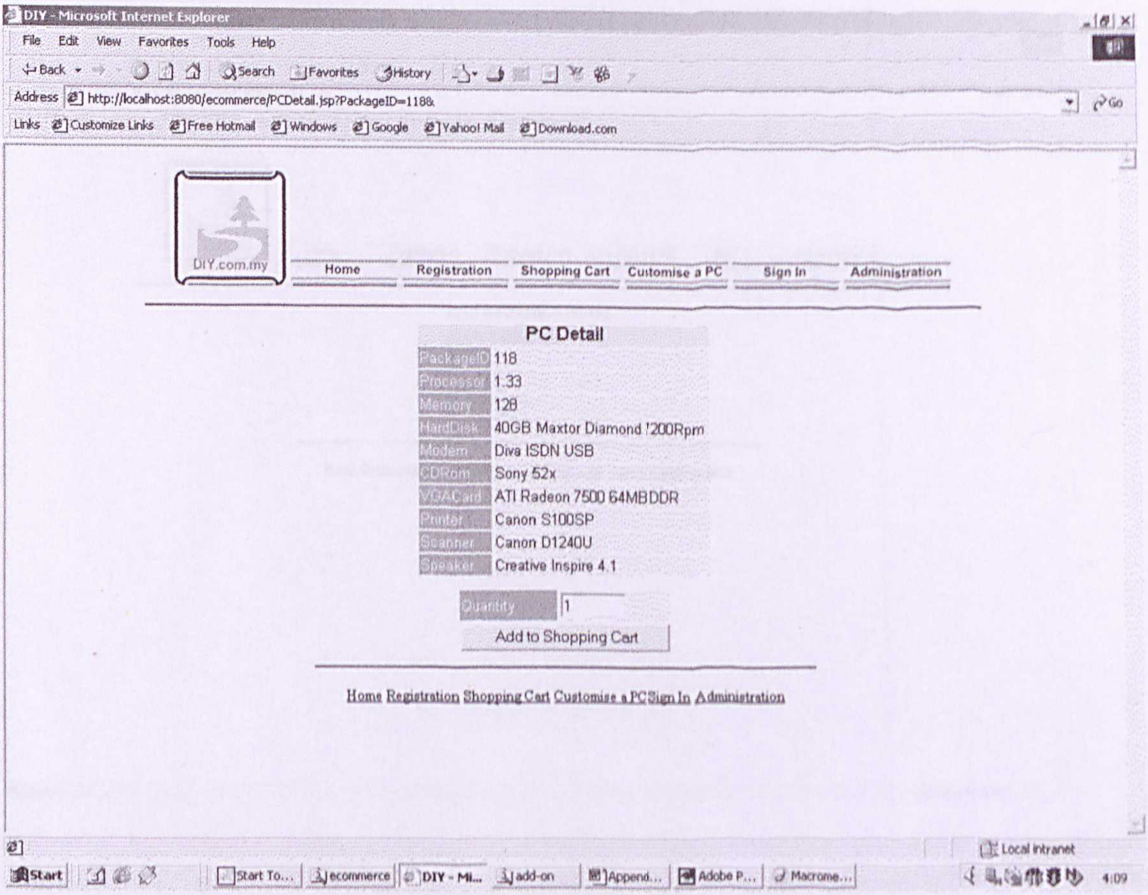
Home Registration Shopping Cart Customise a PC Sign In Administration

Customer Order

Figure B4: Shopping Cart

PC Details

The customer can view the details of the PC by click on it at the default page after that the customer can fill in the total quantity he desired.


DIY - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://localhost:8080/ecommerce/PCDetail.jsp?PackageID=118&
Go
Links Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
DIY.com.my
Home
Registration
Shopping Cart
Customise a PC
Sign In
Administration
Add to Shopping Cart
Home Registration Shopping Cart Customise a PC Sign In Administration
Local intranet
Start
Start To...
ecommerce
DIY - Mi...
add-on
Append...
Adobe P...
Macrome...
4:09

PC Detail

PackageID	118
Processor	1.33
Memory	128
HardDisk	40GB Maxtor Diamond !200Rpm
Modem	Diva ISDN USB
CDRom	Sony 52x
VGACard	ATI Radeon 7500 64MBDDR
Printer	Canon S100SP
Scanner	Canon D1240U
Speaker	Creative Inspire 4.1

Quantity 1

Figure B5: PC Details

Employee Page

If the user is an employee, he will be redirect to the employee page. He can access the function of the system base on his access right.

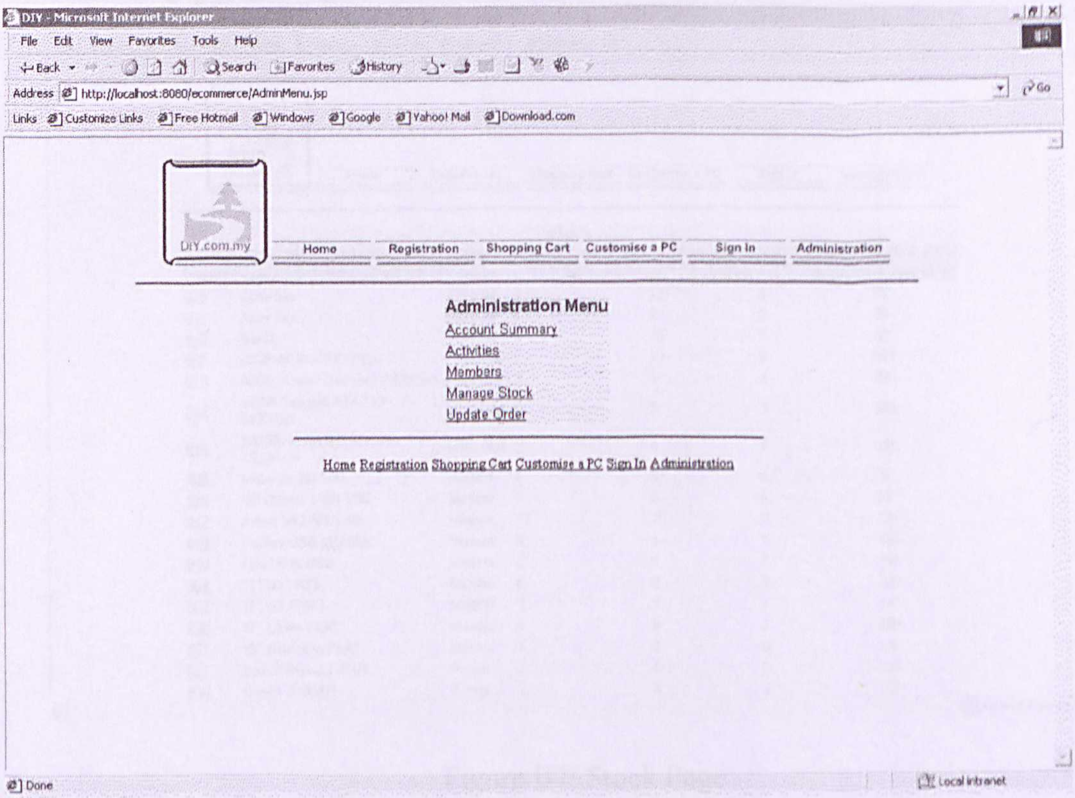
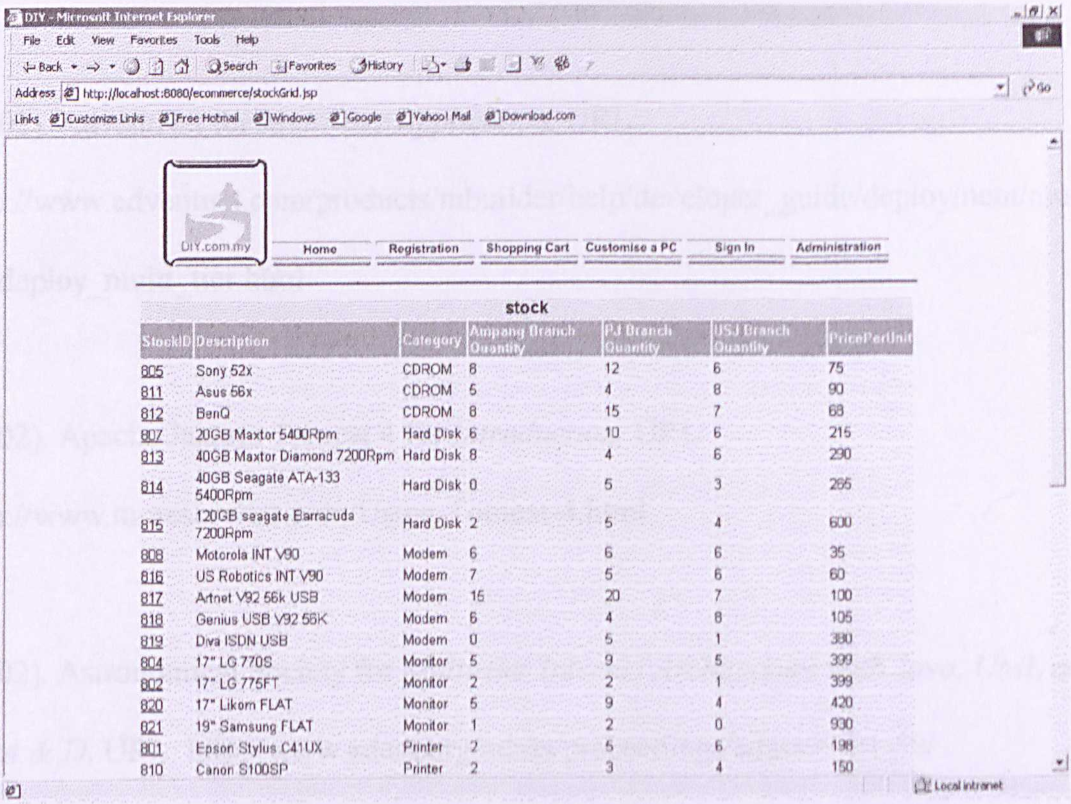

DIY - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://localhost:8080/ecommerce/AdminMenu.jsp
Go
Links Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
DIY.com.my
Home
Registration
Shopping Cart
Customise a PC
Sign In
Administration
Administration Menu
Account Summary
Activities
Members
Manage Stock
Update Order
Home Registration Shopping Cart Customise a PC Sign In Administration
Done
Local intranet

Figure B6: Employee Page

Stock Page

All employee are allow to update the stock details, each event will be log.



DIY - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://localhost:8080/ecommerce/stockGrid.jsp
Go
Links Customize Links Free Hotmail Windows Google Yahoo! Mail Download.com
DIY.com.my
Home
Registration
Shopping Cart
Customise a PC
Sign In
Administration
Local intranet

stock

StockID	Description	Category	Ampang Branch Quantity	PJ Branch Quantity	USJ Branch Quantity	PricePerUnit
805	Sony 52x	CDROM	8	12	6	75
811	Asus 56x	CDROM	5	4	8	90
812	BenQ	CDROM	8	15	7	68
807	20GB Maxtor 5400Rpm	Hard Disk	6	10	6	215
813	40GB Maxtor Diamond 7200Rpm	Hard Disk	8	4	6	290
814	40GB Seagate ATA-133 5400Rpm	Hard Disk	0	5	3	265
815	120GB seagate Barracuda 7200Rpm	Hard Disk	2	5	4	600
808	Motorola INT V90	Modem	6	6	6	35
816	US Robotics INT V90	Modem	7	5	6	60
817	Artnet V92 56k USB	Modem	15	20	7	100
818	Genius USB V92 56K	Modem	6	4	8	105
819	Diva ISDN USB	Modem	0	5	1	380
804	17" LG 770S	Monitor	5	9	5	399
802	17" LG 775FT	Monitor	2	2	1	399
820	17" Likom FLAT	Monitor	5	9	4	420
821	19" Samsung FLAT	Monitor	1	2	0	930
801	Epson Stylus C41UX	Printer	2	5	6	198
810	Canon S100SP	Printer	2	3	4	150

Figure B7: Stock Page

References

1.0 Internet References

(2002). AdventNet for *Multi-tier Application.* URL: http://www.adventnet.com/products/mbuilder/help/developer_guide/deployment/multi_tier/deploy_multi_tier.html

(2002). Apache Jakarta Tomcat 4 for *Introduction.* URL: http://www.moreservlets.com/Using-Tomcat-4.html

(2002). Astronomical Society for *Multi-tier Internet Architecture with Java, UML and OOA & D*. URL: http://www.adass.org/adass/proceedings/adass99/P1-59/

(2002). c2.com for *Waterfall Model.* URL: http://c2.com/cgi/wiki?WaterfallModel

(2002). Database Tutorials Menu. for *databases.* URL: http://www.geekgirls.com/menu_databases.htm

(2002). ils.unc.edu for *Introduction to MySQL and JDBC.* URL: http://www.ils.unc.edu/~lindgren/190/mysql-jdbc/

(2002). Jupitermedia for *ASP.NET.* URL: http://aspnet.4guysfromrolla.com/

(2002). Linux International for *What is Linux?* URL:http://www.li.org/whatislinux.php

(2002). Lucent Technologies for *An Overview of the UNIX Operating System.* URL: http://www.bell-labs.com/history/unix/tutorial.html

(2002). Microsoft Corporation for *Why Windows 2000 is a Great Web Server.* URL: http://www.microsoft.com/windows2000/server/evaluation/features/webserver.asp

(2002). Microsoft Corporation for *Designing Secure Web-Based Applications* for *Microsoft Windows 2000*. URL: http://www.microsoft.com/mspress/books/sampchap/4293.asp

(2002). Microsoft Corporation for *Product Overview.* URL: http://www.microsoft.com/sql/evaluation/overview/default.asp

(2002). searchCRM.com-Definitions for *Data Mining.* URL: http://searchcrm.techtarget.com/sDefinition/0,,sid11_gci211901,00.html

(2002). Webmapping.org for *Why JSP?* URL: http://www.webmapping.org/vcgdocuments/vcgTutorial/tutorial/using_jsp.htm

(2002). Webmasterbase for *Concepts of Database Design and Management.* URL: http://www.webmasterbase.com/article/378

(2002). Webopedia for *database management system.* URL: http://webopedia.com/TERM/d/database_management_system_DBMS.html

Marc A. Mnich (2002). JavaExchange.com for *Multi Tier Architectures for Database Connectivity.* URL: http://www.javaexchange.com/dcb_white.html

Sakari Mattila (2001). Data dictionary for D*ata dictionary - what should be in it?* URL: http://www.canberra.edu.au/~sam/whp/datadict.html

2.0 Book References

Abdullah Embong. (2000). *Sistem Pangkalan Data.* 1st Edition. Tradisi Ilmu Sdn. Bhd.

Dr. P. Sellappan. (2000). *Software Engineering.* 1st Edition. Sejana Publishing.

F.D. Rolland. (1998). *The Essence of Databases.* Prentice Hall Inc.

Keneth E.Kendall and Julie E.Kendall. (1999). *Systems Analysis and Design.* 4th Edition. Prentice Hall Inc.

Shari Lawrence Pfleeger. (2001). *Software Engineering Theory and Practice.* 2nd Edition. Prentice Hall Inc.

Bibliography

(2002). Apple Computer, Inc. for *Java Client and Other Multi-Tier Systems.* URL: http://developer.apple.com/techpubs/webobjects/JavaClientDesktopApps/Introduction/Java_Client_ier_Systems.html

(2002). Lycos, Inc. for *Choosing the Right Database System*. URL: http://hotwired.lycos.com/webmonkey/98/24/index0a.html

(2002). OOP-Research for *File upload JSP/Servlets by multipart/form-data | Web Hosting with Shopping Cart.* URL: http://www.oop-reserch.com/index.html

(2002). OOP-Research for *More Java API for JSP/Servlet programming.* URL: http://www.oop-reserch.com/cross_xml.html

(2002). Webmapping.org for *Design Concepts*. URL: http://www.webmapping.org/vcgdocuments/vcgTutorial/tutorial/review_web_architectures.htm

Thomas H. Grayson (2002*).* Massachusetts Institute of Technology *for Referential Integrity and Relational Database Design.* URL: http://gis.mit.edu/classes/11.521/lectures/lecture7.html