B2B Portal: Web-enable Fulfillment System

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Abstract

The Web-enabled Fulfillment System is basically a web site that enables suppliers to automate and structure the order fulfillment process to help ensure that products and services meet or exceed customer's exact requirements including quality, quantity and specifications. The intelligence of the system will be placed on the server where all calculations and business rules are applies.

Business-to-Business (B2B) E-Commerce implies that both the sellers and buyers are business corporations. Purchase order is use as the system default as the business partners rarely use credit card for payment. Therefore, the order fulfillment process begins when an approved order is routed to the supplier. The supplier begins to pick the products, allocate an appropriate warehouse, consolidate the products, deliver the products and etc. The process complete when every product in a particular order has been fulfilled.

Web-enabled Fulfillment System is planned to be developed by using Microsoft Visual Interdev and Active Server Pages (ASP) technologies on the Window 2000 Server platform. Microsoft SQL Server 2000 is used for the database purpose.

With the latest and powerful technology, the system is not only expected to be workable, but also highly efficient in terms of execution speed and response time. The system design is dynamic and supporting concurrent users to interact with the system over the Internet.

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CHAPTER 1
INTRODUCTION

Chapter 1 Introduction

1.1   Project Definition

Electronic Commerce (E-Commerce) is an emerging concept that describes the process of buying and selling or exchanging of products, services and information via computer networks. Business-to-Business (B2B) E-Commerce implies that both the sellers and buyers are business corporations. B2B E-Commerce covers a broad spectrum of applications that enables an enterprise or business to form electronic relationships with their distributors, retailers, manufacturers, suppliers and other partners.

The current project will develop a B2B portal that will exploit the Internet as the core communication medium between business partners. Historically, procurement in business has been a large and complex exercise, especially in large enterprises. The amount of stock involved is usually large and the range of choices that managers can choose from is equally wide. The process of contacting the suppliers and establishing a preference amongst the lot can be a long and tedious process. In addition to that, the process also is delayed due to communication delays with the suppliers. Through the electronic exchange of information with suppliers, distributors and retailers via the B2B portal, companies can better direct the production, inventory and distribution of goods and more promptly alter prices and production strategies.

The B2B portal allows business partners to browse through the products supported by other partners. The integrated database allows product search and comparison to be done much easier because the result can be displayed on a single screen for easy comparison. The B2B portal also help partners increase revenue by providing a mechanism to up-sell and cross-sell their products. This market find techniques has proven to be very effective in pushing out a company's product.

Besides that, for a scalable and flexible solution, the B2B portal also provides a fast and efficient way to alter the process workflow concerning the approval of purchase orders. This is vital as business rules concerning business-to-business procurement are fluid.

Business becomes much more flexible, as B2B technologies enable multiple choice of trading partners, suppliers and transport logistics – critical for successfully meeting demanding changes in market requirements, or specialist order. Ideally, web-based fulfillment system improves efficiency with choice. Orders that are taken from the web have to be fulfilled. Fulfillment involves taking the products from the warehouse shelf right up to delivering it to the customer's doorstep.

The development of the portal is decomposed into three major modules, which are:

1. Product and catalogue management and purchasing system
2. Order routing system
3. Web-enabled Fulfillment System

The Web-enabled Fulfillment System is emphasized in this report.

1.2   Project Motivation

1. Reduced transaction cost

Operating of any company will be streamlined and take advantages of shared technologies infrastructure to cut transaction costs. Automation of manual process and information flows saves labor, paper, fax and phone service costs.

2. Collaboration

Increased collaboration between transaction parties reduces cycle times, enhances speed of delivery and creates stronger relationship between parties.

3. Empowerment of the purchasing function

B2B portal provide the immediate availability of information and products which can increase buyer's productivity.

4. Improve information management

Management reporting has been a constant frustrating weakness for most computerized system. By changing the way the business process interacts with the other companies in the supply and production chain, B2B allows users to view and react to events as they unfold, responding instantly to unforeseen problem and unfolding opportunities. Such information can be logged and analyzed. Following this, predictive and proactive management strategies can be put into play.

1.3   Project Objective

The objectives of developing Web-enabled Fulfillment System are:

1.   To enable suppliers to automate and structure the order fulfillment process.
2.   To help ensure that products and services meet or exceed customers exact requirement.
3.   To keep close track of goods in transit in different warehouse.
4.   To provide online information regardless of location.
5.   To reduce time periods of products to market.
6.   To reduce paper-based transaction.

The target users for the web-enabled Fulfillment System are those who are in the supply chain, which are the supplier, delivery agents, manufacturer, resellers, distributors or retailers.

1.4   Project Scope

The current project emphasis on developed a procurement system as the basic development of the B2B portal. The overall system structure can be described as the following diagram.
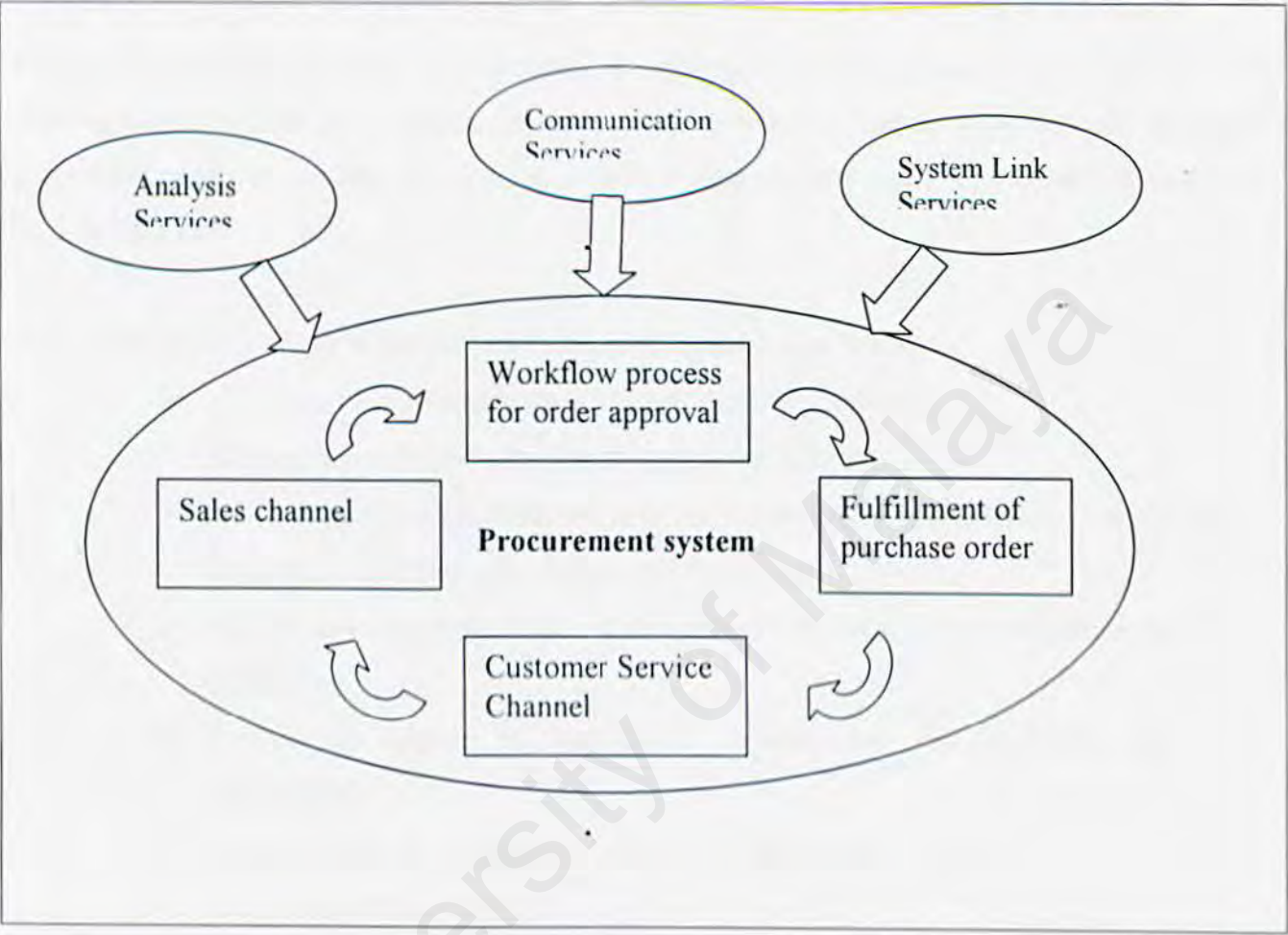
Figure 1.1 A general business-to-business system structure

As the Business-to-business system is large and complicated, this project is narrowed down and focuses primarily on:

1.   Web-enabled Procurement platform (Sales Channel)
2.   Workflow system for routing of orders
3.   Web-enabled Fulfillment System

As mentioned earlier, this project is primarily focused on the Web-enabled Fulfillment System. The Web-enabled Fulfillment System is basically a web-site that enables suppliers to automate

and structure the order fulfillment process to help ensure that products and services meet or exceed customers exact requirement including quantity, quality, specifications, time of delivery and other terms and conditions. The intelligence of the system will be placed on the server where all calculations and business rules are applies.

The order fulfillment process begins when an approved order is routed to the supplier. The supplier begins to pick the products, allocate an appropriate warehouse, consolidate the products, deliver the products and etc. The process complete when every product in a particular order has been fulfilled.

The scope/features of the Web-enabled Fulfillment System is as follow:

- Allow supplier to check stock available in the warehouse.
- Allow supplier to pick the ordered products in batch.
- Allow supplier to generate the pick batch based on some selection criteria, which are pick by quantity and pick by delivery agent.
- System automatically removed the orders that cannot be fulfilled in the Back Order File.
- Enable the supplier to consolidate products that can be found in several warehouses.
- There is a product breakdown for every pick batch to allow the supplier to have the details of each product.
- Allow supplier to view the products that are out of warehouse (delivered to customer).
- Display all the fulfilled orders.
- Allow supplier to view the needed information in a web-based table form.

The limitations of the Web-enabled Fulfillment System are:

- It does not incorporate any online payment system as the system is configured to use purchase order as an alternative.
- Product shipment is not included in the system
- Process of contacting the delivery agents to pick up the orders is not included in the system.
- Invoicing is not included in the system.
- Currency and language selection are not available. Malaysia Ringgit and English language are used as the system default.

1.5   Project Schedule

In view of developing the project, a project schedule is planned as a guideline to manage the time and tasks that need to be accomplished. A project development schedule is highly needed to ensure that effort is distributed within the prescribed time to make the best use of resources. The Web-enabled Fulfillment System development is divided into six phases, which are system study, system analysis, system design, system coding, system testing and documentation.

The schedule of the project is as shown in the Gantt chart below.

	Task Name	May '01 May	Jun '01 Jun	Jul '01 Jul	Aug '01 Aug	Sep '01 Sep	Oct '01 Oct	Nov '01 Nov	Dec '01 Dec	Jan '02 Jan	Feb '02 Feb
1	Research										
2	System Analysis										
3	System Design										
4	System Implementation										
5	System Testing										
6	Documentation										
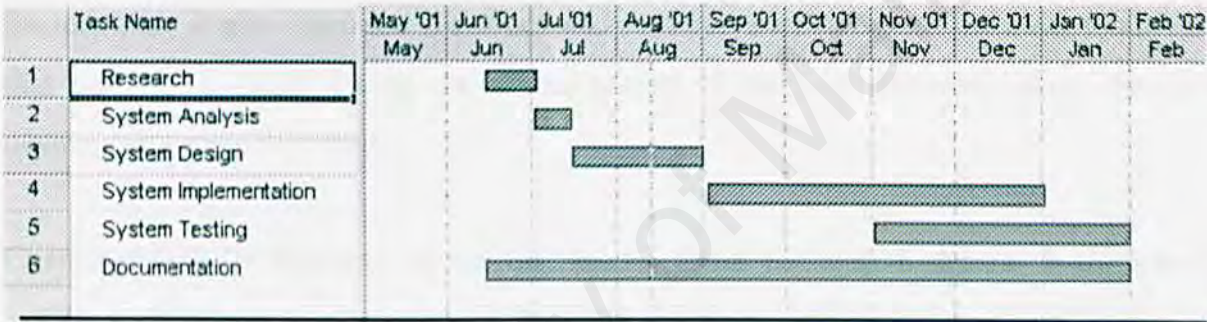
Figure 1.2   Gantt chart for Project Schedule

1.6   Overview of Dissertation

The first chapter gives an overview of the definition of the Web-enabled Fulfillment System. It also gives an idea of the motivation and objective of this dissertation. Finally, it shows the scope and schedule for the project.

The next chapter, which is chapter 2, is represents the literature review. This chapter discusses about the terms, concepts and technologies used in this dissertation. Furthermore, it also discusses the literatures for this dissertation and shows the review for the existing system.

In chapter 3, methodology and the information gathering approaches used will be discussed. Besides that, it also discusses the functional requirements and non-functional requirements that need to consider during the whole project. Finally, it discusses about the system development tools that used.

Chapter 4 will be focusing on the discussions about the system design. It discusses the system architecture, program design, database design as well as the interface design for the whole system.

Chapter 5 will describes the processes and technique of transfers the system design into workable modules and programming codes, setting up the system in the same environment where it will be used.

In Chapter 6, it will discuss various testing techniques that are carried out throughout the development process in order to develop a precise and accurate system.

Chapter 7, which is the System evaluation, focuses on the post-implementation review to determine strengths and limitations/constraints of the system. The appraisal will also provide feasible information to enhance the future project.

The final chapter, chapter 8, is a summary to the whole dissertation and this will conclude everything that has been reviewed in all previous chapters

CHAPTER 2

LITERATURE REVIEW

Chapter 2 Literature Review

Review of literature is a background study about the knowledge and the information gained to develop this project. The purpose of this review of literature is to get a better understanding on the development tools that can be used to develop a project and also to get a better knowledge on the development methodologies used while developing a project.

Apart from that, the review of literature also enables the developer to do comparison on the past-developed projects and study the strength and weakness of it. This will help the author to develop a suitable and powerful system. With sufficient knowledge of strengths and limitation of several development tools may help the developer to choose the right tool to develop the system It will also give an overview of how to improve the weakness and fulfill the requirements needed.

2.1   Electronic Commerce

2.1.1   Overview

In this world, much debate has been going on about Electronic Commerce (e-commerce). The e-commerce has been introduced to the world as the digital key element to the future of business and marketing. Since then, the e-commerce has largely adapted by companies and has begun to spread into this digital era like an airborne virus.

Commerce is the exchange of money for goods or services between companies and/or end consumers. Therefore, e-commerce is doing commerce using electronic technology such as intranets, extranets and the Internet.

A business can conduct commerce either with end consumers or with other businesses. While some businesses conduct commerce with end consumers, all businesses conduct commerce with other businesses. Every business relies upon other companies for

supplies, for utilities and for services. When e-commerce occurs between a business and an end consumer, the industry term for that is Business-to-Consumer (B2C). When businesses conduct e-commerce with other businesses, this is called Business-to-Business (B2B).

2.1.2   Business-to-Business (B2B)

Internet commerce is growing fastest among businesses. It is used for coordination between the purchasing operations of a company and its suppliers; the logistics planners in a company and the transportation companies that warehouse and move its products; the sales organizations and the wholesalers or retailers that sell its products; and the customer service and maintenance operations and the company's customers.

Companies of all sizes can now communicate with each other electronically through the public Internet, networks for company-use only (Intranets) or for use by a company and its business partners (extranets), and private value-added networks. Growth of B2B e-commerce is being driven by lower purchasing costs, reductions in inventories, lower cycle times, more efficient and effective customer service, lower sales and marketing costs and new sales opportunities.

The B2B commerce is the electronic business transaction between businesses with business, which can be said as a supplier, and reseller. A supplier (business) who sells their products to a reseller (business) is considered as the process of the B2B commerce. A reseller is also a supplier, which means that the supplier can be a supplier to another supplier and to another and this goes on and on.

For instance, a music store such as the Tower Record™, which sells music CDs, they will have to buy the CDs from the distributors. The distributors will get the CDs from the record label company; the record label company will have to purchase blank CDs, printings of the covers and etc. This process of producing and selling music CDs is

considered B2B commerce. Figure 2.1 shows the flows of the B2B commerce in the music industry.
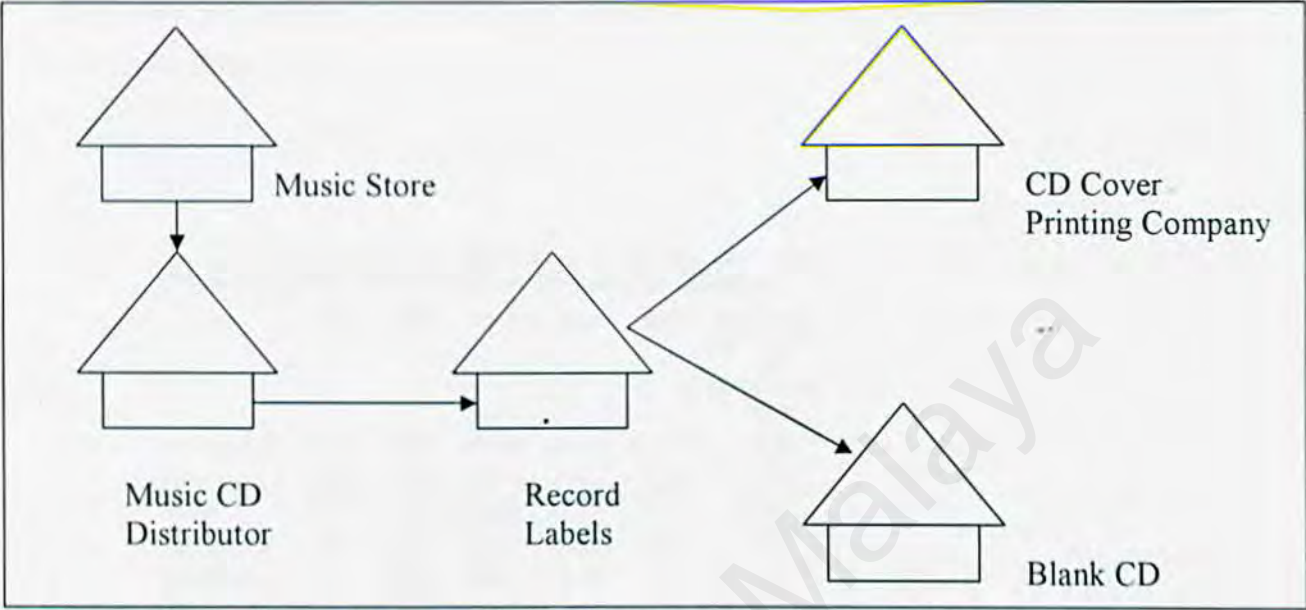
Figure 2.1   Example flow of the B2B commerce in the music industry

The term B2B has become a part of the business vernacular. Quite simply, B2B is business, which is conducted between businesses via some electronic means. From a commerce standpoint, B2B is when two or more businesses buy, sell or strike trading partner agreements between themselves using e-commerce technology. Also, when a company orders office supplies or parts, they frequently order the same products as well as the same amounts. Therefore, repeat and standing orders are a common requirement in B2B. When businesses make purchases, they rarely use credit cards for payment. More likely they will have varied forms of payment such as lines of credit, open orders, purchase order and etc.

2.1.3   Present and Future of Business-to-Business Electronic Commerce

In 1997, about $10 billion worth of business-to-business transaction were conducted over the Internet. According to the eMarketer's just released eCommerce: B2B Report, the eMarketer estimates that worldwide business-to-business e-commerce will reach $2.7 trillion by 2004. [7]

B2B eCommerce by Region, 2000–2004 (in billions)	2000	2001	2002	2003	2004	As a % of Worldwide B2B eCommerce 2004
North America	$159.2	$316.8	$563.9	$964.3	$1,600.5	57.7%
Asia/Pacific	$36.2	$68.6	$121.2	$199.3	$300.6	10.8%
Europe	$26.2	$52.4	$132.7	$334.1	$797.3	28.7%
Latin America	$2.9	$7.9	$17.4	$33.6	$58.4	2.1%
Africa/Middle East	$1.7	$3.2	$5.9	$10.6	$17.7	0.6%
Total	$226.2	$448.9	$841.1	$1,541.9	$2,774.8	100.0%

Source: eMarketer, 2001

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Figure 2.2   B2B e-commerce Growth statistic

2.2   Existing System Review

This section discusses the existing fulfillment system in the market and in the B2B portal. Previous related thesis is not discussed as no thesis related to B2B portal and fulfillment system is found.

2.2.1   Fulfillment System in the market – Accel Team Fulfillment System

This section reviews the Fulfillment System that developed by Accel Team. Accel Team is a developer that had developed a non web-enabled fulfillment system. The system is provided to all kind of users that are involved in the supply chain.

Basically, this fulfillment system has covered all the basic function that need for order fulfillment process. Besides that, the interface design of the system is also very user-friendly to its users. This fulfillment system also included inventory management system to keep track the stocks in the warehouse.

However, there are some weaknesses in the Accel Team Fulfillment System. Firstly, the delivery agents are unable to keep track the stocks outside of the warehouse, as the system is not web-enabled. This brings a lot of inconveniences to them. Besides that, the system is fully based on the paper-based transaction. The administrators need to print out all the report or summary in order to keep track their stocks. It is relatively slow, prone to error and difficult to update.

In conclusion, Accel Team Fulfillment System provides sufficient and quality services to the users.

2.2.2   Fulfillment System in the B2B portal - Fulfillment Specialties Inc. (FSI)

For this section, there is no thorough review on the current existing system implementation because the data in the B2B portal are private and confidential. Besides that, all most all the B2B portals are only accessible by registered partner's users only. Therefore, this section only discussed the information on the requirements of the B2B portal that can be found on their web site.

Fulfillment Specialties Inc. (FSI) is a B2B portal developer. It involved in the order processing, web interface, call center, reporting, account management, warehouse and inventory. The fulfillment process also included the management of the shipping method or transport logistics. Besides that, they also using the bar-code-driven computerized inventory management system to identified products and manufacturers. This ensures the accuracy and efficiency of the order fulfillment process.

Fulfillment Specialties Inc. (FSI) provided a complete order fulfillment system to the users. The users can choose the different kind of services based on their need and budget. FSI also provide customer maintenance and support to the customers.

Basically, it is hardly to find any of the weakness of this well-developed system as it is developed based on the most common user requirements of the market.

2.3   Client-Server Computing

This section discusses the features of client server computing and different types of client/server architecture.

Client server programming is one of the most dominant programs of information technology and has developed as the computer industry moved from a centralized chare logic-based system to a network of workstations and servers. It involves providing an application architecture that enables a computerized process to be broken up into two or more less complex tasks with a commercial mechanism for these sub-processes to co-operate.

The client/server model is an approach to software in which one application (the client) asks for and receives services from another application (the server). Another definition for client/server is " a software partitioning paradigm in which a distributed system is split between one or more server tasks which accept requests, according to some protocol, from (distributed) client tasks, asking for information or action" [1]. This model allows clients and servers to be placed independently on nodes in a network.

One of the prime benefits of a client/server system is the lower cost. Another is increased productivity from the individual to the corporation that results from better access to information and the distribution of resources through the corporation [1].

Though client/server architecture can be very complex, there are generally three kinds of client/server infrastructures to choose from, which are two-tier, three-tier, multi-tier architectures.

2.3.1   Two-tier architecture

The two-tier architecture contains two computers: a client, and a server, with areas of logic combined on the client. The three components of an application- presentation, processing, and data, are divided among two software, entities or tiers: client application

cods and database server. A robust client application development language and a versatile mechanism for transmitting direct requests to the server essential for a two-tier implementation.

Presentation is handled exclusively by the client, processing is split between client and server, and data is stored on and accessed through the server. The client assumes the bulk of responsibility for application (functionality) logic with respect to the processing component, while the database engine, with its attendant integrity checks, query capabilities, and central repository functions, handles data intensive tasks.

2.3.2   Three-tier architecture

The components of three-tier architecture are divided into three layers: a presentation layer, a functionality layer, and the data layer. Each of these layers must be logically separated. The attempt to overcome some of the limitations of the two-tier scheme by separating presentation, processing and data into separate destruct entities.

The same type of tools can be used for presentation as were used in a two-tier environment. However the tools are now dedicated to handling just the presentation. When calculations or data accesses are required by the presentation client, a call is made to a middle tier functionality server.

2.3.3   Multi-tier architecture

In a multi-tier architecture, the business logic is partitioned and distributed over several machines. As requirements change during a systems lifetime, this partitioning and deployment can be reviewed and emended with minimal impact. Furthermore, additional tiers architecture included to support multiple databases and other services such as message switches, legacy system, data warehouses, communication channels and so on.

2.4   Platforms

Developing Business-to-business (B2B) portal need to has a suitable platform. In computers, a platform is an underlying computer system on which application programs can run [2].

A platform consists of an operating system, the computer system's coordinating program, which in turn is built on the instruction set for a processor or microprocessor, the hardware that performs logic operations and manages data movement in the computer. The operating system must be designed to work with the particular processor's set of instructions. There are usually other implied parts in any computer platform such as a motherboard and a data bus, but these parts have increasingly become modularized and standardized.

Historically, most application programs have had to be written to run on a particular platform. Each platform provided a different application program interface for different system services. Although these platform differences continue to exist and there will probably always be proprietary differences between them, new open or standards-conforming interfaces now allow many programs to run on different platforms or to interoperate with different platforms through mediating or "broker" programs.

2.4.1   Windows 2000 Server

Windows 2000 Server is a product of Microsoft Corporation. It is a multipurpose operating system for business of all sizes. It provides services that enable the user to build and deploy servers more quickly. With its feature 'Configure Your Server' wizard, it significantly reduces the time it takes to build a server and reduces the likelihood of error. Windows 2000 Server allows easier network configuration with its support on plug and play network adapters. Furthermore, it provides services that manage the trust relationships between domains in organization, and it provides automated replication and local caching of DNS and DHCP information so that the network is robust and responsive.

Windows 2000 Server provides powerful management services through infrastructure enhancements such as the Active Directory service, as well as tools built on the infrastructure, such as IntelliMirror management technologies. Windows 2000 Server delivers powerful, comprehensive management services to better manage servers, networks and Windows-based desktops, including Group Policy, Windows Management Instrumentation (WMI), Windows Script Host (WSH) and Microsoft Management Console (MMC). But still stability of the operating is still a main concern. Users still faces "blue screen of death" showing the system hangs.

2.4.2   Sun Solaris 8 Operating Environment

Solaris 8 is the latest in a long line of top-notch and high-performance Unix operating environments from Sun. It is designed for multiprocessing and 64-bit computing. By minimizing planned and unplanned downtime, reducing administration errors, and simplifying troubleshooting, it keeps mission-critical applications available, and ensures high-speed, reliable access to your data. Based on a smaller, more stable kernel, the Solaris platform delivers industry-leading load balancing across multiple processors. To maximize uptime, Solaris software provides built-in features such as live upgrade, automatic dynamic reconfiguration, hot relief, hot diagnostics, dynamic system domains,

IP network fail over and balancing, UNIX file system logging, and remote console. With these features it enables user to maximize uptime and increase availability to services.

As with previous versions, the modular construction of the Solaris 8 platform allows installation of new feature updates as they become available while users' applications continue to run. The Sun Solaris 8 is easy to scale and manage as it supports the latest networking protocols and adheres to major industry standards and inclusion of comprehensive system management tools. With Solaris 8 software, security is easy to deploy and manage as many frameworks and products are either incorporated or available via free download. These include Kerberos, IPSec, Smart card authentication, role-based access control for distributing super user authorizations and auditing features. Moreover, Solaris 8 Supports the latest networking protocols and adheres to major industry standards.

However, Solaris 8 operating system does not support the primary protocols used for providing Web-based applications. Using the base Solaris 8 operating environment it is therefore difficult to provide a coherent Internet solution across the different services that would normally make up your Internet service. For example, using the built-in e-mail services and a third party Web server solution requires two different authentication systems. Although this requirement is not an issue for public Web services such as e-commerce, it is a significant omission for Intranet and Extranet applications. Besides that, the base Solaris 8 package does not come with a unified interface for managing different aspects of the operating system. Instead, most systems management tasks are handled by manually modifying the various text files controlling different elements, using a text editor such as *vi* or EMACS. There is an administration tool supported by the X Windows GUI that allows for easier modification of certain databases, but it is limited to modifying the user, group, host, and printer configuration.

2.4.3   UNIX

UNIX is a multi-tasking multi-user operating system. It developed at AT&T Bell Laboratories. It is a powerful and mature operating system and network-based platform.

Besides, UNIX is an ideal platform for running mail servers, networked file systems and so on. UNIX users normally share processing time on a central computer, or cluster of computers. [3]

UNIX, like other operating systems, is a layer between the hardware and the applications that run on the computer. It has functions that manage the hardware and functions that manage the executives of applications. [4]

UNIX includes the traditional operating system. In addition, a standard UNIX system includes a set of libraries and a set of applications. It includes the file system and process control and a set of libraries.

One of the greatest strength of UNIX is the consistent way in which it treats files. It is very easy for the users to work with files because users don't need to learn special commands for every new task. [4]

Basically, UNIX is used for several main purposes, which are:
  ➢ Sending and receiving email, forwarding mail, redirecting and mapping a particular mail group to a list of specific users.
  ➢ Managing centralized databases, serving information to users remotely. For instance, Ingress, Oracle, etc.
  ➢ Storing files, including users personal files as well as publicly accessible software archives.
  ➢ Running a web server, storing web pages.
  ➢ Remotely services – computers running UNIX normally support certain remote services, allowing users to request information from the computer without actually log in.

UNIX is not known only for its longevity and versatility as an operating system, but also for the variety and number of utility programs that called tool. The problem with UNIX is that it is too expensive to use. It need very powerful workstations and therefore not cost effective.

2.5   Web Servers

A Web server is a program that, using the client/server model and the World Wide Web's Hypertext Transfer Protocol (Hypertext Transfer Protocol), serves the files that form Web pages to Web users (whose computers contain HTTP clients that forward their requests). Every computer on the Internet that contains a Web site must have a Web server program. [2]

2.5.1   Apache Web Server

Apache server is a powerful yet flexible web server. It is compliant with HTTP/1.1 and implements the latest protocols, including HTTP/1.1 (RFC2616). Apache web server is highly configurable as it is in open source code and extensible with third-party modules, and can be customized by writing 'modules' using the Apache module API. Moreover, it provides full source code and comes with an unrestrictive license.

Apache web server runs on Windows NT/9x, Netware 5.x, OS/2, and most versions of Unix, as well as several other operating systems. The web server is actively being developed and encourages user feedback through new ideas, bug reports and patches. The features of Apache web server includes DBM databases for authentication, customizable responses to errors and problems, multiple DirectoryIndex directives and unlimited flexible URL rewriting and aliasing. It is compatibles with Windows 2000, NT, Linux, NewWare 5.0 (with Service Pack 5), 5.1 (with Service Pack 1), UNIX, BSD, HP MPE/iX 6.0 or higher and TPF version 4.1 PUT09.

However, there are limitations in Apache Web Server. To corporate Web server customers, the fact that Apache is free can be a drawback, signifying a lack of the explicit or implied accountability they get with vendor products. Its flexibility also can be a double-edged sword. Apache is easy to set up, but those who try to extend it had better know what they are doing. Where there is not a lot of expertise available, customers may also prefer to see features that come together and have been tested together rather than search them out from multiple sources on the Internet. The lack of software support for Apache that has been a stumbling block to its adoption by business users also is

beginning to be remedied. Traditionally, Apache support has been confined to online resources.

2.5.2   Microsoft Internet Information Server (V.5.0)

Internet Information Services 5.0 (IIS) is the Windows 2000 Web service that makes it easy to publish information on the intranet for the Internet. It is completely integrated with Windows NT Directory Services and includes Crystal Reports, a visual reporting tool. Internet Information Server 5.0 has many new features to enables user to create a scalable and flexible web applications. It allows administrators to configure servers, sites, virtual directories, subdirectories and files individually. It also includes crash protection that allows users to run multiple applications reliably. Moreover IIS includes tools to analyze and manage web server content and supports multiple web sited on one IP address.

2.5.3   Netscape Enterprise Server

The Enterprise Server is a high performance, enterprise-strength web server. It provides supports HTTP 1.1 protocol, a built-in search engine with documents attributes and custom views, advanced content publishing and management for end users through an approach called "Netshare", server clustering and administrative rights delegation and Java integration with support for JavaBeans, JDBC and Servlets. It can support a variety of platforms such as Windows NT, Unix, IRIX, AIX, HPUX and others.

Netscape Enterprise Server provides end-users the ability to manage their own content. "Netshare" a built-in tool facilitates group collaboration as multiple users may publish pages to a server, edit, share, collaborate on creating a document and control access to their documents without needing a system administrator to intervene. With its centralized server management capability, it enables large organizations to manage its large number of users more effectively.

However, Netscape Enterprise has several drawbacks. Due to its insufficient GUI-based interface, it is difficult to configure. Users are facing difficulty in getting support as the only way to get technical support is through mailing lists.

2.6   Browsers

2.6.1   Netscape Navigator 6

Netscape Navigator comes in a package with Netscape 6 and built on the innovative Netscape Gecko browser engine and sporting a new look, Navigator is now smaller, faster and fully standards compliant. The interface of Navigator is pared down to the make the most important tasks easy to find, while at the same time freeing up more space, allowing user to see more of what's on the page.

Navigator is based on the innovative Netscape Gecko, its new, fully standards compliant layout engine. It also provides powerful new search that are fast and convenient. With a feature called 'My Sidebar' keeps user connected to important information. Lastly, it can translate web pages in a single click to user's native language with the AutoTranslate feature in Navigator, based on Alis Technologies, Inc.'s Gist-In-Time service for the Internet.

2.6.2   Internet Explorer 5.5

Internet Explorer is a product from Microsoft Corporation. It provides capability for print preview enabling user to see how web pages will look like on paper. Besides that, this version of Internet Explorer can be easily installed on computer. Internet Explorer 5.5 includes an amazing assortment of new DHTML capabilities. For example, it's now possible to make frames transparent so that whatever is in the page behind it shows through - great for creating things such as watermarks. For instance, put a large corporate logo on the background page, and it appears as a watermark on all the pages within that site.

New frames support is possible because Internet Explorer has changed the way it renders frames its own DHTML support. Consequently, it provides faster performance and improved stability. Moreover, the browser contains a ton of features that help developers write Web pages that look good and function well in Internet Explorer. Now, developers

would be able to create colored scroll bars, HTML pop-ups, and other user interface widgets.

2.7   Web Application Programming Language

2.7.1   Active Server Pages

An Active Server Page (ASP) is an HTML page that includes one or more script (small-embedded programs) that is processed on a Microsoft Web server before the page is sent to the user. An ASP is somewhat similar to a Server-side include or a common gateway interface (CGI) application in that all involve programs that run on the server, usually tailoring a page for the user. Typically, the script in the Web page at the server uses input received as the result of the user's request for the page to access data from a database and then builds or customizes the page on the fly before sending it to the requestor.

ASP is a feature of the Microsoft Internet Information Server (IIS), but, since the server-side script is just building a regular HTML page, it can be delivered to almost any browser. You can create an ASP file by including a script written in VBScript or JScript in an HTML file or by using ActiveX Data Objects (ADOs) program statements in the HTML file. You name the HTML file with the ".asp" file suffix. Microsoft recommends the use of the server-side ASP rather than a client-side script, where there is actually a choice, because the server-side script will result in an easily displayable HTML page. Client-side scripts (for example, with JavaScript) may not work as intended on older browsers. [2]

2.7.2   Java Server Page

Java Server Pages allows web developers and designers to rapidly develop and easily maintain, information-rich, dynamic web pages that leverage existing business systems. As part of the Java family, Java Server Pages enables rapid development of web-based

applications that are platform independent. Java Server Pages technology separates the user interface from content generation enabling designers to change the overall page layout without altering the underlying dynamic content.

Java Server Pages technology uses XML-like tags and scriptlets written in the Java programming language to encapsulate the logic that generates the content for the page. Additionally, the application logic can reside in server-based resources that the page accesses with these tags and scriptlets. Any and all formatting (HTML or XML) tags are passed directly back to the response page. This makes Java Server Pages technology makes it faster and easier than ever to build web-based applications. Together, JSP technology and servlets provide an attractive alternative to other types of dynamic web scripting/programming that offers platform independence, enhanced performance, separation of logic from display, ease of administration, extensibility into the enterprise and most importantly, ease of use.

2.7.3 VBScript

VBScript is a member of Microsoft's Visual Basic family of development products. It is a scripting language for HTML pages on the World Wide Web and corporate Intranets. VBScript is fast, portable, lightweight interpreter for use in Web browsers and other applications that use Microsoft ActiveX Controls, Automation severs, and Java Applets. VBScript can be embedded in the HTML pages to build the Web applications.

VBScript is designed for use with Microsoft's Internet Explorer browsers together with other programming that can be run at the client's side, including ActiveX controls, Automation Servers and Java Applets. The VBScript code is interpreted and compiled while the browser is downloading it from a Web server.

2.7.4 JavaScript

JavaScript is a programming language that allows scripting of events, objects and actions to create Internet applications. It is developed by Netscape and it is the first Web

scripting. It is syntactically identical to Java, which is based on C++, but it's an interpreted language as compare to Java, which is a compiled language.

With JavaScript, new dynamic elements let developers go beyond the simple click and wait. Users will not just read the pages but also interact with them. Users can get quick responses the interaction does not need to involve the server but can take place in their browser.

2.7.5   PERL (V5)

Perl is a high-level programming language and derived from the C programming language Perl's process, file, and text manipulation facilities make it particularly well-suited for tasks involving quick prototyping, system utilities, software tools, system management tasks, database access, graphical programming, networking, and world wide web programming. Perl is flexible and extensible to use on virtually any task, from one-line file-processing tasks to large, elaborate systems. For many people, Perl serves as a great replacement for shell scripting. For others, it serves as a convenient, high-level replacement for most of what they'd program in low-level languages like C or C++. But Perl has some drawbacks. Firstly, it has somewhat of a reputation for being unreadable and this can leads to difficulties in maintaining the problem. Secondly, as Perl does has any formal support, it sometimes difficult to get any support when needed. Lastly, there would be a penalty in the execution time of Perl Language as it is a interpreted language.

2.8   Electronic Commerce Portal Development Tools

2.8.1   IBM WebSphere Commerce Suite, Pro Edition

The IBM WebSphere Commerce Suite is IBM's solution for e-business. The IBM WebSphere Commerce Suite provides the framework and solutions for catalog and storefront creation to merchandising, relationship marketing and payment processing in a secure, scalable environment. With its advanced search function, it enables quick access to products, items, and components. Moreover, with the combination of knowledge engineering and parametric search provides search and buying assistance for all types of customer and needs. Parametric search can be customized at every, or any category or subcategory level. Sales assistance is based on the expertise of a company's sales and marketing expertise. Questions and answer selection determines the next question until product determination is reached.

The IBM WebSphere Commerce Suit enables customers to switch easily switch from sales assistance to a parametric search. It also very flexible and customizable to shopping/buyer groups, to industry, segment, or customer needs. Built with IBM's unique technology, it allows for the design of additional search, sales advice, and product guidance methods. The IBM WebSphere Commerce Suit is compatibles with Windows NT, IBM AIX and Sun Solaris platform. But, because of its overall complicated design, it requires to a lot of customization.

2.8.2   InterWorld Commerce Exchange V3.1

InterWorld Commerce Exchange is a procuct by InterWorld Corporation. It is a family of software products designed to enable manufacturers, distributors, and retailers to compete in the digital economy. The products are grouped into tools for business management and development, applications based on best practices, and adapters for integrating Commerce Exchange with legacy and enterprise business systems. The Process Application Server is the engine that drives the software, while Web Broker handles

traffic volume. The three major applications driven by the Process Application Server are Product Merchandising, Order Management, and Account Management. Each application provides a set of best practices from which customers can choose to personalize their version of Commerce Exchange. It can be used with Informix, Microsoft SQL, Oracle, Sybase database.

The strengths of the Interworld Commerce Exchange are its Role-Based Station Tools and allow implementation without customized programming. Role-Based Station Tools allow managers to control their portion of the enterprise online infrastructure without reliance on program code. Business Station, Dev Station, Control Station, and Design Station allow individuals across an organization to collaborate in the development and management of their online business. The latter, customers of Commerce Exchange can launch e-commerce sites without adding any custom programming to the underlying InterWorld technology. This decreases the time it takes to get to market with a Web channel. The InterWorld Commerce Exchange is compatibles with Digital UNIX, Sun Solaris, and Microsoft Windows NT platform.

2.8.3   Microsoft Commerce Server 2000

As its name implied, Commerce Server 2000 is a scalable e-commerce platform that provides ready-to-use features for developing, deploying, and upgrading effective e-commerce applications for the Web developed by Microsoft Corporation. This extensible platform enables customers, Independent Software Vendors (ISVs), and Internet Service Providers (ISPs) to build solutions that scale with business needs and integrate with existing systems and data. The strengths of Commerce Server is its highly scalable user information management that supports millions of users. Users can be grouped into specific groupings so that administrator could effectively target groups of customers. It also has a sophisticated and extensible content scoring framework for managing complex content selection decisions.

Commerce Server 2000 provides flexible campaign management, fully-integrated with the Targeting, Data Mining and Analytics Systems, enables business managers to create, analyze and manage personalized and targeted discounts, direct marketing, and advertising campaigns. It is built-in fast and scalable service to enable personalized, targeted direct marketing, tracking and reporting The Expression Builder empowers business managers to easily create explicit business rules to target content (ads, information, discounts, direct mail) to specific users Integrated and powerful search capabilities make product information easy to find, enhancing user experience Business Desk provides managers with remote access to their business at any time and from any location securely via the Web. In short with its built-in capabilities, the developers could easily build an e-commerce site a short time and less error prone.

2.8.4   Microsoft Visual Interdev 6

Microsoft Visual InterDev, formerly Microsoft's Internet Studio product, is the company's Web application development product for building data-driven, Internet-based business applications. The latest version, 6.0, is offered as a standalone product and as part of the Visual Studio suite. Visual Interdev is based on a distributed architecture and, thus, typical Visual Interdev projects reside on Web servers while the actual development takes place on a developer's workstation or PC.

The strengths of Visual Interdev is the Enhanced Integrated Development Environment (IDE) for rapid Application Development (RAD) Development . The enhanced IDE gives users a high level of control over the development interface. The WYSIWYG Page Editing feature allows users to design/edit a Web application using WYSIWYG views and to see displays of the formatting and content of the HTML source code.

IntelliSense script writing tools analyze both client- and server-side objects and can help developers become familiar with ASP, DHTML, and Internet Explorer 4.0 object models. Syntax Tips offers coding suggestions for Visual Basic, Scripting Edition, and JScript users. Debugging facilities now include a toolbar to start/continue/stop execution, set

breakpoints, and attach to remote server processes. Breakpoints can be set for both client- and server-side script.

The interface also provides a view of all documents on the browser and server; Watch, Local, and Auto windows for inspecting and manipulating variables; an Immediate window for typing in Visual Basic or JScript expressions; and a display of the running threads and Call Stack.

Microsoft's Universal Data Access initiatives are prevalent in Visua Interdev 6.0. Support for three core technologies--OLE DB, ODBC, and ADO--provide developers a means of accessing disparate database systems for use in the development of dynamic Web applications. It also supports Team-Oriented and Enterprise-Level Application Development. With the addition of a Local Working Mode allows individual developers working on a development team to isolate themselves and some of their work from the project without losing the ability to build, test, and debug via VI's features and functions.

2.8.5   Microsoft FrontPage 2000

Microsoft FrontPage 2000 is designed to be an all-purpose web site authoring package. It provides a variety of features and is geared for beginning to intermediate users. FrontPage provides several interesting features. The Themes (which have been increased to 67) are an especially helpful feature, allowing novices and nondesigners to focus on content rather than on design, and simplifying the process of creating sites with a consistent appearance. FrontPage also includes strong site management features, including the capability to visualize a Web site through multiple views and edit the site via drag and drop.

FrontPage provides strong site management features that are also easy to use, especially since FrontPage Editor and FrontPage Explorer, formerly separate modules, are now integrated. FrontPage can automatically verify, edit, or repair hyperlinks, and broken links can be easily discerned. The product automatically renames pages and reconstructs

applicable links when pages are rearranged; users need only drag and drop page icons between folders or tree branches to relocate site content.

Site publishing is also easy and allows developers to upload anything from an entire site to one or more individual pages. There are also features for managing sites in a team development environment. Furthermore, the program now includes 13 new management reports that quickly summarize a site's status.

The main disadvantage is an obvious reliance on Microsoft technology. Features such as DHTML, Visual Basic Scripts, ActiveX Controls, and Channel Definition Format work only with Microsoft products. But in light of America Online's purchase of Netscape and the alliance with Sun Microsystems, this issue may decrease in importance.

2.9   Database

A database is a collection of data that is organized so that its contents can easily be accessed, managed, and updated [1]. All data and information about Fulfillment System such as orders detail needed to be store. Hence a database will be necessary to keep all information. This section will discuss the different types of database and its important.

2.9.1   Oracle 9i Database

Oracle 9i Database is the latest database product from Oracle Corporation. It provides transparent application scalability by sharing cluster-wide caches for coordinated data access. It also includes business intelligence capabilities. With is open framework, programmatic access, centralized management, and multi-channel delivery of internet services can be provided to users. A key feature of the database is the facility to recover from disaster situations.

Besides that, Oracle 9i database is designed with integrated manageability that creates a complete business view of all components powering e-business processing. As any other database software in the market, Oracle 9i provides multiple layers of security to prevent any unauthorized access to the database. Oracle 9i is compatible with UNIX and Windows NT. But, the cost of the Oracle software is more expensive compared to other database software.

2.9.2   Microsoft SQL Server 2000·

Microsoft SQL Server 2000 is an enterprise-level database and is the latest version of Microsoft SQL 7. It is enhanced with Extensible Markup Language (XML) support that enables data return in XML and also enables XML be used to insert, update, and delete values in the database. SQL Server 2000 supports enhancements to distributed partitioned views that allow users to partition tables horizontally across multiple servers. Its full-text search includes change tracking and image filtering.

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In the security point of view, SQL Server 2000 uses Kerberos to support mutual authentication between the client and the server, as well as the ability to pass the security credentials of a client between computers, so that work on a remote server can proceed using the credentials of the impersonated client.

Moreover, SQL Server 2000 introduces a new, more easily understood model for specifying backup and restores options. In term of scalability, it Scales up to 32 CPUs and 64 GB RAM.

2.9.3   Microsoft Access 2000

Microsoft Access 2000 is a relational database application that allows desktop users to create and manipulate megabytes of data, with 50MB being the average size database. Multi-user access to the same database is accomplished via a file-server architecture, rather than a client/server architecture.

Microsoft Access 2000 provides organizations with the tools for finding and managing data by focusing on three key areas. First, Access 2000 simplifies the skill set needed to create simple, useful databases for desktop users. Second, Access 2000 adds Data Access Pages, which are HTML pages that let users interact with data over the Web from any location and maintain live links to a database. Finally, Access 2000, through its support of OLE DB, can act as a front end to high-end database engines such as Microsoft SQL Server, making Access 2000 databases more scalable as business needs grow. But Both the Jet and Microsoft Database Engines available with Access 2000 support only 2GB per database, which means it only supports only individual, workgroup or small company.

2.10 Summary

This chapter discussed the study about the areas that need to be covered in order to develop the system. These areas included e-commerce and B2B commerce. This ensures that the readers have better understanding about the basic concept. Besides that, this chapter also reviewed on the related existing system. The author studied the strength and weakness of the system in order to develop a powerful and suitable system after discovered some of the constraints and limitations of the existing system. Finally, this chapter also discussed the development tools that needed to develop the system. Each development tool is compared among several different kinds of tools that have similar characteristics to help the author choose the right tool to develop the system.

CHAPTER 3

METHODOLOGY

AND

SYSTEM ANALYSIS

Chapter 3   Methodology and System Analysis

3.1 Methodology

In order to develop the Web-enabled Fulfillment System on time and within effort, an effective development method has to be chosen. Methodology is a classically thought of as the set of activities that analysts, designers and users carry out to develop and implement a system. A suitable methodology helps the author to develop the system on time and increases the quality or usefulness of the system [5]. The Waterfall Model with prototyping is chosen as the development methodology for Web-enabled Fulfillment System.

3.1.1 Waterfall Model With Prototyping

The Waterfall Model with prototyping consists of eight major stages. These stages overlap and feed information into each other. The model is not a simple linear model but involves a sequence iteration of the development activities. Design prototyping helps developers assess alternative design strategies and decide which is best for a particular system.

Reason of choosing Waterfall Model with Prototyping:
➢ It is widely used, easily understood and implemented in a system development process.
➢ It supports good process visibility as each activity produces some kind of deliverable. These deliverables may prove to be useful when the system evolves in the future.
➢ It enforces disciplined approach to develop a system as documents prepared after each stage will have to be checked and approved.
➢ It enables maintenance to be carried out at each stage due to its interactive nature. Changes can be done during any of the stages by returning to the previous stages. The iteration process may be carried out as many times as needed and this produces a fine system of high quality that meets user's requirements.

3.1.2   Stages of Waterfall Model With Prototyping

There are nine stages of waterfall model with prototyping. The nine stages are:

- ➤ Requirements Analysis
- ➤ System Design
- ➤ Program Design
- ➤ Coding
- ➤ Unit and Integration Testing
- ➤ System Testing
- ➤ Acceptance Testing
- ➤ Operation and Maintenance
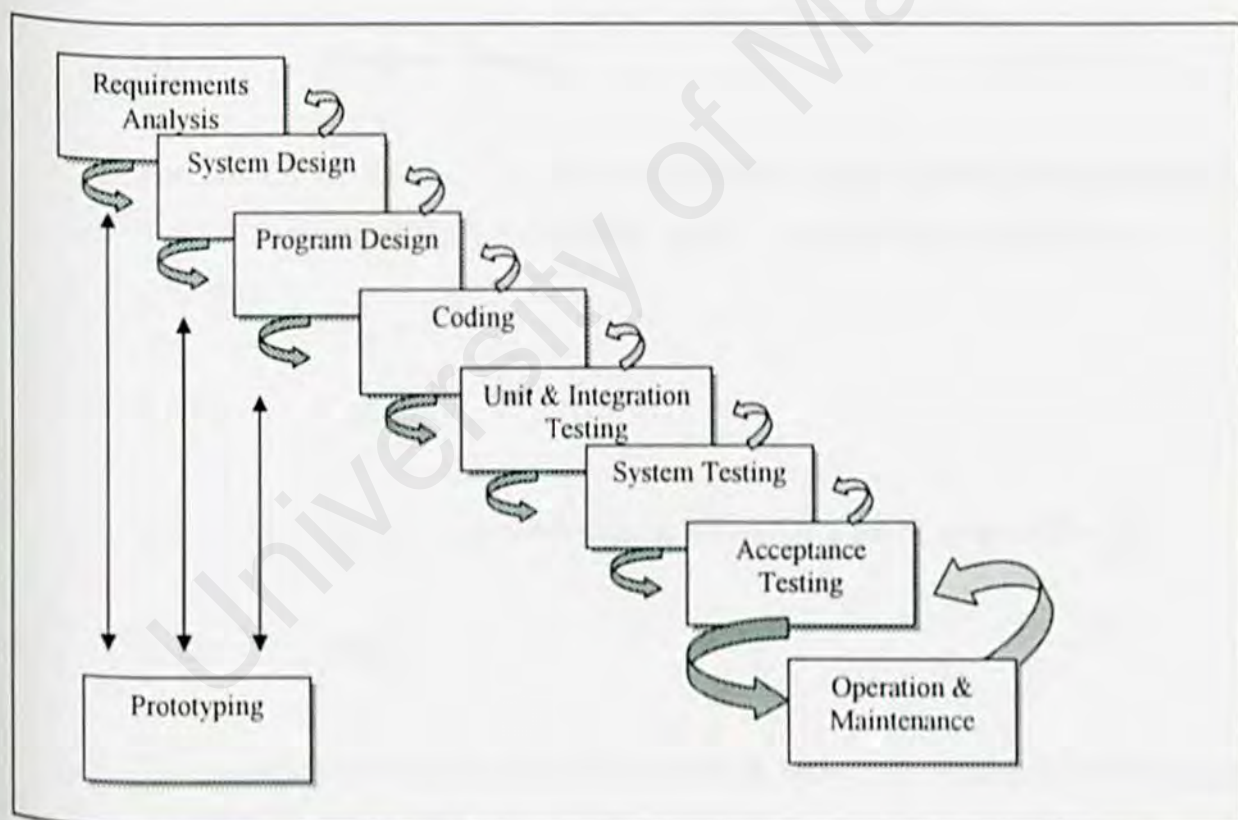- ➤ Prototyping

Figure 3.1   Waterfall Model With Prototyping

3.1.2.1   Requirements Analysis

In this stage, study and research of Web-enabled Fulfillment System have to be carried out to understand the issues concerning the system and the nature of the system. The main objective of this stage is to establish the system's services, constraints and goals. In this stage project requirement, needs, and constraints have to be identified.

3.1.2.2   System Design

The process of transforming the problem into a solution which then incorporated into the system.

3.1.2.3   Program Design

The process of transforming the system design into a programmable structure such decomposing the system into several modules and transforms it into algorithm.

3.1.2.4   Coding

During this stage, the program design is realized as a set of programs codes.

3.1.2.5   Prototyping

The process of continuous developing a quick and rough version of a desired or parts of that system. This stage is important in order to develop a suitable user interface that meets the user requirements especially for the catalogs part.

3.1.2.6   Unit and Integration Testing

During this stage, each program unit or modules are tested independently. Then several modules are combined and tested to ensure integration compatibility.

3.1.2.7   System Testing and Integration

All the modules are combined to form the whole system and then it is tested in its actual or similar environment when the system is implemented.

3.1.2.8   Acceptance Testing

During this stage, the actual user is given the opportunity to use the system. The purpose is to enable the users to determine if the system really meets their needs and expectations.

3.1.2.9   Operation and Maintenance

The system is ready to be implemented. This includes training of users to use the system, system maintenance and enhancement to meet new requirements. Maintenance on the system includes fixing bugs that are discovered. Maintenance is crucial to ensure that the system remains useful.

3.2 System Analysis

System analysis is the process of gathering and interpreting facts, diagnosing problems and using the information to recommend improvement of the system [5]. In order to get an overview of the system requirement, an extensive analysis is needed. The purposes of system analysis are to ascertain the functional and non-functional requirement of the Web-enabled Fulfillment System. It also helps to determine the programming language, databases and hardware needs for this Web-enabled Fulfillment System.

3.2.1 Information Gathering Approach

The information gathering is one of the phases of the system analysis. It was carried out in order to gather relevant information to determine the requirement of the system. Following is the approach used to define the system requirements of the Web-enabled Fulfillment System:

3.2.1.1   Reading Printed Material

The author gathers relevant information about Web-enabled Fulfillment System by reading books, journal, thesis and magazines. The author gathered the information about the similar existing system, method of developing the system, programming language and web application technology through reading. Book of reference will be list in reference.

3.2.1.2   Observation

The author has an additional perspective about the Web-enabled Fulfillment System through the observation of the real environment of existing system. In additional, the author understands the user's need by observed the user response.

3.2.1.3   Surfing Internet

Internet surfing is an efficient way of gathered the updated and useful information. A lot of website that provides useful and expertise which needed in the system. Websites that are visited are listed in reference.

3.2.1.4   Informal Interview

Informal interview with similar existing system users and developer have been carried out to know the system requirement. This will help to understand the need of the existing system from user view. Besides, informal interview with developer of the similar existing system help the author to choose suitable and effective tool for developing the Web-enabled Fulfillment System.

3.3 Requirements Analysis And Specifications

Requirement can be defined as a condition or capability needed by a user to solve a problem or achieve an objective; a condition or a capability that must be met or processed by a system...to satisfy a contract, standard, specification or formally imposed document [IEEE83] Requirements analysis is a set of techniques to identify or extract system problems and solution requirements from the user community.

There are two ways to describe the requirements, which are functional requirement and non-functional requirement. The next section describes the functional requirements and non-functional requirements for the proposed system.

3.3.1 Functional Requirement

Functional requirement describes an interaction between the system and its environment. Furthermore, functional requirement described how the system should behave. Functional requirement are system expected by the user [6]. The functional requirements for the Web-enabled Fulfillment System are shown as below.

3.3.1.1 Fulfillment System

3.3.1.1.1   Login Module
System will allow the authorized administrator to login to the system. User verification will be based on user identification and password.

3.3.1.1.2   Approved order
Orders that are approved will be routed to the warehouse system for fulfillment. This module lists down all the orders that are approved. System will generate the pick batch and automatically allocate a warehouse that has the required products. A pick note is generated after the system generates a pick batch.

3.3.1.1.3   Order·Picking

This module shows pick batches that are in the process of picking. The batch details frame shows the products in the pick batch grouped according to warehouse and warehouse location. User do not get to see any order information because users only need to know where to get the products in the batch.

3.3.1.1.4   Consolidation

Orders that are picked will be reviewed for consolidation. Consolidation will take place if an order has products that can be found in several warehouses. These products may need to consolidate at one warehouse before being taken by delivery agents.

3.3.1.1.5   Staging Area

This module shows products that are ready to be taken by the delivery agents. Products in the Staging Area are grouped by batches. This module is basically developed from the point of view of the delivery agents.

3.3.1.1.6   Out of warehouse

This module shows all the products/orders that are already out of the warehouse. The user has to select the products that have been fulfilled by the delivery agents and manually update each product.

3.3.1.1.7   Fulfilled

This module shows all the orders that are fulfilled. The criteria for an order to be displayed here is that **ALL** of the products under this order must be sent to the customer. Partially fulfilled orders will not be displayed here.

3.3.1.1.8   Stock requisition form (SRF)

SRF is a module that shows the current and transferred warehouse and warehouse's location if a consolidation is toke place. The system will automatically generate the SRF. This module is developed in a web-based table form that will show the user the summary of this stage.

3.3.1.1.9   Pick Note

This module shows the orders or product that are in the pick batch. This module is developed in a web-based table form that will show the user the summary of this stage.

3.3.1.1.10   Logout

This module will ensure that the administrator that had logout cannot access the system already unless they login again.

3.3.2 Non-Functional Requirement

Non-functional requirements are the constraints under which a system must operate and the standards which must be met by the developed system [6].

Following is the non-functional requirement of Web-enabled Fulfillment System:

3.3.2.1   User-friendliness

User-friendliness is important especially for new users because it will help them to use the function provided easily. The system has to be developed with the following features in order to be user-friendliness. The features are:

- ➢ Attractive, simple and ease-used interface design.
- ➢ Systematic standard Window Graphical User Interface (GUI).
- ➢ Field description for every window component.
- ➢ Module browser to allow users to shift among the system modules.

3.3.2.2   Reliability and Accuracy

The system is required to be reliable, as to produce results and information which is required precision and accuracy by the user. This feature is important for this Web-enabled Fulfillment System in order to ensure that the order fulfillment process meet the exact requirements of the customers.

3.3.2.3   Availability

The system should be developed in a way that it is available to be accessed at anytime and anywhere. This feature is important for online system because the purpose of Web-enabled Fulfillment System is to provide convenient way for the administrators and delivery agents to conduct the order fulfillment process.

3.3.2.4   Efficiency

It is one of the important of the system, where it should provide a good response time for user request. Web-enabled Fulfillment System will provide real-time communication. Hence the system should not delay any user request.

3.3.2.5   Expandability

The system is needs to be developed in a way that capable to expand its module and functionality in the coming future.

3.4 Consideration on System Development Tools

A review on several selected system development tools have been carried out in previous chapter, Chapter 2, to discover and study the offered features and capabilities. After the considerations have been carried, the most suitable with the high capabilities tools are chosen in order to develop an efficient system. This section will discuss the features of the tools that had chosen.

3.4.1   Platform

Window 2000 Server was chosen as the platform due to several advantages that are distinct when compared to other operating systems. Below are the reasons why it has been chosen over the other operating system.

➤ Dominant Position

Windows currently enjoys a dominant position as the preferred network operating system by most corporations. In the consumer market, Microsoft's Windows enjoys a penetration rate of almost 90% of the overall market.

➤ User Friendly Environment

Windows 2000 Server support multitasking and it is also extremely user-friendly. Furthermore, the user interface of Windows 2000 Server is very similar to Windows 95 or Windows 98. Therefore, users have no difficulty in adapting to Windows 2000 Server.

➤ Developments Tools

Various development tools have been created for Windows users. Some of these have helped to speed up the software development process.

➤ Skilled Professional

Microsoft boasts of extensive resources of skilled professional as its produce are widely used. However, UNIX does not have as many skilled development and support professionals. This will inherently increase the cost of developing and maintaining the system as the shortage of professional leads to competition.

Windows 2000 Server also supports for innovative web publishing features, customize tools and new wizard technologies makes it the best platform available to publish information over the Internet especially in this proposed system.

3.4.2 Web Server

The considerations in choosing a Web server include how well it works with the operating system and other servers, its ability to handle server-side programming, and publishing, search engine, and site building tools that may come with it.

The main reason that IIS 5.0 was chosen over the other web servers is that the IIS 5.0 is tightly integrated with Windows 2000 Server, which is the platform used to develop this system.

The other benefit for using the Microsoft Internet Information Server 5.0 (IIS 5.0) are:
➤ Innovative web publishing features, customizable tools, and new wizard technologies unique to IIS 5.0, make Windows 2000 Server with IIS the easiest way to publish information and share it securely over the Internet.
➤ Customizable management tools, flexible administrator options and analysis tools many help developers to manage the web server effectively.

Powerful management tools in IIS 5.0 will help to easily maintain web sites, manage content and analyze usage patterns to improve site as it evolves.

3.4.3 Web Application Technology

Active Server Pages (ASP) technology is chosen to develop the Web-enabled Fulfillment System after comparison on different type of web application technologies have done. Active Server Pages (ASP) is a programming environment that provides the ability to combine HTML (Hyper Text Markup Language), scripting and components to create powerful Internet applications that run on server.

The reasons of ASP is chosen as the web application technology are:

➢ ASP enables dynamic Web design to be easier. This feature makes the Web applications easy to maintain and modify to meet the new needs and requirements.

➢ It provides fast execution time. This is extremely important because time saving is really important to the suppliers. Suppliers prefer Web-enabled Fulfillment System mostly because the convenient and time saving provided by the B2B portal.

➢ ASP is easy to learn compare to other related web programming language such as Common Gateway Interface (CGI). ASP language is six times faster to write than other conventional Web page design methods.

➢ ASP applications are browser independent because it is a server-side scripting.

3.4.4 Programming Language

After consideration have done on different programming language, Visual Basic Script (VBScript) is found suitable to develop Web-enabled Fulfillment System. For this project, VBScript is embedded in the HTML pages.

The reasons VBScript is used are:

➢ It is easy to learn and the application programs are easy to write compare to Java. VBScript is based on the easy-to-learn BASIC (Beginner's All Purpose Symbolic Instruction Code). This is important because project time frame should always be considered to make sure the system would be complete on time.

➢ It is fast, portable, lightweight interpreter for use in World Wide Web (WWW) browsers and other web applications.

➢ It is powerful and it can be used to develop interactive client side web pages. Besides that, it also tightly integrates server-side applications.

3.4.5 Database Server

Microsoft SQL Server 2000 had been chosen as the database server that used to develop the database of the Web-enabled Fulfillment System.

Nowadays, E-Commerce solutions place heavy demands on database applications. As users worldwide access e-commerce sites around the clock, high transactional loads must be handled effectively. Besides providing the scalability and reliability required for e-commerce, SQL Server 2000 provides extensive database programming capabilities—built on Web standards—to ensure interoperability and flexibility. Relevant, new features in SQL Server 2000 include rich XML functionality, support for W3C standards, the ability to manipulate XML data using T-SQL, flexible and powerful Web-based analysis, and secure access to the data over the Web. Therefore, the Microsoft SQL Server 2000 is the best choice to develop the Web-enabled Fulfillment System in the B2B portal.

3.4.6   Development Tools

After considered on several different development tools, Microsoft Visual InterDev is chosen as the development tool used to develop the web-enabled fulfillment System. Microsoft Visual InterDev is Microsoft's development tool for building dynamic, data-driven Web sites. In addition, it offers a user interface similar to Visual Studio 6.0 development tools. The Web sites being developed can be tightly integrated with server programs written in any language (including ASP) and access almost any database using Microsoft's Universal Data Access.

3.5   System Requirement

3.5.1   Development Requirement

3.5.1.1 Hardware Requirement

The specifications of the hardware that use to develop the Web-enabled Fulfillment System are listed at Table 3.1.

Table 3.1   Hardware specifications for the development requirement

Minimum Requirements	
Computer/Processor	Pentium II 166 MHz or higher Pentium-compatible CPU
Memory	128 megabytes (MB) of RAM recommended minimum
Hard Disk	2 GB hard disk with a minimum of 1.0 GB free space. (Additional free hard disk space is required if you are installing over a network.)
CPU Support	Windows 2000 Server supports up to four CPUs on one machine
Input Devices	Mouse, keyboard, scanner
Output Devices	Printer
Video Monitor	EGA, VGA or compatible display

3.5.2   Runtime Requirement

3.5.2.1 Server Hardware Requirement

The recommended hardware requirements for the server are listed at Table 3.2.

Table 3.2   Hardware specifications for the server hardware requirement

Minimum Requirements	
Computer/Processor	Pentium II 266 MHz or higher Pentium-compatible CPU
Memory	128 megabytes (MB) of RAM recommended
Hard Disk	2 GB hard disk with a minimum of 1.0 GB free space. (Additional free hard disk space is required if you are installing over a network.)
CPU Support	Windows 2000 Server supports up to four CPUs on one machine
Input Devices	Mouse, keyboard
Output Devices	Printer
Video Monitor	EGA, VGA or compatible display
Internet Connection	At least ISDN line

3.5.2.2 Server Software Requirement

The recommended software requirements for server are listed at Table 3.3.

Table 3.3   Software specifications for the server software requirement

Platform	Microsoft 2000 Server
Web Server	Microsoft Internet Information Server 5.0
Server Scripting Engine	Active Server Pages (ASP)
Database Server	SQL Server 2000

3.5.2.3 Client Hardware Requirement

The recommended hardware requirements for the client are listed at Table 3.4.

Table 3.4   Hardware specifications for the client hardware requirements

Minimum Requirements	
Computer/Processor	Intel Pentium 100 MHZ or greater and other compatible X86 processors like AMD
Memory	128 megabytes (MB) of RAM recommended minimum [64 MB minimum supported; 4 gigabytes (GB) maximum]
Hard Disk	2 GB hard disk with a minimum of 1.0 GB free space. (Additional free hard disk space is required if you are installing over a network.)
CPU Support	Windows 2000 Server supports up to four CPUs on one machine
Input Devices	Mouse, keyboard
Video Monitor	EGA, VGA or compatible display
Modem/Internet Connection	A minimum 28.8kbps modem is required

3.5.2.4 Client Software Requirement

The recommended software requirements for client are listed at Table 3.5.

Table 3.5   Software specifications for the client software requirement

Platform	Microsoft 2000 Server
Web Browser	Internet Explorer 5.5

3.6   Summary

This chapter discussed the methodology used to develop the Web-enabled Fulfillment System, which is the waterfall model with prototyping. It is very important in having the right methodological approach as it will affect whether the aims and objectives could be achieved successfully. Besides that, information gathering approach also discussed in this chapter to enable the reader to understand how the author gather related information and user requirements in order to develop the system.

This chapter also covered the functional requirements and non-functional requirements in the Requirements Analysis and Specifications section. The author needs to study all these requirements and translate it into system characteristics during the system design in order to meet the exact requirements of the users. System development tools that had chosen also discussed in this chapter. These tools are discussed based on their suitability to develop the system.

Finally, the last section in this chapter discussed about the development and runtime requirements for the Web-enabled Fulfillment System.

CHAPTER 4

SYSTEM DESIGN

Chapter 4   System Design

Design phase is the stage of system development where the requirements for the system are translated into the system characteristics to meet the user requirement and satisfaction.

4.1   System Architecture

The Web-enabled Fulfillment System is designed to leverages the traditional client / server architecture and extends it to the web. It is using the 2-tier client / server systems where the first tier is the web client and the second tier is the database server.

For the web-client side, client is equipped with web browser (Microsoft Internet Explorer 5.5) to view the information displayed on the screen, receive data or information from the server. The application logic is buried within the database on the server. Users are running the GUI on the client. It sends file system calls, SQL, or HTTP commands over a network to the server. The server processes the request and returns the results. Figure 4.1 shows the architecture of the 2-tier client / server application.

Tier 1   **Tier 2**

SQL, File Server, HTTP Protocols

Graphical User
Interface (Client)   Database
                                                                        Server
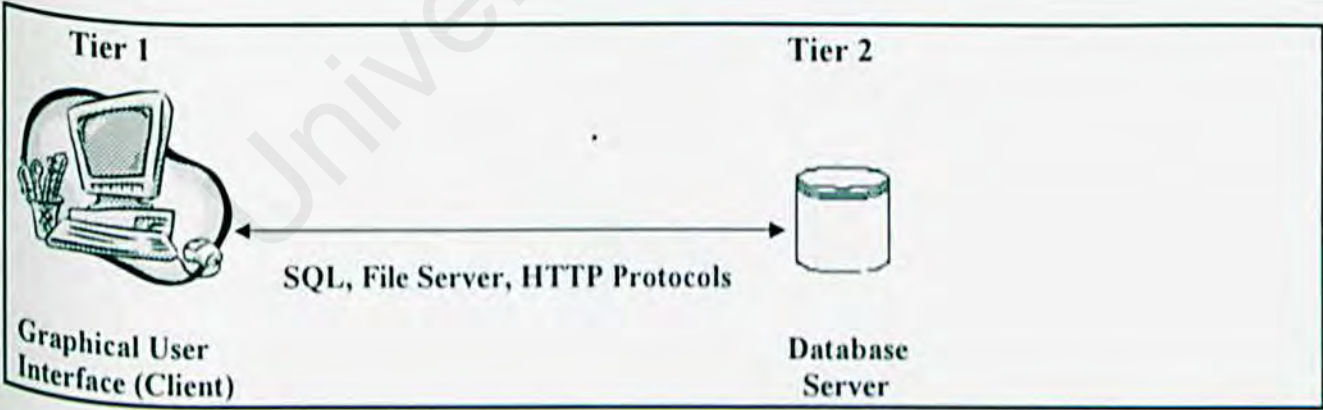
Figure 4.1   A 2-tier Client/Server Application Architecture

4.2 Program Design

Author has imposed program design as a process to transfer the system requirements to system functions. Web-enabled Fulfillment System is designed based on the data flow oriented designs, which divide the system modules and sub modules.

Web-enabled Fulfillment System can be further defined into several sub modules, which are:

1. Fulfillment system
   - Approved order (View functionality)
   - Order Picking (View and edit functionality)
   - Consolidation (View and edit functionality)
   - Staging Area (View and edit functionality)
   - Out of warehouse (View and edit functionality)
   - Fulfilled (View and edit functionality)
   - Stock requisition form (View functionality)
   - Pick Note (View functionality)
   - Login
   - Logout
   - Homepage

4.2.1   System Flow

This section described the task flows of the Web-enabled Fulfillment System. It helps the author to design the system in organize and orderly manner. The flow of the web-enabled fulfillment system can be described as Figure 4.2.
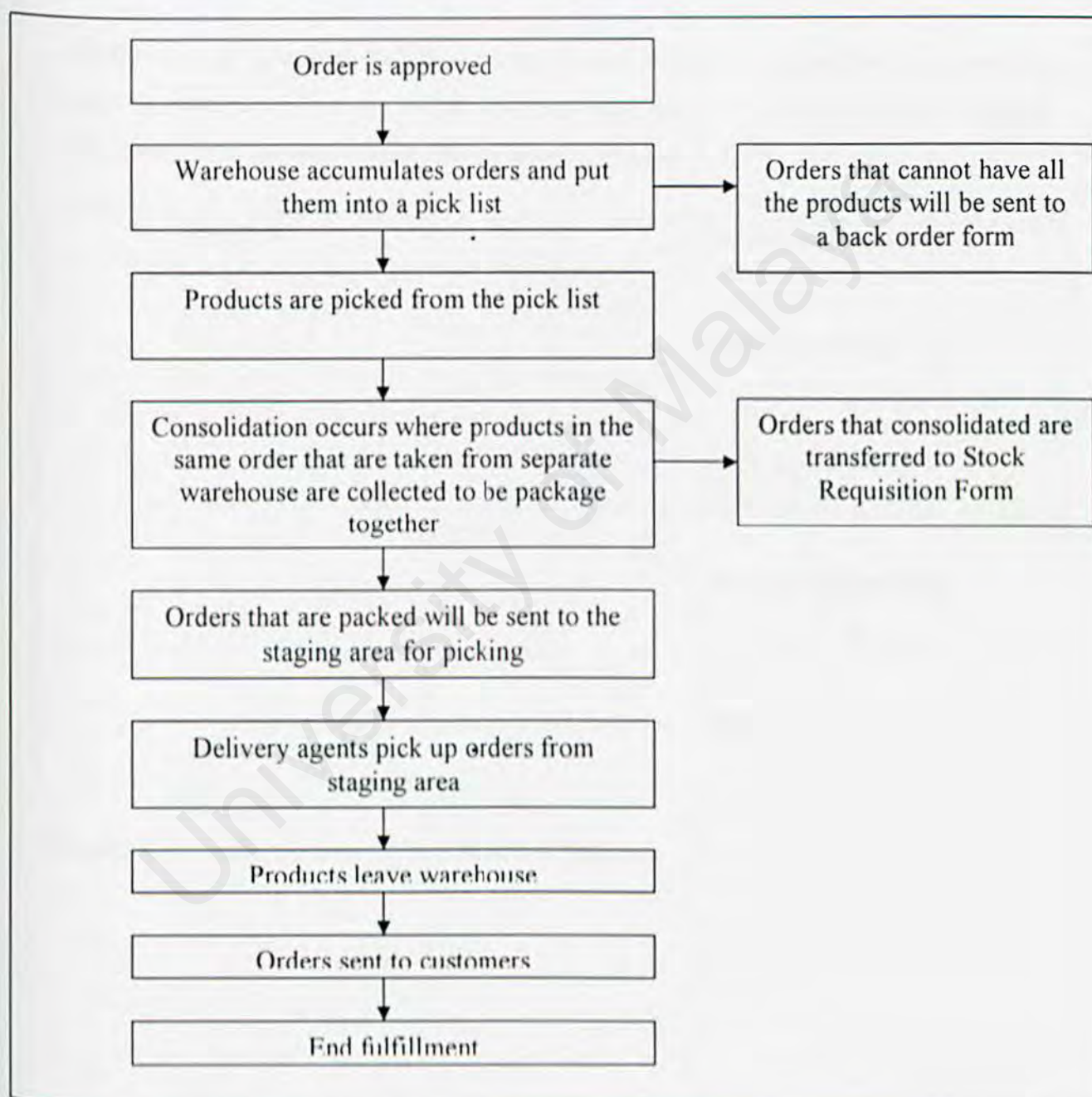
Figure 4.2   Flow of Web-enabled Fulfillment System

4.2.2   Data Flow Diagram

Data Flow Diagram (DFD) is a graphical characterization to illustrate how data flows in a system. By representing system process with DFD, system could be easily understood by non-technical people.

Generally, most data flow modeling methods use four types of symbols to represent four types of system components, which are processes, data flows, data stored and entities. Following is the summary about the system components.
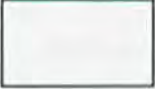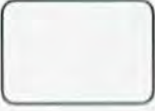
Symbol	Representation
	Represent Entity
	Represent Process
	Represent Data Store
	Represent Data Flows

Figure 4.3   Components of the Data Flow Diagram

This section shows all the Data Flow Diagram for the modules in the Web-enabled Fulfillment System.

4.2.2.1   Context Diagram

4.2.2.2   Diagram 0
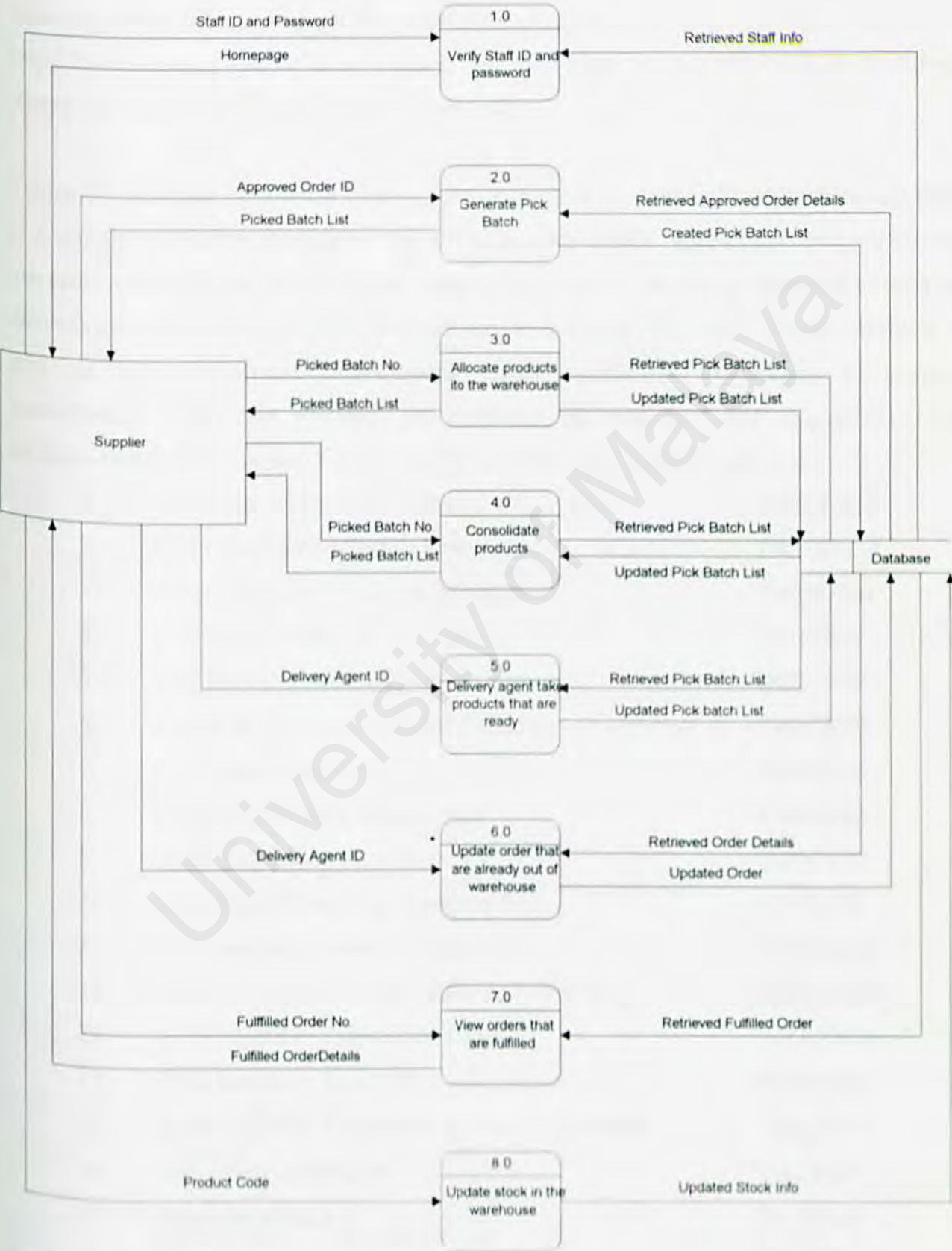
4.3   Database Design

Basically, databases are always the nuclear of most information system for most of the system being implemented. Almost every request and web pages in the Web-enabled Fulfillment System are require a database to support its activities.

For the Web-enabled Fulfillment System, relational model is chosen since it enables data stored in a way that minimizes duplicated data and eliminates certain types of processing errors that can occur when data are stored in other ways. Every table in the system is stored in rows and columns form. However, not all relations are equally desirable. For some relations, changing the data can have undesirable consequences, called modification anomalies. As a result, normalization, which can eliminate the anomalies, is considered and emphasized during database design. Web-enabled Fulfillment System consist of 20 tables, which are:

1.	Order Transaction Information	INORDR1P
2.	Order Transaction Details Information	INORDR2P
3.	Order Transaction Address Information	INORDR4P
4.	Pick Note Transaction Information	INPICK0P
5.	Pick Note Transaction Details Information	INPICK2P
6.	Pick Note Transaction Actual Picked Details Information	INPICK3P
7.	Pick Count Details	INPICK6P
8.	Stock Requisition Form Headers	INPICK7P
9.	Stock Requisition Form Details	INPICK8P
10.	Stock Requisition Form Inventory Link	INPICK9P
11.	Stock Inventory Balance Information	INBALN1P
12	Stock Inventory Lot/Serial Balance Information	INBALN2P
13	Stock Inventory Transaction Header	INTRAN0P
14	Stock Inventory Transaction Information	INTRAN1P
15	Stock Inventory Transaction Remark Information	INTRAN2P
16	User Login Information	INLOG1P
17	Employee Details	INLOG2P
18	Delivery Agents Information	STCTRY2P

This section list down all the database structure for the Web-enabled Fulfillment System.

Table 4.1   Order Transaction Information INORDR1P
Key: TXCD + REF

Field	Description	Type	Len	Dec
RCTY	Records type : A for active record, * for delete record	Char	1	
CRDT	Create date	Number	8	0
TXCD	Transaction code : SO for sale order , CS for cancel sale order , RT for goods return , EX for goods exchange	Char	2	
REF	Reference number	Char	7	
FIRM	Firm	Char	10	
ORDT	Order date	Number	8	0
TIME	Order time	Number	6	0
STAT	Status code : B for back order , P for pending approval , A for approved , K for picking . D for go to delivery agent , G for go out from delivery agent , C for completed delivery , V for verify	Char	1	
ACNO	Account number, auto-generate the account number for new ID number	Char	8	
PAYM	Payment method : V for credit card , C for COD , Q for cheque , P for pre-paid , I for installment	Char	1	
OSRC	Order source : T for telephone order ,V for voice mail order , M for mailing order , E for e-mail order , W for web order	Char	1	
EADD	Email address	Varchar2	60	
TEL	Telephone number	Varchar2	20	
VSTY	Credit card type : V for Visa , M for Master , D for diners	Char	1	
VSNO	Credit card number .	Varchar2	20	
VSNM	Credit card client name	Varchar2	40	
VSYM	Credit card expiry YYYYMM	Number	6	
VSCD	Credit card approval code , 'COD' will be used for COD and cheque	Varchar2	10	
DLAC	Delivery agent account number	Char	8	

RLTX	Related transaction code	Char	2	
RLRF	Related transaction reference	Char	7	
CCY	Currency	Char	3	
AMT	Amount	Number	15	2
IMTH	Installment month	Number	9	0
OMSG	Order message	Char	40	
SPORDR	Special delivery date flag	Char	1	
SPDATE	Special delivery date	Number	18	0
SAMT	Settled amount	Number	15	2

Table 4.2   Order Transaction Details Information INORDR2P

Key: TXCD + REF + PROD

Field	Description	Type	Len	Dec
RCTY	Record Type: A for active record, * for delete record	Char	1	
CRDT	Create date	Number	8	0
TXCD	Transaction code:SO for sale order,CS for cancel sale order	Char	2	
REF	Reference number	Char	7	
PROD	Product code	Char	15	
MKID	Marketing Program ID	Char	5	
QTY	Quantity	Number	15	2
PRIC	Price	Number	15	2
CCY	Currency	Char	3	
AMT	Amount	Number	15	2
SAMT	Settled amount in settle currency	Number	15	2
SUPP	Supplier	Char	8	
STAT	Status	Char	1	
DLAC	Delivery agent	Char	8	
CHRG	Charge code	Char	3	
SPORDR	Special delivery date flag	Char	1	
SPDATE	Special delivery date	Number	8	0
FIRM	Firm	Char	10	
IMTH	Installment months	Number	9	0
DID	Discount value	Number	18	0
IMTHNXT	Next installment date	Number	8	0

Table 4.3   Order Transaction Address Information INORDR4P

Key: TXCD + REF

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Create date	Number	8	0
TXCD	Transaction code:SO for sale order,CS for cancel sale order	Char	2	
REF	Reference number	Char	7	
ADD1	Address line 1	Varchar2	3	
ADD2	Address line 2	Varchar2	40	
ADD3	Address line 3	Varchar2	40	
ADD4	Address line 4	Varchar2	40	
ZIP	Address zip code	Varchar2	10	
CTRY	Address delivery country	Char	2	
NAM1	Delivery name	Varchar2	40	
NAM2	Delivery name	Varchar2	40	
NAM3	Delivery name	Varchar2	40	
TEL	Telephone number	Varchar2	20	
ZONE	Delivery zone	Varchar2	10	
CHRG	Charge code	Char	3	

Table 4.4   Pick Note Transaction Information INPICK0P

Key: BATCHNO + TXCD + REF

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Crete date	Number	8	0
BATCHNO	Batch number	Char	10	
TXCD	Transaction code:SO for sale order,CS for cancel order	Char	2	
REF	Reference number	Char	7	
STAT	Status	Char	1	
READY	Ready status	Char	1	

Table 4.5   Pick Note Transaction Details Information INPICK2P

Key: BATCHNO + TXCD + REF + PROD + WHSE + LOCA

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Create date	Number	8	0
TXCD	Transaction code:SO for sale order,CS for cancel sale order	Char	2	
REF	Reference number	Char	7	
PROD	Product	Char	15	
WHSE	Warehouse	Char	3	
LOCA	Location code	Char	15	
QTY	Quantity	Number	18	0
PKDT	Pick date	Number	8	0
PKTM	Pick time	Number	18	0
EXNO	External number	Char	20	
RLTX	Related transaction code	Char	2	
RLRF	Related transaction number	Char	7	
BATCHNO	Batch number	Char	10	

Table 4.6   Pick Note Transaction Actual Picked Details Information INPICK3P

Key: TXCD + REF

Field	Description	Type	Len	Dec
RCTY	Record type: A for record, * for cancel record	Char	1	
CRDT	Create date	Number	8	0
TXCD	Transaction code:SO for sale order,CS for cancel sale order	Char	2	
REF	Reference number	Char	7	
PROD	Production	Char	15	
WHSE	Warehouse	Char	3	
LOCA	Location code	Char	15	
LOT	Lot number / serial number	Char	20	
QTY	Quantity	Number	18	0
PCNT	Package count	Number	18	0

Table 4.7   **Pick Count Details INPICK6P**

          Key: **BATCHNO + PROD + WHSE + LOCA**

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Create date	Number	8	0
BATCHNO	Batch number	Char	10	
WHSE	Warehouse	Char	3	
LOCA	Location	Char	15	
PROD	Product	Char	15	
QTY	Quantity	Number	18	0
PCNT	Package count	Number	18	0

Table 4.8   **Stock Requisition Form Header INPICK7P**

          Key: **BATCHID + SEQ**

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Create date	Number	8	0
BATCHID	Batch number	Char	10	
SEQ	Sequence number	Char	3	
DLAC	Delivery agent	Char	8	
SEND_FROM	Send from warehouse	Char	3	
SEND_FROM_LOCA	Send from warehouse location	Char	15	
SEND_TO	Send to warehouse	Char	3	
SEND_TO_LOCA	Send to warehouse location	Char	15	
PAYM	Payment type	Char	1	

Table 4.9   **Stock Requisition Form Details INPICK8P**

          Key: **BATCHID + SEQ + ORD_TXCD + ORD_REF + PROD**

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Create date	Number	18	0
BATCHID	Batch number	Char	10	

Field	Description	Type	Len	Dec
SEQ	Sequence number	Char	3	
ORD_TXCD	Order type	Char	2	
ORD_REF	Order reference	Char	7	
PROD	Product	Char	15	
QTY	Quantity	Number	10	0

Table 4.10   Stock Requisition Form Inventory Link INPICK9P

Key: BATCHID + SEQ

Field	Description	Type	Len	Dec
BATCHID	Batch number	Char	10	
TXCD	Transaction code:SO for sale order,CS for cancel sale order	Char	2	
REF	Reference number	Char	7	
SEQ	Sequence number	Char	3	
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Create date	Number	8	0

Table 4.11   Stock Inventory Balance Information INBALN1P

Key: FIRM + WHSE + PROD + YYMM

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Create date	Number	8	0
YYMM	Year / Month	Number	6	0
FIRM	Firm	Char	10	
WHSE	Warehouse	Char	3	
PROD	Product	Char	15	
TQTY	Total Quantity	Number	15	2
OQTY	Ordered Quantity but not delivery out of warehouse	Number	15	2
UQTY	Unavailable quantity	Number	15	2
AQTY	Available quantity	Number	15	2

Table 4.12   **Stock Inventory Lot/Serial Balance Information INBALN2P**

      Key: FIRM + WHSE + PROD + LOCA + LOT

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Creation date	Number	8	0
FIRM	Firm	Char	10	
WHSE	Warehouse	Char	3	
PROD	Product	Char	15	
LOCA	Location	Char	15	
LOT	Lot number / Serial number	Char	20	
TQTY	Total quantity	Number	18	0
OQTY	Ordered quantity but not delivered out of warehouse	Number	18	0

Table 4.13   **Stock Inventory Transaction Header INTRAN0P**

      Key: REF

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Creation date	Number	8	0
TXCD	Transaction code: PR for product received, PD for product delivery, GR for goods returned, IS for Stock Issue, TR for Stock Transfer, AD for Stock Adjustment	Char Char Char	2	
REF	Reference number	Char	7	
DTACTIVE	Date active	Char	10	
FIRM	Firm	Char	10	
WHSE	Warehouse	Char	3	
RLTX	Related transaction code	Char	2	
RLRF	Related transaction reference	Char	7	
SUPP	Supplier code	Char	10	
SUPPNAME	Supplier name	Char	40	
STS	Status	Char	1	
OWNERID	UserID	Char	10	
TOWHSE	To warehouse	Char	3	

Table 4.14   Stock Inventory Transaction Information INTRAN1P

Key: TXCD + REF + PROD

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Creation date	Number	8	0
TXCD	Transaction code:PR for product received, PD for product delivery, GR for goods returned	Char	2	
REF	Reference number	Char	7	
SEQ	Sequence number	Number	18	0
REMK	Remark	Char	40	

Table 4.15   Stock Inventory Transaction Remark Information INTRAN2P

Key: TXCD + REF + SEQ

Field	Description	Type	Len	Dec
RCTY	Record type: A for active record, * for delete record	Char	1	
CRDT	Creation date	Number	8	0
TXCD	Transaction code: PR for product received, PD for product delivery, GR for goods returned	Char	2	
REF	Reference number	Char	7	
TOLOCA	To location code	Char	15	
PROD	Product code	Char	15	
LOCA	Location code	Char	15	
LOT	Lot number / serial number	Char	20	
TQTY	Total quantity	Number	18	0
BEF_CUM	Before cummulative	Number	18	0
AFT_CUM	After cummulative	Number	18	0

Table 4.16   **User Login Information INLOG1P**

               Key: USRID

Field	Description	Type	Len	Dec
USRID	User ID	Char	8	
USRNM	User Name	Char	10	
PASWD	User Password	Char	8	
LUPDT	Last Update Date	Number	8	0

Table 4.17   **Employee Details INLOG2P**

               Key: EMPNO

Field	Description	Type	Len	Dec
EMPNO	Employee No	Char	8	
DESC	Employee Name	Char	20	
OCCUP	Occupation	Char	20	
WHSE	Warehouse	Char	3	
FIRDT	First Date of Employment	Number	8	0
LASDT	Last Date of Employment	Number	8	0
USRID	User ID	Char	8	
LASTLOGIN	Date and Time of the Last Time This User Logged into System	Number	12	0

Table 4.18   **Delivery Agent Details STCTRY2P**

               Key: DLAC

Field	Description	Type	Len	Dec
RCTY	Record Type: A for active record, * for delete record	Char	1	
CRDT	Create date	Char	10	
FIRM	Owner	Char	10	
DLAC	Delivery Agents	Char	8	
ZONE	Zone Code	Char	10	

Table 4.19   **Warehouse Information INWHSE1P**

Key: WHSE

Field	Description	Type	Len	Dec
RCTY	Record Type: A for active record, * for delete record	Char	1	
CRDT	Create date	Char	10	
FIRM	Owner	Char	10	
WHSE	Warehouse Code	Char	3	
NAME	Warehouse Name	Char	40	

Table 4.20   **Warehouse Location Information INLOCA1P**

Key: LOCA, WHSE

Field	Description	Type	Len	Dec
RCTY	Record Type: A for active record, * for delete record	Char	1	
CRDT	Create date	Char	10	
LOCA	Warehouse Location	Char	8	
FIRM	Owner	Char	10	
WHSE	Warehouse Code	Char	3	
NAME	Warehouse Name	Char	40	

4.3   Interface Design

System Interface design plays an important role in system development. Interactive and user-friendly interfaces enable users to interact with component more efficiently. These simple and yet easy-to-navigate interfaces help users to solve their problems when they browse through the system.

Basically, the interfaces for Web-enabled Fulfillment System are presented in the form of Web pages. Screen designs are performed in a standard layout to generate a better and user-friendly interface.

There are two main parts for the Web-enabled Fulfillment System interface design, which are navigation bar and working area. The navigation bar consists of function buttons that guide the users to browse through the Web pages in the system. Whereas the working area is the part of the Web page that interact with the users' input and displays the output or results.

The interface consists of two main colours only, which are navy blue and light blue with white background. Too many colours in the interface always confuse the users.

The following are some interface design for the Web-enabled Fulfillment System.
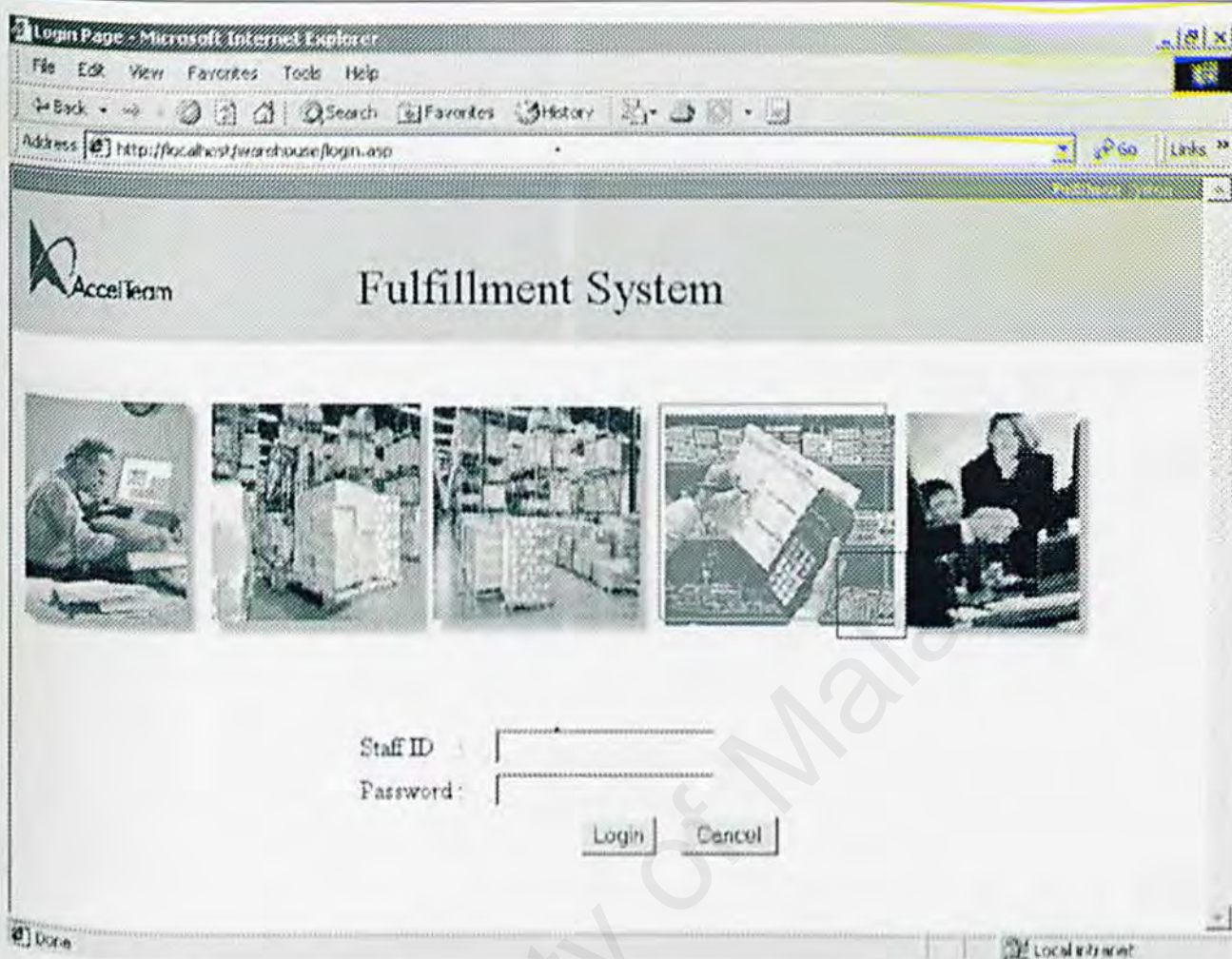
Figure 4.4   Interface for the login module.
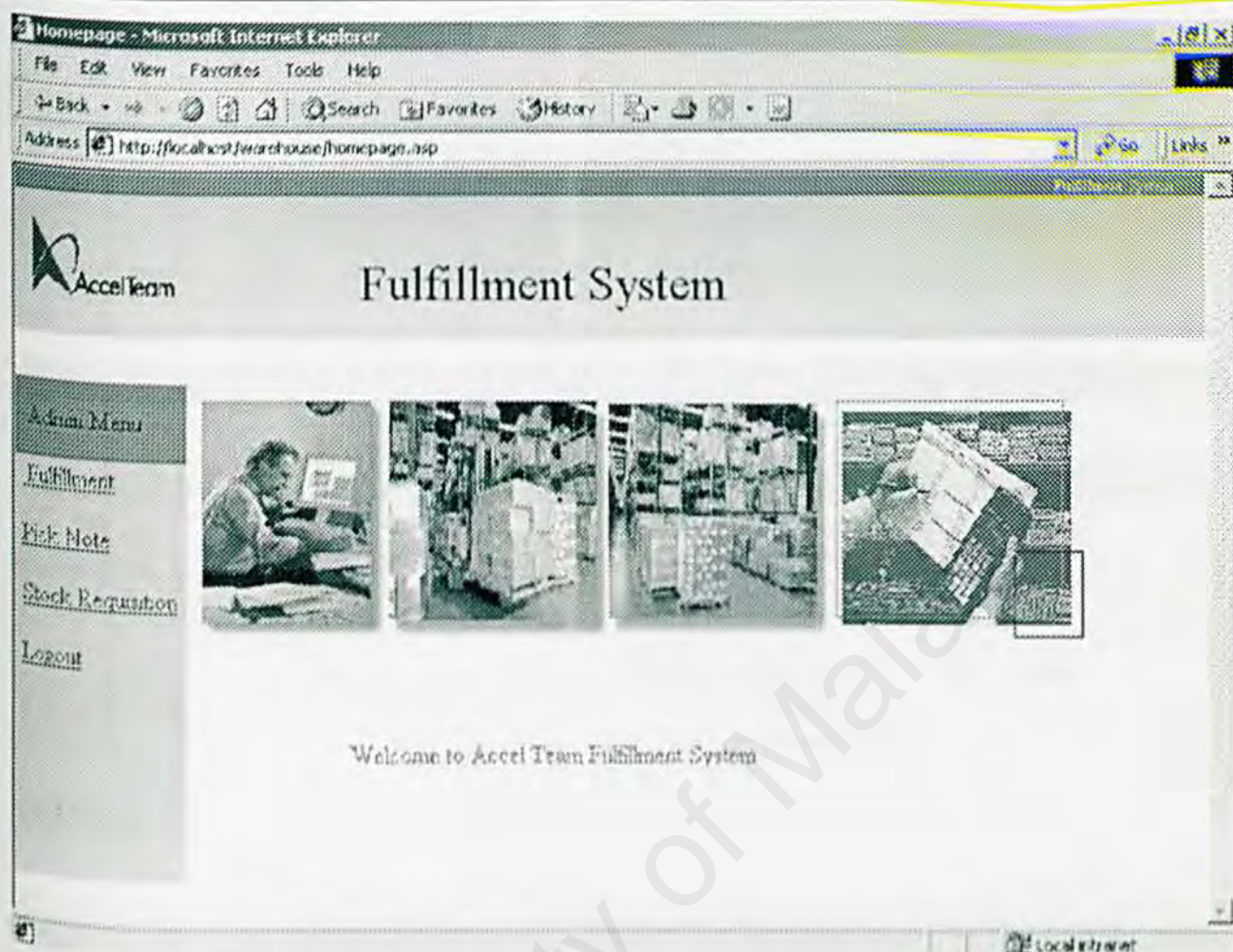
Figure 4.5   Interface for the main page of the Web-enabled Fulfillment System. The navigation bar guides the user to link to web pages that they need.
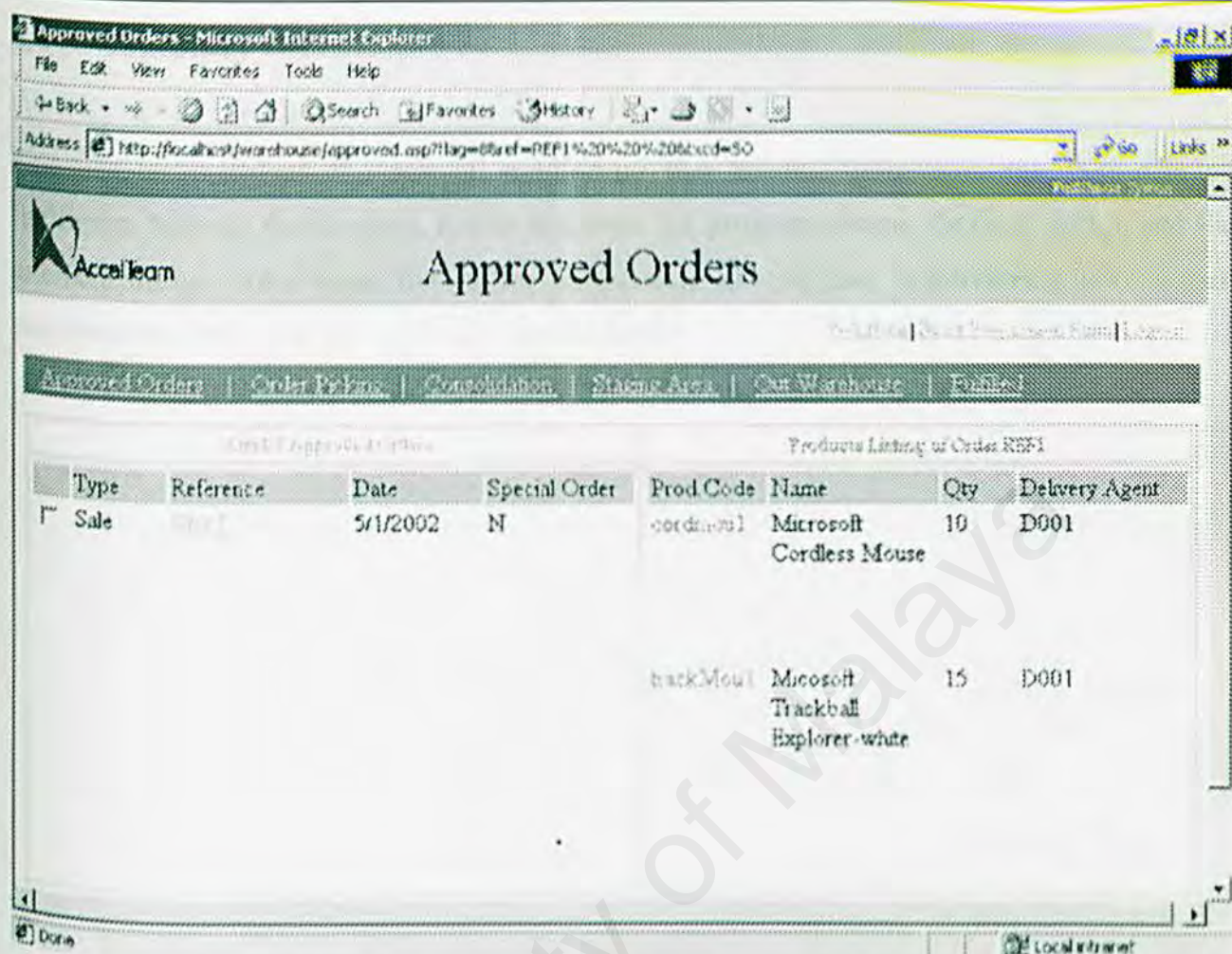
Figure 4.6   Interface for the Approved Order module in the Fulfillment System.

4.4   Summary

This chapter discussed the system architecture that needed to develop the Web-enabled fulfillment System. Furthermore, it also discussed the program design, database design and the interface design. This helps the author to translate all the user requirements into system characteristics that meet the exact user requirements.

CHAPTER 5

SYSTEM

DEVELOPMENT

AND

IMPLEMENTATION

Chapter 5 System Development and Implementation

Nearly all the design phases that have been presented to this point are directed towards a final objective: to translate representation of software into a form that can be "understood" by the computer. This section will describes the processes and technique of transfers the system design into workable modules and programming codes, setting up the system in the same environment where it will be used.

5.1   System Development

5.1.1   Introduction

In the system development phase, the design has to transfer into workable modules and the coding must be written according to the system design and the business logic. This is an important phase and developer must be very careful because any error or mistake in this phase will affect the performance of whole system.

In order to reduce the mistakes and increase the quality and performance, the following steps must be considered when develop a system:
1. Development strategy
2. Development platform configuration
3. Development technique

5.1.2   Development strategy

In order to choose an appropriate system development strategy to develop this Web-enabled Fulfillment System, a few development strategies have been studied. Finally, the module approach has been chosen to apply into this system development phase.

A module is a stand alone, independent function of the system. Each module is developed separately and later integrated into the fully functional system. In this system, each

module does a different and separate function. The relationships between modules are looser compare to the components in the module. Therefore, the module approach is suitable to be use during the development phase.

In this approach, one module will be developed first by following the module development steps. These processes will repeat until all modules of the system have been created. Finally, those modules will be integrated to make up a single and complete system.

The development steps used to develop this system are:

1. Develop a Home or Main Menu of the system where all the services are called through it. This step will just be taken in the first time to start develop the system;
2. Develop an independent module on its own. Each sub module or internal level in the module will be develop first and then slowly move to the outer level of the module;
3. Test the module following the sequence;
4. Repeat step 2 and step 3 for another modules until all modules have been created;
5. Integrate these modules and carry out the integration testing.
6. System level implementation;
7. System testing;
8. System evaluation.

5.1.3 Development Platform Configuration

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

5.1.3.1 Hardware Configuration For Development

Table 5.1 shows the hardware that are used to develop the system:

Table 5.1 Hardware specifications for the development requirement

Minimum Requirements	
Computer/Processor	Pentium II 166 MHz or higher Pentium-compatible CPU
Memory	128 megabytes (MB) of RAM recommended minimum
Hard Disk	Hard disk with a minimum of 2 GB free space.
CPU Support	Windows 2000 Server supports up to four CPUs on one machine
Input Devices	Mouse, keyboard
Network	Network Adapter Card
Video Monitor	EGA, VGA or compatible display

5.1.3.2 Software Configuration for Development

Bellow outline the software tools that need to develop the system.

Table 5.2 Software specifications for the development requirement

Software	Purpose
Microsoft Visual Interdev 6.0	Coding the web pages
Microsoft FrontPage 2000	Design user interface
Microsoft SQL Server 2000	Database
Microsoft Internet Explorer 5.5	Browser
Microsoft Windows 2000 Server	Operating System
Microsoft Internet Information Server 5.0	Web Server

5.1.4   Development Technique

This section will explain the technique and strategy that are applied in the actual developments. It consists of three aspects:
- ➢ Web Page Development
- ➢ Database Design
- ➢ Debugging

5.1.4.1 Web Page Development

The programming language chosen to develop the web page is Active Server Pages (ASP). As mention in the early chapter, the main tools chosen for the web development are Microsoft Visual Interdev, Microsoft FrontPage and the Internet Explorer5.5. The application is designed with platform-independence in mind.

The page interface is first design using the Microsoft FrontPage. Then, coding or scripts are added to the page by using the Microsoft Visual Interdev. When the coding is done, the page is view by browse it through the Internet Explorer. If any mistake or error is detected, changes are immediately made and the document will be test again and again until no mistake is detected. Beside that, other supporting tools such as Adobe Photoshop are used in order to make the interface more attractive.

5.1.4.2 Database Development

Database is the most critical and important thing in a system. It plays an important role during the development and also for future enhancement and customization. A proper design database will ease the development and customization process and vice versa.

The database for this system is created by using the Microsoft SQL Server 2000. After the creation of all the database tables, appropriate data will be inserted into

some of the database tables to initialize the system. In order to connect to the database, a connection string call 'connectdata.asp' had been created where each web page include this connection to connect to database. Example code to connect to database:

```
StrConnect = "Provider=SQLOLEDB; Data Source=MSCS; " &_
"Initial Catalog=warehouse; User Id=sa; Password=mscs"
```

5.1.4.3 Debugging

Debugging is an activity to finding and fixing the bugs in the system. If a program doesn't have any error, it didn't mean that it is free of bugs. Therefore, programmer needs to carry out this debugging or trouble shooting process to eliminate these bugs. Debugging is considered as the most boring process during the development phase.

There are various types of errors that exist in the system; compile error, run-time error and logic error. For example, when handling logical error, it is important to insert temporary debugging codes at certain intervals to track movement of the program and return values of key variables in strategic location inside the program. This is the most effective way to debug logical errors in the system.

5.2   System Implementation

5.2.1   Introduction

System implementation is the process of setting up the system in the actual environment to provide actual service. The strategy used to implement the system is a straightforward deployment.

5.2.2   Deployment

The deployment of this Web-enabled Fulfillment System is ease and simply. Firstly, after the completion of the coding process, the folders that contain the web page need to copied and upload into the server. Finally, the 'connectdata.asp' file must be edited to reflect the data source. The detail step of deployment and setup can be referring to the user manual.

5.2.3   Training

For each new system, training must be carrying out in order to explain to and train the user about the functions provided by the system and the correct way to use it. As the potential user of this system are not IT-savvy (staff of a non IT company), user training must be done properly to ensure that the user understand how to handler and use this system. Therefore, a comprehensive user manual that contains guidance and instruction to the system will be prepared for this purpose in the end of this dissertation.

5.3   Summary

This chapter describes the processes and techniques of transfers the system design into workable modules and programming codes, setting up the system in the same environment where it will be used.

Development strategy, development platform configuration and development techniques are the three most important aspects in the system development phase.

This chapter also discusses the system implementation to set up the system in the actual environment to provide actual service. The strategy used to implement the system is a straightforward deployment.

CHAPTER 6
SYSTEM TESTING

CHAPTER 6
SYSTEM TESTING

Chapter 6 System Testing

6.1   Introduction

Testing is a process that tests the half or full-developed system to make sure it can fulfill the objective requirement. Since Web-enabled Fulfillment System is developed using Model Waterfall with Prototyping, so testing is carries out along the development process.

The main objectives of the testing process are stated as bellow [8]:

➤ To reveal different types of error with a minimum amount of time and efforts.

➤ To checks that the system performs its functions as specified in the requirement.

➤ To assure the customers that the system they requested is the system that was built for them.

➤ To allow users to exercise system functions and document additional problems that result from being at the actual site.

The testing process of the Web-enabled Fulfillment System includes testing the interfaces between subsystems, the correctness of the output, and the usefulness and understandability of system documentation and output.

The system has undergone 4 stages of testing which are:

1. Unit Testing
2. Integration Testing
3. System Testing
4. User Testing

6.2 Unit Testing

In unit testing, the most basic units of the system – the individual modules are tested. A module is tested independent of other modules. The main objective of unit testing is to ensure program accuracy, data integrity, usability and efficiency at the module level.

The steps involved in unit testing of this Web-enabled Fulfillment System are listed as bellow:

1. First, examine the program coding by reading through it, trying to spot algorithm, data and syntax faults.
2. Then, compare the code with the specifications and design to make sure that all relevant cases had been considered.
3. After finished the coding of that module, view the web page through the browser and eliminate remaining syntax faults or errors if exist.
4. Finally, develop the test cases to show that the input is properly converted to the desired output.

The test cases, which will be built, are used to test some important aspects of the system such as the interface, local data structure, output of the program, boundary conditions and also the error handling paths.

Conclusion of Unit Testing

Unit testing has been done during the coding and development phase. It is a continuous process, which must be carried along this phase to ensure that the output and the logic and process flow of that unit or module can satisfy the user requirement.

After carried out the unit testing, a lot of logic errors, data structure faults, input validation and unexpected output have been found. These errors and faults need to be solve before proceed to the integration testing process.

As the conclusion, some modification has been carried out in order to fix these errors and upgrade the functionality of this system. Therefore, a lot of new control functions had been inserted into the program in order to control the input and output value of the program, for example the display function that will prompt a message to inform user that no information is found.

6.3   Integration Testing

The integration testing process will be carried out after the unit testing process has been done. When the individual modules are working correctly and meet the system objective during the unit testing, these modules then combined·into a working system. While several independent modules combined into a single system, it will cause some unpredicted and unexpected errors that related to the integration of these modules. So, integration testing is a systematic approach for constructing the application while conducting tests to uncover errors associated with interfacing of different components or modules.

The development of the Web-enabled Fulfillment System is divided into modules and then all the modules are integrated as one main system. Therefore the bottom up approach is the most suitable integration testing method. Each component or module at the lowest level of the system hierarchy is tested individual first. Then, the next components to be tested are those that call the previously tested ones. This approach is followed repeatedly until all components or modules are included in the testing.

After finished the integration test, those errors and faults discovered should be corrected as soon as possible in development in order to proceed to the system-testing phase.

6.4   System Testing

After all the modules are completed, the entire system must now be validated. This validation is done by carry out the system testing process. Testing the whole system is very different from unit and integration testing. When doing the system testing process, the major different compare to unit and integration testing is that we need to work with the entire environment of the system such as the hardware, software, databases and computer systems.

There are several types of system testing that can be used to test a software system. But only two types of system testing are used for this system:

6.4.1   Function testing

Function testing focus on the functionality of the system that based on the system functional requirements. It checks whether the system provides the necessary function to do a particular task, which it supposes to do.

6.4.2   Performance testing

This testing is carrying out after the function testing process. When the system performs the function required by the requirements, the testing process then turn to test the way in which those functions are performed. Thus, the performance testing addresses the non-functional requirements. The purpose of this testing is to test the run time performance of this software within the context of an integrated system. It involves both hardware and software instruments.

6.5   User Testing

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

For this project, the author has invited several users to perform the user testing. The users are one of the programmers that involved in the development of warehousing system and a few non-IT savvy users.

After perform this user testing, a lot of useful information has been gained. This information is very useful and helpful when performing the system upgrade process and bugs checking process. Bellow is a summary of some comments given by the user during the user testing.

> The interface design is not enough attractive, it will cause the user feel bored when using the system. Some colorful but formal picture and icon can be inserted into the system to make the interface look more nicely.
> The reporting module only provides some common reports, more details report about warehouse system is not provided.
> The system must have a help file, which can guide the user when using this system. So, it can reduce the mistake or error cause by unskillful user.
> All the necessary tasks and functions that need to be done during the fulfill orders process are included.
> The system is easy to use and understand.

After study these comments by those users, some comments have been considered during the upgrade process and modification has been performed to eliminate or reduce those weaknesses.

6.6   Summary

Testing is a very important process that can ensure the accuracy and precise of the developed system. Errors that are discovered during the testing can be eliminated before distribute it to the users.

This chapter discusses the four types of testing techniques that the author used for the testing process which are unit testing, integration testing, system testing and user testing.

CHAPTER 7
SYSTEM
EVALUATION

Chapter 7 System Evaluation

7.1   Introduction

This is the final phase in the life cycle of this project. During the period of coding and implementation, various technical and non-technical problems were encountered. So, this chapter highlights some of the problems faced throughout the project and also the solutions that have been taken to solve it. Besides that, this chapter also includes the evaluation of the system to identify its strengths and limitations. As suggestion to further improvement of this system, the possibility to enhance the system is also explored.

7.2   Problems and Solutions

7.2.1   Difficulty in making decision when choosing development tools

Choosing suitable development tools is the most important and critical process in the software development cycle. There are many software tools available in the market today, for example: Active Server Pages, Java, C, Cold Fusion, Java Server Pages that can be used to develop a web site and Microsoft Access, Microsoft SQL Server 2000, Oracle 9i Database that can be used for database. Unfortunately, this wide range of tools available had raised the problems on making the decision in choosing the most suitable tools for the system needs.

In order to solve this problem, the author first defines the needs of the system. After that, research is carried based on the needs of the system. The researches are done by surfing the Internet and seek for advice from experience people such as the ex-supervisor during the industrial training and even the seniors that engaging in similar project.

7.2.2   Ambiguity in understanding the fulfillment process

It is quite difficult to understand the business flow of the fulfillment system. A lot of logical problems were encounter during the development phase. Besides that, ambiguous related to the fulfillment process has caused a lot of logical faults in the program.

This problem was solved by asking help from some experience people that involve in the fulfillment process or warehouse system. In addition, by referring to some business books could also lead to better understanding and knowledge on the fulfillment process.

7.2.3   Lack of knowledge and experience in the web development

Starting the project without prior knowledge of ASP, VBScript and JavaScript causes a lot of uncertainty in the coding. As never being exposed to such languages through out the course of studies, learn-trial strategies were used instead.

This problem was solved by putting a lot of hard work on referring the books and online information. These do help a lot in order to grasp these languages. Besides that, the author also asking advice from course mate who are using the same tools and always discussed problems that encounter with them. Therefore, this problem only proved to be slight delay in the schedule with several weeks with little progress. After the knowledge and skills has been familiarized, everything went on rather smoothly.

7.2.4   Determining Scope of the System

It is quite hard for the author to determine the scope of the system. The detail that involved in the fulfillment process is unclear because of the inexperience in the topic. Finally, many discussions with experienced programmer that involve in the development of the fulfillment system help the author to outline the scope of the project to be build in the initial stages.

7.3 Strength of Web-enabled Fulfillment System

7.3.1 User-friendly interface

The interface of the Fulfillment System is simple and easy to use. As mentioned earlier, this Web-enabled Fulfillment System is used for the warehouse's administrators only. All the data is critical, as fault that makes in one stage will affect all the other stages and also the whole fulfillment process. Therefore, the interface only consists of 2 main colours with no animation in order to not confusing the users. Besides that, useful Graphical User Interface (GUI) such as drop-down list is used to make the interface simple and to shorten the process time of the user. Navigation bar on top of each pages allow user to go through each process easily and clearly by simple point-and-click function.

7.3.2 Fast response time

Each web page is designed as simple as possible to allow fast loading. Large size graphical images are avoided. This consideration has also been taken into the scripting part where overhead of calling script are kept to a minimum. The data validations are also carried out at the client site to enhance fast response time.

7.3.3 Reliable processing

The programming logic applied in the program is well tested to ensure it accuracy and correctness. Data entry was verified and validated first before any updating carried out into the database to prevent the database integrity. The system prompts an error message whenever the user inputs invalid information or the system does not have sufficient information to update the database in order to proceed to other stages.

7.3.4   Effective System Control

This Web-enabled Fulfillment System has employed the advance identification and authentication technology to protect the system from authorized access. Users are allowed to make the fulfillment process and proceed from one stage to another stage after logon to the system with their unique ID and password. Unregistered users are prohibited from entering into the system. Therefore, the system is well designed that unauthorized users are not allowed from accessing the information stored in the database.

7.4   Limitation of Web-enabled Fulfillment System

After the development phase, author has successfully identified some of the system limitations found in the system. These system limitations are due to the time constraint, facilities constraint and lack of knowledge about the programming languages. The limitations are stated as bellow.

7.4.1   Browser Limitations

At the moment, this Web-enabled Fulfillment System can be fully operational and interpreted using Microsoft Internet Explorer only. Users using other web browsers such as Netscape Navigator will not get the full advantage of the system. Some of the features in the system will not function properly if users choose to use web browsers other than Microsoft Internet Explorer. This is because VBScript has been widely employed as the default programming language for the system.

7.4.2   Lack of Security Features

Whole system security is control by the login process only. This will make it difficult to protect the database integrity and output the unreliable database. The unauthorized users can easily access to the system if they can crack the login module.

7.4.3   Absence of Shipping Method

Currently, this Web-enabled Fulfillment System does not provide the facilities of choosing the appropriate transportation that used to send the products to the customers. This is due to the time constraints and lack of information about the implementation of the shipping methods.

7.4.4   Absence of Process to Contact Delivery Agent

This Web-enabled Fulfillment System does not implement the process of contact the delivery agents to collect the products. This is due to the time constraint. Besides that, the author does not have enough knowledge to use the advanced technology to contact the delivery agents such as SOAP.

7.5   Future Enhancement

Although a lot of efforts have been dedicated in developing this system, there still has a space for the future enhancement. The following list stated some suggestions for future evolution of the system which are not covered in this project.

7.5.1   Enhance the Existing Reporting Module

The existing reporting module needed to enhance to provide more powerful function. It should have the function that can allow the user to customize the type and style of report they needed. Besides that, the users must be provided with the function, which enable them to save the reports in certain format or type of document file they want for further study or analysis.

7.5.2   Provide Help Facility

Add a feature that can provide the help file for the users to guide them in using this system. The users can browse to the help module and search for the topic they needed in order to get the help information. This is very important for new users that without a user manual to getting started using the system.

7.5.3   SOAP Technology to Contact Delivery Agents

Simple Object Access Protocol (SOAP) is a lightweight protocol for exchanging information in a decentralized and distributed environment [11]. Messages are routed along a message path and this can be used to contact the Delivery agents by sending message to them.

7.5.4   Inventory Management System

The existing Fulfillment System that had been developed allows the warehouse's administrator to check stock in the warehouse for fulfillment process only. With Inventory Management System, they can actually enter the stock movement in the warehouse that includes the Goods Received Note, Stock Adjustment, Stock Issue and Stock Transfer.

7.6   Summary

This chapter highlights some of the problems faced throughout the project and also the solutions that have been taken to solve it. Besides that, this chapter also includes the evaluation of the system to identify its strengths and limitations. As suggestion to further improvement of this system, the possibility to enhance the system is also explored.

CHAPTER 8
CONCLUSION

Chapter 8   Conclusion

Web-enabled Fulfillment System is developed in order to help the suppliers to automate and structure the order fulfillment process. Every important aspects to made up a successfully web based application has been seriously reviewed and planned. The expected outcomes of the Web-enabled Fulfillment System are fast and secure transactions, user-friendly system and the most important is easy to manage and maintain.

In the process of developing the system, a lot of useful knowledge and valuable experience were gained. This project provides a chance for author to learn how to develop a complex system starting from system study to system design. Besides that, throughout the system development process, author has given the opportunity to study and practiced some useful skills and knowledge in web based programming languages such as ASP, VBScript, HTML and techniques such as configuring web server and database. The valuable experiences will definitely prove useful in the future endeavors.

In conclusion, involving in e-commerce system development is a valuable experience for author and further enhancement needs to be conducted to improve the system's functionality and efficiency.

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APPENDIX

Table of Contents

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Appendix A: Survey Questions

1. Do you know about Business-to-business (B2B) electronic commerce?
    A. Yes
    B. No

2. Have you ever involved in any fulfillment system or warehousing management?
    A. Yes
    B. No

If yes, please answer the following questions.

3. The ability to get suppliers enabled and ready to transact business online is one of the success of any e–procurement. What do you think about this?
    _____
    _____

4. Do you want to conduct the transaction of your warehouse by your own company or allow a fulfillment company to handle the transaction management for you? Why?
    _____
    _____

5. Do you store your products in different warehouse at different location?
    A. Yes
    B. No

6. Detailed reports monitor progress and provide project analysis. Do you agree with it? Why?
    A. Yes
    B. No
    _____
    _____

7. Are delivery agents allowed to keep track the status of each product in the warehouse? Why?
    A. Yes
    B. No
    _____
    _____

8. Products are always picking in batch before delivered it to customer. How do you prefer to pick your products? (more than one option can be selected)
   A. Pick by order
   B. Pick by quantity
   C. Pick by due date
   D. Pick by delivery agents
   E. Others (please specify)

   _____

   _____

Appendix B: User Manual

Introduction

This manual will provide some basic insights on how to install, manage and use the Web-enabled Fulfillment System. Basically, this web site is a simple and easy-to-use web based system. All the functions in the system can be easily found and executed by a simple point-and-click on the available function buttons and the related hyperlinks.

About This User Manual

This user manual will guide user through all the functions available in the system. The manual includes the following sections:

Chapter 1   : Getting started with Web-enabled Fulfillment System
Chapter 2   : Administrator Section

Chapter 1: Getting Started With Web-enabled Fulfillment System

1.1 System Requirements

1.1.1 Hardware Requirements

- ➤ A Pentium processor or above (at least Pentium II is recommended)
- ➤ Minimum of 128 MB RAM
- ➤ Modem / NIC to connect to the Internet / Web Server
- ➤ Hard disk with a minimum of 100 MB free space
- ➤ Keyboard and mouse
- ➤ VGA colour monitor

1.1.2 Software Requirements

- ➤ Window 2000 Server
- ➤ Microsoft SQL Server 2000
- ➤ Microsoft Internet Explorer 5.5
- ➤ Microsoft Internet Information Server (IIS)

1.2   System Installation Procedures

1.2.1   Web Server Configuration

1.2.1.1 Creating Virtual Directory

Web-enabled Fulfillment System is implemented using the Microsoft Internet Information Server as the web server.

First of all, to setup the web server (IIS), user may create a virtual directory named *warehouse* in the web server under the root directory **Inetpub\ wwwroot**.

After this, if the project files are not stored inside the root directory (**Inetpub\ wwwroot\warehouse**), map the virtual directory to the physical directory in the server hard drive where all the project files are stored, for example C:\ web\warehouse.

If user would not like to map the virtual directory to the root directory (**Inetpub\ wwwroot\warehouse),** then all the project files must be uploaded to the web server root directory (**Inetpub\ wwwroot\warehouse).**

1.2.1.2 Setup Web Server Permission

After the virtual directory has been created, permission must be assigned to the newly created directory.

For Microsoft Internet Information Server (IIS), please select the following permissions:

a)   **Read.**

This permission enables browsers to read or downloads files stored in a home directory or a virtual directory.

b)   **Execute Permissions.**

There is three types of execute permission available in IIS: None, Script only, Scripts and Executables. Please select the **scripts only** option. This option will allow the ASP script to be executed in the Web server and then sends the resulting HTML page back to the browser.

1.2.1.3 Uploading Project Files

After users had successfully created and setup the virtual directory, copy project files in each diskette into their respected virtual directory.

1.2.2 System Database Configuration

1.2.2.1 Create New Database

This Web-enabled Fulfillment System's database is implemented using the Microsoft SQL Server 2000. First of all, user needs to create a new database named **warehouse** using the SQL Server Enterprise Manager (Figure 1.1).

Figure 1.1 SQL Server Enterprise Manager

1.2.2.2 Create New Table

After Create the new database, user needs to create the new tables based on the database design that had been done.

Chapter 2: Administrator Section

2.1   Introduction

Web-enabled Fulfillment System is designed to provide simple, useful and user-friendly interface for user to deal with it. Generally, Web-enabled Fulfillment System's screen design can be divided into two parts, which are navigation area and working area (Figure 2.1).

1.   **Navigation Area**

Navigation bar is located on the top of the screen. The bar contains main Fulfillment System menu of the system and user can just point-and-click on any of the function button in the bar to perform the desired task.

2.   **Working Area**

Working area will occupy the whole part bellow the navigation area. It is the area that displayed the information corresponds to the user's selection on the navigation bar.
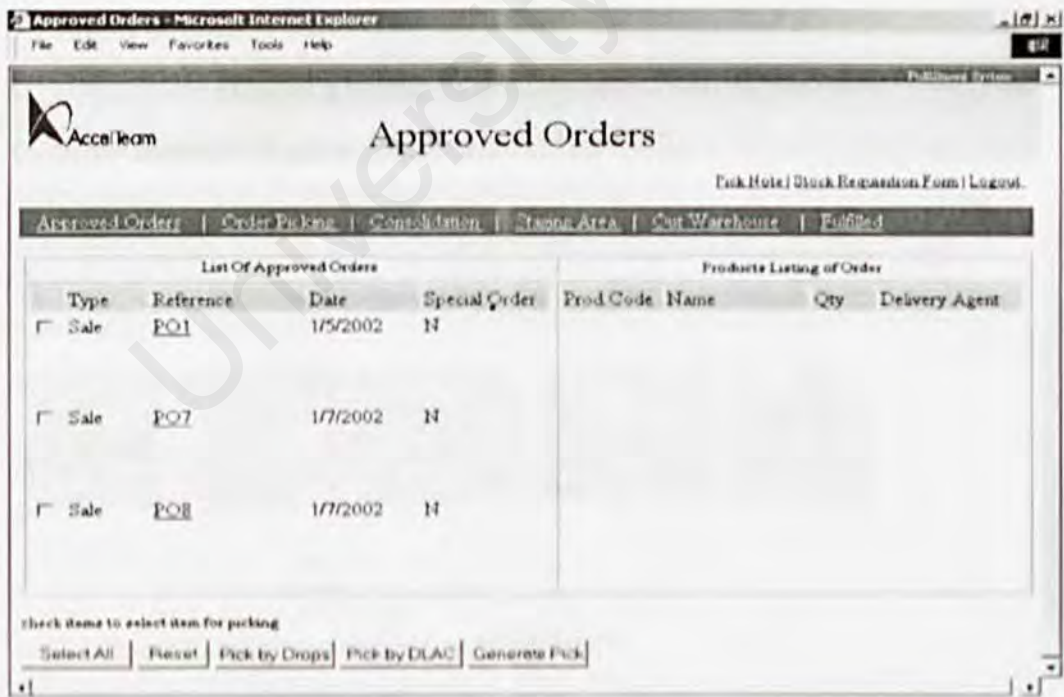
Figure 2.1   System Basic

2.2   Login Module

Figure 2.2   Login Page

1. When you key in the correct web site URL (Uniform Resource Location), for example, http://computername/warehouse/login.asp, this login page will be displayed (Figure 2.2).

2. Enter your Staff ID and password in the **StaffID** and **Password** column then click the **Login** button.

3. If you have entered a wrong or not complete Staff ID and password, you will be guide to the **Relogin Page** to login again (Figure 2.3).

Figure 2.3   Relogin Page

4. After entering a correct Staff ID and password, you will be guided to the homepage (Figure 2.4).

2.3   Homepage

Figure 2.4   Homepage

1. The homepage is consisting of two parts, which is the Fulfillment System and reports. Pick Note and Stock Requisition Form are the modules for reporting.

2. You can select the desired part that you wish to go by clicking the hyperlink at the navigation bar.

2.4   Approved Orders Page
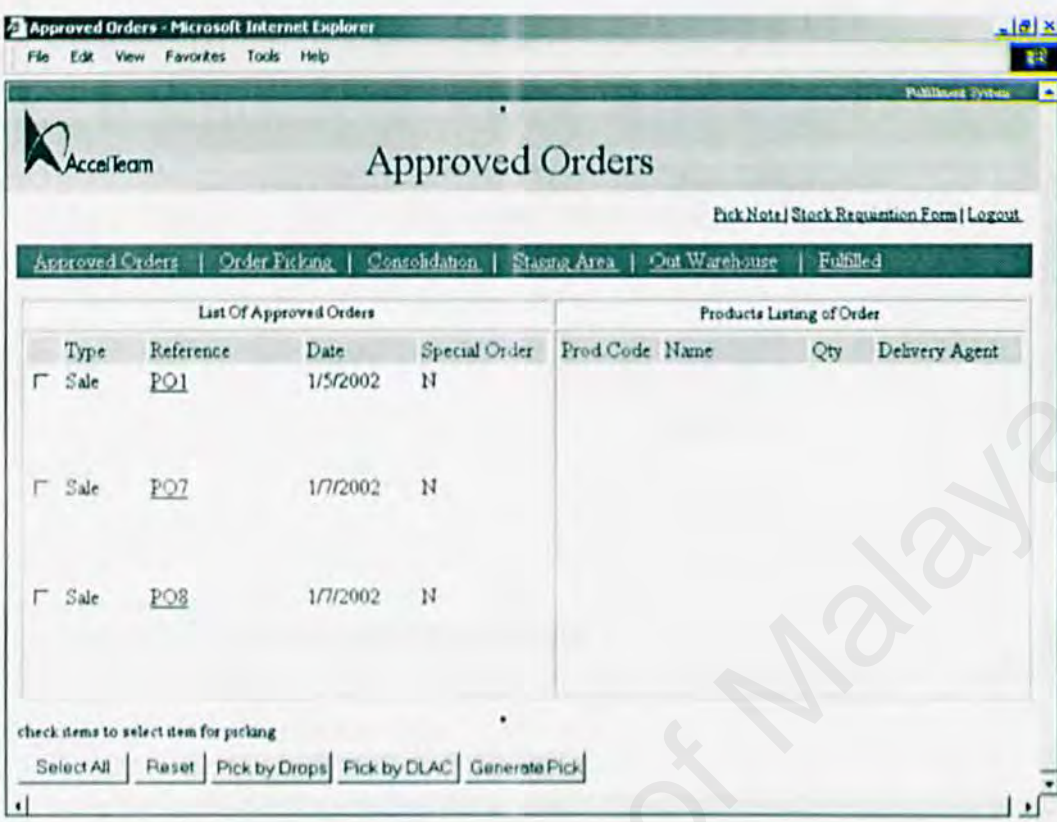
Figure 2.5   Approved Orders Page

1. This is the first module for the Web-enabled Fulfillment System (Figure 2.5). You
    can click the hyperlink above to work on other module such as Order Picking,
    Consolidation, Staging Area, Out Warehouse and Fulfilled.

2. This Approved Orders Page shows all the orders that are approved. These approved
    orders are routed to the warehouse for fulfillment process.

3. The **Reference** is the Purchase Order number, **Date** is the order date and **Special
    Date** is the Special Delivery Date.

4. You can click the **Reference** to view the products details for that order (Figure 2.6).

Figure 2.6   Order Details

5. There is four selection criteria where you can use to select the appropriate orders to be pack in one package. These selection criteria are:

   a. **Select All**

   ➢ Select all the orders to generate the pick (Figure 2.7).

   b. **Reset**

   ➢ Uncheck all the selected orders.

   c. **Pick by Drops**

   ➢ Select the orders that have the required quantity by the administrator. You can enter the quantity that you want in the textbox given (Figure 2.8).

   d. **Pick by DLAC**

   ➢ Select all the orders that are under a particular delivery agent in order to pack the orders. You can enter the Delivery agent ID in the textbox given (Figure 2.9).

6. The system will automatically check the checkbox based on the selection criteria (Figure 2.10).
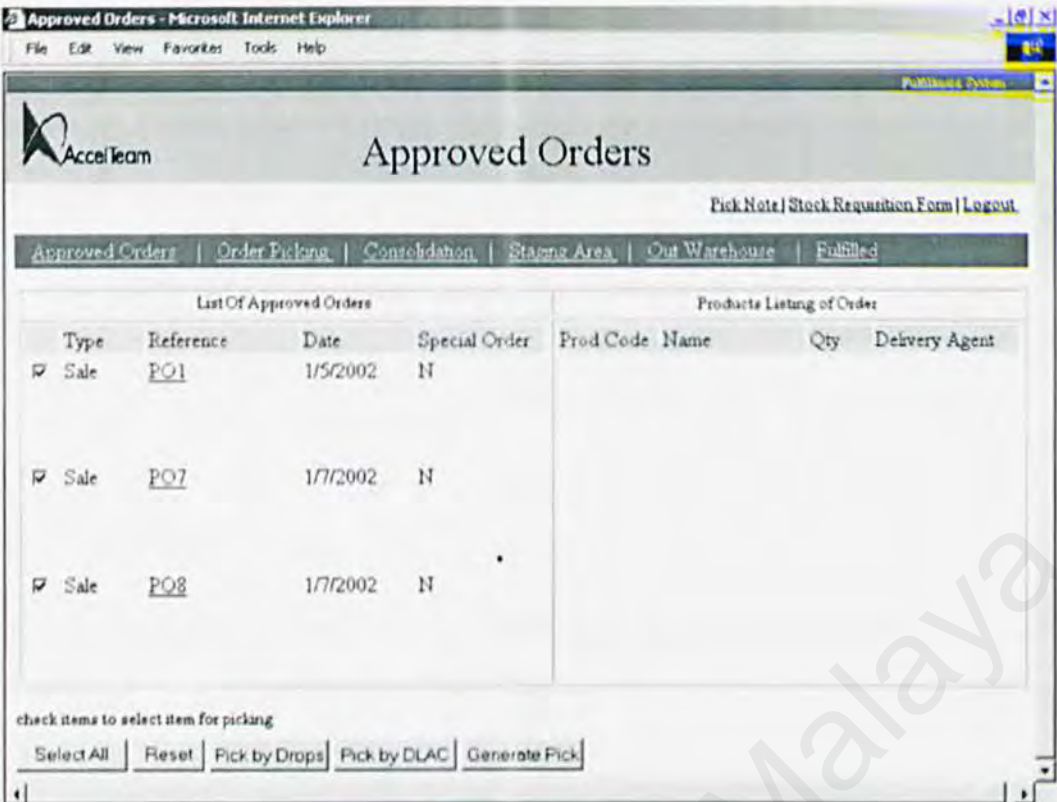
Figure 2.7   Select All Criteria
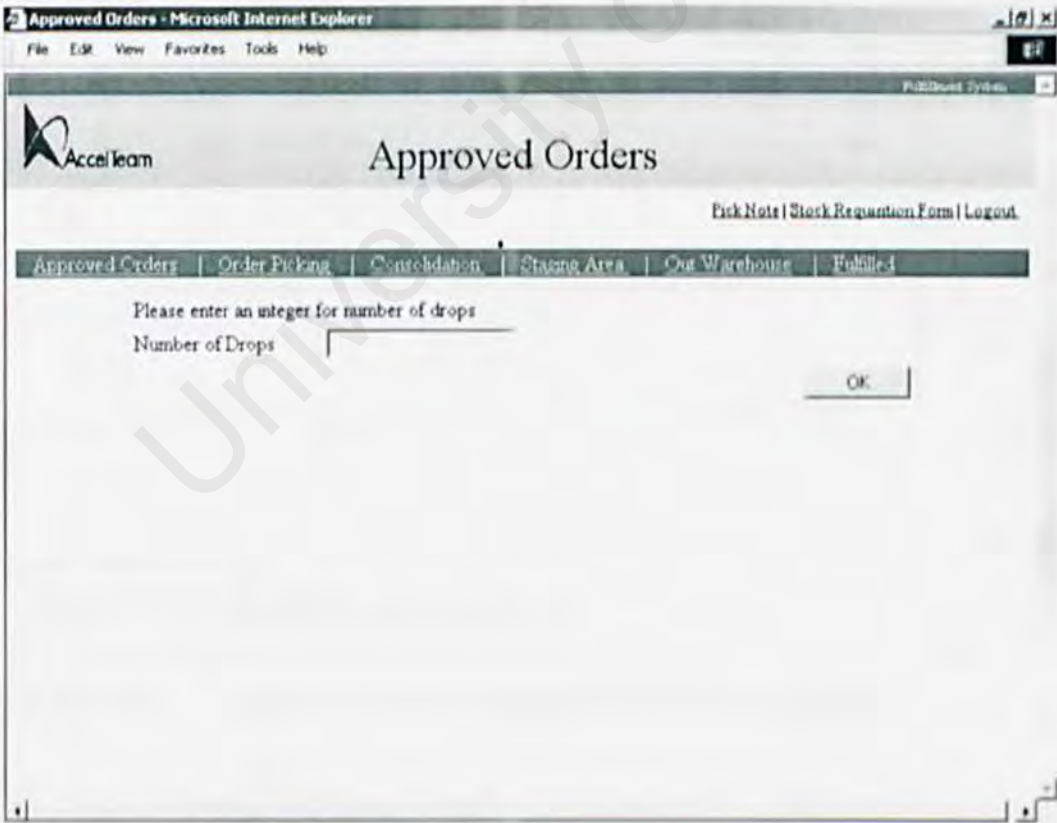
Figure 2.8   Pick by Drops Page

Figure 2.9   Pick by Delivery Agent Page

Figure 2.10   Orders will be checked based on the selection criteria.

7. After select the appropriate orders, you can now generate pick batch by clicking the **Generate Pick** button. A message will prompt immediately to ask you whether you want to generate batch for the selected products. (Figure 2.11)

VBScript: Generate Pick   ☒

Confirm generating batch for picking products?
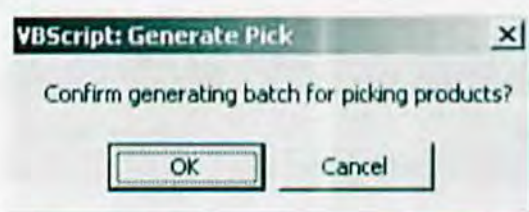
OK   Cancel

Figure 2.11   Generate Pick Message

8. Click Cancel if you do not want to generate pick now. If you have clicked OK button, a message will prompt up to tell you that the pick batch has been generated (Figure 2.12).

VBScript: Approved Order   ☒

Pick Batch is generated

OK

Figure 2.12   Pick Batch Generated Message

9. You are now started to group orders together for the delivery agent to pick the orders in batch. The system will automatically allocate a warehouse that has the required products that you had selected.

10. The orders that have been picked in batch will not be displayed in the Approved Orders Page again (Figure2.13).

11. If there are no more orders that need to be process in the Approved Orders Page, a message will be prompt to inform user to proceed to another page (Figure2.14).

Figure 2.13   Orders (PO7, PO8) that have been generated in batch will not be displayed again.

Figure 2.14   Message to shows that no more approved order which need to be process.

2.5   Order Picking Page

Figure 2.15   Order Picking Page

1. This Order Picking Page shows pick batches that are in the process of picking.

2. Select the **Batch Number** from the drop-down list and click the **Search** button to view orders that are in that pick batch.

3. By default, the system assumes that all the products can be picked. If that is not the case, you can enter the actual picked by click on the **Warehouse** (Figure 2.16). Then you need to click to edit the actual picked. Click to update the database.

4. If you find that the batch is not suitable, you can delete the batch by clicking the **Delete Batch** button. The system will prompt a message to confirm the deletion (Figure2.17).
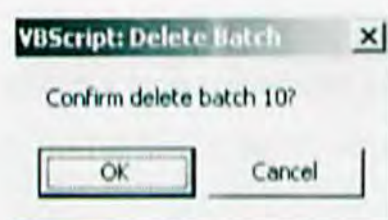
Figure 2.17   Delete Batch Message

Figure 2.16   Products Details

5. If the batch has been deleted successfully, the delete order will be displayed in the Approved Orders Page.

6. After the products have been picked, you can proceed to another stage by clicking the **Package** button. A message will prompt immediately to confirm the separating products for packaging (Figure 2.18).
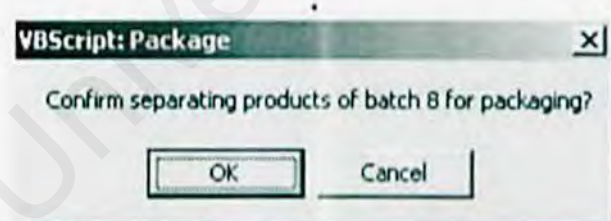
Figure 2.18   Confirm Package Message

7. The system will prompt a message to inform the user about the number of orders that can be fulfilled and the number of orders that are fail (Figure 2.19).
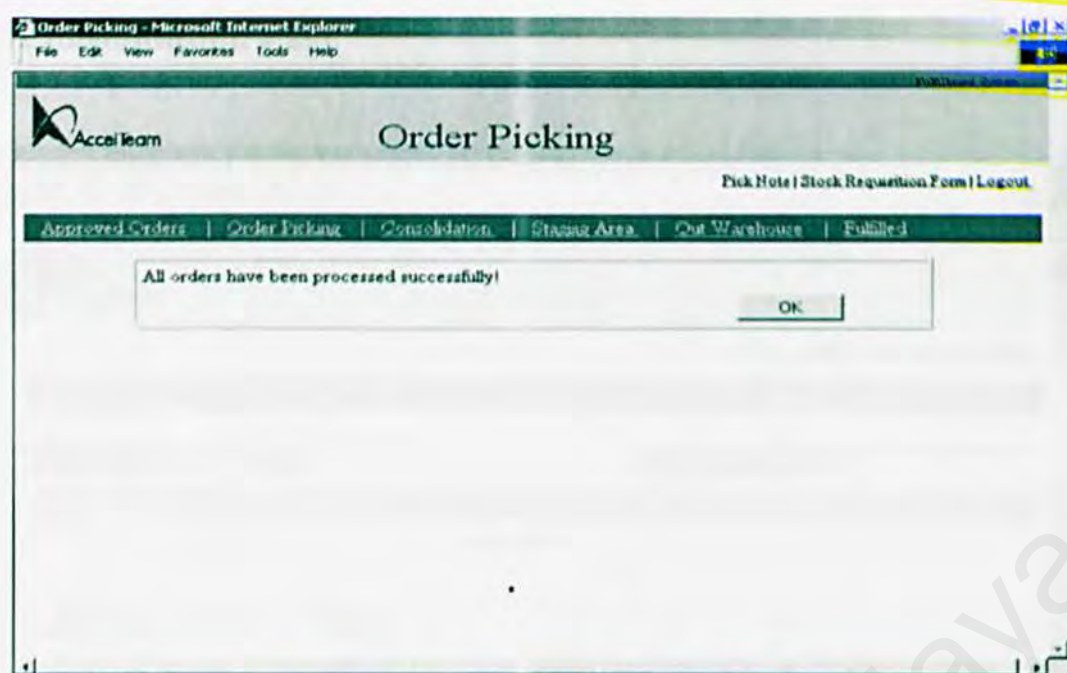
Figure 2.19   Message that shows the number of pass and fail orders

2.6 Consolidation Page

Figure 2.20 Consolidation Page

1. Orders that are picked will be reviewed for consolidation. Consolidation will take place if an order has products that can be found in several warehouses. The order will have an **Unmatched** status.

2. Select the **Batch Number** from the drop-down list and click the **Search** button to view orders that are in that pick batch.

3. If the order has an **Unmatched** status, this order cannot be packaged. It needs to be consolidated (Figure 2.20). You can click the **Reference** to view the order details (Figure 2.20).

4. To consolidate the product, you need to click the product that needs to be consolidated. A drop-down list for **Warehouse** will be shown. Select the desired warehouse and then click the **Search Location** button (Figure 2.21).

5. **Location** for the selected warehouse is displayed. Select the desired Location and then clicks **Consolidation** button to start consolidate the product (Figure 2.22).

Figure 2.21   Warehouse Drop-down list

Figure 2.22   Location Drop-down list

6. After consolidate the product, a message will be displayed to shows that the product
    is undergoing consolidation. The **Consolidation** button is disabled because no other
    product can be consolidates while another product is undergoing consolidation
    (Figure 2.23).
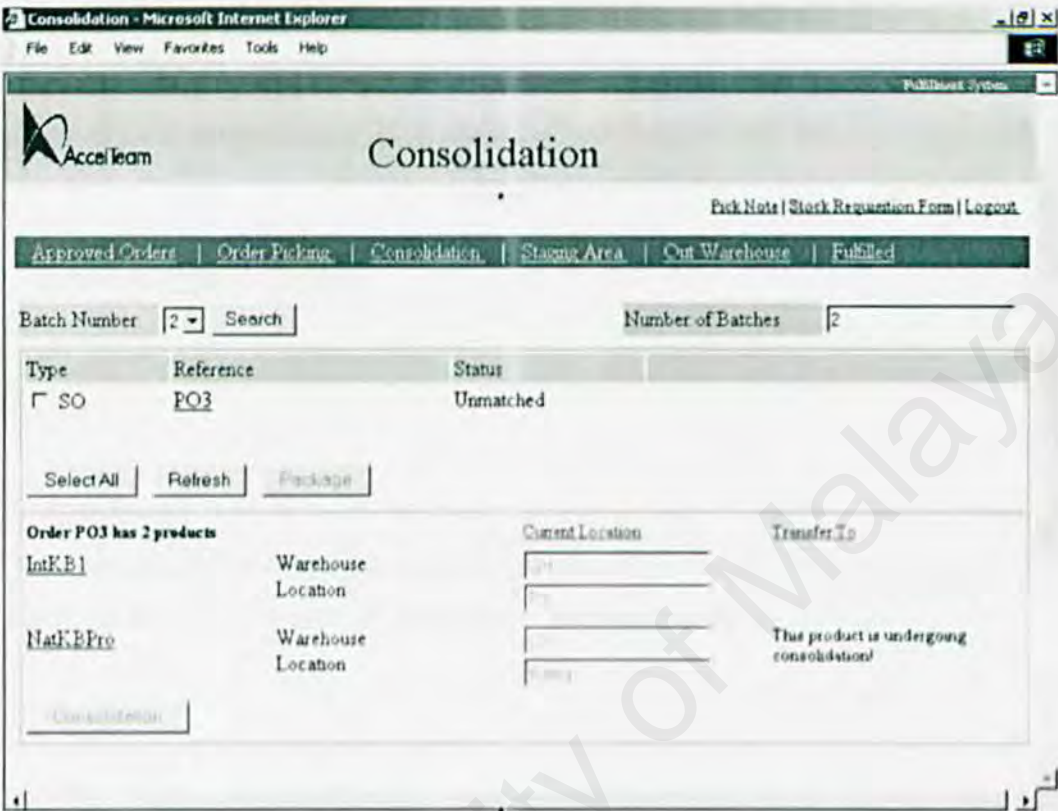
Figure 2.23   Message for consolidated product

7. If the order status is **Matched**, the products do not need to be consolidated
    (Figure2.24). You can now select the order to start packing all the products from the
    warehouse by clicking the **Package** button. A message will prompt to confirm the
    action of package the orders (Figure 2.25).

Figure 2.25   Message to confirm the package action

Figure 2.24   Orders that can be package (Matched status)

2.7   Staging Area Page

Figure 2.26   Staging Area Page

1. Products in the Staging area are ready to be taken by the Delivery Agents.

2. You can select the **Delivery Agent ID** from the drop-down list and click the **Search** button to know how many batches are ready for that particular Delivery Agent (Figure 2.26).

3. If there is no ready batch for the selected delivery agent, a message will prompt as shown in Figure 2.27.

4. After that, you can use the drop-down list for the **Batch ID** to view the batch detail. After select the **Batch ID**, you need to click the **Batch Details** button to search the detail of that batch (Figure 2.26).
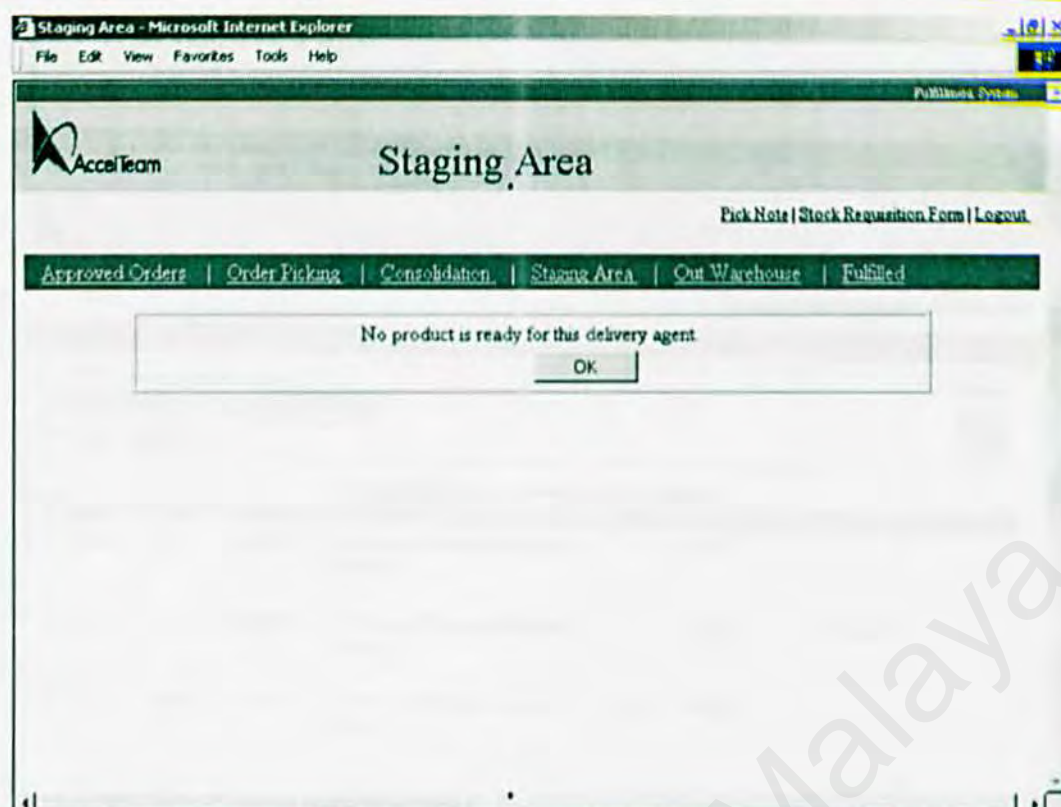
Figure 2.27   Message

Out Warehouse Page
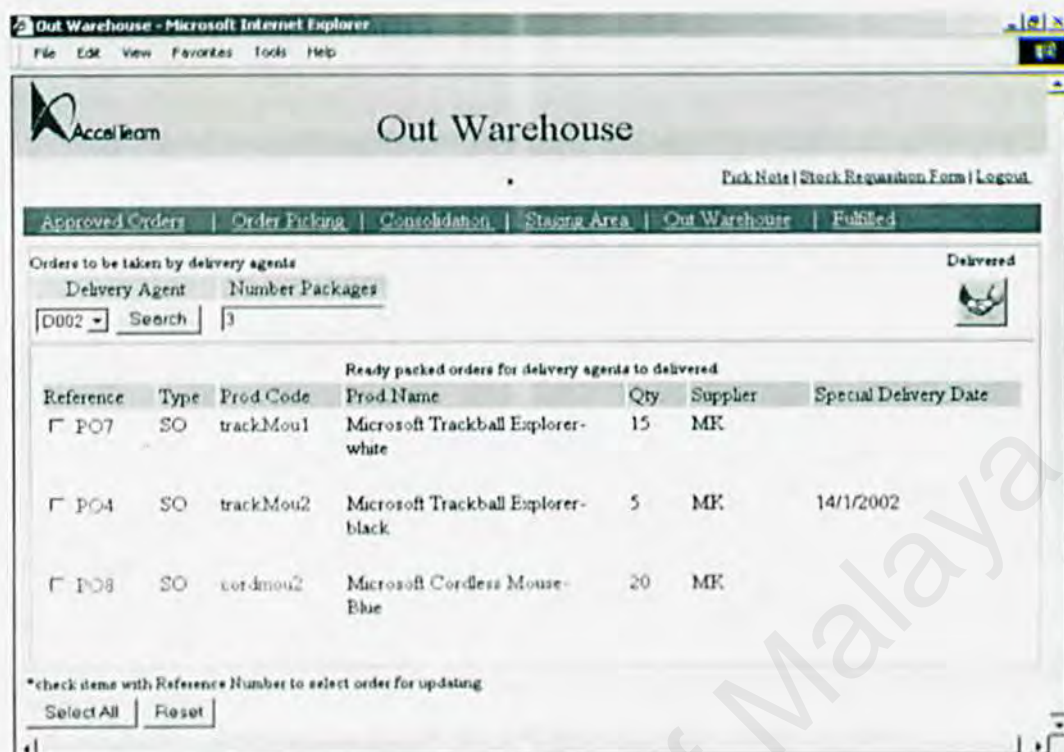
Figure 2.28   Out Warehouse Page

1. This page shows all the products that are already out of the warehouse.
2. You need to select the **Delivery Agent ID** from the drop-down list and then click the **Search** button to search all the products that had delivered to the customer for that Delivery Agent (Figure 2.28).
3. If there are no orders that have been sent by the selected delivery agent, a message will prompt as shown in Figure 2.29.
4. Now, you need to select the products that are already out from the warehouse and manually update them by clicking the **Delivered** button (Figure 2.28). A message will prompt immediately to confirm the action (Figure 2.30).
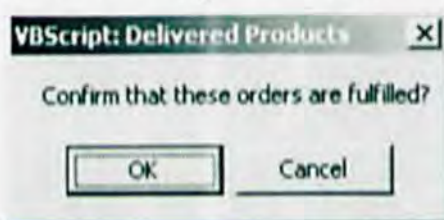
Figure 2.30   Message to confirm the fulfilled product
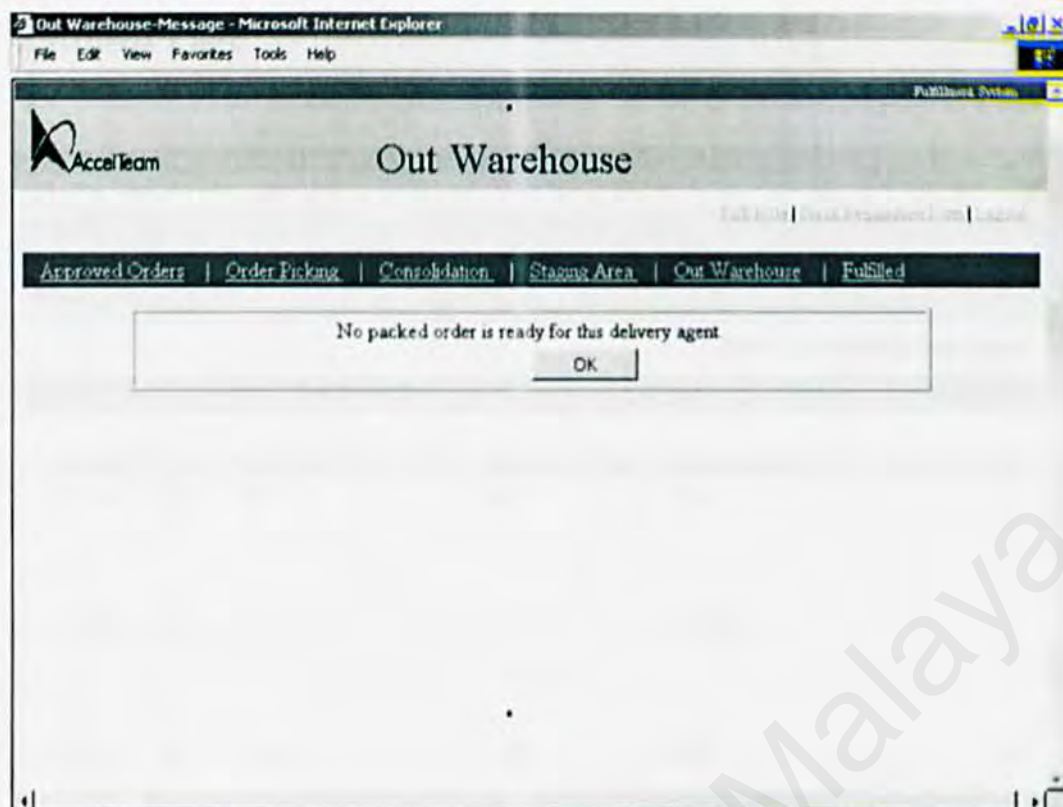
Figure 2.29   Message to shows that the delivery agent sends no batch
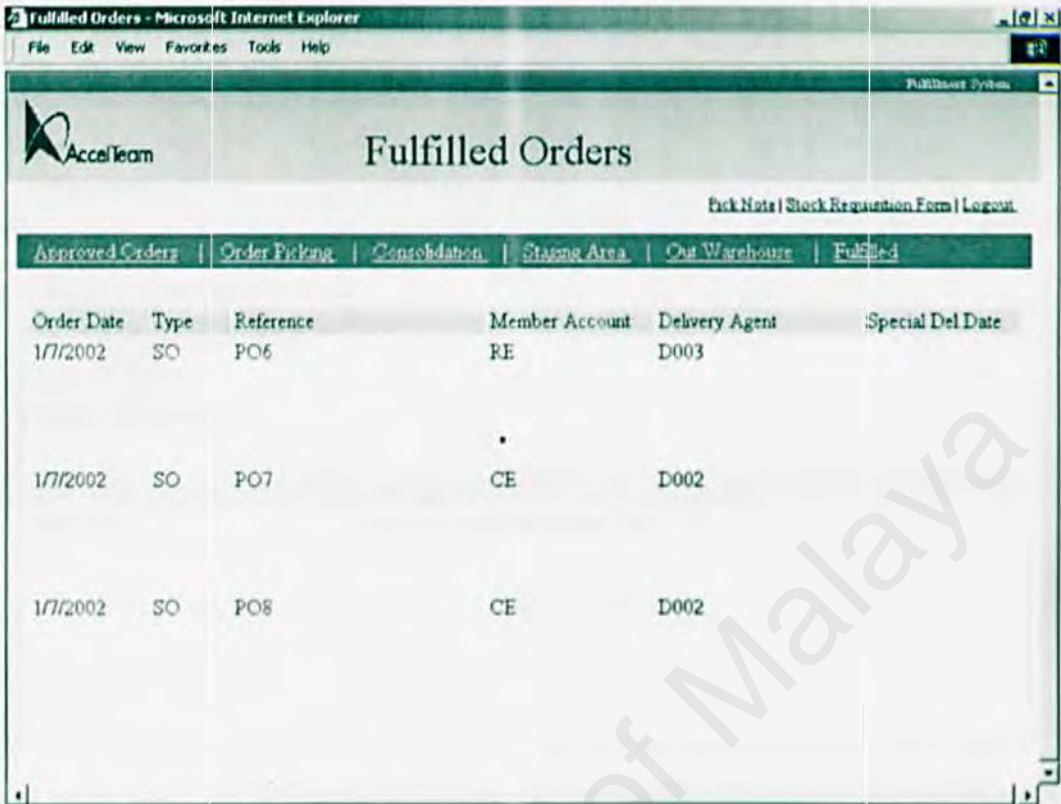
2.9   Fulfilled Page

Figure 2.31   Fulfilled Page

1. This page shows all the orders that are fulfilled. The criteria for an order to be displayed on this page are that all of the products under that order must be sent to the customer. Partially fulfilled orders will not be displayed here.

2.10 Pick Note

Figure 2.32   Pick Note

1. This is the report that shows all the pick batches in the database (Figure 2.32).

2. You need to select the **Batch Number** from the drop-down list to view the details of that **Batch Number**.

3. Click the **Search** button after you have select the **Batch Number**.

2.11   Stock Requisition Form

Figure 2.33   Stock Requisition Form

1. This is the report that shows the current and transfer warehouse and location for a particular pick batch.
2. You need to select the **Batch ID** from the drop-down list to view the details of that **Batch ID**.

2.12   Logout

If you want to logout, you can click the **Logout** link, which is on top of every page.