Faculty of Computer Science and Information Technology
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WXES 3182 : Thesis Project

E–Computer Shop System
(ECSS)

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ABSTRACT

The E-Computer Shop System (ECSS) is conceived to solve problems with typical business models, which are inefficiency and lots of procedure in managing stock inventory. The E-Computer Shop System (ECSS) will serve to further enhance the current business model in search of a cost-effective and sophisticated solution.

This project aimed for Computer Shop Owner in order to assist them to meet the challenge and real business environment in the midst of today's evolving world of information technology. The ECSS is able to manage all stock inventory in their shop effectively and easily. The ECSS also help to enhance ordering and receiving goods from suppliers with drag-and-drop interface. The ECSS also will help computer shop owner to setup and manage their own website as a way to promote their shop through internet.

The ECSS is designed to automate the existing inventory management process running on SQL Server. This project will harness the full capabilities of Microsoft .NET Framework technology using Microsoft Visual Basic .NET (VB .NET) as system application language and Microsoft Active Server Pages .NET (ASP .NET) as dynamic webpage language.

Eventually, the successful implementation of the ECSS will create an automatic and paperless environment, revolutionizing the way of inventory management and internet promotion. Hopefully, it will be a generic system to suit all computer shop owner.

ACKNOWLEDGEMENT

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Chapter 1 - INTRODUCTION

1.1 Overview

Maintaining a stock of inventory items has long been an arduous task for many computer shop owners. If computer shop owners fail to have the stock available for customers, they will always lose potential business. Because if the customers cannot get it from you, they can get it from another shop. Although inventory control can be done manually using the old methods of cataloging by part or item numbers. But with the use of computer programs to track stock-keeping units, it can be done faster, cheaper and better by automating some or all of the inventory control process.

If customers who want to buy full package or some parts of computer, two things they need to know: the information about the product and the price of the product. We surely can get the information about the product by browsing through the internet. But the price always are the list price stated by the manufacturer, not the price offer by the shop. Normally the shop price is cheaper than the list price because the shop want to get more customers.

Thus, technology should be adopted to help both parties to overcome those problems. That's why E-Computer Shop System (ECSS) is needed. ECSS helps shopkeeper to manage their inventory and help the customers to get detail information about the product.

With ECSS, computer shop owners can manage inventory easily such as counting and monitoring inventory, anticipating inventory movement and publishing the product's information on internet.

ECSS also enable the customers to get their information and specification about the product easily, the price and new promotion packages offered by the shop and place comments about the product.

1.2 Project Motivation

- Time-consuming and inefficient
  - o Produces receipts, invoices, etc manually wasted a lot of time
  - o Paperwork make process complex and hard to analyze
- Items Shortages
  - o Don't know the availability of the item in shop
  - o Lose potential business if shortages occur
- Unreliable
  - o Transaction records may lost
  - o Calculation of stock can't be done often because work is done manually
  - o Mistakes may occur during manual calculation
- Market demand
  - o Large of transaction records
  - o Hard to analyze current and future demands
  - o Hard to generate a complete reports
- Ways of promote
  - o Can only use traditional media (newspaper, radio, magazine, etc)
- Costly and not so effective

1.3 Project Objectives

Core objectives of the projects are as below:

- To provide the users a faster, cheaper and efficient way to manage their inventory.

- To save cost for long term and short term maintenance.

- To give the users a view of the trend of the market demand through statistic, graph and chart even without any knowledge of inventory control.

- To provide the users a way of promoting their shop through Internet.

- To enable the customers to get information of computer product easily by browsing through the website produce by the shopkeeper.

1.4 Project Scope

Basically, ECSS can be divided into 2 part which are inventory management part and website part. Inventory management part is windows-based while website part is internet-based. This system is specifically developed for computer shop owner. This system will reduce the time wasted just to update the stock information. Everyday when the shop's owner wants to retrieve information such as yesterday sales, they just need to login to the system and press a button. And the system will calculate it and generate a report in form of graph or table.

The ECSS system will be divided into three major sections which are the System Administration Section, Staff Section and Website Section.

1.4.1 System Administration Section

The System Administrator (mostly the owner of the shop) will have all information related to their shop inventory. This section provides an interface for the system administrator to add, delete and modify the information of all users in the system. When the quantity of a stock is below the minimum stock level, the system will alert the system administrator. Beside the alert function, the system also has the ability to generate certain reports such as daily/annual selling report, total earning, top 10 product sales, etc.

1.4.2 Staff Section

This section provides functions for daily transaction. The system has interaction with printer. When a successful transaction has being made, the system will print out

receipt automatically for the customers. Beside that, when a successful transaction has being done, the system will subtract from the inventory in the database. By automatically update the inventory for each transaction, this will greatly reduce the workload needed to keep a running total.

1.4.3 Website Section

This section includes developing a website for the customer to get information about the product sell at the shop. The webpage will have the most update price list and promotion packages offer by the shop. Every information of the website are store at the database. Whenever have a new product or modification, the website will automatically be update.

1.5 Significance of the System

- To reduce too much of paperwork
- To provide a more systematic method in managing inventory
- Let the system helps to calculate every records correctly and accurately
- Use the Internet which is a growing market to increase shop's sales
- To provide an one-stop website for browsing every information of computer hardwares and accessories

1.6 Hardware and Software Specification

Server

➢ Hardware :

- Intel Pentium 4 Processor 1.8 GHZ or AMD Athlon 1800+ Processor

- 512MB 266MHz DDR SDRAM

- 20GB Hard Disk Drive

- 3.5" FDD/ 52X Max CD-ROM

- Monitor and Keyboard and Mouse

➢ Software :

- Windows 2000 Advanced Server

- IIS 6.0

- Microsoft SQL 2000 Server

Client

➢ Hardware :

- Intel Pentium 4 Processor 1.6 GHz or AMD Athlon 1600+ Processor

- 256MB 266MHz DDR SDRAM

- 10GB Hard Disk Drive

- 3.5" FDD/ 52X Max CD-ROM

- Monitor and Keyboard and Mouse

- Local Network Connection

1.7 Expected Outcome

1.7.1 Expected Outcome for System Administration Section

- A standard sign-on screen for administrator to login.

- A login system that will bar and deactivate users who fail to provide the correct password after three attempts.

- System administration panel – for add / delete / modify (users / items / packages) information.

- Report generate panel – to generate daily/annual sales reports.

- The system is smart enough to detect the item's quantity level and alert the administrator when the item is below the specified level.

1.7.2 Expected Outcome for Staff Section

- A standard sign-on screen for staff to login.

- A daily transaction interface – field to input sales item and print receipt for customer.

- Provides staff right to create, edit and delete items.

- Provide staff to update the item's stock.

1.7.3 Expected Outcome for Website Section

- Dynamically generate products information page (name, specification, requirement, price, picture, etc) from information in database.

- Dynamically generate promotion packages page.

- Dynamically generate top selling product page.

1.8 Project Schedule

Project Stage	June				July				Aug				Sept				Jan				Feb				Mac				Apr	
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Preliminary Study and Planning		▓	▓	▓																										
Literature Study					▓	▓	▓																							
System Analysis							▓	▓	▓																					
System Design									▓	▓	▓																			
Prototyping													▓																	
Development and Coding														▓	▓	▓	▓	▓												
Unit Testing																					▓	▓								
System Testing																							▓	▓	▓					
Documentation																										▓	▓			
Implementation and Maintenance																												▓	▓	▓

Table 1.1: Project Schedule

Chapter 2 - REVIEW OF LITERATURE

2.1 Analysis Study

This review of literature is to analyze and research the current systems which have same or similar function to ECSS. The idea, knowledge and experience gained during the survey will be used in the development of ECSS. Various good and relevant features are to be noted during the survey, particularly, the design and interface methods used by various system. Thus the literature review provides pertinent information and validity to the research and the environment will be necessary to determine and implement the best solution.

2.1.1 Case Study 1 - ShopFront

2.1.1.1 Introduction

ShopFront is a Point of Sale and Inventory management system for small to medium enterprises [SMEs]. The system consists of two module which are the point of sale (POS) module and management module. It provides a comprehensive range of features including user friendly interface, cash drawer operation, bar code capability, password protection, debtor control, cashbook etc. The large number of reports provides daily reconciliation, price tags, barcode labels, sales analysis.
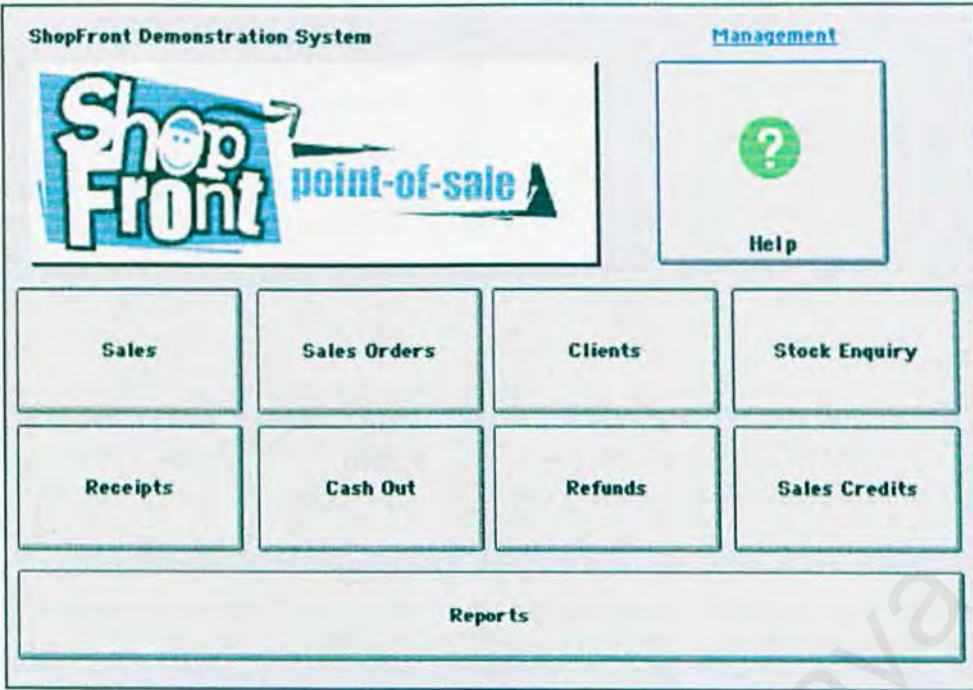
Figure 2.1 ShopFront Point of Sale Windows

The POS module includes features for Sales, Sales Order(tracks the salesperson, the client and their entire order and it's status), Clients(shows all clients information), Stock Enquiry(searches for items by their group, their code, their description, brand or their manufacturer), Receipts(provides a complete audit trail of all Sales and their associated Receipts), Cash Out(keeps track of what is in and who took it out), Refunds(makes easy and painless to manage and track refunds), Sales Credits(managing credits) and Reports(doing reports and cashing up registers).

Figure 2.2 ShopFront Management Window

The management module includes some additional features such as Suppliers (holds detailed information on each Supplier), Purchase Orders(entered purchase orders and the status of each tracked), Deliveries(entered deliveries and matched against Purchase Orders), Purchase Credits(allows for entry of goods which may be returned to a supplier), Inventory(holds detailed information on each inventory item), StockTake(provides automated and manual stocktake methods), Export Accounting.

2.1.1.2 Result of Study

Strength:

- Provides a lot of features from management every information to generate reports.

- Supports many devices such as printers and bar code scanner.

Weakness:

- Can not customize the system. Not all features will be used by the users.

- Needs training and help from the provider to fully utilize the system.

- Performance decrease when database grow

2.1.2 Case Study 2 - Skandata Skantrak Inventory Management System

2.1.2.1 Introduction
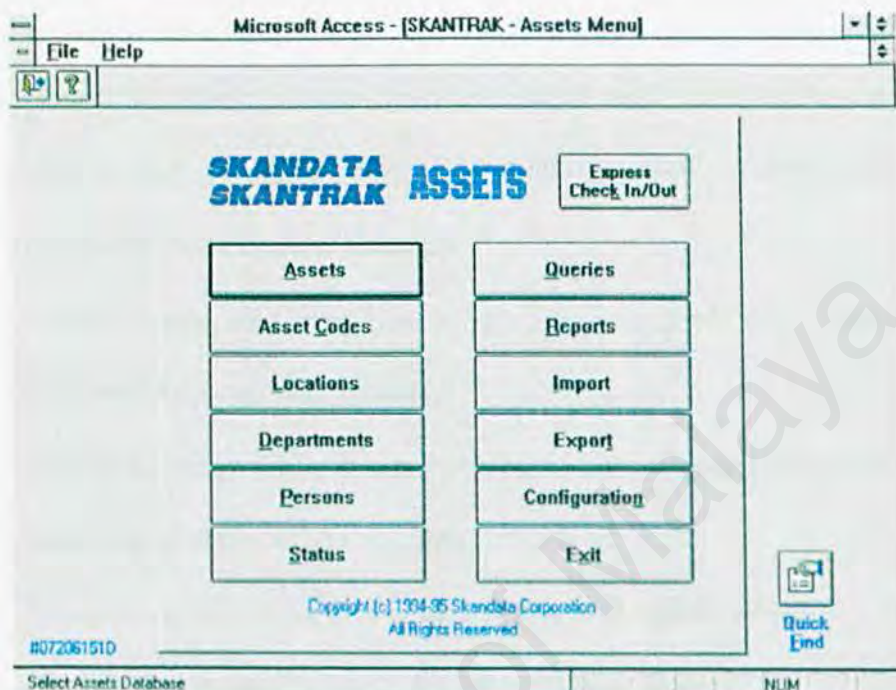
Figure 2.3 Skandata Skantrak Inventory Management System

UBS Stock Control is produced by Skandata Corporation. The system offers service to track item inventory levels and issues/returns/receipt transactions of consumable items, office supplies, production components, spare parts, etc. The system is compatible with Windows 3.1, Windows 95/98/2000/XP and Windows NT. The system uses Microsoft Access as the database. It also supports check in/out transactions, bar code readers, portable data collection, custom reports and many other features.

2.1.2.2 Features

- Easy-to-Use operation for users at any level.

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- Express Check In/Out capability provides for fast and easy processing of item issues, receipts, returns or moves.

- Review current and history records for any item or transaction.

- Query-by-Form (aka: Filter-by-Form) feature provides the ability to generate custom queries, reports or exports, to users at any level.

- Over 40 standard item and transaction reports, bar code menus and bar code label formats to choose from, plus ability to create custom reports with Skantrak's Quick Reports generator.

- Ability to print Bar Codes directly from Database, Keyboard, or using Auto-Increment Mode on laser printers.

- Password Access Control capability limits use of system menu selections according to each user's pre-defined access level.

- Experienced Access users may modify standard reports. create new bar code label formats or modify Skantrak's bar code label formats.

- Skantrak includes Skandata Access Toolkit for ability to attach directly to any Skantrak database table, allowing unrestricted use of Microsoft Access Form, Report, Query and other Access Wizards, for additional flexibility.

- Experienced Access users may customize Skantrak's Main Menu/Control Panel to add custom application Buttons, Reports, Basic Modules, Access Macros, Queries, and other features.

2.1.2.3 Result of Study

Strength:

- Simple interface.

- Fast and easy to create management reports.

- fast and easy processing of item issues, receipts, returns or moves

Weakness:

- Only supports Microsoft Access. No compatibility with Microsoft SQL or Oracle.

- Need to know SQL language to generate reports and queries.

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2.1.3 Case Study 3 - UBS Stock Control

2.1.3.1 Introduction

UBS Stock Control is produced by UBS Corporation Sdn Bhd. UBS Stock Control is a real time system that updates your stock immediately after entry. It also performs as an invoicing system whereby you can print invoice and delivery order. Extensive R & D over the years has improved the effectiveness of the system. A simple yet powerful Bill of Material module has been included to enhance the system.

Four methods of stock valuation are provided in the system, namely Fixed Cost, First In First Out (FIFO), Monthly Moving Average and Moving Average. Different levels of security for data access are available. The system also provides two types unit of measurement with location, category and item group control. If required, a picture of the stock item can also be inserted.

2.1.3.2 Features

- Different levels of data access security

- Real-time update of stock with each receipt, issue of item, etc.

- Credit limit control on invoicing

- Able to maintain foreign currency and auto conversion on foreign exchange.

- Authorised password to print 2nd invoice (optional)

- Item Assembly (Assemble parts to become a finished item)

- Four (4) valuation method (Fixed Cost, FIFO, Monthly Moving Average, Moving Average)

- Negative stock level (optional)

- Types of unit measurement

- Integration facility with UBS Accounting

2.1.3.3 Result of Study

Strength:

- Provide a range of comprehensive features.

- The features are intended to be used by all type of business organizations.

Weakness:

- Cannot customize for any type of business.

- Features may be too many and redundant.

2.2 Software Architecture

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

2.2.1 Mainframe Architecture

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

2.2.2 Client-Server Architecture
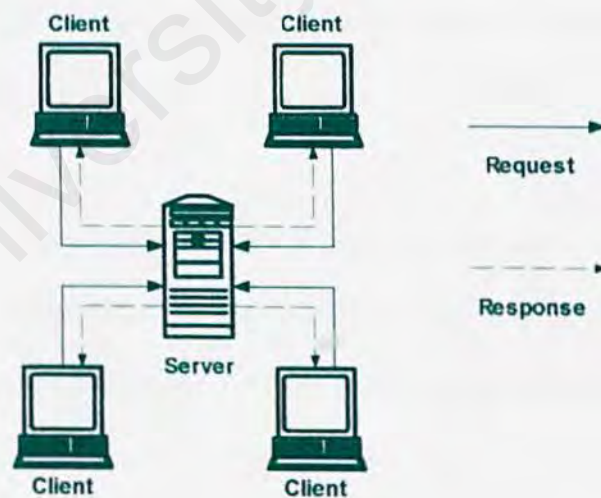
Figure 2.4 Client-Server Architecture

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Client: A program running on the local machine requesting service from a server. A client program is finite, which mean it is started by the user (or another application program) and terminates when the service is complete.

Server: A program running on the remote machine providing service to the clients. When it starts, it opens the door for incoming requests from clients, but it never initiates a service until it is requested to do so. A server program is an infinite program. When it starts, it runs infinitely unless a problem arises. It waits for incoming requests from clients. When a request arrives, it responds to the request.

The idea about the client-server computing is that client and server are separate logical that work together over a network to accomplish a task. Nevertheless, there is a definition for it "A software partitioning paradigm in which a distributed system is split between one or more server task which accept requests, according to some protocol, from (distributed) client tasks, asking for information or action. There may be either one centralizes server or several distributed ones. This model allows clients and servers to be placed independently on nodes in a network.

Generally, it refers to a computing model where two or more computers interact in such a way that one provides services to the other. This model allows customers to access information resources and services located anywhere within the customers information network.

The part of a client-server system is the client, server and the network. Processing is actually divided between the client system and the server. Each application involves

two programs: one program is a client; the other is a server. These programs are linked by a network. The client makes requests for services provided by the server.

The client can be a PC or as known as workstation on which users run application. The application is relies on server. Client program usually manage the user interface portion of the application and allow data entered by the user. The server is a computer or device on a network that manages network resources. It should be a platform that suited for a specific application or task. The server's role is to wait passively for a client to request a service. The client and server might be in the same room or half of a world apart.

Client-Server computing is really much more than a simple separation of a use's Pc from a server computer. The client-server model has evolved from a two tier architecture to a three tier architecture.

System architectures define the way in which the components of systems interact with one another and the way they are mapped onto an underlying network onto computers. Currently, there are a few architectures intended in the real-world environments such as Mainframe architecture, Client-Server architecture, Two-Tier architecture and Three-Tier architecture etc.

2.2.3 Two-Tier Architecture
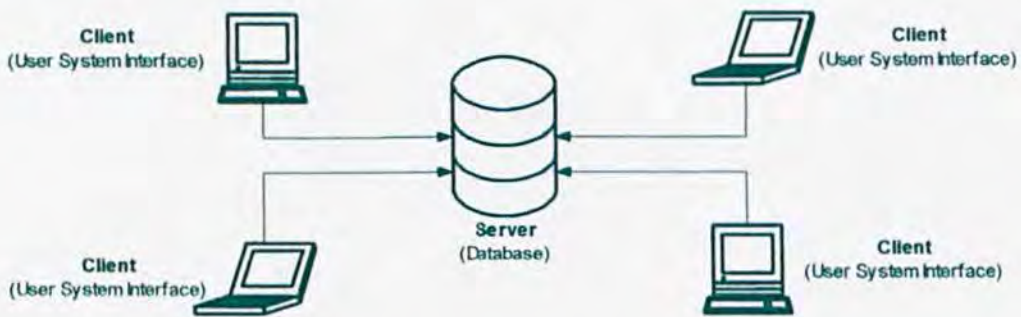
Figure 2.5 Two-Tier Architecture

A two tier architecture is where a client talks directly to a server, with no intervening server. Processing management is split between the user system interface environment and the database management server environment. The database management server provides stored procedures where as the processing is done in the server as well. The two-tier application requires separate database products such as Oracle, Sybase or Microsoft SQL Server.

With the limitation of number of user in a working environment (less than 100), performance begins to deteriorate when the number of users exceeds more than 100. A second limitation of the two-tier is that implementation of processing management services using vendor proprietary database procedures restricts flexibility and choice of database management system for applications. Finally, current implementation of the two-tier provides limited flexibility in moving (repartitioning) program functionality from one server to another without manually regenerating procedural code.

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2.2.4 Three-Tier Architecture

Figure 2.6 Three-Tier Architecture

Three-tier client-server architecture also referred to as the multi-tier architecture. This architecture emerged to overcome the limitation of the two-tier architecture. On the other hand, three-tier applications are much more difficult to build than the two-tier applications.

In the three-tier architecture, a middle-tier was added between the user system interface client environment and the database management server environment. There are a variety of ways of implementing this middle-tier architecture, such as transaction processing monitors, message servers or application servers.

The most basic type of middle layer is the transaction processing (TP) and its monitor is kind of message queuing service. The client will connect to the transaction processing monitor instead of the database server.

2.3 Network

Network occurs when computer systems are connected together and exchanged in formations. There are is a few types of network can be considered to be used in this project: LAN, WAN, internet and intranet.

2.3.1 Local Area Network (LAN)

A LAN is usually privately owned and links the devices in a single office, building or campus. LAN allows users to share files, programs, or data with a minimum of effort. A LAN can be as simple as two PCs and a printer in someone's home office or it can extend throughout a company. Currently, LAN size is limited to a few kilometers. A LAN tends to use just one set of networking options. For example, a LAN generally uses one network operating system, one type of cable, and one logical topology. A LAN is not limited to any particular computer operating system. DOS, Macintosh, and UNIX can all run across a LAN. Actually, they can all run across the same LAN at the same time, if the right software is used.

2.3.2 Wide Area Network (WAN)

A WAN provides long distance transmission of data, voice, image and video information over a large geographical area that may comprise a country, a continent or even the whole world.

The WAN is typically used to connect two or more local area networks (LANs). WANs may utilize public, leased or private communication devices, usually in

combination and can therefore span an unlimited number of miles. A WAN that is wholly owned and used by a single company is often referred to as an enterprise network.

2.3.3 Internet

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

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

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

2.3.4 Intranet

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

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

2.4 Operating System

Operating system (OS) is software that controls the execution of programs on a PC or serves and manages all hardware and software resources. OS acts as an interface between the user of a computer and the computer hardware.

The OS is the key of the stability of the whole system by make sure that different programs or applications running at the same time do not interfere with each other. For security, OS ensures that unauthorized users do not access the system. OS provides a software platform to allow application programs run on it.

The most popular operating systems currently are Microsoft Windows 2000 Server Family, Microsoft Windows NT Server 4.0, Novell Netware 5.0 and LINUX.

2.4.1 Microsoft Windows 2000 Server Family

Windows 2000 Server is the multipurpose network operating system for businesses of all sizes. Windows 2000 Server provides an integrated, comprehensive and easy-to-use solution. Windows 2000 Server, like Windows NT Server 4.0, has been designed from the ground up as an integrated multipurpose operating system. As opposed to combining un-integrated services, Windows 2000 Server provides complete integration between its services resulting in easier management and lower TCO. For instance, once authenticated to the directory, users don't need to re-authenticate themselves to access other applications and services.

Features:

- The file and printer sharing implementation in Windows 2000 Server provides customers with an advanced solution, offering a distributed file system, Internet printing, content indexing, dynamic volume management, and Plug-and-Play support.

- Networking infrastructure is complete and manageable—it offers true dynamic configuration, integrated dial-up and VPN with support for the latest IETF VPN protocol suite, telephony, and a Quality of Service (QoS) solution to guarantee bandwidth and network availability.

- Windows 2000 Server provides customers with a scalable solution in terms of CPU and memory support. The combination of Clustering Services, component load balancing, and the Windows Load Balancing Service provides customers with a comprehensive availability/load-balancing solution to further increase system scalability and reliability. Windows 2000 Server and COM+ provide a flexible and robust platform upon which to build distributed applications. Finally, integrated Terminal Services provides customers with a comprehensive thin-client solution.

- Offering numerous unrivaled Internet services management, publishing, streaming media, and performance enhancement capabilities.

- The Active Directory™ service in Windows 2000 Server is built completely around Internet-standards and offers extensibility and scalability. This makes it a solution upon which to build enterprise-level directory-enabled applications. Microsoft Management Console (MMC) provides customers with a single customizable interface for managing networking services and applications. The combination of IntelliMirror™ management technologies,

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Windows Installer, and Group Policy Services easily provides a comprehensive solution for software distribution and desktop management. Security support in Windows 2000 Server provides support for Kerberos, smart card authentication, fully integrated public key infrastructure, and file system encryption services.

2.4.2 Microsoft Windows NT Server 4.0 (WinNT)

WinNT is one of the powerful OS for network computing. It has matured by virtue of being put to wide use. WinNT is also a OS that perform a reliable, secure, multithreaded, symmetric processing and support client-server system. WinNT provides organizations with a centralized directory for managing users and groups amd single logon services.

Features:

- WinNT in file and printer sharing support is robust. WinNT offers fewer file system limitations, integrated namespace support, data striping and data striping with parity.

- Offering several unmatched capabilities such as integrated dial-up access and VPN support.

- Providing numerous capabilities such as message queuing, clustering and load balancing and a thin-client solution in the form of the Terminal Server Edition of Windows NT Server. Furthermore, with the addition of Active Server Pages (ASP), the power of COM and Transaction Server-based applications can be extended to the Web.

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- Offering load balancing, content management, and protocol support including SMTP and NNTP that is simply unrivaled.

- Provide easy-to-use graphical tools, MMC management for key services, and the Zero Administration Kit to control desktops.

2.4.3 Novell Netware 5.0

Novell NetWare 5.0 provides the services in the major customer deployment scenarios. Many of the services are simply provided as add-ons and lack common installation, management interfaces, and security infrastructure. Because of the lack of an integrated architecture, NetWare 5.0 is very difficult to use and administer at times. Furthermore, NetWare 5.0 lacks many of the features, such as clustering, load balancing, VPN support, distributed file system, dynamic volume management, and others that provide customers with better availability and lower TCO.

Features:

- File and print services are extremely robust, but functionality limitations in Novell Storage Services and client and device compatibility issues with Novell Distributed Print Services negates the usefulness and all of the benefits for many customers.

- Native TCP/IP support is provided, but client compatibility will be an issue for many existing environments. Hot Plug PCI support is innovative.

- NetWare 5.0 provides services to develop Java/CORBA applications.

- The Internet services implementation found in NetWare 5.0 provides organizations with the basic HTTP and FTP services required to host Internet and Intranet sites.

- Although it boasts an extremely impressive feature-set, NDS is beset by scalability or latency issues and a general lack of support for Internet-standards, making it not appropriate a choice for the enterprise. The GUI administration tools in NetWare 5.0 are adequate, offering in some ways better integration than Windows NT Server 4.0.

2.4.4 LINUX

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

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

Features:

- Configuration files are easily changed to suit user's need. If configuration file is damaged, only need to replace that damaged file.

- Wide range of tools to configure system.

- It has choice of select to run an application using GUI interface or command line.

- Compiler, perl, sed, awk, TCL, shell scripts and other development tools are free.

- Easily parsed text file to automated administration.

- It can change run-levels without rebooting.

- It can access DOS/Win/NT file systems.

- Backups are compatible between different distributions of LINUX and versions of UNIX as well as other system (except Windows NT).

- Application can take advantage of LINUX memory management and therefore multiple copies can run on the same machine, serving multiple users.

2.5 Web Server

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

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

2.5.1 Apache

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

The keys to Apache's attractiveness and popularity lie instead in the qualities listed above and its extensibility, its freely distributed source code, and active user support

for the server. And version 1.3.0, now in official release, is already being touted as the most stable and fastest version of Apache ever.

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

2.5.2 Internet Information Server (IIS) v6.0

Internet Information Services 6.0 (IIS 6.0) is the Windows .NET Web server that makes it easier to share information among partners, customers and employees over an intranet, the Internet or via an extranet. With IIS 6.0, Microsoft has completely revised the IIS architecture in the Windows Server family to address the demanding needs of enterprise customers, Internet service providers (ISPs), independent software vendors (ISVs) and organizations of all sizes. This article provides an overview of benefits, new features, and improvements for IIS in Windows .NET Server.

IIS 6.0 offers a wide variety of new features and technologies making it more dependable, versatile and manageable. IIS 6.0 with services such as comprehensive failure protection, broad scalability, and advanced security ensures a highly dependable framework that customers can count on to conduct their business.

IIS 6.0 offers pervasive administrative access, powerful administration capabilities, and flexible configuration management options. In addition, IIS 6.0 enables faster response times and Web page rendering. IIS 6.0 offers tighter integration with

powerful application serving capabilities and support for the latest Web standards, including XML, SOAP and IPv6.

2.5.3 Personal Web Server (PWS)

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

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

One of the best uses for PWS is as a platform for testing out Web sites on Windows 95/Windows NT Workstation computers before hosting them on the Internet. This allows users to check the validity of links, scripts, and applications as well as to ensure that the overall organization of the site is functioning correctly.

PWS presents the ability to develop transactional Web applications using the Microsoft Transaction Server. Overall, while most large enterprises will likely bypass Microsoft's Personal Web Server for the high-end Internet Information Server,

PWS will remain one of best available options for individuals wanting to serve their own personal home pages and for small organizations needing to host their own Web sites.

2.6 Security Technology

Security is an important part in developing a web site. Without a good security system, a web site can be hacked and make the user to loose confidence of web site. SSL is considered for securing the transport of information in DECP.

2.6.1 Secure Sockets Layer (SSL)

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

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

The advantage of the SSL Protocol is that it is application protocol independent. A "higher level" application protocol (e.g. HTTP, FTP, TELNET, etc.) can layer on top of the SSL Protocol transparently. The SSL Protocol can negotiate an encryption algorithm and session key as well as authenticate a server before the application

protocol transmits or receives its first byte of data. All of the application protocol

data is transmitted encrypted, ensuring privacy.

2.7 Database Server

2.7.1 Microsoft SQL Server 2000

Microsoft SQL Server 2000 is the complete database and analysis offering for rapidly delivering the next generation of scalable e-commerce, line-of-business and data warehousing solutions. Microsoft SQL Server 2000 provides agility to data management and analysis, allowing organization to adapt quickly and gracefully to derive competitive advantage in a fast-changing environment.

Microsoft SQL Server 2000 is a fully Web-enabled database product, providing core support for Extensible Markup Language (XML) and the ability to query across the Internet and beyond the firewall. With scale up and scale out capabilities, SQL Server meets the needs of demanding ecommerce and enterprise applications. SQL Server 2000 is the data management and analysis backbone of the Microsoft .NET Enterprise Servers. SQL Server 2000 includes tools to speed development from concept to final delivery.

2.7.2 Oracle 9i

On June 14, 2001, Oracle launched Oracle9i. Oracle 9i is the latest version of Oracle enterprise database system. Oracle 9i is a multi-user database. It provides unprecedented ease-of-user and is pre-tuned and pre-configured for today's dynamic workgroup and line-of-bus environment.

Oracle 9i includes a fully integrated set of easy-to-use management tools, full distribution, replication and web features. Oracle 9i also provides the highest levels of availability through fast failover, easier management, and zero data loss disaster

protection, with Data Guard, the only complete data protection solution available on the market.

Oracle9*i* solves shared-disk scalability bottlenecks that plagued previous versions of Oracle. Oracle9*i* simplifies database management and increases database administrator productivity with smart self-tuning that help organizations make better business decisions faster. Oracle 9*i* can runs on UNIX, Linux and Windows platform. However, it is expensive and separate licenses are required for each of its database engine.

2.7.3 MySQL

The MySQL database server is the world's most widely used open source database. Its ingenious software architecture makes it extremely fast and easy to customize. Extensive reuse of code within the software and a minimalistic approach to produce functionally rich features has resulted in a database management system unmatched in speed, compactness, stability and ease of deployment. The unique separation of the core server from the table handler makes it possible to run MySQL under strict transaction control or with ultra fast transaction less disk access, whichever is most appropriate for the situation.

The MySQL Database Software is a client/server system that consists of a multi-threaded SQL server that supports different backend, several different client programs and libraries, administrative tools, and a wide range of programming interfaces (APIs). We also provide MySQL Server as a multi-threaded library which you can link into your application to get a smaller, faster, easier-to-manage product.

2.8 Data Access technology

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

2.8.1 Universal Data Access (UDA)

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

2.8.2 Active Data Object (ADO)

ADO is Microsoft's strategic, high-level interface to all kinds of data. ADO provides consistent, high-performance access to data, whether in creating a front-end database client or middle-tier business object using an application, tool, language, or even an Internet browser. ADO is the single data interface need to know for 1- to n-tier client/server and Web-based data-driven solution development.

ADO is designed to eventually replace *Data Access Objects (DAO)* and *Remote Data Objects (RDO)*. Unlike RDO and DAO, which are designed only for accessing

relational databases, ADO is more general and can be used to access all sorts of different types of data, including web pages, spreadsheets, and other types of documents.

2.8.3 Open Database Connectivity (ODBC)

Open Database Connectivity (ODBC) is a widely accepted application programming interface (API) for database access. It is based on the Call-Level Interface (CLI) specifications from X/Open and ISO/IEC for database APIs and uses Structured Query Language (SQL) as its database access language.

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

2.8.4 OLE DB

OLE DB is Microsoft's strategic low-level interface to data across the organization. OLE DB is an open specification designed to build on the success of ODBC by providing an open standard for accessing all kinds of data.

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

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

Data mining is a highly effective strategy for capturing both the visible and the underlying patterns in business data. To take advantage of data mining's benefits, Microsoft's OLE DB for Data Mining specification makes data mining accessible through a single established API--OLE DB. Developed with the help and contributions of a team of leading professionals in the business intelligence field, this specification introduces a methodology that will enable you to easily--and affordably--embed highly scalable data mining capabilities into existing applications.

2.8.5 JDBC

JDBC™ technology is an API that lets you access virtually any tabular data source from the Java™ programming language. It provides cross-DBMS connectivity to a

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wide range of SQL databases, and now, with the new JDBC API, it also provides access to other tabular data sources, such as spreadsheets or flat files.

The JDBC API allows developers to take advantage of the Java platform's "Write Once, Run Anywhere™" capabilities for industrial strength, cross-platform applications that require access to enterprise data. With a JDBC technology-enabled driver, a developer can easily connect all corporate data even in a heterogeneous environment.

2.9 Language

2.9.1 Visual Basic .NET (VB .NET)

VB .NET is part of Microsoft Visual Studio .NET, the latest development environment from Microsoft. With VB .NET, we can create powerful Windows and Internet application using a unified toolkit. With the release of VB .NET, Visual Basic received advanced language features on par with languages like C++, C# and Java. Powerful new features give VB .NET the simplicity of its predecessors, but with the power of creating full-fledged applications that take advantage of the computing field's latest innovations.

With new Windows Forms, developers using Visual Basic .NET can build Windows-based applications that leverage the rich user interface features available in the Windows operating system. All the rapid application development (RAD) tools that developers have come to expect from Microsoft are found in Visual Basic .NET, including drag-and-drop design and code behind forms.

VB .NET use full object-oriented constructs to create reusable, enterprise-class code. VB .NET also supports a broad range of mobile applications.

2.9.2 ASP .NET

ASP .NET is a key part of the wider Microsoft .NET initiative, Microsoft's new application development platform. .NET is a complete rewrite from ground up, using all the advanced features .NET makes available which is both an application architecture to replace the Windows DNA model and a set of tools, services,

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applications and servers based around the .NET Framework and common language runtime (CLR).

ASP .NET can take advantage of all the .NET has to offer, including support for around 20 or more .NET languages from C# to Perl .NET and all the full set of .NET Framework software libraries. Besides that, web applications written in ASP .NET are fast, efficient, manageable, scalable, flexible and easy to understand and to code. All components and web applications are compiled .NET objects written in the same languages and they offer the same functionality. So no need to leave the ASP environment for purely functional reasons. With only few lines of code, ASP .NET can talk to XML, serve as or consume a web service, upload files, "screen scrape" a remote site or generate an image.

2.9.3 JavaScript

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

2.10 Development Tools

2.10.1   Macromedia Dreamweaver MX

Dreamweaver MX is a easy and powerful application uses to create websites and internet applications. It provides a single environment to quickly create, build, and manage websites and Internet applications. Macromedia Dreamweaver MX combines its renowned visual layout tools with the rapid web application development features of Dreamweaver UltraDev and the extensive code-editing support of Macromedia HomeSite.

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

Dreamweaver MX supports for ColdFusion MX, ASP .NET, JSP and PHP. Dreamweaver MX can enhance productivity using the new integrated workspace, which is shared with Macromedia Flash MX and Fireworks MX. It uses one integrated development environment to develop HTML, XHTML, XML, ASP, ASP.NET, JSP, PHP, and Macromedia ColdFusion websites. Internet applications can be develop using libraries of code to create database insertion and update forms, record set navigation pages, and user authentication pages.

2.10.2   Adobe Photoshop 7.0

Adobe Photoshop is the most popular image-editing available for Macintosh and Windows-based computers. It is used as drawing, painting and designing purposes. Users can retouch an image, apply special effects, swap details between photos, introduce text and logos, adjust color balance, and even add color to a grayscale scan.

Photoshop 7.0 provides sophisticated controls and security setting for superior images, precise output, and worry-free file sharing. Photoshop 7.0 help to work more efficiently and edit with ease by provides intuitive tools and advanced automation controls. It contains graphical icons to represent every functions of each button. Besides that, it also provides many shortcut keys that is easier and save time for users and for those who do not like to use mouse.

2.10.3   NotePad

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

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

Notepad has the same interface for all versions of Windows, so moving over to the latest version of Windows should not hamper HTML code creation. The Notepad web-authoring tool is compatible with every single standard of Internet presentation medium yet devised. Notepad was designed to have a very small application

footprint, taking up as little space as possible in computer's memory, and a minimum of disk space.

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

Chapter 3 - SYSTEM REQUIREMENTS ANALYSIS

Requirement analysis allows developer to determine the functional and behavioral for the system analysis and design. A complete understanding of software requirements is essential to develop a system that can fulfill the user's need.

Requirement analysis is done during analyzing system needs. Requirement analysis activities include analyzing and determining functional requirements and non-functional requirements.

3.1 Methodology

Over the years, software engineers have come up with several software development methodologies, techniques and tools to help software developers produce quality software faster and at a lower cost. These methodologies, tools and techniques are intended to improve the software development process by simplify the work of the software developer.

A methodology is a method to create a system with a series of steps or operations or can be defined as system life cycle model. Every system development process model includes system requirements (user, needs, resource) as input and a finished product as output. There are several process models in system development:

1. Waterfall Model

2. Waterfall Model with Prototyping

3. V Model

4. Prototyping Model

5. Operational Specification Model

6. Transformational Model

7. Spiral Model

Different methodologies have different objective. Some emphasize on human aspects such as whether the system requires the user to learn new skills or change job. Some emphasize on organization aspects, such as whether the system requires a changes in the organizational culture or management style. Some emphasize on technical aspects such as whether the system should use object-oriented or function-based approach. System developers may need to take into consideration some or several of these aspects in order to build a successful information system.

In this system, Waterfall Model with Prototyping is chosen because:

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

3.1.1 Waterfall Model with Prototyping

Waterfall Model with prototyping (see Figure 3-1) consists of nine stages that are depicted as cascading from one to another. Each development stage should be completed before the next begins. Thus, when all of the requirements are elicited from the customer, analyzed for completeness and consistency and documented in a requirements document, then the development team can go on to system design activities. The nine stages are:
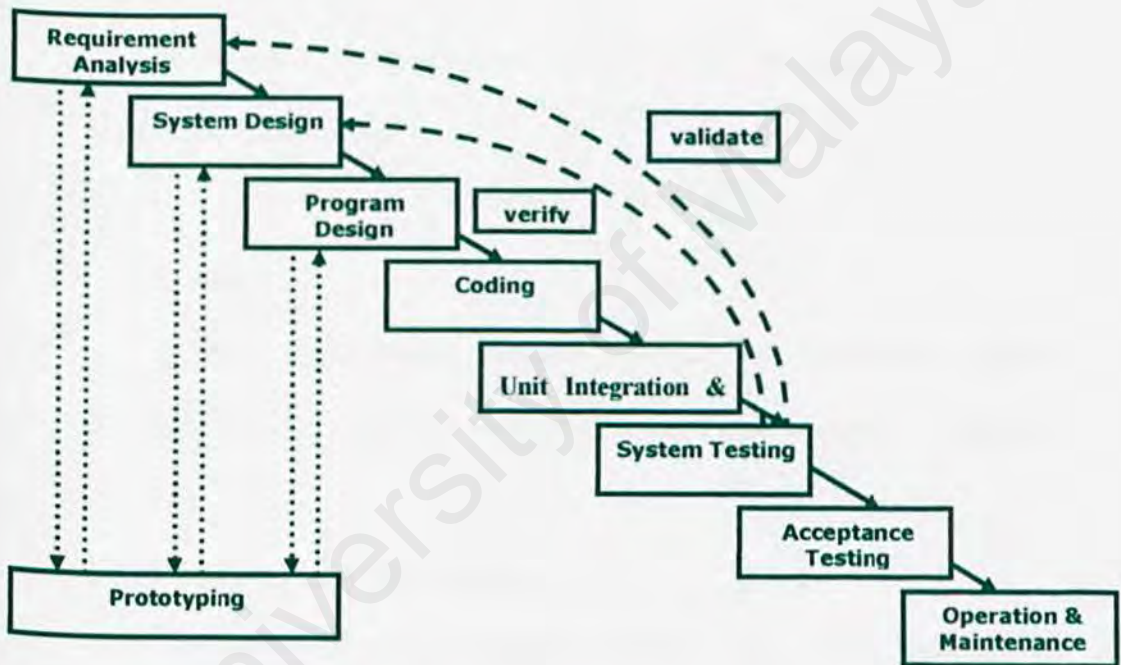
Figure 3.2 Waterfall Model with Prototyping

i. **Requirement Analysis**

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

ii.   **System Design**

Outlining system functional by having feasibility studies or case studies on current system, determining and specifying hardware or software architecture and verifying system design. It establishes overall system architecture. Software design involves representing the software system function in a form that may be transformed into one or more executable programs.

iii.   **Program Design**

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

iv.   **Coding**

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

v.   **Unit Integration and Testing**

Test units separately and integrate the tested units. Then, testing on the integrated units.

vi.   **System Testing**

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

vii.   **Acceptance Testing**

Testing on system completed. The system is delivered.

viii.   Operation and Maintenance

Control and maintain the system. Revalidating of system.

3.1.2 Prototying

Prototyping is a sub-process and prototype is a partially developed product or a simple simulator of the actual system to examine the proposed system and overview on the functionalities. In this stage, prototyped system are revealed to the system users to ensure that what is needed is what is proposed. This is an important stage to gather the requirement and feedback from the user. Besides that, the suggestions about changing the prototyped system and the possible innovations of the system are also collected. Additionally, the feedback from the user about which prototype be develop next will also gathered.

3.1.3 Advantages of Prototyping

Prototyping is not necessary or appropriate in every system project. However the advantages should also be given consideration when deciding whether to prototyping. The 3 major advantages are: the potential for changing the system early in its development, the opportunity to stop development on a system that is not working and the possibility of developing a system that more closely addresses user needs and expectations. All 3 advantages are interrelated.

Changing the system early in its development

Successful prototyping depends on early and fragment user feedback, which can be used to help modify the system and make it more responsive to

actual needs. As with any system effort, early changes are less expensive than changes made late in the project development.

Since the prototyping can be changed many times and since flexibility and adaptation are at the heart of prototyping, the feedback that calls for a change in the system is often the action taken. Feedback will help to tell you if changes warranted in the input, process or output areas or if all 3 need adjustment.

Scrapping undesirable system

Using prototyping, as an information gathering technique is the possibility of scrapping a system that is just not what users and analysts had hoped it would be. Permanently removing the prototype system from use is done when it becomes apparent that the system is not useful and does not full-fill the information requirements that have been set. Although scrapping the prototype is a difficult decision to make, it is infinitely better than putting increasing sums of time and money into a project that is plainly unworkable.

Design a system for user needs and expectations

The third advantage of prototyping is that the system being developed should better fit with users needs and expectations. It is a better practice to interact with users throughout the system development life cycle. If you makes a commitment to ongoing user involvement in all phases of the project, then the prototype can be used as an interactive tool that shapes the final system to accurately reflect user requirements. Users who take early ownership of the

system development work will ensure its success. One may faster early user support is to involve users actively in prototyping.

3.2 Functional Requirements

Functional requirement is a statement of the service or functions that a system should provide how the system reacts to particular inputs, and how the system should behave in particular situations. [Sommerville, 1998]. In some cases, the functional requirements may also explicitly state what the system should not do. It describes an interaction between the system and the environment. In principle, the functional requirement definition of a system should be both complete and consistent. The completeness means that all services required by the users should be defined. Consistency means that requirements should not have contradictory definitions.

The functional requirement for ECSS consists of four main parts: System Administration Section, Inventory Section, Sales Assistant Section and Webpage Section. For System Administration Section, functional requirement consists of user management module, suppliers module, customers management module, stock alert module and report generate module. For Inventory Section, functional requirement includes stock in module, inventory management module and upload module. For Sales Assistant Section, functional requirement includes sales module, receipts module and customers' management module. For Webpage Section, it is a open webpage sample that can automatically update the webpage with new information from database by using upload module in Inventory Section. Finally there is an authentication module that controls the access of users.

3.2.1 Authentication Module

This module check for the user's level when one login to the system and bring him to the control that he had access to. User needs to key in a valid user name and

password to be able to use the system. The password will be compare with decrypted password store in database.

3.2.2 User Management Module

Basically, this module allow administrator to add and remove user, view and edit user's info, edit user's password and also specify the rights of the user. The user's password is encrypted and store in the database.

3.2.3 Stock Alert Module

For each item trade in and out, the system will automatically update the stock level. This module specifies a level as the minimum stock where when the stock reaches this level, the module will generate an alert to the administrator to order this item.

3.2.4 Report Generate Module

The module will calculate the daily/annual selling, best selling item, and total earning through information store in database and generate associate report for the administrator.

3.2.5 Inventory Management Module

User can view and edit all item information such as name, ID number, description, price, cost price, etc.

3.2.6 Sales Module

This module enables the sales assistant to key in the item purchased by the customer, total up the sales and pass the information to the receipts module to printout the receipt. The module will subtract the item that had trade out from the database.

3.2.7 Receipts Module

This module provides the format of the receipt that will print out and information that will contain in the receipt.

3.2.8 Website Sample

A simple website that includes information of the price list, promotion packages for the visitors to express the experiences of using certain item. The website design is open so that the webpage can use information from the database to update the webpage.

3.3 Non-Functional Requirements

Non-functional requirements are as important as functional requirements. Non-functional requirements specifications are the constraints under which a system must operate and the standards which must be met by the delivered system [**Sommerwille, 1995**]. The E-Computer Shop System must ensures certain qualities like:

3.3.1 Usability and User Friendliness

System utilizes the Graphic-User Interface (GUI) for better visual meaning to the users. The usage of suitable and meaningful colors will help ensure that users use the system with more confidence and avoid mistakes made by user unintentionally. Besides that system will also display a confirmation message for any non-travial process such as deletion and data updating.

3.3.2 Modularity and Maintainability

System is developed using modular approach so that it can be easily maintained to meet new requirement in the future and also improve developing speed. The modules are developed and tested it separately. Then these modules are combined and the integrated system is tested again to ensure no error occurs. Some of the common procedures or functions are reused so that save a lot of development time and prevent the code redundancy.

3.3.3 Consistency

System is developed using standardize process so that can prevent the possible of the function confusion to these keywords when shifting among difference modules. It

can also enhance the simplicity of the system and improve usability and user friendliness.

3.3.4 Efficiency

Efficiency means a process or a procedure that can be called or accessed in an unlimited number of times to produce similar outcomes or outputs at a creditable pace or speed.

3.3.5 Understandability

Understandability in terms of the coding method used, allow other programmers to understand the logic of program flows, thus changes can be made easily upon the necessary program segment or messages are displayed so that users can use this system without difficulty.

3.3.6 Reliability and Dependability

System is said to be reliability because it does not produce dangerous or costly failures when it is used in a reasonable manner which is in a manner that instructed by the system. Appropriate messages and prompts were designed to enable user use the complicated part of the system step by step and with complete and enough guidance. Assumptions were encountered by the system design in order to prevent user acts in an unusual pattern.

3.3.7 Robustness

System consists of different modules, which will be completely tested to ensure each module fulfils its functional requirements and user satisfactions. The modules will then integrated into the main system and system testing will be performed. Any errors that occur during system testing will be solved immediately. This double testing method is to ensure that the system is as robust as what it has expected before and to ensure what was developed is what was required.

3.3.8 Legislation

All software used in developing system is ensured to be licensed copy. This will make the system meet the requirements of legislation.

3.3.9 Implementation

Organization must train its workers before implementing this system or they might need to hire any new employee to operate this program.

3.3.10   Security

In web application, the more powerful and flexible the operating system is, the more easily the system is hacked by some of the popular hackers all over the world. Therefore, a more powerful firewall or some secure network system should be implemented so that minimizes the security problem faced.

3.4 Chosen Platform, DBMS , System Application Language and Tools

3.4.1 Chosen Development Platform

Over all the operating system that I had analyzed, Windows 2000 Advanced Server is chosen as the development platform for ECSS. Windows 2000 Advanced Server is one of the members in Microsoft Windows 2000 Server Family.

The main reason for choosing Microsoft Windows 2000 Advanced Server as the development platform is that the OS contains all the functionality and reliability of the standard version of Windows 2000 Server, plus additional features for applications that require higher levels of scalability and availability. This makes Advanced Server the right operating system for essential business and e-commerce applications that handle heavier workloads and high-priority processes.

Advanced Server helps ensure the system is available by addressing the causes of both planned and unplanned network and server downtime. It also has features that let the applications grow to support large numbers of users and data. With distributed servers over multiple networks and locations, the OS provide the administrators with needed tools that enable them to centrally manage their servers and provide a comprehensive service to their users.

Finally, Windows 2000 Advanced Server can support for implementation of Microsoft SQL 2000 Server Side Edition.

3.4.2 Chosen Database Management System (DBMS)

After compared and analyze between Microsoft SQL Server 2000 and Oracle 9i, I have chosen SQL Server 2000 as the DBMS for ECSS. Microsoft SQL Server 2000 Enterprise Edition is the complete database and analysis offering for rapidly delivering the next generation of scalable e-commerce, line-of-business and data warehousing solutions.

Over the year, Online analytical processing (OLAP) and data mining are become more and more important in e-business environment. OLAP and data mining help to uncover meaningful patterns and rules that help corporations improve their marketing, sales and customer support operations. Microsoft includes two data mining algorithms that are Microsoft Decision Trees (MDT) and Microsoft Clustering as standard features in SQL Server 2000 Enterprise Edition. Oracle, however, offers these items only as extra-cost options on Oracle9i Enterprise Edition. This means that the significant price difference between the two products grows considerably when a customer requires these business intelligence features. For example, an organization that uses a server with eight processors to deliver OLAP and data mining capability will pay 400 percent more for the correct Oracle9i license, than for the correct SQL Server 2000 license ($640,000 versus $159,992).

Besides that, it is strongly believed that customers who use SQL Server will enjoy benefits in these key areas:

Full Web-Enabled

Query, analyze and manipulate data over the Web. Use Extensible Markup Language (XML) in SQL Server 2000 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. Analyze and link online analytical processing (OLAP) cubes, even over the Web. Perform click stream analysis to learn about your Web customers.

Highly Scalable and Reliable

Grow without limits with enhanced scalability and reliability features. Partition your database workload to achieve scale-out of applications. Take full advantage of Symmetric Multiprocessing (SMP) hardware, and, with the Microsoft Windows 2000 Datacenter. Server operating system, support up to 32 CPUs and 64 GB of RAM.

Fastest Time-to-Market

Rapidly build, deploy, and manage e-commerce, line-of-business, and data warehousing solutions. Perform sophisticated data mining on customer and financial data. Reduce development time with the integrated T-SQL debugger, and develop your own functions that can be reused in different applications. SQL Server 2000 provides the fastest route to Web application development.

Ease of Use

Features provided by SQL Server ensure easy-to-use for database administrators in building, managing and deploying business applications. For example, the Dynamic Self-Management automates many routine tasks. Besides, the profiling and tuning tools also help to simplify the process of

finding the process of finding and fixing database problems by capturing and replaying server activity.

- **Data Warehouse**

  The data transformation services make it easy to import, export and transform heterogeneous data using OLE Database, Open Database Connectivity (ODBC) or text-only files. In other words, automatic distributed update capability across two or more SQL is enabled. Furthermore, the repository integration and the Open Information Model help integrate and share meta-data about SQL Server database, Online Analytical Processing (OLAP) and Data Transformation Services. Besides, referential integrity and quick operation recovery due to numerous failures are maintained.

3.4.3 Chosen System Application Language

In this system, Visual Basic .NET is chosen because VB .NET provides the features that are most important to programmers, such as full object-oriented programming, strings, graphics, graphical-user-interface (GUI) components, exception handling, multithreading, multimedia (audio, images, animation and video), file processing, prepackaged data structures, database processing, Internet and World-Wide-Web-based client/server networking and distributed computing.

The language is appropriate for implementing Internet-based and World-Wide-Web-based applications that seamlessly integrate with PC-based applications. VB .NET is the next phase in the evolution of Visual Basic, the world's most popular programming language.

The VB .NET includes in the .NET platform. .NET platform offers powerful capabilities for software development and deployment, including independence from specific language or platform. Rather than requiring developers to learn a new programming language, programmers can contribute to the same software project, but write code using any (or several)of the .NET languages (such as Visual Basic .NET, Visual C++ .NET, C# and others) with which they are most competent. In addition to providing language independence, .NET extends program portability by enabling .NET applications to reside on, and communicate across, multiple platforms – thus facilitating the delivery of Web services over the Internet. .NET enables Web-based applications to be distributed to consumer-electronic devices, such as cell phones and personal digital assistants, as well as desktop computers.

Chosen Platform, DBMS , System Application Language and Tools

3.4.4 Chosen Development Platform

Over all the operating system that I had analyzed, Windows 2000 Advanced Server is chosen as the development platform for ECSS. Windows 2000 Advanced Server is one of the members in Microsoft Windows 2000 Server Family.

The main reason for choosing Microsoft Windows 2000 Advanced Server as the development platform is that the OS contains all the functionality and reliability of the standard version of Windows 2000 Server, plus additional features for applications that require higher levels of scalability and availability. This makes Advanced Server the right operating system for essential business and e-commerce applications that handle heavier workloads and high-priority processes.

Advanced Server helps ensure the system is available by addressing the causes of both planned and unplanned network and server downtime. It also has features that let the applications grow to support large numbers of users and data. With distributed servers over multiple networks and locations, the OS provide the administrators with needed tools that enable them to centrally manage their servers and provide a comprehensive service to their users.

Finally, Windows 2000 Advanced Server can support for implementation of Microsoft SQL 2000 Server Side Edition.

3.4.5 Chosen Database Management System (DBMS)

After compared and analyze between Microsoft SQL Server 2000 and Oracle 9i, I have chosen SQL Server 2000 as the DBMS for ECSS. Microsoft SQL Server 2000 Enterprise Edition is the complete database and analysis offering for rapidly delivering the next generation of scalable e-commerce, line-of-business and data warehousing solutions.

Over the year, Online analytical processing (OLAP) and data mining are become more and more important in e-business environment. OLAP and data mining help to uncover meaningful patterns and rules that help corporations improve their marketing, sales and customer support operations. Microsoft includes two data mining algorithms that are Microsoft Decision Trees (MDT) and Microsoft Clustering as standard features in SQL Server 2000 Enterprise Edition. Oracle, however, offers these items only as extra-cost options on Oracle9i Enterprise Edition. This means that the significant price difference between the two products grows considerably when a customer requires these business intelligence features. For example, an organization that uses a server with eight processors to deliver OLAP and data mining capability will pay 400 percent more for the correct Oracle9i license, than for the correct SQL Server 2000 license ($640,000 versus $159,992).

Besides that, it is strongly believed that customers who use SQL Server will enjoy benefits in these key areas:

- **Full Web-Enabled**

    Query, analyze and manipulate data over the Web. Use Extensible Markup Language (XML) in SQL Server 2000 to exchange data between loosely coupled systems. Access data easily and securely from a browser,

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through firewalls, and perform fast full-text searches of formatted documents. Analyze and link online analytical processing (OLAP) cubes, even over the Web. Perform click stream analysis to learn about your Web customers.

- **Highly Scalable and Reliable**

  Grow without limits with enhanced scalability and reliability features. Partition your database workload to achieve scale-out of applications. Take full advantage of Symmetric Multiprocessing (SMP) hardware, and, with the Microsoft Windows 2000 Datacenter. Server operating system, support up to 32 CPUs and 64 GB of RAM.

- **Fastest Time-to-Market**

  Rapidly build, deploy, and manage e-commerce, line-of-business, and data warehousing solutions. Perform sophisticated data mining on customer and financial data. Reduce development time with the integrated T-SQL debugger, and develop your own functions that can be reused in different applications. SQL Server 2000 provides the fastest route to Web application development.

- **Ease of Use**

  Features provided by SQL Server ensure easy-to-use for database administrators in building, managing and deploying business applications. For example, the Dynamic Self-Management automates many routine tasks. Besides, the profiling and tuning tools also help to simplify the

process of finding the process of finding and fixing database problems by capturing and replaying server activity.

- **Data Warehouse**

  The data transformation services make it easy to import, export and transform heterogeneous data using OLE Database, Open Database Connectivity (ODBC) or text-only files. In other words, automatic distributed update capability across two or more SQL is enabled. Furthermore, the repository integration and the Open Information Model help integrate and share meta-data about SQL Server database, Online Analytical Processing (OLAP) and Data Transformation Services. Besides, referential integrity and quick operation recovery due to numerous failures are maintained.

3.4.6 Chosen System Application Language

In this system, Visual Basic .NET is chosen because VB .NET provides the features that are most important to programmers, such as full object-oriented programming, strings, graphics, graphical-user-interface (GUI) components, exception handling, multithreading, multimedia (audio, images, animation and video), file processing, prepackaged data structures, database processing, Internet and World-Wide-Web-based client/server networking and distributed computing.

The language is appropriate for implementing Internet-based and World-Wide-Web-based applications that seamlessly integrate with PC-based applications. VB .NET is the next phase in the evolution of Visual Basic, the world's most popular programming language.

The VB .NET includes in the .NET platform. .NET platform offers powerful capabilities for software development and deployment, including independence from specific language or platform. Rather than requiring developers to learn a new programming language, programmers can contribute to the same software project, but write code using any (or several)of the .NET languages (such as Visual Basic .NET, Visual C++ .NET, C# and others) with which they are most competent. In addition to providing language independence, .NET extends program portability by enabling .NET applications to reside on, and communicate across, multiple platforms – thus facilitating the delivery of Web services over the Internet. .NET enables Web-based applications to be distributed to consumer-electronic devices, such as cell phones and personal digital assistants, as well as desktop computers.

Chapter 4 - SYSTEM DESIGN

4.1 Introduction

System Design is a critical part of development. The design begins at a high level, with important decisions about system architecture based on system requirements, desirable design attributes and the long-term intended use of the system (such as reuse or modification). Several characteristics in system design are modularity, levels of abstraction, coupling, cohesion, fault tolerance, prototyping and user-interface design. Measurement is useful in evaluating the quality of components as well as in predicting which components are likely to be costly to build or maintain.

In the previous chapter, the requirements needed for the system had been determine. System Design will translate all requirements of ECSS into the system characteristics. System design includes the following issues :

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

4.2 System Functionality Design

4.2.1 System Structure Charts

The objective of system structure chart is to show how the modules in SCSS are related to each other.

Figure 4.1 Structure Chart for ECSS

ECSS consists of four major parts, which are the System Administration Section, the Sales Assistant Section, the Inventory Section and the Webpage Section. Basically, the System Administration Section is to let System administrator to give approval to user to use the system, to manage the suppliers, customers and items information, to alert the system administrator if stock is out of order and to generate report for the system administrator about their sales. On the other hand, the Sales Assistant Section is to let sales assistant in doing their daily job in sales transaction and add new customer information. The Inventory Section provide function in calculate inventory status when stock in. Finally, the Webpage Section lets system administrator to

upload the updated webpage to their website and collects the comments send by visitor to the website.
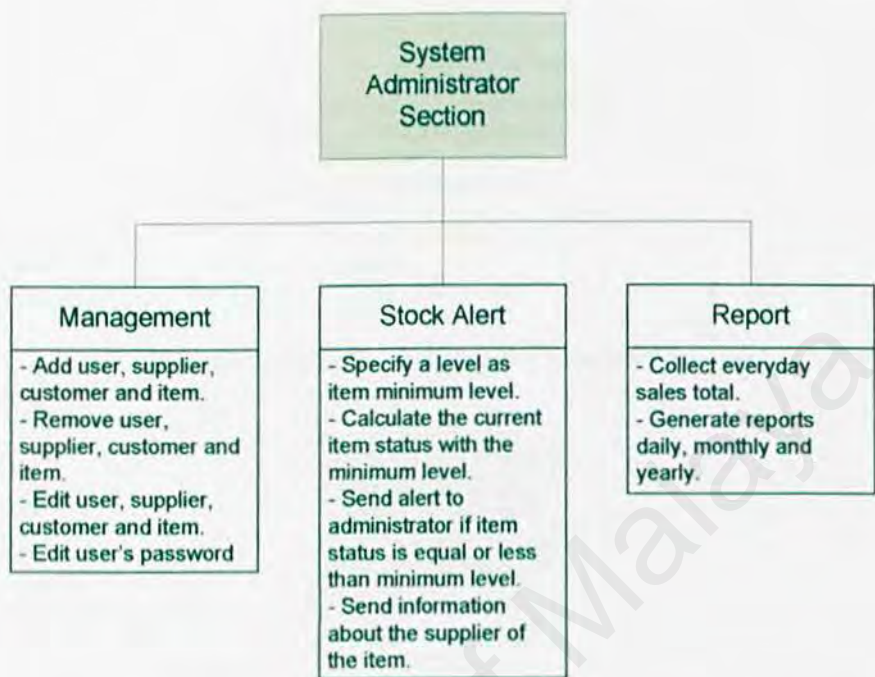
Figure 4.2 Structure Chart for System Administrator Section
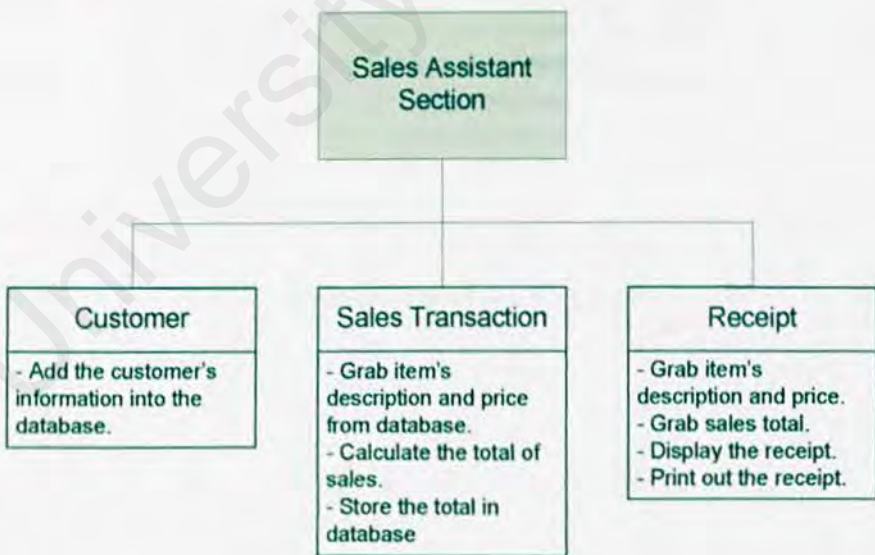
Figure 4.3 Structure Chart for Sales Assistant Section

4.2.2 Entity-Relationship Diagram (ERD)
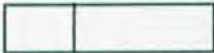
The Entity-Relationship (ER) Data Model is a detailed, logical representation of the data for an system application. The model is expressed in terms of entities in the system environment, the relationships between entities and the attributes of both entities and relationships. The ERD (Entity-Relationship Diagram) is used to graphically represent the ER data model.

4.2.3 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) is a graphical technique used to show the flow of data through a business system. It gives an overview of a system's inputs, processes and outputs and shows the flow of data from the source entities to the processes and from the processes to the destination entities.

The DFD provides the system analyst with the ability to specify a system at the logical level (what the system does) rather than the physical level (how it does). The use of DFD has several advantages:

- It is easy to understand since only four symbols are used.

Symbols	Attribute
	Entity
→——→	Flow of Data
	Process
	Data Store

- It enables the system to be structured into independent units of a desirable size and thus helps the analyst to better understand the ralationships between the system and its subsystems.

- It acts as an effective communication tool between the analyst and the customers/users.

- It helps the analyst to identify the required data and processes of the proposed system and making sure that they have been defined.

- It gives the analyst freedom from committing to the technical implementation of the system too early.

The convention, which is used to design DFD are based on the work by C.Gane and T.Sarson. The data flow is conceptualized with a top-down perspective. So, the

Context Level Diagram will be drawn, followed by the Diagram 0. Diagram 0 is an overview process of all the major modules in ECSS that includes all the data stores, entities and process involved.
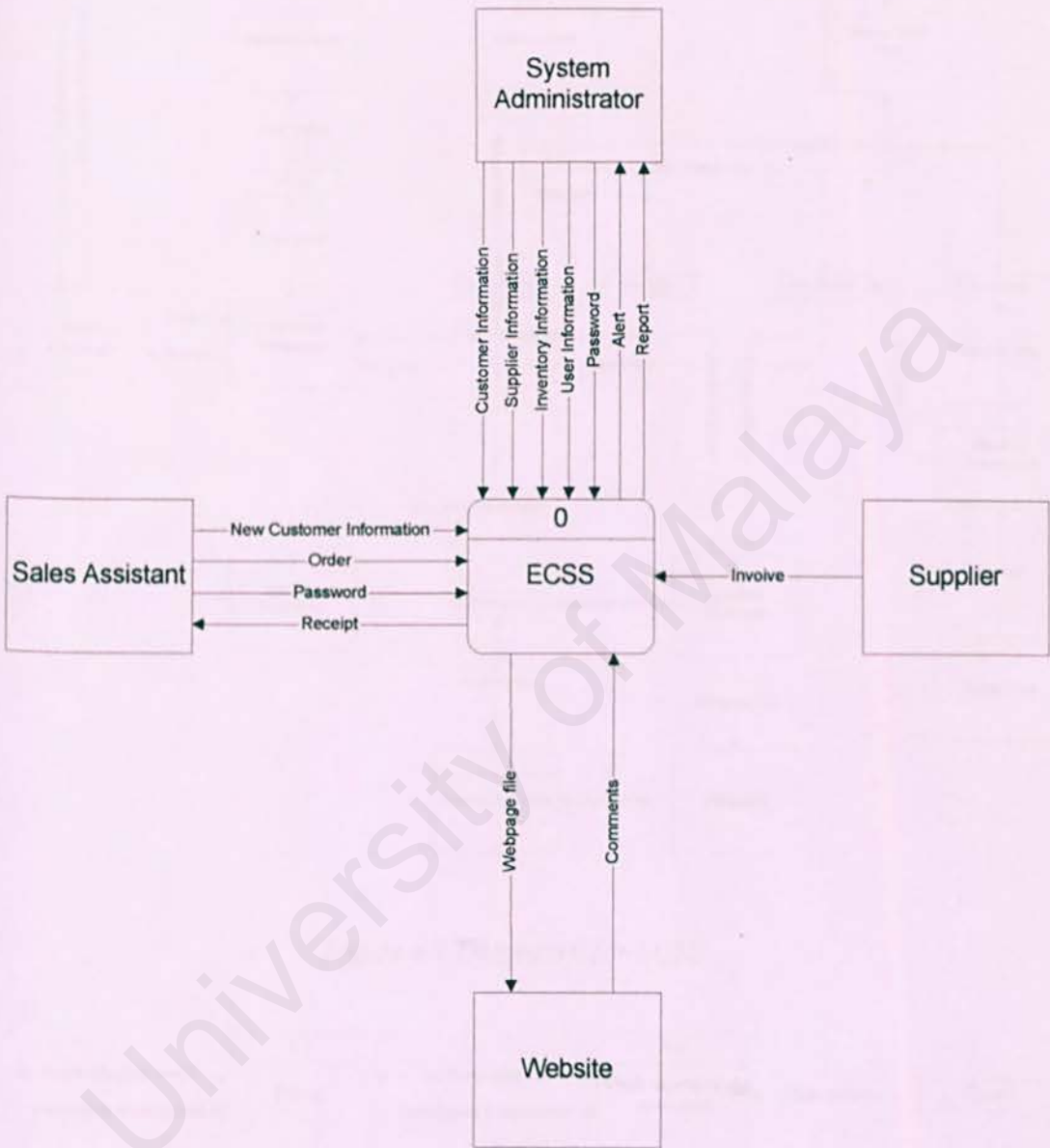
Figure 4.6 Context Diagram for ECSS

Figure 4.7 Diagram 0 for ECSS

Figure 4.8 Diagram 1 for ECSS
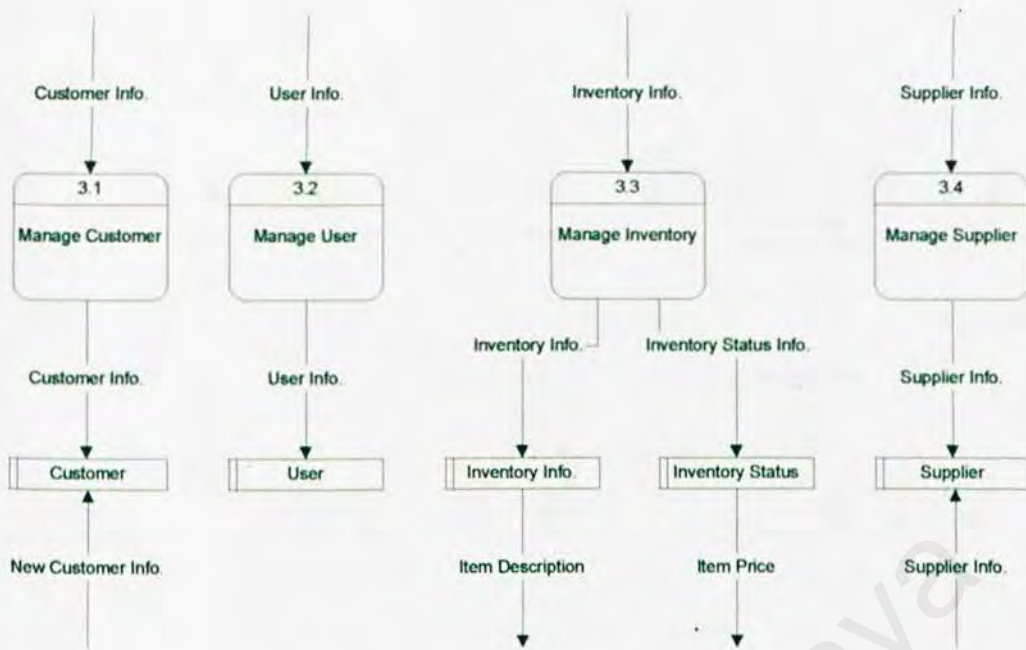
Figure 4.9 Diagram 3 for ECSS
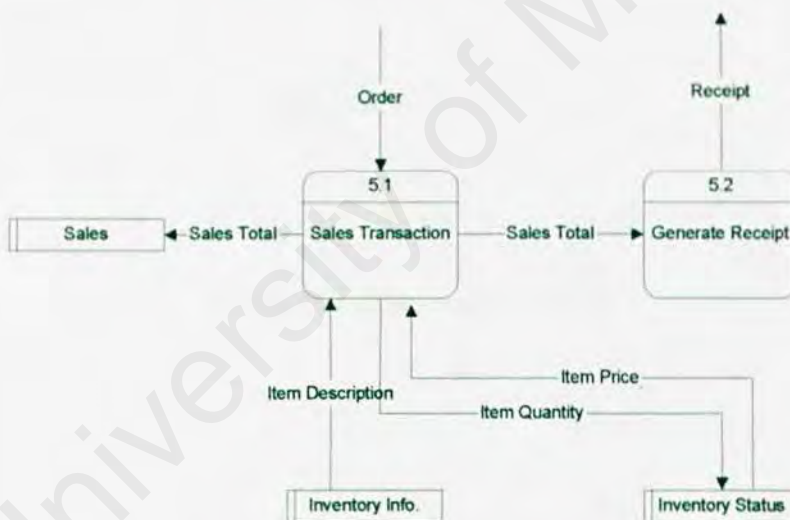
Figure 4.10 Diagram 5 for ECSS
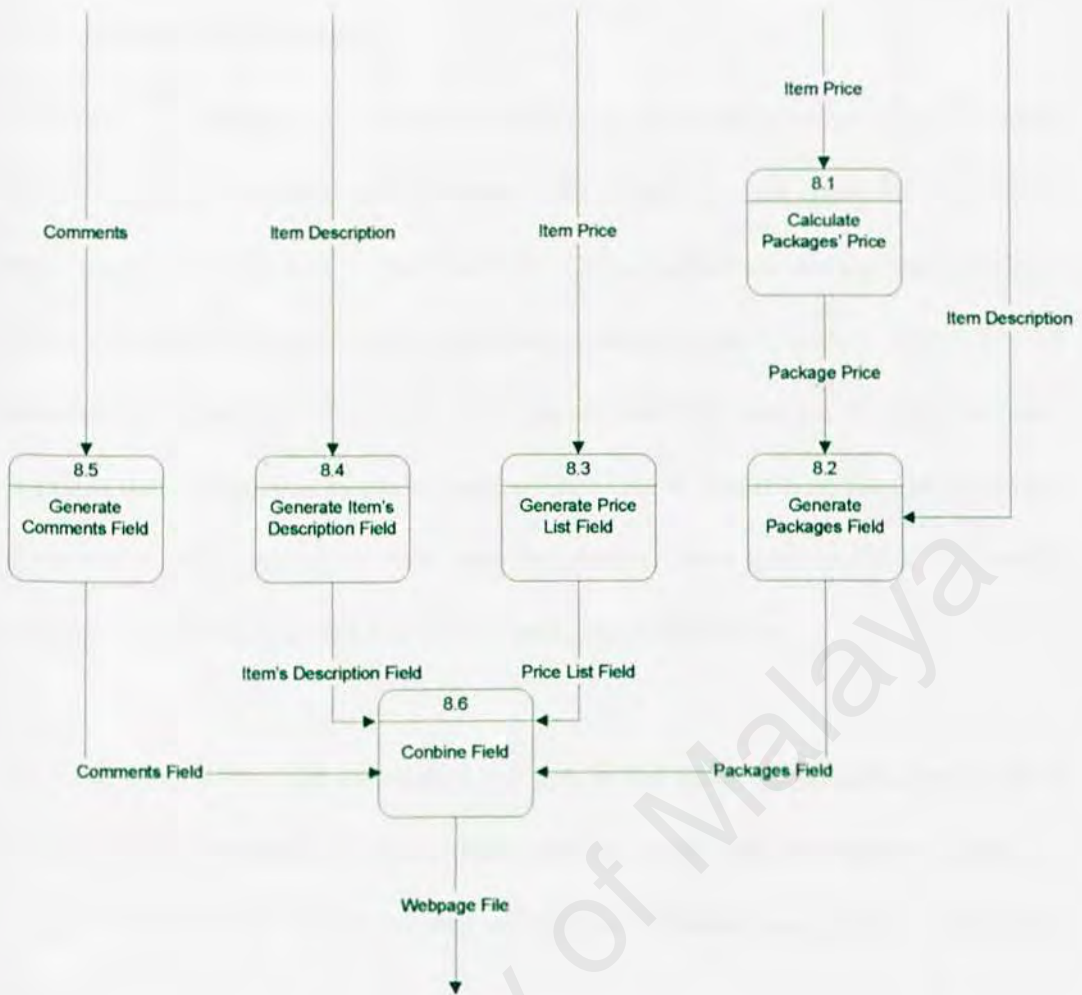
Figure 4.11 Diagram 8 for ECSS

4.3 Database Design

Data storage is considered by some to be the heart of an information system (Kendall, 1996). It is a central source of data meant to be shared by many users for a variety of applications. The heart of a database is the DBMS (database management system), which allows the creation, modification and updating of the database; the retrieval of data and the generation of reports. The main objective of database design is to make sure that data is available when the user wants to use it. Apart from that, the accuracy, consistency and integrity of data must be assured from time to time, to provide efficient data storage as well as efficient updating and retrieval.

In 1976, Peter Chen had introduced the use of the entity-relationship model (E-R Model). An E-R diagram contains many entities, many different types of relations, and numerous attributes. The benefits of Entity Relationship modeling are mentioned below:

i.   Databases need to be designed and entity relationship (ER) modeling is an aid to design.

ii.   An ER model is a graphical representation of the system and is a high-level conceptual data model.

iii. Supports a user's perception of data and is independent of the particular DBMS and hardware platform.

4.3.1 Data Dictionary

Data Dictionary (DD) also known as Catalogue or Repository, stores the metadata of the information system. Data Dictionary also can be defined as descriptions of the .

database structure and contents. Metadata is data about data. The DD stores information about system entities and their relationships with one another attributes of entities, primary and foreign keys, validation rules and triggers. The information listed below is typical:

- Description of data items in natural language

- Names associated with data items

- Details of ownership (who created the data)

- Details of data items in a database

- Data validation rules and triggers

- Details of the relationship of the data items to others

- Security level and storage requirements

Data dictionary defines the field, field type and descriptions of each table.

Data dictionary for ECSS is as below:

Column Name	Data Type	Length	Allow Nulls
Type	char	10	
Counter	int	4	

Figure 4.12 Counter's Table

Column Name	Data Type	Length	Allow Nulls
CompanyID	char	10	
CompanyName	varchar	40	✓
CompanyAddress	varchar	200	✓
CompanyPhone	char	15	✓
CompanyFax	char	15	✓
CompanyWebSite	char	40	✓

Figure 4.13 Company's Table

	Column Name	Data Type	Length	Allow Nulls
►	UsrID	char	15	
	fName	varchar	50	
	lName	varchar	50	
	UsrType	char	15	
	password	char	10	
	NoFail	int	4	

Figure 4.14 User's Table

	Column Name	Data Type	Length	Allow Nulls
►🔑	ItemID	char	6	
	ItemName	varchar	50	
	CategoryID	char	2	
	UnitPrice	money	8	✓
	Quantity	int	4	✓
	ItemImage	varchar	50	✓
	URL	varchar	50	✓

Figure 4.15 Item's Table

	Column Name	Data Type	Length	Allow Nulls
►🔑	CategoryID	char	2	
	CategoryName	varchar	50	
	ItemNo	int	4	

Figure 4.16 Item Category's Table

	Column Name	Data Type	Length	Allow Nulls
►	TRecordNo	int	4	
	StockID	char	10	
	ItemID	char	6	
	TQuantity	int	4	

Figure 4.17 Stock In's Table

	Column Name	Data Type	Length	Allow Nulls
►🔑	TRecordNo	int	4	
	CartID	char	10	
	ItemID	char	6	
	CQuantity	int	4	

Figure 4.18 Cart's Table

Column Name	Data Type	Length	Allow Nulls
SRecordNo	int	4	
SalesID	char	10	
ItemID	char	6	
Quantity	int	4	
Price	money	8	

Figure 4.19 Sales's Table

Column Name	Data Type	Length	Allow Nulls
SalesID	char	10	
CustomerID	char	10	
Total	money	8	
Payment	money	8	
Balance	money	8	
DateCreated	datetime	8	

Figure 4.20 SalesDetails's Table

Column Name	Data Type	Length	Allow Nulls
CustomerID	char	10	
CustomerName	varchar	50	✓
CustomerPhone	char	15	✓
CustomerAddress	varchar	100	✓

Figure 4.21 Customer's Table

Column Name	Data Type	Length	Allow Nulls
QCRecordNo	int	4	
QCartID	char	10	
ItemID	char	6	
Quantity	int	4	

Figure 4.22 Quotation Cart's Table

Column Name	Data Type	Length	Allow Nulls
QRecordNo	int	4	
QuoteID	char	10	
ItemID	char	6	
Quantity	int	4	
Price	money	8	

Figure 4.23 Quotation's Table

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	Column Name	Data Type	Length	Allow Nulls
🔑	QuoteID	char	10	
	VisitorName	varchar	50	
	VisitorPhone	char	15	
	VisitorEmail	varchar	40	
	VisitorAddress	varchar	100	
	Total	money	8	
	DateCreated	datetime	8	

Figure 4.24 Quotation Details' Table

4.4 Interface Design Sample

Figure 4.25 Main Interface Design

SALES ORDER LIST

Item Management

   New Item

   Edit / Delete

   Stock In

Sales

   Purchasing

   Price List

   Logout

⦿ Components Sales

○ Promotion Packages

Add by Item ID : [ ] Add

Item ID	Item Name	Qty		Price	Subtotal	Remove
AB2	Intel Pentium 4 1.7GHz	1	/ 49	RM 465.00	RM 465.00	☐
CB4	ABIT BE7-G	1	/ 99	RM 100.00	RM 100.00	☐
OA1	Logitech Wheel Mouse Optical	1	/ 90	RM 81.50	RM 81.50	☐

Total : RM 646.50

Update Cart

Customer Name
1-50 characters

Customer Phone
Format : xxx-xxxxxxx

Customer Address
1-100 characters

Payment
RM [ ]
Format : RM xx.xx

Sell

Best View with 1024x768 screen and IE 5.5 +

Figure 4.26 Daily Sales Interface Sample

Chapter 5 - SYSTEM IMPLEMENTATION

5.1 Introduction

System implementation in software development is a process to convert system requirements into program codes. The initial stage of system implementation involves setting up the development environment. This includes setting up development tools to facilitate the system implementation.

Generally, the development environment is suited according to different development phases, which can be categorized into system design, system development and report writing process.

5.2 System Design

Although system design is clearly stated in chapter 4, nevertheless, during the initial stage of system development, a number of considerations and adjustments were done to the initial system design in order to match the actual needs and requirements.

5.3 System Development

The basic tools used for the system development are:

- Microsoft Windows 2000 Advanced Server (Operating System)
- Microsoft SQL 2000 Server (DBMS)
- Microsoft Internet Information Services(IIS) 6.0 (Web Server)

- Microsoft Visual Studio .NET – Microsoft .NET Framework 1.0 (Development Platform)

- ADOBE Photoshop 7.0 (Image Editing Tool)

- Macromedia Dreamweaver MX (Web Design Tool)

- Microsoft Internet Explorer 6.0 (Web Browser)

- UltraEdit-32 Professional Text/HEX Editor v8.00b and Notepad (Editor for HTML, ASP .NET, JavaScript and Java Applet)

5.4 Report Writing

All the problems encountered, together with solutions found throughout the processes (from system implementation until system evaluation) were recorded as well as result from system testing and system integration.

5.5 System Coding – Coding Approach, Style and Scripting Language

5.5.1 Database Implementation

For ECSS, the database is stored in a PC in which SQL 2000 Server is installed. This PC is acting as the heart of the ECSS system. Any data creation, updates or data retrieval will be connected directly to the database server using ADO .NET *Connection* object The .NET Framework includes a data access technology called ADO .NET that make it easy to connect to data sources, access the data, display it and even alter it. ADO .NET can interact with many types of data – not only data

stored in database, but also data stored in e-mail servers, text files, application documents like Excel and XML data.

The database includes tables of users, items, sales, quotations and even carts details. ECSS is a web-based computer shop's inventory management system with the ability of web browsing for items' details and making quotation online.

After the ECSS is completed and tested successfully, all the raw data were flush from the database. All the unnecessary tables were eliminated from ECSS database to avoid data overlapping and to reduce workload of the entire system when deployment.

5.5.2 Application Server Configuration

Internet Information Server (IIS) is a Microsoft's Web publishing and web server that allow users of windows NT/2000 to serve web page on the Internet. IIS is available in both Professional and Server version of Windows 2000.

Essentially, the default directory of web application is in **\InetPub\wwwroot** but users also can choose to use virtual directory. With virtual directory, users can place the application at any place and make a path to the directory in IIS.

To enable user to use ECSS, a directory called **\ECSS** is created and the default web page is *default.aspx*

\ECSS

\bin   (folder contains DLL files)

\Component   (folder contains classes where all methods declared)

\Image   (folder contains all images except computer items' image file)

\Product   (folder contains all computer items' image file)

\System   (folder contains all ECSS system pages)

\Report   (folder contains reporting pages)

\Web   (folder contains website pages)

\Details   (folder contains all computer items' description page)

Figure 5.1 ECSS's file structure

5.5.3 Program Implementation

5.5.3.1 Coding Approach

Top-down approach is chosen to break the ECSS system into small and separated functions and procedures. All these small modules or functions are built and developed separately.

5.5.3.2 Coding Style

One of the best things of ASP .NET is a technique called Code Behind. In ASPX file, we can put all of the extra code to enable validation in the small functions at the bottom of the page to avoid cluttering up the presentation code. But there is another cleaner way of doing this, which is to move all of this code into a code-behind file.

A code-behind file is used to store all of the script blocks of an ASP.NET page while presentation code remains in ASPX file. The ASPX file is the central point for the application and from here, the page reference the code-behind file and any user controls.

A code-behind file can be written in any .NET-compatible language. In ECSS, the code-behind file is written in VB .NET form.

File Type	Description
.aspx files	Files with presentation code and ready to receive request from clients.
.aspx.vb files	Code-behind files which act as the intermediate between .aspx file and .vb file.
.vb	Files that contain all the user control and processing function. Codes that involve accessing database located at here.

ECSS
Database
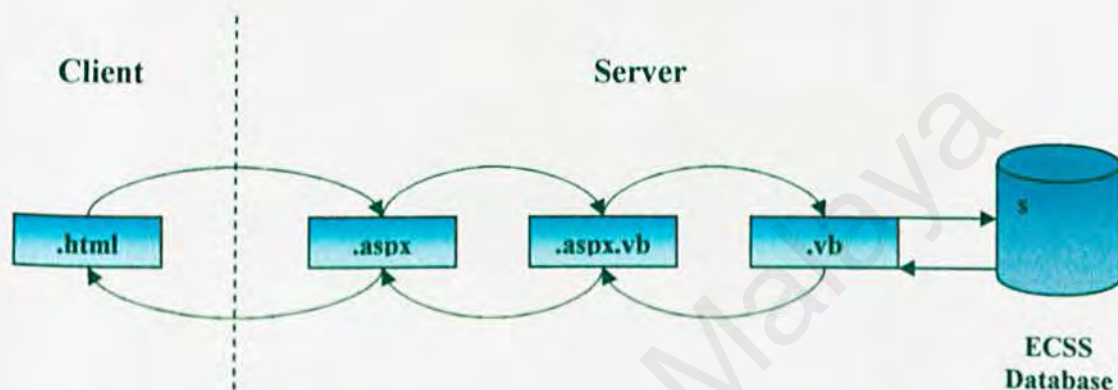
5.5.3.3 SQL Stored Procedure

In the .NET Framework, the *SqlConnection* class allows me to have even larger performance gains, since it can actually execute native SQL Server code. By using SQL stored procedures, the performance gains are estimated at 200 to 300% over *OleDB* or *Odbc* connections.
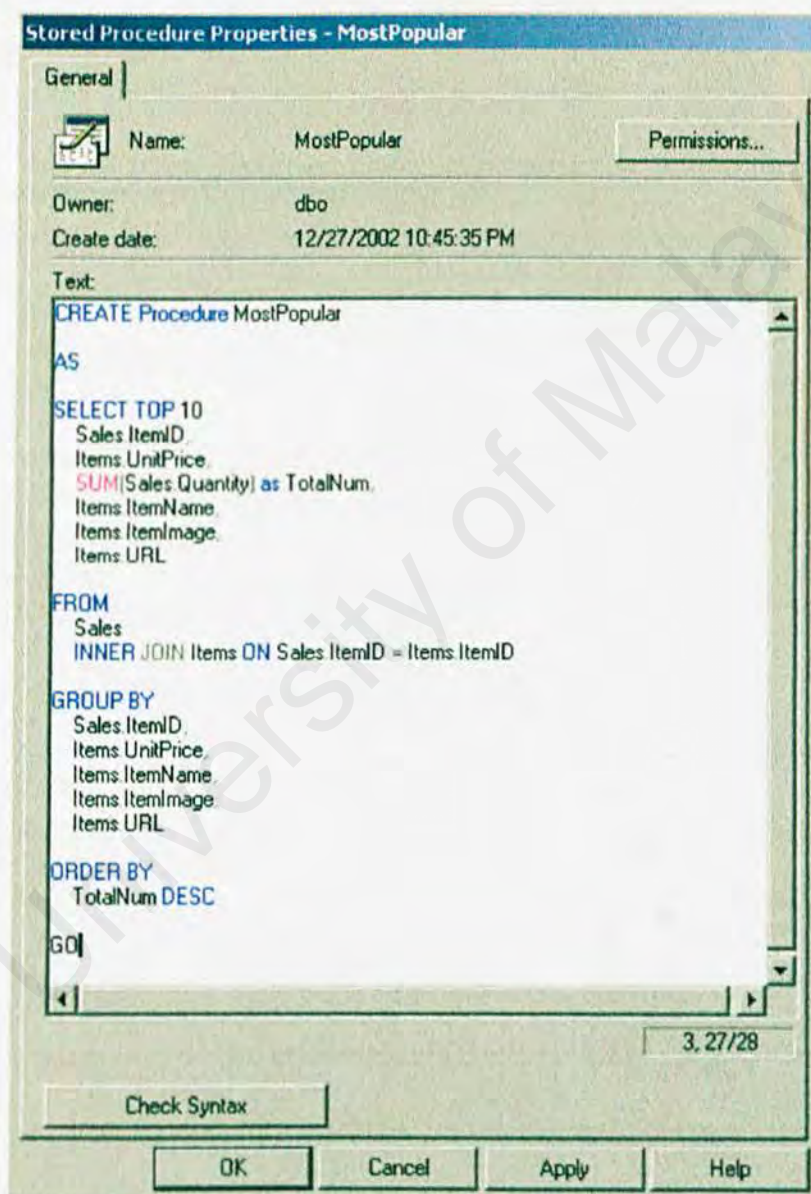
Figure 5.2 "MostPopular" Stored Procedure

5.5.3.4 Connection String

The connection string is a list of key/value pairs that the *Connection* object will parse; it will use the information to find the Data Source, authenticate and establish a connection. In ECSS, the connection string is put in the *web.config* file. The *web.config* file is an XML document that belongs in the root of ECSS application. With *web.config* file, it is easy to change database by just changing the *Provider* attribute.

Below is a snapshot of ECSS's *web.config* file:

```xml
<?xml version="1.0" encoding="utf-8" ?>
<configuration>

  <!-- Connection String -->
  <appSettings>
      <add key="constring" value="server=localhost;database=Inventory;uid=loong;password=asd;"/>
  </appSettings>

  <system.web>

    <!-- DYNAMIC DEBUG COMPILATION
        Set compilation debug="true" to insert debugging symbols (.pdb information)
        into the compiled page. Because this creates a larger file that executes
        more slowly, you should set this value to true only when debugging and to
        false at all other times. For more information, refer to the documentation about
        debugging ASP.NET files.
    -->
    <compilation defaultLanguage="vb" debug="true" />

    <!-- CUSTOM ERROR MESSAGES
        Set customErrors mode="On" or "RemoteOnly" to enable custom error messages, "Off" to disable.
        Add <error> tags for each of the errors you want to handle.
    -->
    <customErrors mode="RemoteOnly" />

    <!-- AUTHENTICATION
        This section sets the authentication policies of the application. Possible modes are "Windows",
        "Forms", "Passport" and "None"
    -->
    <authentication mode="Windows" />


    <!-- AUTHORIZATION
        This section sets the authorization policies of the application. You can allow or deny access
        to application resources by user or role. Wildcards: "*" mean everyone, "?" means anonymous
        (unauthenticated) users.
    -->
    <authorization>
        <allow users="*" /> <!-- Allow all users -->

        <!-- <allow     users="[comma separated list of users]"
                    roles="[comma separated list of roles]"/>
             <deny      users="[comma separated list of users]"
                    roles="[comma separated list of roles]"/>
        -->
    </authorization>

    <!-- APPLICATION-LEVEL TRACE LOGGING
        Application-level tracing enables trace log output for every page within an application.
        Set trace enabled="true" to enable application trace logging. If pageOutput="true", the
        trace information will be displayed at the bottom of each page. Otherwise, you can view the
        application trace log by browsing the "trace.axd" page from your web application
        root.
    -->
    <trace enabled="false" requestLimit="10" pageOutput="false" traceMode="SortByTime" localOnly="true" />


    <!-- SESSION STATE SETTINGS
        By default ASP.NET uses cookies to identify which requests belong to a particular session.
        If cookies are not available, a session can be tracked by adding a session identifier to the URL.
        To disable cookies, set sessionState cookieless="true".
    -->
    <sessionState
        mode="InProc"
        stateConnectionString="tcpip=127.0.0.1:42424"
        sqlConnectionString="data source=127.0.0.1;user id=sa;password="
        cookieless="false"
        timeout="20"
    />

    <!-- GLOBALIZATION
        This section sets the globalization settings of the application.
    -->
    <globalization requestEncoding="utf-8" responseEncoding="utf-8" />

  </system.web>

</configuration>
```

Figure 5.3 Contents of the web.config file

5.5.3.5 Layout Design

Many people leave the layout design as the last portion of their program

implementation without realizing the many pitfalls that lies ahead. A few of these

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complications include the complexity of merging the designs together with the sub-completed web application in the later stages (resulting in wasted time), insufficient time to come up with a good design, the additional constraints that will be placed on the design to accommodate the sub-completed application and many other 'unforeseen' problems. Planning to avoid these pitfalls, I decided to design the web layout early during the development stage. Here's the summary of how I implemented the web layout design:

- The layout was also carefully designed to suit the coding of ASP.NET files, bearing in mind that only minimal changes are needed to be done if required in future.

- Images were optimized before saving them to make sure file sizes are small enough to cater different Internet connection speeds.

- ASP.NET user control's header and menu bar containing repeatedly used html tags and scripts located before the actual content and after the actual content were created separately for each of the main modules. This created a standard design and alignment throughout the whole application. If the need to change a certain portion of the design arises, I only need to edit the header and menu bar concerned and have the changes reflected instantly throughout the whole application.

- The use of a standard Cascading Style Sheet (CSS) can be very handy as the whole application's html tag formatting can be done in a single and centralized way. It also helps to keep the codes tidy and manageable. Below is a snapshot of ECSS's CSS file:

```css
1   /* Default CSS Stylesheet for a new Web Application project */
2   BODY {
3       scrollbar-arrow-color: #FFFF00;
4       scrollbar-3dlight-color: #499BF5;
5       scrollbar-highlight-color: #000000;
6       scrollbar-face-color: #499BF5;
7       scrollbar-shadow-color: #000000;
8       scrollbar-darkshadow-color: #499BF5;
9       scrollbar-track-color: #7BC2FD;
10      margin-bottom : 0;
11      margin-left : 0;
12      margin-right : 0;
13      margin-top : 0;
14      max-height : 0;
15      max-width : 0;
16  }
17
18  .link {
19      FONT-SIZE: 11px; COLOR: #0099cc; FONT-FAMILY: Verdana,Sans-Serif; TEXT-DECORATION: none
20  }
21  A.link {
22      COLOR: #0099cc; TEXT-DECORATION: none
23  }
24  A.link:hover {
25      COLOR: #0099cc; TEXT-DECORATION: underline
26  }
27  A.link:visited {
28      COLOR: #0099cc; TEXT-DECORATION: none
29  }
30  A.link:active {
31      COLOR: #0099cc; TEXT-DECORATION: none
32  }
33
34  .ProductTitle
35  {
36      color:#0066CC;
37      FONT-SIZE: 12pt;
38      font-family:Verdana,Sans-Serif;
39      font-weight:bold
40  }
41
42  .ProductSubTitle
43  {
44      color:#003399;
45      FONT-SIZE: 12pt;
46      font-family:Verdana,Sans-Serif;
47      font-weight:bold
48  }
49
50  .bluetextbox
51  {
52      FONT-SIZE: 10pt;
53      BACKGROUND-COLOR: #c1def9
54  }
55
56  .bluetextboxVerdana
57  {
58      FONT-SIZE: 10pt;
59      BACKGROUND-COLOR: #c1def9;
60      font-family:Verdana,Sans-Serif;
61      color:Black
62  }
63
64  .alertText
65  {
66      font-size:10px;
67      font-family:Verdana;
68      color:Red
69  }
70
```

Figure 5.4 Part of the Styles.css file

5.5.3.6 Security Concerns in ECSS

Security is a major concern in ECSS. The system needs to have a way in protecting it from invalid access by unknown users, especially since the inventory management and transaction parts of the system is web-based and can be access from internet.

Some security methods that implemented in ECSS are as below:

- At login section, a user only has **3 chances** to input a correct password. If the user fail to do that, his account will be lock and the account can only be unlock by the administrator. This is a double protection where the intruder does not know the user name of ECSS. If he know, he also hard to access the system. And administrator will know if someone was trying to break in using specific user id and can change the user id.

- The login page will be loaded in the new window which does not contain the menu bar, status bar and others. (Plain window). This is to avoid users from knowing the exact URL of the page and access it without go through login page.

- On every page, there will be a checking of user type to prevent unauthorized users viewing the specific pages. This will make sure that users can only access the page through login page.

- Disable the **BACK** button functionality. I also included extra JavaScript codes in every web page to prevent the user from pressing the 'dangerous' Back button. This is just another redundant security mechanism in case needed.

Chapter 6 -   TESTING

6.1 Introduction

The main objective of testing is to examine the system for correctness, accuracy, completeness and reliability and to judge whether the program is usable in real environment. Since the ECSS is a large system, the testing procedures are carried out in stages. Stages involved can be divided into two categories, isolated testing and integrated testing. Isolated testing, as implied by the name, involves testing the individual systems of the system in an isolated environment. This type of testing includes unit/module testing and interface testing. Integrated testing and system testing will require testing the system as a whole.

Bottom-up approach is adopted as the integration testing approach for ECSS. In this approach the lower level modules are coded and tested first and integration moves upwards. Then the next higher level modules are integrated and tested with the already tested modules. This is repeated until all the modules are tested.

6.2 Testing Process

In general, the testing process of ECSS can be shown in the following figure. All the details will be further explained in subsequent sub-sections.
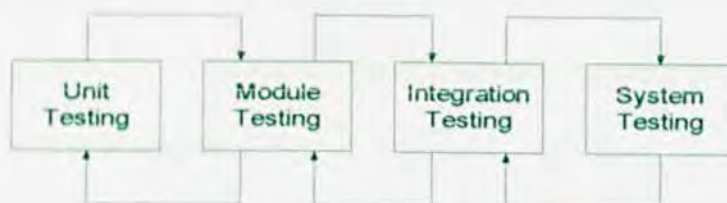
Unit Testing	Module Testing	Integration Testing	System Testing

Figure 6.1 TestingProcess

6.3 Levels of Testing

6.3.1 Unit/Module Testing

Unit/module testing is the process to test the individual component to ensure that they function properly. Each component is tested independently without the interference from other system components. Unit/module test is performed concurrently with the development process.

In ECSS, unit/module testing combines the black box and white box approaches. Black box testing focuses on the most important aspect of a module: how well the module meets its specification. The module is looked at from outside. The focus is on inputs to and outputs from the module, with an eye toward the functions that are to be carried out by the module. While the white box testing focuses on the idea of coverage. Coverage is as measure of how much of a module or system has been exercised/covered/executed by a test case or a series of test cases.

Unit test is performed concurrently with the development process. Techniques used during the process of performing unit testing are as follows:

- Compilation using Visual Studio .NET Compiler

    This method is fast and easy to discover errors. During the compilation, the VS .NET compiler will detect type of errors in a program and display the error type as well   as the line number in which the error occurs.

- Line-by-line debugging

    If error occurs during the loop of a function, then it will be difficult to identify the actual error. Therefore, breakpoint is used to debug codes line-by-line. This method can get values passed from a function to another and check

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whether there is any mistake in passing data. This is important as it helps to trace the program and allows the developer to identify the actual step in which an error has occurred.

- Code Review

If the above methods can not solve the error, codes need to be reviewed line-by-line to discover any syntax error as well as semantic error. If errors are discovered, they are corrected immediately.

6.3.2 Interface Testing

In the ECSS, the input interface plays an important role in ensuring that the user provides valid data. Therefore, a thorough testing of the interface behavior is crucial in this system.

The behavior of other components as the invalid input is typed, is observed to ensure that the components in the interface behave as intended. If the user types in an invalid input, an alert message should be prompt out beside of the test box. Testing, for example, involves trying to click the button after providing a wrong input to watch what happens next. Testing also involves trying to guess all user actions that would result in errors and watching how the system will handle these inputs.

Other than that, the interface is also tested for user-friendliness. This is accomplished by asking some user to test out the interface. The actions performed by the user is observed and later evaluated to determine the level of user friendliness. This will also enlighten the problems associated with the interface.

6.3.3 Integration Testing

After performing the unit/module test, the modules are integrated or combined into a working system. This integration planned and coordinated so that when a failure occurs, it can be solved immediately. Integration testing aims to ensure that all modules in the ECSS are able to interact and work seamlessly together.

There are two approaches to integration testing — a bottom-up testing and a top-down testing. The approach used in this system is the bottom-up approach where the low level modules are tested first then moves to the next higher level. The bottom-up approach is used in ECSS because the system has many general-purpose utility routines at the lower level and integrates a large number of stand-alone reused modules.

The main focus in integration test is to navigate the interfaces repeatedly to detect any interface mismatch problem. Several important aspects are checked to ensure that the flow of the data in ECSS is well organized and are user friendly to all the system users.

6.3.4 System Testing

After integration testing, all components are integrated to make the entire system. The main purpose of system testing is to ensure that the system meets its functional and non-functional requirements. This test covers the function, performance, acceptance and installation testing.

The main purpose in system testing is to find errors that result from unanticipated interactions between sub-systems. Problems might occur by the time the new developed system is integrated to existing system.

Chapter 7 - SYSTEM EVALUATION & CONCLUSION

7.1 Introduction

Evaluation is the ultimate phase of developing a system and an important phase before delivery the system to the end users. Evaluation is related to user environment, user approaches, information priorities and several other concerns that are to be considered carefully. Evaluation is a continuous process, drawing on a variety of sources and information from time to time.

7.2 Problems Encountered & Its Solutions

7.2.1 Unfamiliar with New Technology

ASP.NET and VB.NET are still very new technology to the computing world. Problems are faced in understanding the concepts and implementing the new technology to develop modules to support the development tasks. There is very little of references even on the internet.

7.2.2 Limited Chart Generating Capabilities

I use a Java Chart Applet throughout the application to generate charts under the Reporting module. However, with limited samples and no documentation at all (you need to purchase the documentation), using the applet was very hard. I solved this by searching the Internet for third-party developers who had used this applet before and then provided some sample coding.

7.2.3 Difficulties in defining the system scope and features

I having some doubts on the features and functions that I should include into the ECSS system at the beginning stage. But through studies and starting of coding section, I become clearer about the features that should be includes in my system. Due to the time frame given, it was impossible to incorporate too many features into system.

7.2.4 Setting up server

Many problems faced in setting up the IIS server for the ECSS system. This problem is due to lack of experiences in dealing with the servers. Many problems are also faced with index server which requires a different set of installation procedures compared to IIS.

7.2.5 Interconnecting Server

Problems are faced trying to interconnect the IIS, database server and Index server. The IIS is unable to detect the database server even though connection string is written probably. Index server have to maintenance to make sure it run probably and problem are encounter when error occur but few people have knowledge about it.

7.3 Solutions

7.3.1 Interconnecting Server

The problem of interconnecting the IIS server and the database server is solved through setting-up trust relationships among the related server.

7.3.2 Information Gathering

In trying to solve the various problems faced in the development of the ECSS, I went to browse through the Microsoft web site to look for possible solutions. Apart from the Microsoft web site, other ASP.NET and VB.NET site is also of a great help. I also tried to get advice from developers, programmers and the Microsoft support team.

7.4 Strengths of the System

7.4.1 System Security

All the page and sites involve Inventory Management and Transactions in ECSS are highly secured in which only authorized user will have access to view and use the functions available. This is done by using programming control. System security is very important as there are three different types of users will be using this system and each of them is restricted to execute certain functions only. Below is the summary of the security features in ECSS:

- Ability to lock users account if login fail 3 times

    At login section, a user only has **3 chances** to input a correct password. If the user fail to do that, the user account will be lock and the account can only be unlock by the administrator.

- Pop-up a new browser window when user accesses inventory management and transaction part of ECSS

    The login page will be loaded in the new window which does not contain the menu bar, status bar and others. (Plain window). The main reason is to avoid intruders from knowing the actual path of the system.

- Checking of user type in every page

    There will be a checking logic in every page to make sure only authorized user using the system.

- No-BACK support

    Extra JavaScript codes are included in every web page to disable the functionality of back button in the tool bar.

7.4.2 Wide-accessibility

The ECSS is a web base system which has provided wide-accessibility to users where users can access from everywhere in the world. Visitors can browse the products offered by the shop on internet website.

7.4.3 User Friendly & Easy-to-Use Interface

The layout of ECSS is very attractive, simple and well organized. Therefore, it is easy to use, simple to learn up and understandable. Normal users with some computer knowledge will find ECSS easy to handle.

7.4.4 Instant Update of Webpage

The webpage is generated dynamically using data from database. For instances, when there is a new transaction make, it will immediately update the Top 10 Popular Products List.

7.4.5 Error Checking/Discovering Capabilities

Every input field will be validate before proceed to next stage. This will make sure that no invalid data updated to database which may affect the functionality of the system. Therefore, all the information/records retrieved or updated into the database are reliable and free from any errors.

7.4.6 Graphical Reports

Administrator, who mostly is the boss of the computer shop, is provided a reporting function where they are able to generate graphical reports such as bar charts to represent the required statistical information. Graphical reports offer a good overall view of the statistical information like total sales between months in certain year.

7.5 Limitation

7.5.1 Unencrypted User Information

Currently, the information of users stored in database is not in encrypted form. This makes it a possible that intruders may hack into database and get user's information such as user id and password.

7.5.2 Insufficient Capabilities

Due to time constraints, ECSS that developed still have some problems to implement in real environment. This is because of the too many different in computer's hardware accessories and consideration that need make to setup a functional PC.

7.6 System Constraints and Future Enhancements

ECSS is still not fine enough to work at its full efficiency. Some refining work needs to be done to the system to increase its usability and reliability. The aspects to be refine and some suggestions to upgrade the system are as below:

7.6.1 Additional Reporting Module

Beside bar chart for annual sales report, the system can still increase its capabilities with additional reporting module such as sales comparison between different products of computer components like motherboard, printer and mouse. With this, the administrator will not which item has higher demand.

7.6.2 Email Reply for Quotation

A mail server can be setup to enable using of template in replying the visitor's quotation request.

7.6.3 An Online Forum

Online forum will let the visitors to discuss and exchange information about computer hardware and software problems and solutions.

7.6.4 Driver Download

Provide the ability to download the driver of products offered by the shop.

APPENDIX A – INSTALLATION & CONFIGURATION

A.1 Installation & Setup of IIS 6.0

Microsoft IIS only available and support Windows NT, Windows 2000 Professional, Server, Advanced Server and Windows XP. The default operating system for ECSS is Windows 2000 Advanced Server. The reason to choose Windows 2000 Advanced Server is because the database of ECSS is SQL 2000 Server which only supports Windows 2000 Server series.

We need to install IIS in the server as the default installation of Windows 2000 Advanced Server is without IIS. To install IIS, please follow the steps below:

A.1.1 Installation of IIS 6.0

1. Go to *Start -> Setting -> Control Panel*. In Control Panel, double click on the "*Add/Remove Programs*".

2. In the "*Add/Remove Programs*" menu, select the "*Add/Remove Windows Components*". When the window of "*Windows Components Wizard*" pop-up, click on the "*Internet Information Services*" checkbox to checked it. Then click on "*Next*" button to continue installation. Installation disc for Windows will be needed.

A.1.2 Setting up ECSS's Website

1. Before set up ECSS's website, copy all system files in the ECSS into the \InetPub\wwwroot\ECSS folder at the root directory (example: C:\InetPub\wwwroot). The ECSS folder will need to create manually.

2. To set up ECSS's default website, go to *Start -> Programs -> Administrative Tools -> Internet Services Manager*

3. In the "*Internet Services Manage*" window, the folder of ECSS will be seen. But a virtual directory needs to be created before ECSS can browse by internet browser.

4. Right click on "*Default Web Site*" and click on *New -> Virtual Directory*
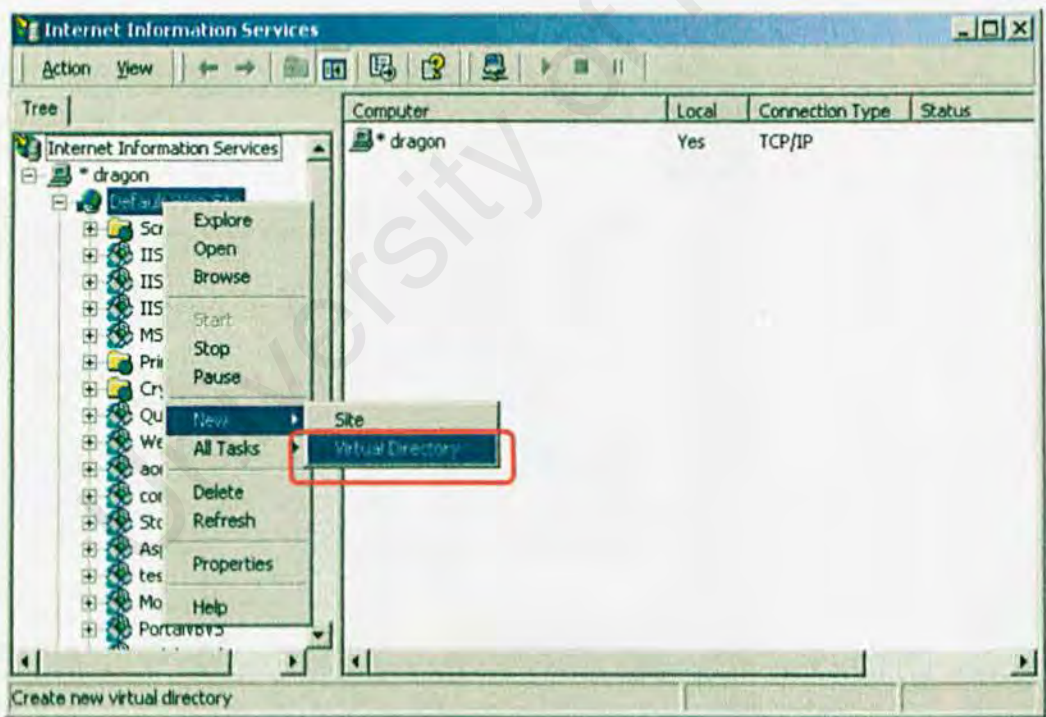
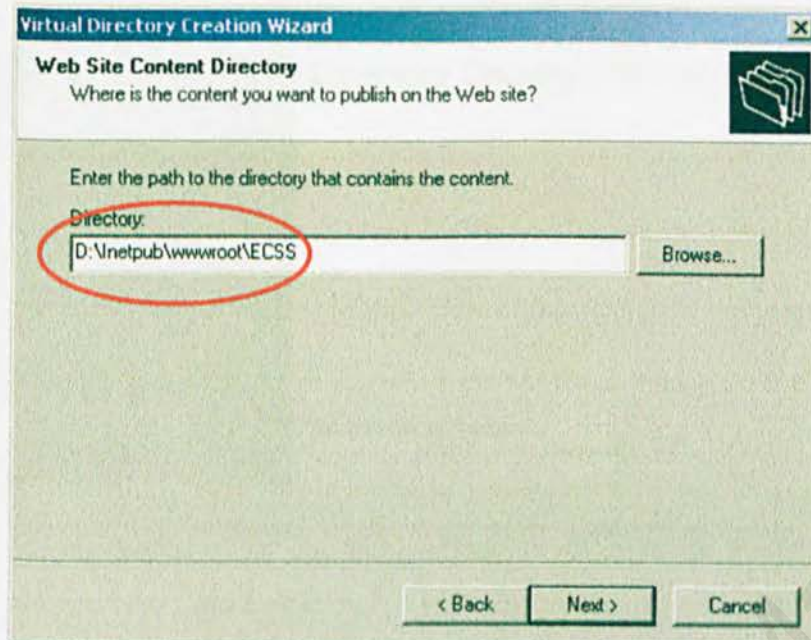5. Click "*Next*" to continue set up the virtual directory.

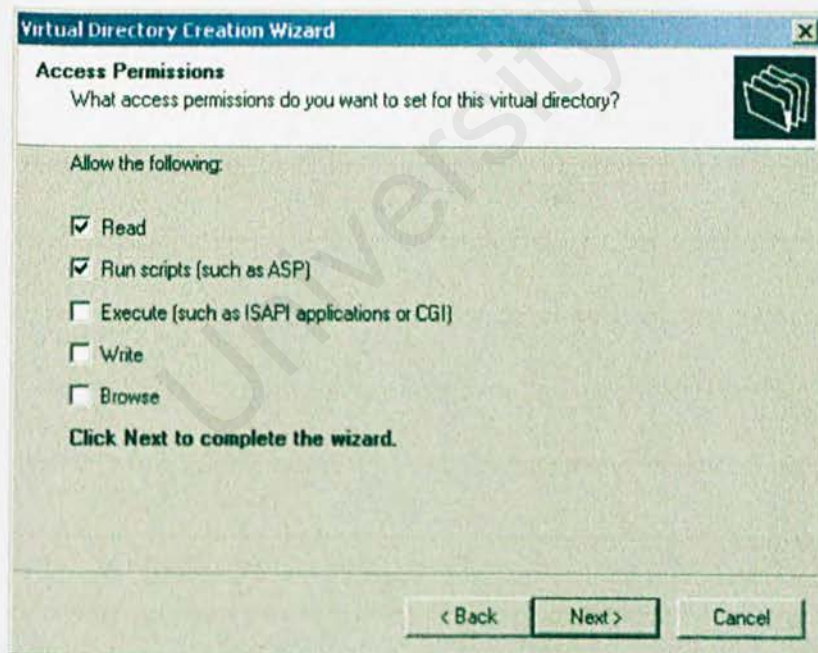6. Specify the **alias** of website URL which will be use by the user to access

    ECSS.
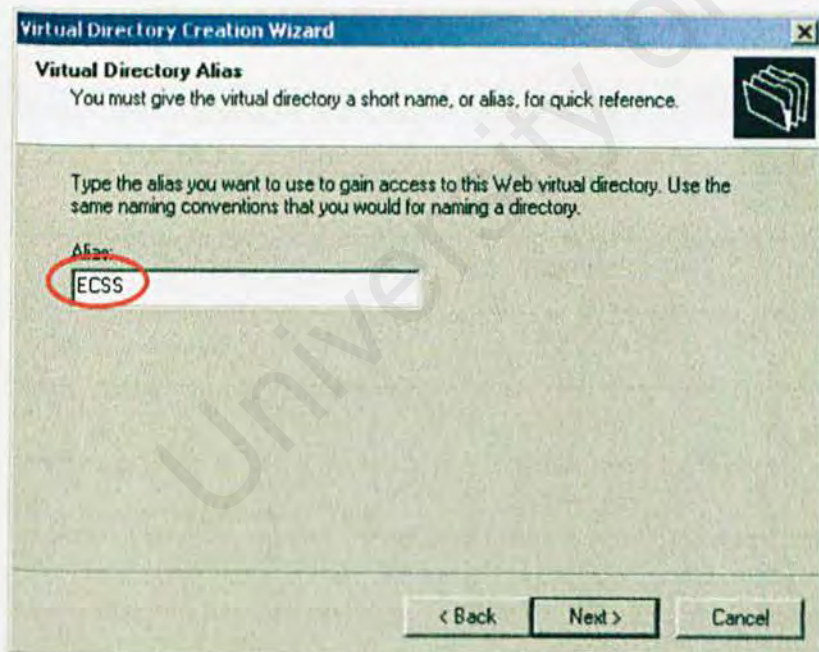
7. Specify the path that contains the ECSS system. (example:

   C:\InetPub\wwwroot\ECSS)

8. Make sure the read and run script options are selected as snapshot below

   shows.

9. Finally, click "*Finish*" to complete the creation of virtual directory.

A.1.3 Setting up ECSS's SQL Database

1. The ECSS comes with a specific database. To deploy the system in real time environment, the database for ECSS ("**Inventory**") must be attach to the SQL 2000 Server.

2. Before attaching the database into SQL 2000 Server, a new login account must be created. The login account will be granted authority to use the ECSS's database.

3. Click on the "*New Login*" button to start creating a new user account in SQL Server.
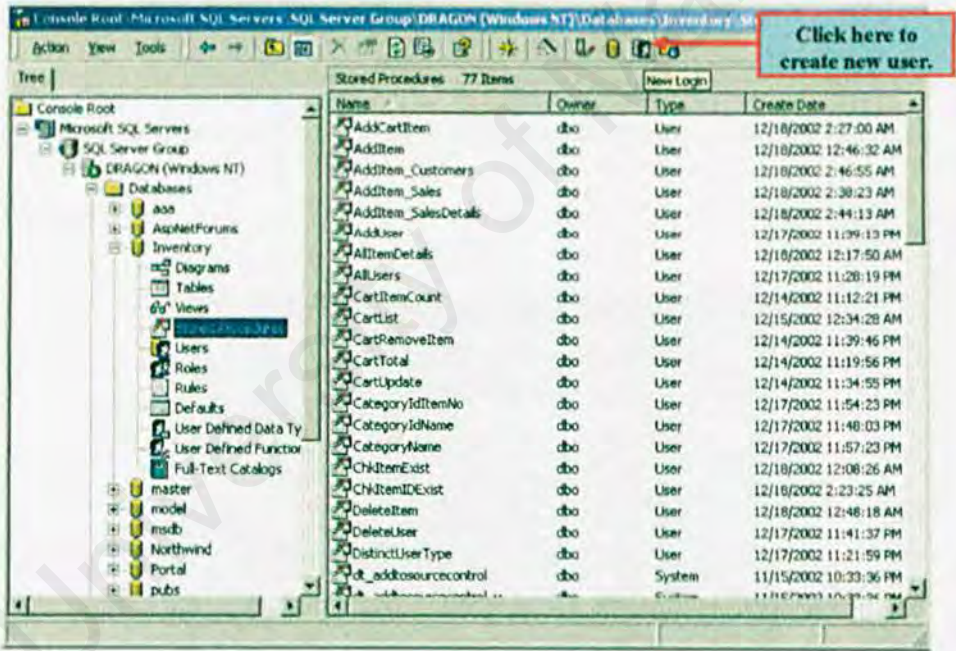
4. In the "*New Login*" window, specify the name field as "**loong**" and the

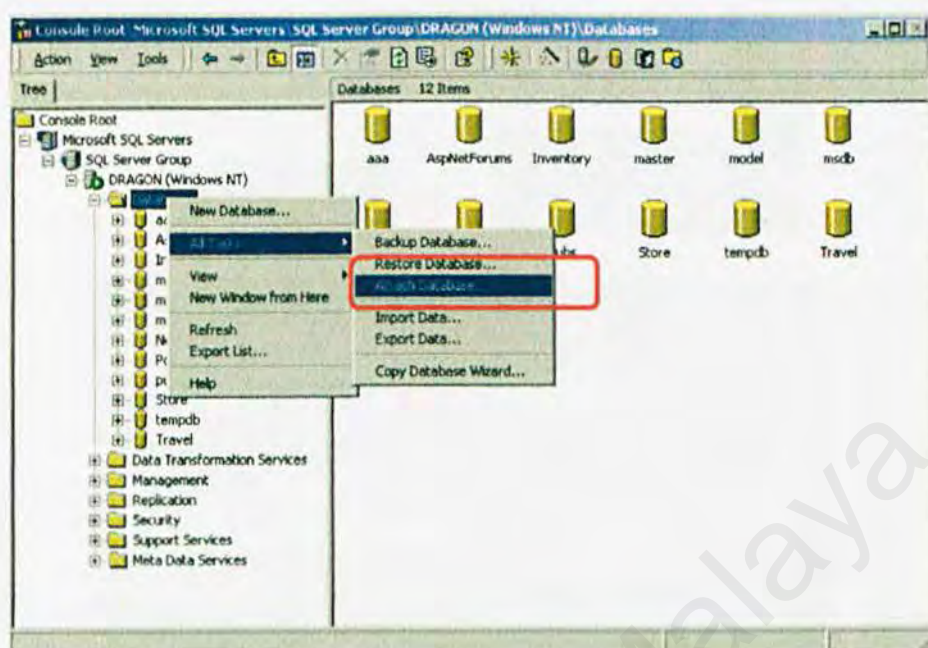   password for *SQL Server Authentication* is "**asd**"
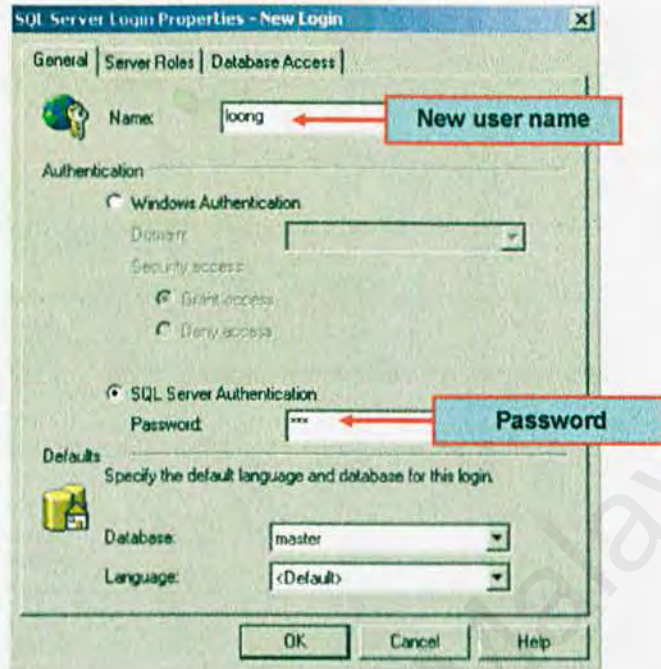
5. After re-enter the password again and click on OK button, the user account

   will be created.
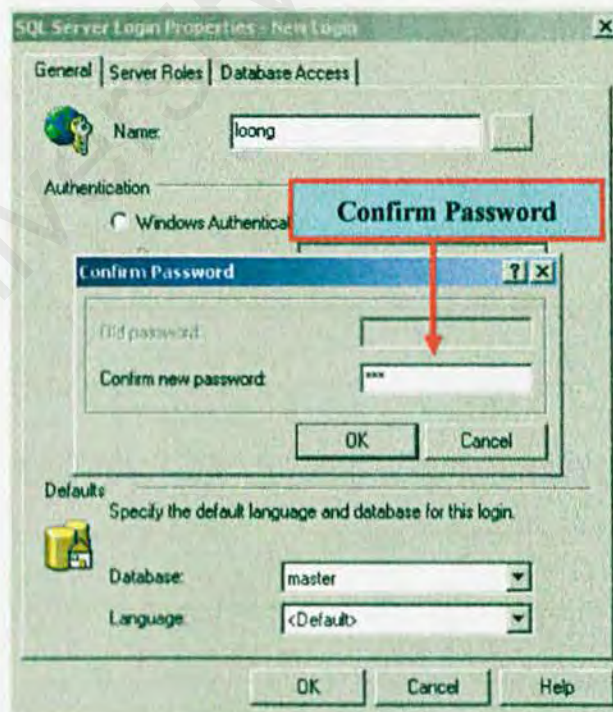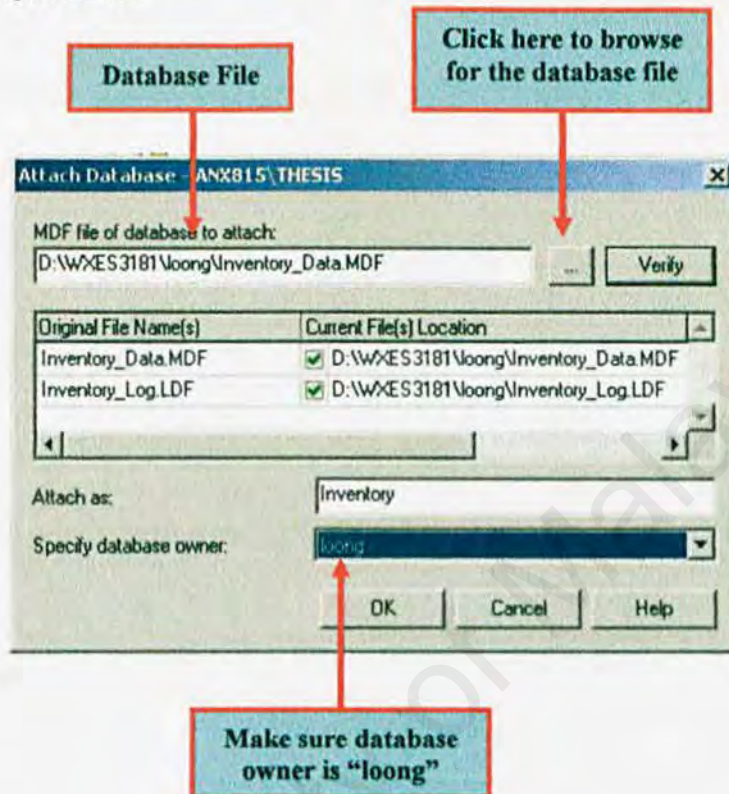

6. After the user account already created, you can then proceed to next stage to

   attach the database of ECSS.

7. To attach database, right click on "*Database*" and go to "*All Tasks*" ->

    "*Attach Database…*"

8. In the "*Attach Database*" window, click on the browse button to specify the path the **MDF file** located. Then make sure the field for "*Attach As*" is **Inventory** Then click on "*OK*" button and the ECSS database will be attach to the SQL Server.

Database File

Click here to browse for the database file

Attach Database - ANX815\THESIS

MDF file of database to attach:

D:\WXES3181\loong\Inventory_Data.MDF · · · Verify

Original File Name(s)	Current File(s) Location
Inventory_Data.MDF	☑ D:\WXES3181\loong\Inventory_Data.MDF
Inventory_Log.LDF	☑ D:\WXES3181\loong\Inventory_Log.LDF

Attach as: Inventory

Specify database owner: loong

OK   Cancel   Help

Make sure database owner is "loong"

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