E-BOOK STORE FOR UNIVERSITY OF MALAYA

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Abstract

E-Book Store for University of Malaya is a web-based application that provides Pekan Buku (official book store in University of Malaya) services on-line to the users. Users can use this service from any location at any times as long as they have network connection and able to access to the Internet.

This project proposal contains the literature review of the system, methodology of system development, system analysis and system design. These topics are explained in detail in each chapter of this proposal.

Literature review chapter explains and discusses in detail about the existing systems and technologies that are available in the market. Methodology chapter is concerning about the software engineering principles and techniques that will be applied in the system development process. The system analysis and system design chapters are dealing with the proposed system's analysis and design issues.

It is hoped that this proposal is useful for users in order to understand the proposed system.

Acknowledgements

I would like to sincerely thank Ms. Azwina Mohd Yusof for accepting my proposal and become my supervisor. She had given me countless advices and valuable ideas in designing and developing the proposed system. She also helps me a lot in completing this proposal.

Special thank to my moderator, Ms Norazlina Khamis. She had helped me to further understand my proposed system by asking me the questions that related to my system design issues during the VIVA session.

I would like to thank University of Malaya and Faculty of Computer Science and Information Technology because providing good facilities such as Internet service and Thesis Room for me and the students. I have been using the Internet service to find information and doing reference from seniors' thesis in the Thesis Room.

Besides that, I would like to thank all my friends for their guidance and support. They had shared their ideas and knowledge to me in doing this proposal.

Finally, a great "Thank You" is due to all who had been helping me in this project proposal. Without your support, this proposal would not accomplish.

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Chapter 1: Introduction

1.1 Project Overview

Pekan Buku is the official book store in University of Malaya. It supplies the academic books to all University of Malaya members and public. The books that are selling in Pekan Buku are recommended by the lecturers or publishers. Customers can reserve the books that they want at Pekan Buku. Pekan Buku currently do not own any web-based system.

E-Book Store for University of Malaya is a web based system that provides the Pekan Buku services on-line to its customers. This system tries to supply the current Pekan Buku. Customers can find or search their desire books from Pekan Buku via this system. This system also provides the "Rate Books" and "View Books Sales Ranking" to the users

Besides that, the customers can use this system to reserve their desire books from Pekan Buku. They are no longer need to go to Pekan Buku to do the books reservation. But, this system will set a books reservation amount quota to the customers according to their categories.

Finally, the Pekan Buku staffs can use this system to record their books sales record. They can use this system to generate a sales report for a certain period.

1.2 Statement of Problems

Below are the problems with the current existing system, Pekan Buku. These problems are come the three categories of users who are lecturers, students and Pekan Buku staffs.

- **Lecturers**

  They feel inconvenience when order the academic books for students via Pekan Buku because they need to follow a series of procedures. These procedures are wasting time and not effective.

- **Students**

  They need to go to Pekan Buku to check their desire books availability. They feel hard to find their desire books in Pekan Buku because Pekan Buku does not provide a search engine to its customers. They need to search the books manually from the books racks. Unfortunately, the books on books racks are not arranged properly according to their alphabetical order.

- **Pekan Buku Staffs**

  They do not have a system that used to record the books sales. So they do not know how many books that had been sold for particular time or period. They want to know which the hot selling books are.

1.3 Project Objectives

- Modernize the current Pekan Buku system by developing a web based system that provides Pekan Buku services on-line.
- Simplify the books ordering procedures for lecturers.
- Provides the latest information about the Pekan Buku books stock on-line.
- Helps the Pekan Buku staffs to record the books sales.
- Enables the Pekan Buku customers to reserve books via the Internet.
- Promotes the Pekan Buku services to public via the Internet.

1.4 Project Scope

The main users for this proposed system are students and lecturers because they are the main users for the current Pekan Buku. They use Pekan Buku more frequently compare to other non-university members or publics. But this system services also open to publics since they are also the customers for Pekan Buku.

The proposed system design is focusing on lecturers, students and Pekan Buku staffs requirements. Their requirements are the main consideration compare to the non-university members' requirements.

Unlike other commercial e-book stores system, this project does not provide on-line transaction or purchasing service. This is because the majority customers for this project are the students who most of them do not have credit card. So, the on-line transaction or purchasing service is meaningless for them. Instead of providing that service, this project provides an on-line books reservation service to its customers.

1.5 Expected Outcome

- Lecturers can use this system to order academic books from Pekan Buku easily.
- Students and other customers can get the latest information about the books that available in Pekan Buku.
- Pekan Buku staffs can record their sales record correctly.
- Users can use this system to reserve books from Pekan Buku.

1.6 Project Schedule

This project has being schedule from beginning stage of planning until the final stage of implementation and testing. This is important in order to estimate the project delivery date and make sure that the project can be delivered on time. The Gantt Chart below shows the entire project schedule:

	Task Name	Duration	Start	Finish
1	Research	63 days	Tue 6/10/03	Thu 9/4/03
2	Literature Review	38 days	Tue 7/1/03	Thu 9/4/03
3	System Analysis	24 days	Mon 8/4/03	Thu 9/4/03
4	Proposal Writing	43 days	Tue 7/1/03	Thu 9/11/03
5	Preparation for Implementation	17 days	Mon 10/6/03	Tue 10/28/03
6	Coding	42 days	Mon 11/3/03	Tue 12/30/03
7	System Integration & Testing	40 days	Thu 1/1/04	Wed 2/25/04
8	Report Writing	83 days	Mon 11/3/03	Wed 2/25/04

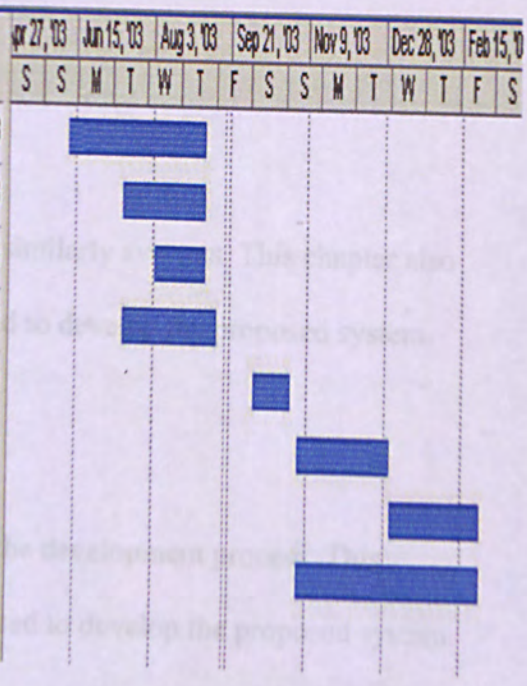


Figure 1.1 Project Schedule

1.7 Report Layout

This project proposal consists of eight chapters. This report layout will give overview for each chapter. Following are the brief description for each chapter:

Chapter 1: Introduction

Introduces the project and give an overview of the objectives, scope, expected outcome and the project schedule.

Chapter 2: Literature Review

Studies and analyzes the existing system and other similarly systems. This chapter also discusses the available technologies that can be used to develop the proposed system.

Chapter 3: Methodology

Discuss the methodology that will be using during the development process. This chapter also justifies the technologies that will be used to develop the proposed system.

Chapter 4: System Analysis

Analyzes and determines the functional and non functional requirements for the proposed system. The hardware and software requirements for this project are also determined in this chapter.

Chapter 5: System Design

Explains the conceptual and technical design for the proposed system. This chapter represents multiple types of design charts and interfaces for the proposed system.

Chapter 6: System Implementation

Discuss the development environment, platform and database configurations that are needed in order to build the proposed system. This chapter also lists out the coding approach, coding principles and debugging techniques. Some important codes are attached in this chapter.

Chapter 7: System Testing

Explains the testing objectives, testing process and various kind of testing that had been performed.

Chapter 8: System Evaluation and Conclusion

Discuss the system strengths, system limitations, some possible future enhancements, problems encountered and solutions and knowledge and experience that had gained from this project. An overall conclusion is made in this chapter.

1.8 Chapter Summary

This chapter is introducing the Pekan Buku and the proposed system, E-Pekan Buku for University of Malaya. The background of the current system, Pekan Buku and the objectives to build a new system for Pekan Buku had been discussed in this chapter. This chapter tries to give an abstract understanding about the current system and the proposed system to the readers.

Chapter 2: Literature Review

2.1 Domain Studies

In order to produce a high quality solution system, a research had been done on the several existing systems. All the systems had been analyzed in order to determine their strengths and weaknesses. The strengths of these systems will be adopted into this project while their weaknesses will be avoided from practicing in this project. This section also tries to recognize the good systems' behaviors that this project should mimic.

2.1.1 Definition

E-book store is a virtual book store that exists in the internet. Unlike the conventional book stores, e-book store is not necessary has a premise or a building to operate, all it need is the internet. It is because e-book store actually is a web-based solution system that provides the common book stores services. It is operating in the Internet.

E-book store has competitive advantages compare to the conventional book stores. First, it can be visited by the customers from world wide as long as they have the Internet connection, but conventional book stores cannot because they have a fix location. Second, customers can find the books that they want in home by browsing the e-book store web pages. They no need to go out to the specific book store location in order to find their books. Customers also can make reservation for their books or buy the books via e-book store at home or any places that have the internet connection. Finally, the operating cost for e-book store is lower than conventional book stores. It is because

e-book store no need to hire a building and many workers to operate. It also no need to pay the electricity, water and other operating bills.

This project: E-book store for University of Malaya is a subset of the formal e-book store. It makes the University of Malaya book store, Pekan Buku services available on-line. Pekan Buku mainly sells the academic books that are needed by the university students. Students can buy their academic books at Pekan Buku or reserve the books that are currently not available at Pekan Buku. Pekan Buku also provides it services to the public. Outsiders who are not the students, lecturers or the university members still can buy or reserve the books from Pekan Buku.

2.1.2 Existing Systems Review

There are a lot of e-book stores available in the internet. These e-book stores are either a web based system that function as supplement for the existing conventional book stores or a pure e-commerce system.

2.1.2.i Pekan Buku

Pekan Buku is the official book store in University of Malaya. It supplies the academic books to all University of Malaya members. These academic books majority are the books that contains are related to the university courses or recommended by the university lecturers. Pekan Buku also sell the academic books that are recommended by the publishers and other non-academic books. Pekan Buku currently does not use any web based solution system, so it does not provide its services to users on-line. Pekan Buku is using a "half computerize" system to manage its stock. The system is only recording the stock in but does not record the stock that had been sold.

Pekan Buku is using a books database as reference when ordering stocks from supplier. The database is called "CD Book Find" and is subscribed from the books supplier twice a year. The database includes books' title, author, publisher, year of publish, edition, ISBN, price and format. When Pekan Buku receives a books ordering request from customer, it will check the database to confirm these books availability. If the books are available, it will place an order to supplier via telephone, e-mail or post. Else, the customer request will be rejected. Usually customer has to wait for 14 days for his/her ordered books to be delivered if the books are available in Singapore main stock

house otherwise customer has to wait for 3 months because the books will be delivered from the overseas stock house like the UK or USA stock house.

Pro:

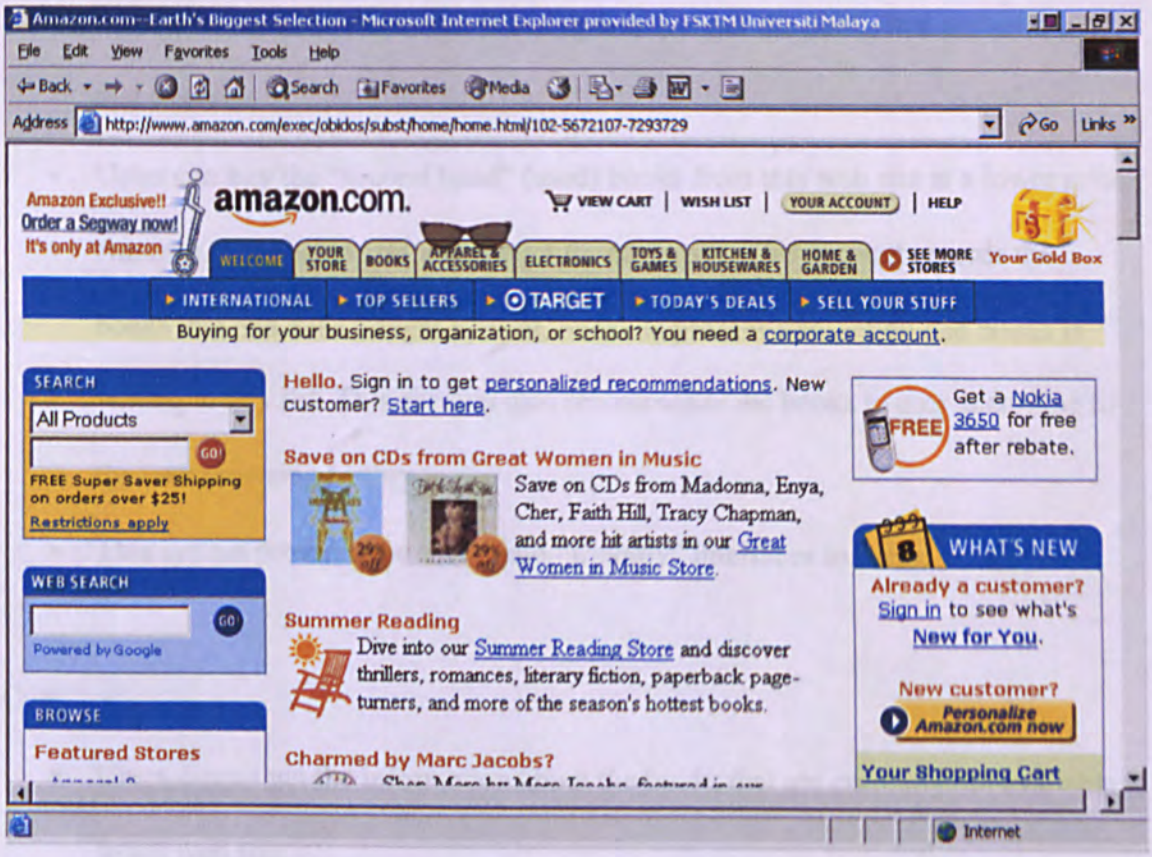
- Users can reserve the books that are unavailable or out of stock from Pekan Buku as long as the books are available from supplier.

Cons:

- Users hard to search the books that they want. It is because Pekan Buku does not provide a search engine to users. Users have to search the books manually from the book racks.
- The books on book racks are not sorting according to their alphabetical order.

2.1.2.ii Amazon.com

Amazon.com was founded by Jeff Bezos. Currently, amazon.com is the world largest e-book store and retail web site. Amazon.com is a pure e-commerce system. All business transactions with Amazon.com are done on-line.



Pros:

- The books that are selling in this web site are arranged and sorted properly according to their categories and types.
- This web site introduces the new and hot selling books to users.
- Amazon.com also provides the cover image to almost all the books that are selling in its web site.

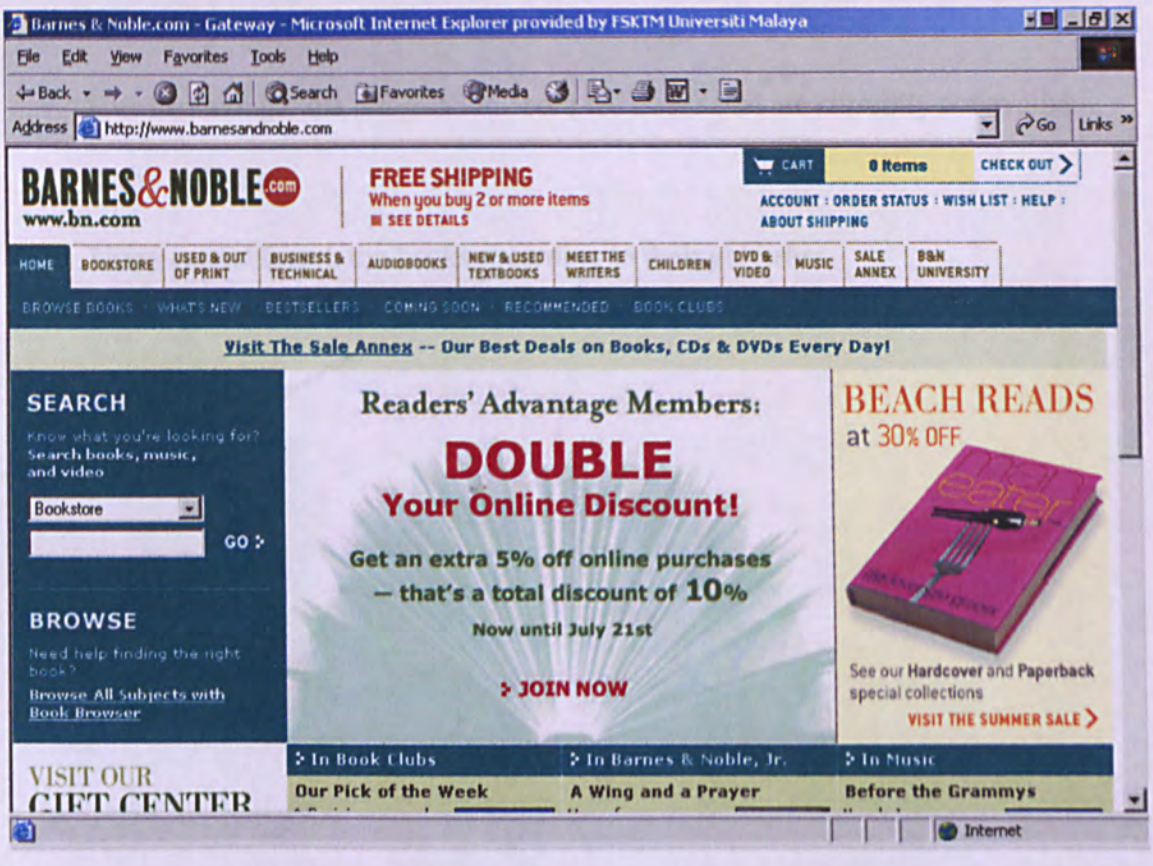
- Users can search the books that they want in this web site quickly by using a powerful search engine that is provided if they do not want to browse into each book category. They can search the book according to its title, author, publisher, ISBN, year of publish, category or title keywords.
- Users can rate the books that they like.
- Users can leave their commands and opinions about the books that are selling in this web site.
- Users can buy the "second hand" (used) books from this web site at a lower price.
- Amazon.com customizes an account for each user. This account records the books that had been bought by user, books in process transaction and books in willing to buy list. This account also recommends the books to user according to the user browsing history.
- This system provides the "soft" and "friendly" interfaces to users.

Con:

- Users cannot get the information about the books that are currently not available in the web site.

2.1.2.iii Barnes&Noble.com

Barnes&Noble.com is another famous e-book store in the internet besides the Amazon.com. It is more focus on books selling if compares to Amazon.com (Amazon.com sells many other things besides books like electronics, toys and games, house wares and etc.)



Pros:

- The books that are sold in this web site are sorted and arranged not only following their categories and types, but also following their publisher, books series, prices range and book format.

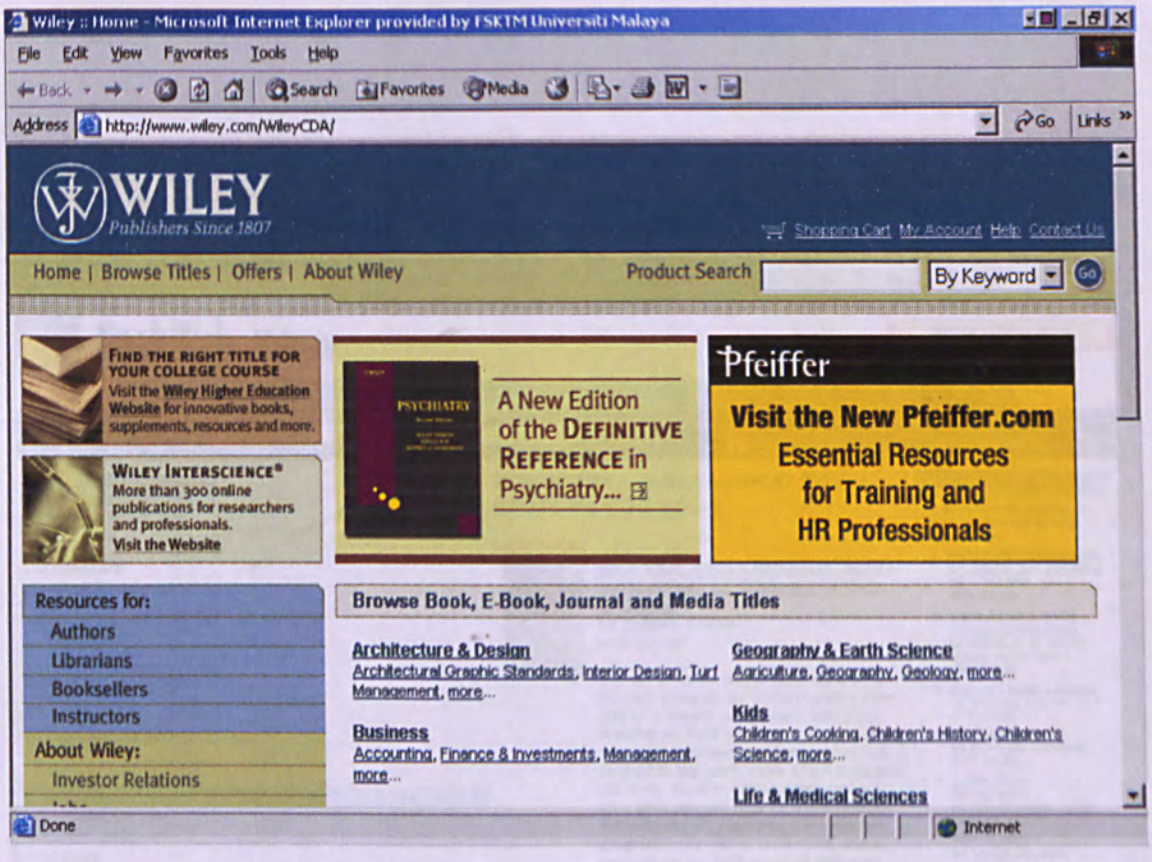
- This web site is providing a brief introduction and description to each book that are selling.
- Users can rate the books that they like.
- Users also can share their opinions and commands about the books that are selling in this web site.

Cons:

- Users cannot get the information about the books that are currently not available in the web site.
- Users cannot search the books according to their publisher.

2.1.2.iv Wiley.com

John Wiley & Sons, Inc is a books publisher that publishing various types of books. It provides its services on-line to customers via www.wiley.com.



Pro:

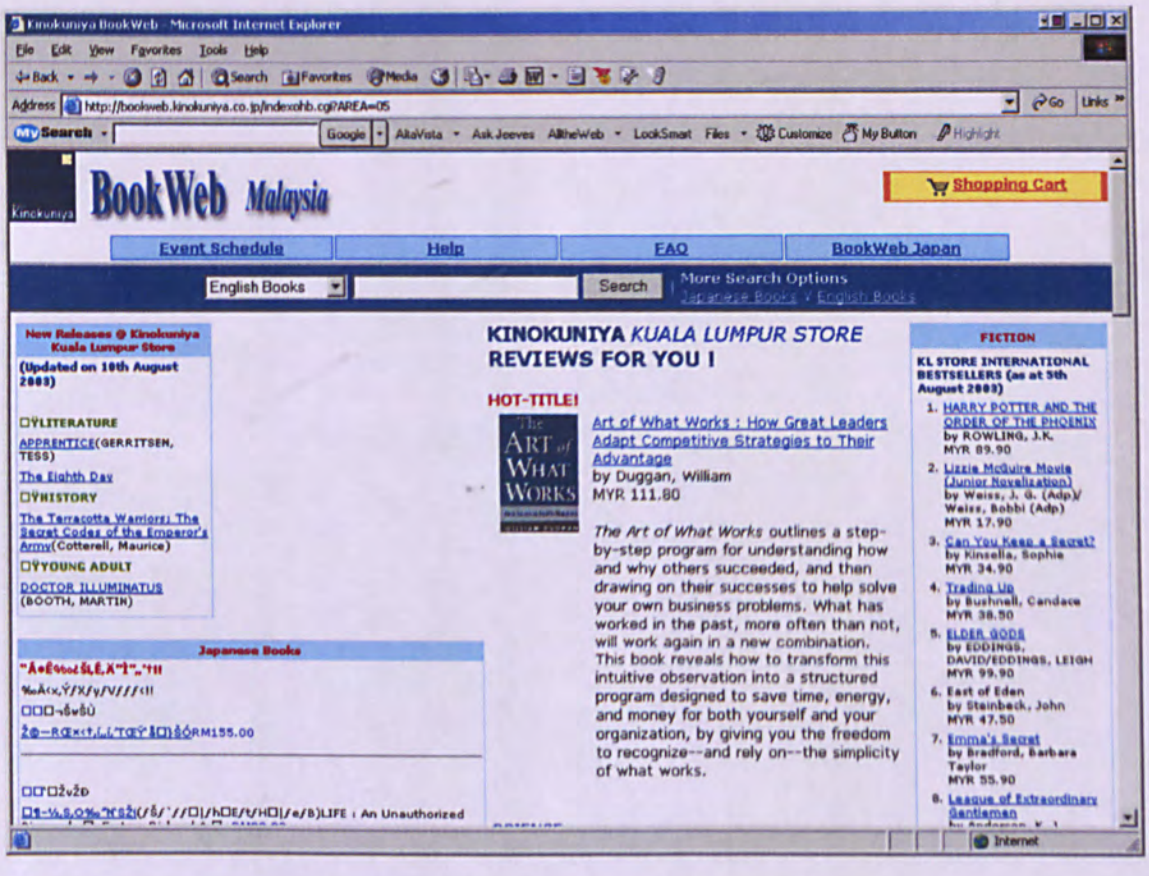
- The books categories and types are showing on the system main page. So, users can faster browse into these books categories in order to find their desire books.

Con:

- Users cannot search the books which are published by other publishers.

2.1.2.v Kinokuniya.com.my

Kinokuniya.com.my is an e-book store which is also a part of the Kinokuniya book store. Kinokuniya book store is a Japanese book store which has a lot of branches around the world. Kinokuniya not only selling Japanese books but also selling other languages books like English and Chinese books.



Pro:

- The search engine in this system provide a variety of searching bases on the book title, author, publisher, ISBN, year of publish, category or title keywords,

Cons:

- Users need to install Japanese Language pack into their computer in order to view the web site properly. This will make the non Japanese Language group users inconvenience.
- This web site does not classify and showing the books that are selling according to their categories and types. This makes the users hard to find their desire books.
- This web site does not provide "HOME" feature. It makes users hard to go back to system main page.

2.1.2.vi MPH.com.my

MPH (Malaysian Publishing House) is the biggest book store in Malaysia. It has many branches around Malaysia. MPH is mainly selling English books. MPH provides its services to users on-line via this MPH.com.my web site.

Pros:

- The books that are selling in this web site are arranged and sorted properly according to their categories and types.
- The books categories and types are showing on the system main page. So, users can faster browse into these books categories in order to find their desire books.

Cons:

- The search engine in this system cannot search book by its publisher although this function is provided.
- The books in each category are not sorted in alphabetical order.
- This web site does not provide "HOME" feature. It makes users hard to go back to system main page.

2.1.3 Proposed System

The proposed system: E-Book Store for University of Malaya should remain the books reservation services that provided by Pekan Buku. This convenience service is welcome by most of the Pekan Buku customers. So it is one of the key features in the proposed system.

The proposed system should provide a search engine that enables the users to quickly find out their desire book by providing some information that related to the book such as title, author, publisher, ISBN or keywords. The search engine will shorten the time that is needed by users to find out their books because the users are no longer need to browse into each book categories in order to find out their books.

The books that will be selling in the proposed system should be arranged properly according to their types and categories. The users will easier to find out their desire books if the system does so.

The proposed system should provide a "HOME" function in each web page. The "HOME" function is a hyperlink that links the current web page back to its system main page. The users can quickly go back to the system main page to view the important messages if the "HOME" function is provided.

The proposed system should "User Friendly" and the system interfaces should be simple because this will leave a good impression to the users and will attract them to visit the system again in the future.

2.2 Technologies Review

Many technologies have been using in developing a software system. Below are the descriptions about various technologies that are available in the market.

2.2.1 Development Models

Developing a software system involves a series of software process. Software process is defined as a set of activities and associated results which lead to the production of a software product. Development model is an abstract representation and a simplified description of a software process. It represents a process from a particular perspective. There are many types of development models that have been using by software developers like Waterfall Model, Incremental Model, Unified Software Development Process (USDP) Model and etc. Following are the descriptions about some of the development models.

2.2.1.i Waterfall Model

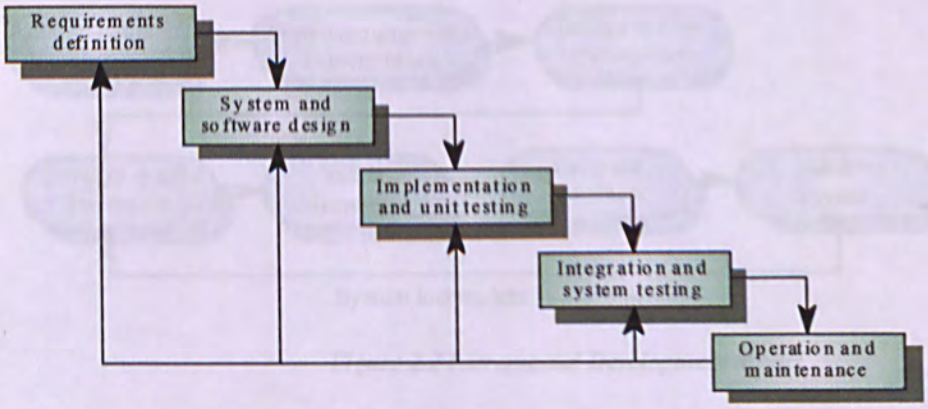


Figure 2.1 Waterfall Model

- Waterfall Model also known as Software Life Cycle. It is a simple management model
- Development phases in this model cascade from one phase to another.
- The following phase will only start after the previous phase completed.
- This model is inflexible because it partitions a project into several distinct phases. These phases will be remaining and following by the developers through out the development process.
- This model is difficult to respond to the changing customer requirements. It is because once the requirements are changed, the entire model must be restructured in order to meet the changes.
- Therefore, commitments between stakeholders must be made at an early phase in this model.
- This model should only be used when the requirements are well understood and defined.

2.2.1.ii Incremental Development Model

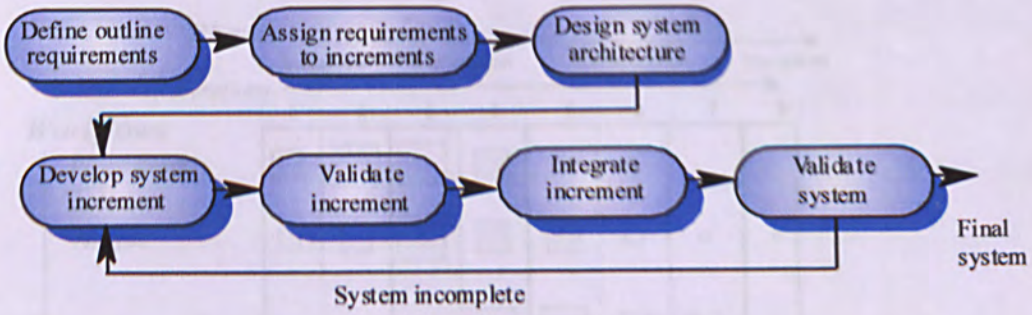


Figure 2.2 Incremental Development Model

- Customers identify the services to be provided by the system and the services priority (most important to least important) in outline.
- Then, a number of delivery increments are defined where each increments provide a subset of the system functionality.
- After that, the services are assigned to the increments based on their priority. The highest priority services are delivered first to the customers.
- Once an increment is completed and delivered, customers can put it into service.
- As new increments are completed, they are integrated with existing increments.
- Customers can use the system services in the early stage of process development once the first increment was delivered.
- In this model, the most important system services receive the most testing because it was delivered first to customers.
- This model has a lower risk of overall project failure because it delivers project in a number of separate increments that have their own functionality.

(Sommerville Ian. 2001)

2.2.1.iii Unified Software Development Process (USDP) Model

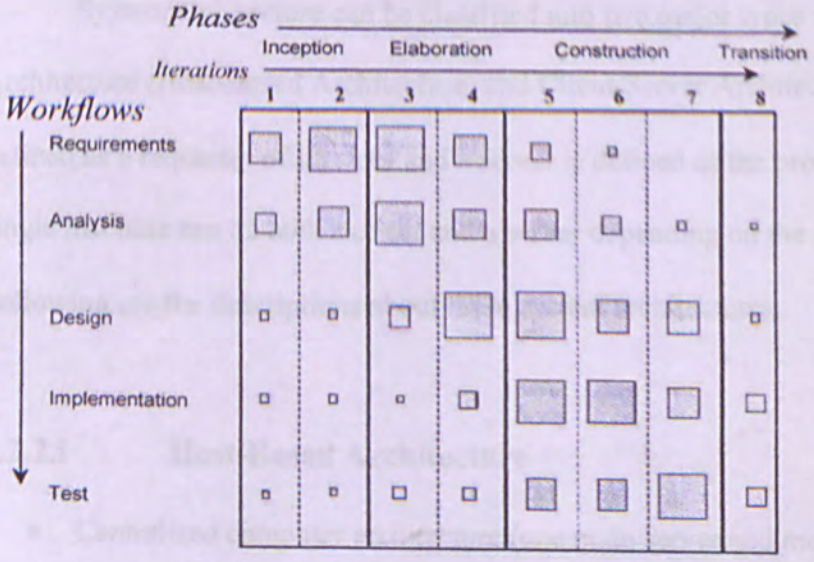


Figure 2.3 USDP Model

- USDP model using the object oriented methodology.
- It adopts an iterative approach within the four main phases: Inception, Elaboration, Construction and Transition.
- The number of iterations in each phase is determined on a project basis.
- An increment is delivered at the end of each iteration. The increment is not necessary additive but it may be a reworked version of a previous increment.
- A phase may involve a series of different activities or workflows that are independent of the phases.
- Various UML techniques and notations are used in this model like: Use Case Modeling, Class and Object Modeling, Prototyping and etc.

2.2.2 System Architectures

System architecture can be classified into two major types which are Mainframe Architecture (Host-Based Architecture) and Client/Server Architecture. A client is defined as a requester of services and a server is defined as the provider of services. A single machine can be both a client and a server depending on the software configuration. Following are the descriptions about these system architectures.

2.2.2.i Host-Based Architecture

- Centralized computer architecture (one main server and many dummy terminals).
- A single powerful computer server (host) performs all the important functions such as interface logic, business application and database.
- Dummy computer terminals are at the other end, used for requesting a task or displaying results.
- No processing is done at the dummy terminals. Only display is done.
- A powerful database engine on the host provides shared data processing functions to all other applications.
- Jobs and tasks are executed in batches.
- In order to spare the computing capacity of the host, a dummy server or Front-End Processor (FEP) is inserted between the host and dummy computers for connection and authorization services.

Cons:

- Usually do not support graphical user interfaces.
- Do not support access to multiple databases from geographically dispersed sites.
- Expensive to implement because need a high performance mainframe to work as the host.
- Maintenance cost is high.

2.2.2.ii. Two-Tier Client/Server Architecture

- Two tier architectures consist of three components distributed in two layers: client (requester of services) and server (provider of services). The three components are:
  - User System Interface (such as session, text input, dialog, and display management services)
  - Processing Management (such as process development, process enactment, process monitoring, and process resource services)
  - Database Management (such as data and file services)
- Allocates the user system interface exclusively to the client.
- Places database management on the server and splits the processing management between client and server in creating two layers.
- The user system interface client invokes services from the database management server.

- Most of the application portion of processing is in the client environment. The database management server usually provides the portion of the processing related to accessing data (often implemented in store procedures).
- Clients commonly communicate with the server through SQL statements or a call-level interface.

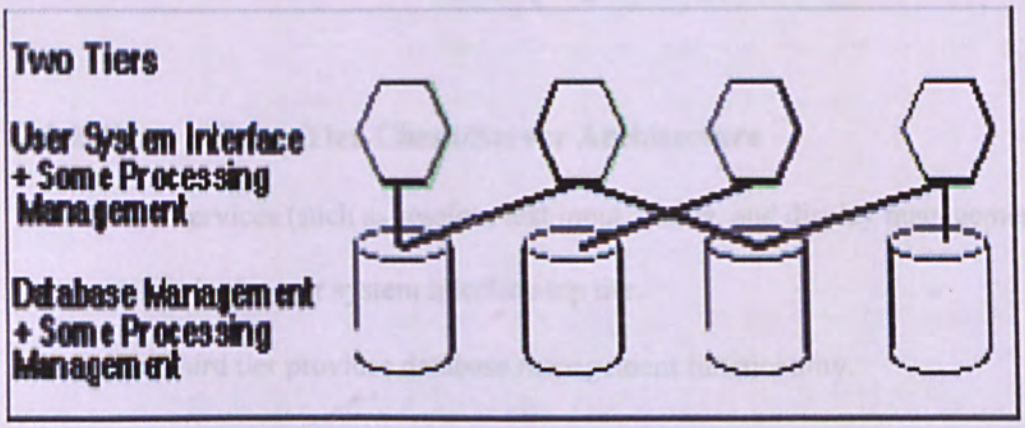


Figure 2.4 Two-Tier Client/Server System Architecture

Pros:

- Good solution for distributed computing when work groups are defined as a dozen to 100 people interacting on a LAN simultaneously.
- Only require minimal operator intervention.
- Inexpensive workstation software.
- A mature computing technology that is well known and used throughout industries.

Cons:

- When the number of users exceeds 100, performance begins to deteriorate. This limitation is a result of the server maintaining a connection via "keep-alive" messages with each client, even when no work is being done.
- Limited flexibility in moving (repartitioning) program functionality from one server to another without manually regenerating procedural code.

2.2.2.iii. Three-Tier Client/Server Architecture

- User services (such as session, text input, dialog, and display management) reside in the user system interface top tier.
- The third tier provides database management functionality.
- A middle tier was added between the user system interface client environment and the database management server environment. It provides process management services (such as process development, process enactment, process monitoring, and process resourcing) that are shared by multiple applications.
- The middle tier can perform queuing, application execution, and database staging. For example, if the middle tier provides queuing, the client can deliver its request to the middle layer and disengage because the middle tier will access the data and return the answer to the client.
- In addition the middle layer adds scheduling and prioritization for work in progress.

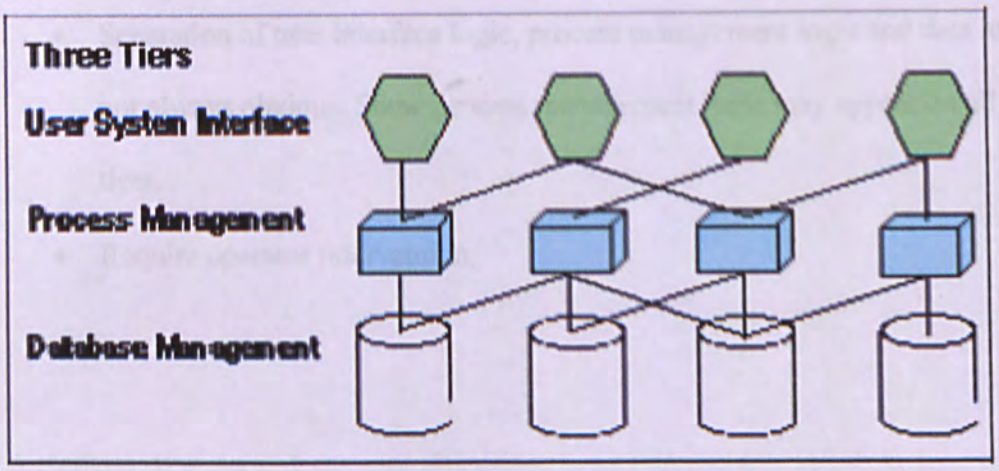


Figure 2.5 Three Tier Client/Server System Architecture

Pros:

- Support hundreds of users, more scalable than the two tier architecture.
- Dynamic load balancing: if bottlenecks in terms of performance occur, the server process can be moved to other servers at runtime.
- Allow different tiers to be developed in different languages, such as a graphical user interface language or light Internet clients (HTML, applets) for the top tier; C, C++, SmallTalk, Basic, Ada 83, or Ada 95 for the middle tier and SQL for much of the database tier.
- Suitable for real-time information processing in complex systems.

Cons:

- Building three tier architectures is complex work. Programming tools that support the design and deployment of three tier architectures do not yet provide all of the desired services needed to support a distributed computing environment.

- Separation of user interface logic, process management logic and data logic is not always obvious. Some process management logic may appear on all three tiers.
- Require operator intervention.

2.2.3 Application Platforms

Table 2.1 Operating System Statistics
(http://www.w3schools.com/browsers/browsers_stats.asp)

Operating System	Jul 02	Oct 02	Jan 03	Apr 03	Jul 03
Windows 98 / ME	64%	62%	60%	59%	40%
Windows XP					19%
Windows 2000	20%	24%	27%	29%	30%
Windows 95	4%	3%	2%	2%	2%
Windows NT	5%	4%	3%	3%	2%
MAC	1%	2%	2%	2%	2%

Operating systems that count for less than 0.5% are not listed.

Table above shows the statistics about the different types of operating system that used to browse the Internet from July 2002 to July 2003. This table shows that Microsoft Windows series operating systems are the dominant operating system that used to browse the Internet with more than 90% of Internet users are using these operating systems.

2.2.3.i. UNIX

- UNIX was developed by some of the members of the Multics (Multiplexed Information and Computing Service) team at the Bell Labs starting in the late 1960's by many of the same people who help created the C programming language.
- UNIX initially is called UNICS (UNiplexed Information and Computing Service).
- UNIX is primarily a command line oriented operating system. It is an open operating system.
- UNIX is not a single operating system, but a class of similar operating systems.

- The UNIX operating system is organized into three layers as below:

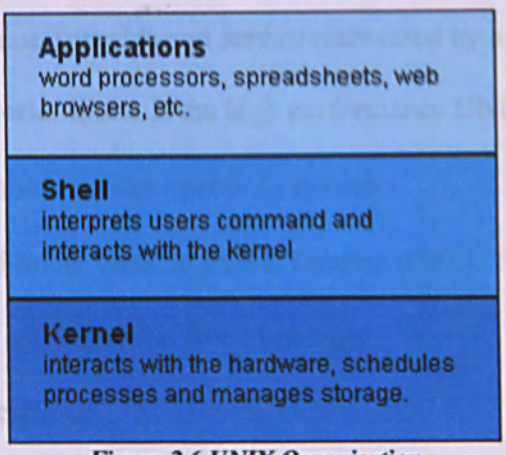


Figure 2.6 UNIX Organization

- Some of UNIX features:
  - The most seamless and stable multitasking environment.
  - Multiuser.
  - Ultimate computer programming environments by providing powerful C, C++, Fortran and Java compilers along with development tools for free.

Pros:

- A powerful and mature operating system and network-based platform.
- Large scalability and reliability.

Cons:

- It needs very powerful workstations to run.
- Most versions of UNIX or Variants of UNIX are very expensive.

2.2.3.ii. Linux

- Developed by Linus Torvalds and further elaborated by a number of developers throughout the world. Linux is the high performance UNIX like operating system.
- A free and open source codes operating system.
- Linux was placed under General Public License (GPL). The system can be distributed, used and expanded free of charge.
- Some of Linux features:
  - Protected 32bit Multi-user operating system.
  - Multitasking.
  - Multiplatform: runs on many different CPUs, not just Intel.
  - Memory protection between processes, so that one program can't bring the whole system down.
  - Support IPv6 networking.

Pros:

- Linux and Linux variants are less expensive to run.
- Issues and bugs are generally resolved more quickly then other operating system.
- Linux is available for free or for a small cost.

Cons:

- Availability of software and drivers are low.
- Linux is inherently unsafe because its source codes are exposing to everybody in the world including the malicious crackers and hackers.

2.2.3.iii. Microsoft Windows XP Professional

- The latest Microsoft personal computer operating system that release formally in year 2001.
- Windows XP Professional integrates the strengths of Windows 2000 Professional, such as standards-based security, manageability and reliability, with the best business features of Windows 98 and Windows Millennium Edition, such as Plug and Play, simplified user interface, and innovative support services.
- Some of the Windows XP Professional features:
  - Preemptive multitasking architecture.
  - Encrypting File System (EFS) with multi-user support.
  - Provide the IP Security (IPSec).
  - Wireless networking support.
  - Provide the Internet Connection Firewall.
  - Support peer-to-peer networking.

Pros:

- A stable, multipurpose, "user friendly" GUI operating system.
- It can be used as a server in networking.

Cons:

- Its 32-bit computing architecture cannot support some older 16-bit computing architecture software.
- Minimal system requirements to run this software are high compare to others OS.

2.2.4 Web Servers

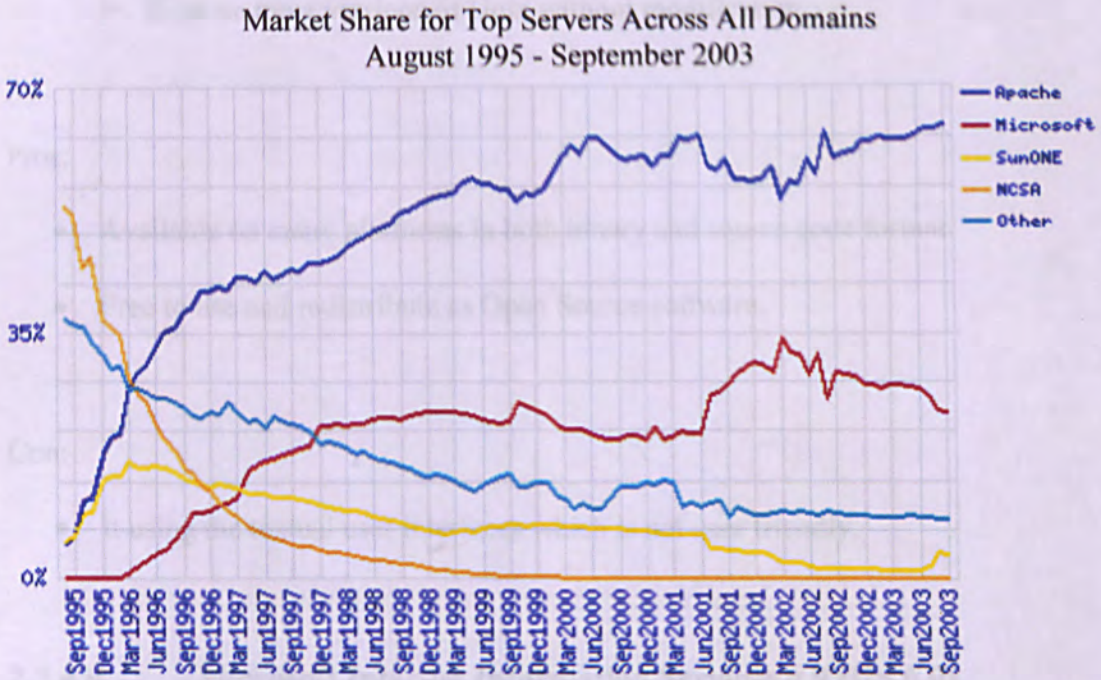


Figure 2.7 Web Servers Statistic (http://news.netcraft.com/archives/web_server_survey.html)

Figure above shows that Apache is dominating the web servers market with more than 60% servers in the market are the Apache products.

2.2.4.i. Apache HTTPD Server

- A free server that available at www.apache.org.
- Some of the Apache HTTPD Server features:
  - Powerful, flexible, HTTP 1.1 compliant web server that implements the latest protocols, including HTTP 1.1.
  - Highly configurable and extensible with third-party modules and can be customized by writing 'modules' using the Apache module API
  - Provides full source code and comes with an unrestrictive license.

- Unlimited numbers of Alias and Redirect directives.
- Runs on most versions of Unix without modification

Pros:

- Available on many platforms in both binary and source code format.
- Free to use and redistribute as Open Source software.

Con:

- It using the textual user interfaces which is not user friendly.

2.2.4.ii. Microsoft Internet Information Services 6.0 (IIS 6.0)

- Software services that support web site creation, configuration, and management, along with other Internet functions.
- Internet Information Services include Network News Transfer Protocol (NNTP), File Transfer Protocol (FTP), and Simple Mail Transfer Protocol (SMTP).
- It is a free component that bundles with Windows NT, Windows 2000 and Windows XP series.
- Some of IIS 6.0 features:
  - Uninterrupted TCP/IP connection.
  - Administration using graphical user interface (IIS Manager).
  - Support for Active Directory Service Interfaces (ADSI).
  - Binary and Unicode Transformation Format-8 (UTF-8) logging.
  - Buffer and memory-overflow protection

- Support for Secure Sockets Layer (SSL) 3.0 and Transport Security Layer (TSL).
- Provide XML Web Services.
- Support for ASP (Active Server Pages), ASP.NET and Microsoft .NET Framework.
- Support for IPv6

Pros:

- Reliable versatile web server.
- User friendly and using the graphical user interfaces.

Con:

- Only can run in Microsoft Windows series operating system. Do not support multiplatform.

2.2.4.iii. Netscape Enterprise Server 3.6

- Some of the Netscape Enterprise Server 3.6 features:
  - Support HTTP 1.1 and SSL hardware accelerators.
  - Helps ensure server availability with support for multiple processes and process monitors.
  - Increases server availability and reliability by automatically restarting failed server processes without administrator intervention.
  - Reduces server downtime by rotating server logs dynamically.

- Provides easy administration of multiple servers with cluster management
- Integrates with common management systems, including CA/Unicenter, HP OpenView, IBM/Tivoli TME, and Sun Solstice.
- Include built-in Java runtime with support for JDK 1.1 and support for object serialization, JDBC, and JavaBeans.

Pros:

- Multiplatform supports Sun Solaris, Windows series, Linux and etc.
- Stable, seldom requires rebooting and does not have system failures apart from potential hardware problems.

2.2.5 Web Browsers

Table 2.2 Web Browsers Statistics
(http://www.w3schools.com/browsers/browsers_stats.asp)

Browser Version	Jul 02	Oct 02	Jan 03	Apr 03	Jul 03
Internet Explorer 6.x	39%	45%	52%	57%	59%
Internet Explorer 5.x	51%	46%	39%	36%	34%
Internet Explorer 4.x	2%	2%	1%	1%	1%
Netscape 4.x	3%	2%	1%	1%	1%
Other Netscape compatible	1%	1%	1%	1%	1%
Opera					1%

Browsers that count for less than 0.5% are not listed.

Table above shows the web browsers that used to browse the Internet from July 2002 to July 2003. Microsoft Internet Explorer series browsers are dominating the browsers market with more than 90% Internet users are using Internet Explorer series.

2.2.5.i Internet Explorer 6.0

- A free product that comes along with Microsoft Windows series operating system. The latest version of Internet Explorer is Internet Explorer 6.0 that came along with Microsoft Windows XP.
- Some of the Internet Explorer 6.0 features:
  - Fault Collection that enables users to extract information about an Internet Explorer problem and upload the data to Microsoft for analysis.
  - Auto Image Resize.
  - Provides DHTML features to users in order to build a powerful user interfaces.
  - Full CSS (Cascading Style Sheets) Level 1 Support.

- Full DOM (Document Object Model) Level 1 Support.
- Enhanced SMIL (synchronized multimedia integration language) 2.0 multimedia support.
- Support for XML.
- Provide the Java VM (Virtual Machine).

Pro:

- A powerful and reliable Internet browser.

Con:

- Only can run in a few non Microsoft Windows series operating systems like Macintosh and UNIX.

2.2.5.ii. Netscape Navigator 7.1

- The second most famous web browser.
- A free web browser.
- Some of the Netscape Navigator features:
  - Java based terminal emulator.
  - Support Secure Sockets Layer (SSL) version 2 and 3.
  - Advanced preferences customization that can even customize the cache size.
  - Popup Controls.
  - Junk Mail Filtering.

- Address Book Palm Sync that synchronizes users' Address Book with their Palm handheld.
- Tabbed Browsing that allows users to browse multiple pages within a single browser window.
- Web Standards Compliance. Netscape 7.1 is the most standards compliant browser on the web today which supporting HTML, CSS, DOM, XML, SOAP, WSDL and many more.
- Uninstall feature is simple and thorough.

Pro:

- A stable multiplatform web browser.

2.2.5.iii. Opera

- Opera started out as a research project in Norway's telecom company, Telenor, in 1994, and branched out into an independent development company named Opera Software AS in 1995.
- Opera Software AS develops the Opera Web Browser and is an industry leader in the development of web browsers for the desktop and device markets.
- Some of the Opera features:
  - M2 mail client that automatically categorizes and sorts e-mail messages. It has an integrated spam filter and supports POP3, IMAP and ESMTP.
  - Built-in search utility.
  - Allows user interface customization and supports multiple user style sheets.

- Full screen and opera show that turn the browser into a full-screen mode and an advanced presentation tool.
- Supports Secure Socket Layer (SSL) versions 2 and 3, and Transport Layer Security (TLS).

Pros:

- Small, yet full-featured and functions well on systems with limited resources.
- Fastest browser in the world.
- Cross-platform that supports Windows, Linux, Macintosh, FreeBSD, QNX, OS/2, Solaris, and Symbian (for mobile phones).

Con:

- Its users are limited compares to Internet Explorer and Netscape.

2.2.6 Programming Languages

2.2.6.i Active Server Pages .NET (ASP .NET)

- ASP is a server side scripting technology that enables scripts (embedded in web pages) to be executed by an Internet server.
- ASP .NET is the next generation ASP. It is an entirely new paradigm for server-side ASP scripting.
- ASP .NET is a part of the new .NET (dot net) Framework. It is not fully backward compatible with previous ASP versions.
- The .NET Framework is a common environment for building, deploying, and running Web applications and Web Services.
- The .NET Framework contains a common language runtime and common class libraries like ADO .NET, ASP .NET and Windows Forms in order to provide advanced standard services that can be integrated into a variety of computer systems.
- ASP .NET has better language support, a large set of new controls and XML based components, and better user authentication.
- Some oh the ASP .NET features:
  - Event Driven Programming
  - Contains a new set of object oriented input controls, like programmable list boxes, validation controls.
  - Rich Class Framework.

- Compiled execution. ASP.NET will automatically detect any changes, dynamically compile the files if needed, and store the compiled results to reuse for subsequent requests.
- Rich output caching.
- Memory Leak, Deadlock and Crash Protection. It automatically detects and recovers from errors like deadlocks and memory leaks to ensure the application is always available to the users.
- Dynamic update of running application.
- Support for XML Web Services.
- Mobile Web Device Support.

Pro:

- A powerful and reliable server side scripting language.

Con:

- Do not fully backward compatible with previous ASP versions.

2.2.6.ii. PERL

- PERL -- Practical Extraction and Report Language is a high-level programming language optimized for scanning arbitrary text files, extracting information from those text files, and printing reports based on that information.
- One of the most popular languages for writing CGI (Common Gateway Interfaces) scripts.

- Some of PERL features:
  - Multiplatform language.
  - Unlimited strings and data structures, nested to any depth.
  - Support for namespaces, classes, and objects.
  - Object-oriented programming.
  - Modularity and reusability using innumerable modules.
  - Compilability into C code or PERL byte code.
  - Support for light-weight processes (threads).

Pro:

- An ideal language for writing CGI script.

2.2.6.iii. JSP

- JSP or Java Server Pages is Sun's solution for developing dynamic web sites.
- JSP provide excellent server side scripting support for creating database driven web applications.
- JSP enable the developers to directly insert java code into jsp file, this makes the development process very simple and its maintenance also becomes very easy.
- JSP pages are efficient, it loads into the web server's memory on receiving the request very first time and the subsequent calls are served within a very short period of time.

2.2.7 Authoring Tools

2.2.7.i Microsoft FrontPage 2002

- A part of the Microsoft Office XP family.
- An HTML editor that is suitable for small projects, not for heavy web site design.
- Some of the Microsoft FrontPage 2002 features:
  - Inline Frames via HTML 4-based support
  - Provides Speech Recognition that allows user automates his/her common tasks by telling FrontPage what he/her wants it to do.
  - Provides Hand Writing Recognition.
  - Usage Analysis Reports that allowing user to quickly find what pages are getting the most hits and how customers find the site.
  - Supports XML Formatting.
  - Built-in FTP Support that used to publishing to servers that don't run FrontPage Server Extensions.

Pro:

- User friendly, simple and less complex HTML editors.

Con:

- Less powerful HTML editor compare to others.

2.2.7.ii. Macromedia Dreamweaver MX

- An HTML editor for professional Web site design.
- The program allows advanced design, without dealing with HTML code all the time.
- Some of the Macromedia Dreamweaver MX features:
  - Rich CSS support.
  - Use one integrated development environment to develop HTML, XHTML, XML, ASP, ASP.NET, JSP, PHP, and Macromedia ColdFusion websites.
  - Leverage Secure FTP to fully encrypt all file transfers and prevent unauthorized access to user's data, files contents, usernames, and passwords.
  - Supports advanced DHTML.
  - Supports dynamic generated pages and databases.
  - Provides complete HTML debugger.
  - Built-in animation capability.

Pro:

- A very powerful HTML editor.

2.2.7.iii. Microsoft Visual Studio .NET

- Run on the .NET Framework.
- It is an integrated development environment that used to build a web application and other computer applications.

- It includes various programming languages such as Visual Basic .NET, Visual C++ .NET, Visual C# .NET and ASP .NET.
- Some of Microsoft Visual Studio .NET features:
  - Provides various programming languages that can be integrated with each others.
  - Full UML 1.2 Modeling that including Use Case, Activity, State, Component, Class and Deployment diagram.
  - Provides integrated debugger that supports cross-language, cross-process and remote debugging
  - Visually design XML Web services.
  - Provide automated testing capabilities.
  - Provide XML Designer that working with XML and XSD files.
  - Provide Form Inheritance that allows standard forms to be inherited and extended.

Pros:

- Multiple programming languages support.
- A powerful tool to create various types of computer applications.

Con:

- Only can run in Microsoft Windows series operating system. Do not support multiplatform yet.

2.2.8 Database Management Systems

2.2.8.i. Microsoft Access 2002

- A relational database management system (RDBMS) that used to create and manage the relational database.
- A part of the Microsoft Office XP family.
- Some of the Microsoft Access 2002 features:
  - Provides database wizard that help the novice users to create their own database.
  - Provides Speech Recognition that allows user to dictate text and navigate menus using speech and voice commands.
  - Compact and Repair functionality that recovers files with broken forms and reports.
  - Provides encryption services that allows user to encrypt his/her database.
  - XML Support.
  - Bind Data Access Pages to Embedded or Linked XML Files

Pro:

- User friendly and simple database.

Con:

- Low scalability therefore it is not suitable for medium or large business applications.

2.2.8.ii. Microsoft SQL Server 2000

- A client/server relational database management system (RDBMS) that is highly integrated with the Windows NT, Windows 2000 and Windows XP operating system.
- Designs for small and medium business applications.
- Some of the Microsoft SQL Server 2000 features:
  - High scalability that can support database size up to 1,048,516 TB.
  - Provides Analysis (OLAP) Services and Data Mining.
  - Data Transformation Services (DTS) that automates extract, transform, and load data routines from heterogeneous sources.
  - Using English Query.
  - Rich XML Support.
  - Enables Web Access to Data.
  - Provides Web and Application Hosting.

Pro:

- High scalability and reliable database management system.

2.2.8.iii. MySQL

- The most popular Open Source SQL database that developed, distributed and supported by MySQL AB.
- MySQL AB is a commercial company, founded by the MySQL developers, that builds its business providing services around the MySQL database.
- MySQL is a relational database management system (RDBMS).
- Some of the MySQL features:
  - Written in C and C++.
  - Fully multi-threaded using kernel threads. This means it can easily use multiple CPUs if available.
  - Easy to add another storage engine.
  - All ODBC 2.5 functions are supported.
  - Clients may connect to the MySQL server using TCP/IP Sockets, Unix Sockets (Unix), or Named Pipes (NT).

Pro:

- Works on many different platforms.

2.2.9 Data Access Technology

2.2.9.i. ODBC (Open DataBase Connectivity)

- The most widely supported standard for data access.
- It based de-facto standard and de-jure standards: the SAG CLI and ANSI/92 SQL.
- Client-side ODBC drivers are available for Windows, UNIX, Macintosh and other environments. It also available for a large number of databases, both relational and non-relational.
- The ODBC can access data from multivalue system regardless of the hardware, DBMS, operating system or communication protocol used.
- Some ODBC drivers require users' data to be very well structured with all multivalue defined with association values before they will access the data correctly.
- ODBC will be suitable to use when:
  - Client applications are Win32 only.
  - Client applications all support ODBC and users have an available ODBC driver for their database platform.

2.2.9.ii. OLE DB (Object Linking and Embedding DataBase)

- This technique unlike ODBC, it is not standards based. It is a standard that was intended for Win32 and ActiveX in particular.
- OLE DB supports both Microsoft Connection Pooling and Distributed Transactions.
- OLE DB interacting directly with the data store.
- One of the wonderful strengths of OLE DB is the ability to using Microsoft Visual Studio 6.0 wizards to create an OLE DB consumer object that consumes an OLE DB driver. Users can build ActiveX components and include them in a same package with OLE DB. By using MTS (Microsoft Transaction Server), this package can be configured to remote the ODBC calls so that instead of installing the OLE DB drivers on all the clients, they are installed on a server.
- Very few applications support OLE DB drivers, unless they have full ODBC-style query support. But OLE DB drivers with that level of support are presently few.
- OLE DB will be suitable to use when:
  - User is planning to access data on Win32 platforms only.
  - User is a Visual Basic or Visual C++ developer with a need to create custom applications to access multivalued data.

2.2.9.iii. ADO .NET (ActiveX Data Objects .NET)

- The latest Microsoft technology that provides consistent access to data sources such as Microsoft SQL Server, as well as data sources exposed through OLE DB and XML.
- Data-sharing consumer applications can use ADO.NET to connect to these data sources and retrieve, manipulate, and update data.
- ADO.NET cleanly factors data access from data manipulation into discrete components that can be used separately or in tandem.
- ADO.NET includes .NET Framework data providers for connecting to a database, executing commands and retrieving results. Those results are either processed directly or placed in an ADO.NET DataSet object in order to be exposed to the user in an ad-hoc manner, combined with data from multiple sources or remotes between tiers.
- The DataSet contains a collection of one or more DataTable objects made up of rows and columns of data, as well as primary key, foreign key, constraint, and relation information about the data in the DataTable objects.
- The ADO.NET DataSet object can also be used independently of a .NET Framework data provider to manage data local to the application or sourced from XML.
- ADO .NET will be suitable to use when:
  - Users developing project in Microsoft .NET Framework.
  - Users are using the .NET technologies.

2.3 Chapter Summary

This chapter has been analyzed the current existing system and some other existing systems that similar with the proposed system. All the systems have their own strengths and weaknesses. So the proposed system will adopt these system strengths and aware the weaknesses of that systems.

This chapter also studies and reviews some of the technologies that available for development models, system architectures, application platforms, web servers, web browsers, programming languages, authoring tools, database management systems and data access technologies. All of these technologies have their own strengths and weaknesses and the suitable conditions to use.

Chapter 3: Methodology

3.1 Methodology Consideration

Methodology is a very formal and precise system development process that defines a set of activities, methods, best practices, deliverables and automated tools for system developers and project managers to use to develop and maintain software system.

The main objective of using a methodology is to make the system development process productive, efficient and produce a high quality product. Methodology reduces the risk of failure in system development process. Methodology also produces complete and consistent documentation from one project to the next. This will make the future system maintenance becomes easier and faster.

3.1.1 Benefits of Good Methodology

A good methodology should be able to provide the following advantages to the developers:

- Helps to produce a better quality product, in terms of documentation standards, acceptability to the user, maintainability and consistency of software.
- Help to ensure that the user requirements are met completely.
- Helps the project manager by giving better control of project execution and a reduction in overall development costs.
- Promote communication between project participants by defining essential participants and interactions and by giving a structure to the whole process.

- Encourage the transmission of know-how throughout an organization by the standardization of process and documentation.

3.1.2 Conclusion on Development Methodology

The system development methodology used in developing the "E-Book Store for University of Malaya" is Unified Software Development Process (USDP). The USDP has been developed by the team that created UML (Unified Modeling Language). USDP adopts the object oriented concept. It divides the development process into four main phases which are: Inception, Elaboration, Construction and Transition. Iterative approaches are adopted in each phases. Within each phase, the development activities are carried out in an iterative manner as: *Do some investigation, model the requirements, analyze them, do some design, do some coding, test the code then repeat the whole process.* All four phases include the full range of workflows from requirements to testing, but the emphasis that is given to each workflow changes between the phases. In the earlier phases, the emphasis lies more on the capture, modeling and analysis of requirements, while in the later phases the emphasis moves towards implementation and testing.

The following figure shows the visual layout of the USDP model:

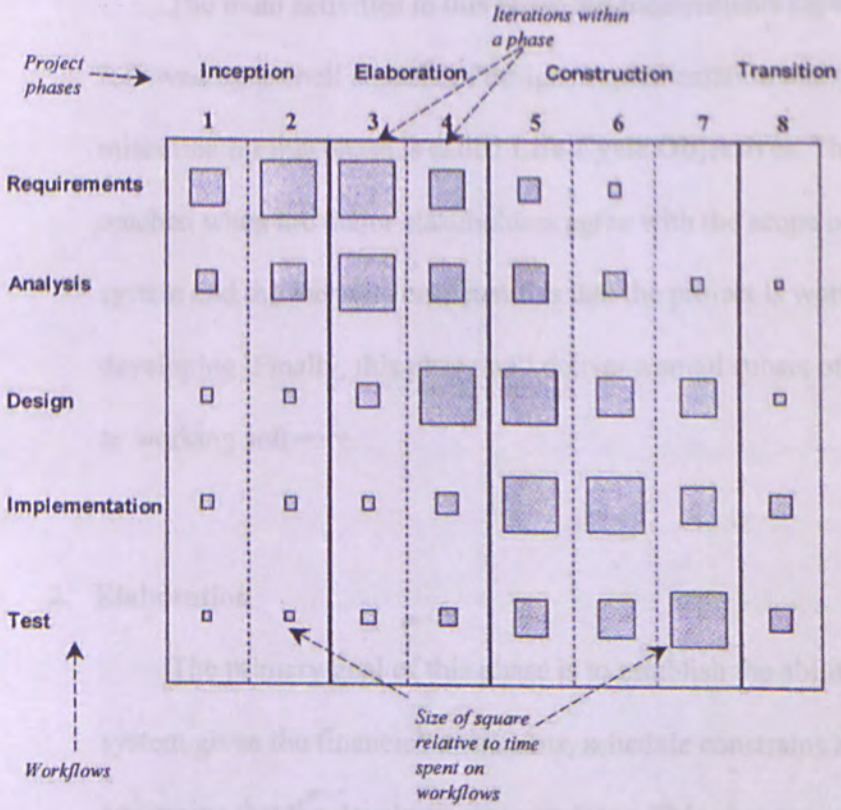


Figure 3.1 USDP Model

The Four Phases of USDP:

1. **Inception**

During this phase, the potential risks of the project in comparison with its potential benefits are assessed in order to determine the project viability and feasibility. The critical risks will be identified and be determined when and how the project will handle them. Then, the project team will start to make the business case to proof that the project is worth doing based on the initial estimates of cost, effort, schedule and product quality. The scope of the system will be defining in this phase.

The main activities in this phase are requirements capture and analysis, followed by a small amount of design, implementation and testing. The major milestone for this phase is called **Life-Cycle Objectives**. This milestone is reached when the major stakeholders agree with the scope of the proposed system and the business case justifies that the project is worth for continue developing. Finally, this phase will deliver a small subset of the requirements as working software.

2. Elaboration

The primary goal of this phase is to establish the ability to build the new system given the financial constraints, schedule constrains and other kinds of constrains that the development team faces. This phase try to reduce the cost uncertainties. This is done by producing a design for a suitable system that demonstrates how it can be built within an acceptable timescale and budget. This phase emphasis design activities and the proportion of time spent on these activities increases significantly.

During this phase, the project team will capturing a healthy majority of the remaining functional requirements, identify the significant risks on an ongoing basis, finalizing the business case for the project and preparing a project plan that contains detail sufficient to guide the next phase of the project. The major milestone for this phase is called **Life-Cycle Architecture**. This milestone is reached when most of the functional requirements for the new

system have been captured in the use case model and the project team has an initial project plan that describes how the Construction phase will proceed.

3. Construction

This phase concentrates on building a system (through a series of iterations) that is capable of operating successfully within its target environments and in beta customer environments. Implementation and testing become the core activities in this phase. The project team will build the system iteratively and incrementally in order to make sure that the viability of the system is always evident in executable form. The major milestone for this phase is called **Initial Operational Capability** and is reached if a set of beta customers has a more or less fully operational system in their hands.

4. Transition

This final phase concentrates on achieving the intended full capability of the system. During this phase, the project team focus on correcting defects and modifying the system to correct previously unidentified problems or problems that have emerged late in the project. It could also include system conversion, if an older system is being replaced. The major milestone for this phase is called **Product Release**.

(Scott, Kendall. 2001)

3.1.3 Justification on Methodology

The reasons for choosing USDP as the development methodology are:

- **Iterative**

  The five workflows, Requirements, Analysis, Design, Implementation and Test are performing iteratively in each phase of the USDP model. This means the tasks in each phase have being tested and refining during each iteration. This will reduce the risk of software failures.

- **Incremental**

  After each phase in USDP finished, a small increment will be delivered. This will allow the customer to use and experience the proposed system from a small aspect at an earlier stage of development. This increment can act like a prototype that used to elicit further requirements from customer. The risk of overall project failure also can be reduced because at least some services of the system will be successfully delivered to the customer. Besides that, frequent releases of increment allow problems to be fixed quickly.

- **Requirements Driven**

  USDP model uses a lot of techniques to capture the user requirements. These techniques are Use Case Modeling, Class and Object Modeling, Sequence Modeling and etc. This will gain the more precise users' requirements and therefore produce a system that can fulfill all the users' requirements.

3.2 Information Gathering Methods

Information gathering is an important step in software development process because it used to elicit and determine the stakeholders' requirements. The precise and clear requirements are important in building a new system because a system will be considered fails if it cannot meet the stakeholders' requirements. Besides that, the requirements are used to determine the system functionalities and behaviors.

There are many methods that used to gather information such as observation, analysis of existing system, interview, questionnaire, brainstorming, document inspection, background reading, joint application design (JAD) and etc. All of these methods have their own strengths and will be used based on the project type.

This project used four methods to gather information. These four methods are background reading, analysis of existing system, interview and questionnaire. These methods had been performed at different time on different stakeholders.

- **Background reading**

  The Pekan Buku background had been studied and analyzed in order to determine its characteristic and functionalities. This is important in determine the project scopes and the system users groups.

- **Analysis of existing system**

  The current Pekan Buku manual system and several similar existing systems had been analyzed. The detail about this analysis had been elaborated in Chapter 2.

The common functionalities of these systems had been determined via this analysis.

- **Interview**

Several informal interviews had been performed. The interviewees are from different groups of system users. Questions about the Pekan Buku, problems with existing manual system and the desire new system had been asked. The table below shows the information about the interviews:

Table 3.1 Information about Interview

User Group	User Name and Position	Date and Time	Place
Lecturer	Ms. Azwina Mohd Yusof, Lecturer from FSKTM	3 September 2003, 2.00p.m.	FSKTM
Administrator	Ms. Maimunah Lassim, Customer Service from Pekan Buku	16 July 2003, 3.00p.m	Pekan Buku, UM
Student	Lim Poh Tiong, Student from FSKTM	20 July 2003, 1.00p.m.	Desa Persona
	Teo Soon Tong, Student from Faculty of Engineering	22 July 2003, 3.00p.m.	Interviewee's home
	Yap Boon Kiat, Student from Faculty of Science	10 August 2003, 7.00p.m.	Interviewee's home

- **Questionnaire**

Questionnaire had been performing on 100 students from different faculties in University of Malaya. The target of this questionnaire is the students because

they are the majority system users. The sample of questionnaire had been appended in Appendix. This questionnaire is trying to elicit the functional requirements of this system.

3.3 Conclusion on Tools and Technology

After studies and analyzes all the technologies that stated in Chapter 2, the most suitable and appropriate tools for developing the proposed system are identified and selected. Following are the tools and technologies that had been selected:

- **Application Platform**

  Microsoft Windows XP Professional was chosen because it provides the "User Friendly" graphical user interfaces. It is a reliable and stable operating system that supports the networking application. Besides that, Windows XP Professional supports almost all of the software in the market. There are many software and hardware manufacturers design their products for Windows XP Professional.

- **Web Server**

  Microsoft Internet Information Services 6.0 (IIS 6.0) was chosen because it fully supports and integrates with Microsoft Windows XP Professional and provides powerful security, administration and development functionalities. It is a free component that bundles with Windows XP. It supports various networking technologies such as SSL 3.0, TSL, IPv6 and etc.

- **Web Browser**

  Internet Explorer 6.0 was chosen because it supports various types of web technologies such as DHTML, CSS, DOM, SMIL, XML and etc. Besides that, it is the most famous web browser in the world and further more it is free component that bundles with Windows XP.

- **Programming Language**

  ASP .NET was chosen because it is a powerful server site scripting language that can be used to make both static and dynamic web system. It is an event driven programming language. It has rich set of libraries support and well integrates with Windows XP.

- **Authoring Tool**

  Microsoft Visual Studio .NET is chosen because it is the best tool in writing the ASP .NET application. Besides that, ASP .NET is the default language that provided by this tool. This tool is an integrated development environment that used to build various types of web and non web applications.

- **Database Management System**

  Microsoft SQL Server 2000 was chosen because of it high scalability that can support database size up to 1,048,516 TB. It is a high performance database management system that can support up to 50 concurrent users to use at the same

time. So, it is suitable for small to medium size business application. It is also working well under the Windows XP environment.

- **Data Access Technology**

  ADO. NET was chosen because this proposed system is developing using .NET technology. ADO .NET provides consistent access to data sources such as Microsoft SQL Server, as well as data sources exposed through OLE DB and XML. Besides that, it is the best technology that used to access data under the .NET environment.

3.4 Chapter Summary

The USDP model has been chosen as the development model for this proposed system because USDP is iterative, incremental and requirements driven.

Four different methods have been chosen to gather information. These methods are Background Reading, Analysis of Existing System, Interview and Questionnaire.

Microsoft Windows XP Professional, Microsoft Internet Information Services 6.0 (IIS 6.0), Internet Explorer 6.0, ASP .NET, Microsoft Visual Studio .NET, Microsoft SQL Server 2000 and ADO .NET have been chosen to develop the proposed system.

Chapter 4: System Analysis

4.1 System Requirements Analysis

System requirements analysis is an important phase in software development process. This phase will determine the proposed system's functionalities and behaviors. A complete and successful system requirements analysis will reduce the project failure possibility.

4.1.1 Results from Information Gathering Methods

Below are the results of information gathering methods that had been discussed in Chapter 3:

- **Background reading**
  - The majority Pekan Buku customers are students.
  - The non university members or the public also are the Pekan Buku customers.
  - Lecturers order academic books for students via Pekan Buku.
  - Pekan Buku currently do not has its own web site.
  - Books reservation is a "conventional" service that provided by Pekan Buku and need to be preserved for future new system.

- **Analysis of existing system**
  - Search books function is a common function in all e-book store systems.
  - All the books that selling in e-book store systems is arranged properly according to their categories and types.
  - Rate books function is a famous function in e-book store systems.
  - "User Friendly" is an important concept in designing an e-book store.

- **Interview**

Below are the important questions that had been asked during these informal interviews and their associated answers from the respective interviewees.

(**Q:** Question, **A:** Answer)

Lecturers

- **Q: Do you face any problem when you dealing with Pekan Buku?**

  A: Feel inconvenience during the ordering books process because need to follow a series of procedures.

- **Q: What are the procedures that you meant?**

  A: The procedures are: I call publisher to order a certain amount of academic books. Publisher goes to Pekan Buku to get an "Adoption Form". Then, publisher asks me to confirm the books ordering by sign in the "Adoption Form". After that, publisher returns the form to Pekan Buku and Pekan Buku will order 70% of the books amount from publisher.

- **Q: What things do you want the new system to do for you?**

  A: I want the new system to eliminate all these procedures by allowing me to directly reserve the books at Pekan Buku via the Internet.

Administrators

- **Q: What type of system you need?**

  A: I need a web based system that can publish the Pekan Buku in store books at the Internet.

- **Q: What other features you want from the new system?**

  A: I want a system that can keep the books sales record.

Students

- **Q: What improvement that you wish from Pekan Buku?**

  A: I wish Pekan Buku has a web based system that will allow us to check our desire books availability via the Internet.

- **Q: What features you want from the new system for Pekan Buku?**

  A: I want to reserve books from the system via the Internet.

- **Q: Any other features you want from the new system?**

  A: I wish the new system can provide a books sales ranking

- **Questionnaire**

  Number of participants: 100 persons

Table 4.1 Questionnaire Results

Questions	Answers	
	Yes (person)	No (person)
1. Do you ever visit Pekan Buku before?	97 (97%)	3 (3%)
2. Do you have your own credit card?	12 (12%)	88 (88%)
3. Do you ever using the Internet before?	98 (98%)	2 (2%)
4. Do you ever visit any on-line book store (for example: Amazon.com) before?	70 (70%)	30 (30%)
5. Do you ever buy any thing from the Internet or do any on-line transaction?	4 (4%)	96 (96%)
6. Do you wish Pekan Buku to provide its services on-line?	91 (91%)	9 (9%)

Question	Number of person
7. If Pekan Buku provides its services on-line, please choose the services that you wish to obtain from the list below: (You may choose more than one services.)	
A. Search books	100 (100%)
B. Reserve books	84 (84%)
C. Books sale ranking	84 (84%)
D. Rate the books	78 (78%)
E. On-line transaction using credit card	33 (33%)
F. Others	12 (12%)

4.1.2 Conclusion of the Results from Information Gathering Methods

- **Background reading**
  - Pekan Buku has three types of customers who are students, public and lecturers.
  - Pekan Buku need a web based system.
  - Books reservation is a functional requirement for the proposed system.

- **Analysis of existing system**
  - Search books function is a functional requirement for the proposed system.
  - The proposed system should provide rate books function.
  - The proposed system should "User Friendly".

- **Interview**
  - The proposed system should be a web based system.
  - The proposed system should allow lecturers and students to reserve books.
  - The proposed system should be able to generate sales report.
  - The proposed system should allow users to view the books sales ranking.

- **Questionnaire**
  - Most of the students have been visiting Pekan Buku. They do not have their own credit card. Most of them using the Internet and visited on-line book

stores before but do not buy any thing from the Internet. They wish to have an on-line Pekan Buku.

- The proposed system should provide search books function, reserve books function, books sales ranking and rate books function.
- On-line transaction using credit card is an optional function for the proposed system.

4.1.3 Functional Requirements

- **User Identification Function**

  Provide a login procedure that used to identify user's group. It is because this system has four types of users' groups which are: Administrators, Lecturers, Students and Public (Non Universities Members). Each group has different authority in using this system. This procedure will be implemented by asking user to provide his/her User ID and Passwords during login.

- **Search Books Function**

  Provide a search engine to users to search their desire books in this system. This function is important because it gives users alternative way to find their desire books if they failed to find the books by browsing into the book category. This function also can help users to find their desire books faster compare to find the books by browsing into each book category. This search engine will provide multiple ways to search books like searching books according to their title, author, publisher, ISBN, year of publish, category or title keywords.

- **Reservation Function**

  This system will provide two types of reservation functions for the users according to their group. First reservation function is for the lecturers. Lecturers can use this function to reserve the academic books that will be using by the students who taking their courses. Under this function, lecturers can reserve a massive amount of books for example more than 200 copies of books that are not available in this system. Another reservation function is for the students and public. Students or public can use this function to reserve the books that are available or not available in this system. But this function will limit the users' books reservation to maximum 10 books per person.

- **View Books Sales Ranking Function**

  This function allows the users to view the books sales ranking from this system. Users will know which the hot selling books are in this system via this function. The results in this function are provided by the administrators and the administrators are the persons who are allowed to modify the results.

- **Rate Books Function**

  This function allows the users to rate the books that they had read but with condition. The condition is: only the books which are currently available in this system can be rated. The rating scale is from 1 to 5 which 1 represents the lowest satisfaction and 5 represents the highest satisfaction. User is not allowed to rate the same book more than one time.

- **Sales Report Generation Function**

  This function is used by administrators to generate the books sales report for certain period. The sales report includes the amount of books from different categories that had been sold for certain period. This report also including the best selling book from different categories, each book selling status and the total of books from all categories that had been sold for certain period. This report will be used to generate the books selling ranking from this system.

4.1.4 Non-Functional Requirements

- **Reliability**

  This system should be reliable. It means that: the failure effect of this system must be in an acceptable range. When a failure occurs in a process in this system, other processes in the same system should not be affected. For example, one client of this system "hangs", the other clients of the same system should not be affected by this failure and can continue operates. This system should recover from failures within 24 hours in order to be reliable.

- **Maintainability**

  This system must be easy to maintain by the administrators. It is because this system needs to be updated frequently. New books are publishing almost every day. So, administrators have to upload the new books into this system and unload the obsolete books from the system frequently.

- **Speed**

  The response time for this system must be fast. It is because users will feel bore when the response time for processing data is too long. They will finally leave the system because of the slow response time. So, the modules in this system like search engine, reservation and sales report generation functions must give response to user within 10 seconds after the user did request. The downloading time for this system into user computer should be fast and the ideal time is within 15 seconds.

- **User Friendly**

  This system should be easy to use. This can be achieved by mimicking the existing systems design like the Amazon.com. It is because the users are already familiar with the existing system design. They will feel easy and comfortable to use a new system which design is similar with the existing system. The interfaces design should not be too complex. It is because users need extra time to adapt the "extraordinary" interfaces design. This system will use soft and cool colours like white and light blue as system interfaces main colours. It is because users will not easily feel tired when facing with these colours for long time if compares with the hot colours like red and yellow.

- **Robust**

  This system should response to any unexpected inputs from the users and should not "hang" due to the unexpected inputs. For example: there is a field in a client

site form that only receives numeric input, but the user key in a character string. Instead of "hangs", this system should operate normally by tell the user that he / she entered a wrong input and ask he / she to reenter the input. This can be done by performing the validation checks on the user input before submit the client site form to server site. Any unexpected or incorrect inputs from the user will be responded by prompting an error message and ask the user to reenter the inputs.

- **Learn ability**

  This system should be easy to learn. This means that the administrators will be able to master this system within one week. This can be done by design the system base on the "User Friendly" concept and mimicking other similar existing systems.

4.1.5 Use Case Diagram

A use case diagram shows the interactions between the actor and use case. It used to modeling the dynamic aspects of system. Use case diagram also used to modeling the behaviour and context of a system, a subsystem or a class. Use case diagram is important for visualizing, specifying and documenting the behavior of a system.

Below are the basic symbols used in use case diagram, their name and meanings:

Table 4.2 Description of Use Case Diagram Components

Symbol	Name	Meaning
	Actor	A role that a user can play with regard to a system. An entity that resides outside the system.
	Use Case	A sequence of actions that an actor performs within a system to achieve a particular goal.

The following shows the use case diagram for E-Book Store for University of Malaya:

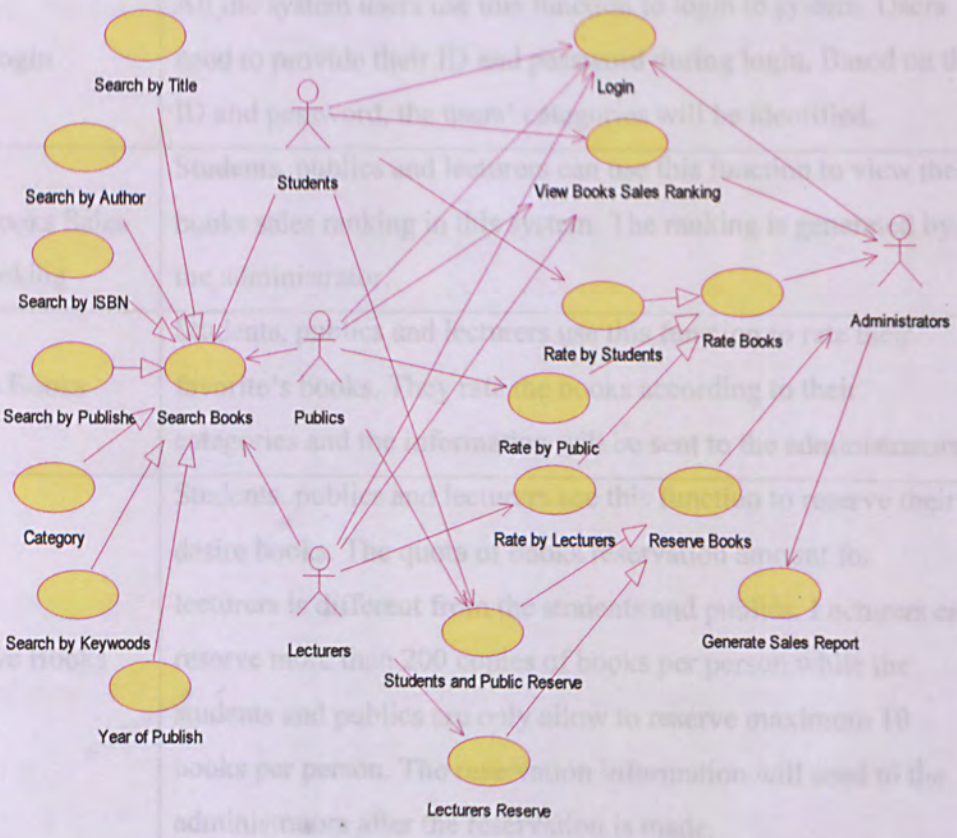


Figure 4.1 Use Case Diagram for E-Book Store for University of Malaya

Table 4.3 Actors of Use Case Diagram Component

Actor	Description
Students	Students from University of Malaya.
Publics	Non University of Malaya members or residents.
Lecturers	Lecturers from University of Malaya.
Administrator	Administrators for the system and also Pekan Buku staffs.

Table 4.4 Use Cases of Use Case Diagram Component

Use Case	Description
Login	All the system users use this function to login to system. Users need to provide their ID and password during login. Based on the ID and password, the users' categories will be identified.
View Books Sales Ranking	Students, publics and lecturers can use this function to view the books sales ranking in this system. The ranking is generated by the administrator.
Rate Books	Students, publics and lecturers use this function to rate their favorite's books. They rate the books according to their categories and the information will be sent to the administrators.
Reserve Books	Students, publics and lecturers use this function to reserve their desire books. The quota of books reservation amount for lecturers is different from the students and publics. Lecturers can reserve more than 200 copies of books per person while the students and publics are only allow to reserve maximum 10 books per person. The reservation information will send to the administrators after the reservation is made.
Generate Sales Report	Administrators use this function to generate books sales report for particular period.
Search Books	Students, publics and lecturers can use this function to search their desire books. They can search the book according to the book's title, author, ISBN, publisher, category, keywords and year of publish.

4.2 Tools and Technologies Proposed

Following are the tools and technologies that used to develop this system:

4.2.1 Hardware

Processor:	Intel Pentium 4, 1.4GHz
RAM:	128MB
Hard Disk Spaces:	40GB
Monitor Screen Resolution:	1024 x 768 pixels

4.2.2 Software

Operating System (OS):	Microsoft Windows XP Professional
Web Server:	Microsoft Internet Information Services 6.0 (IIS 6.0)
Web Browser:	Internet Explorer
Programming Language:	Active Server Pages .NET (ASP .NET)
Authoring Tool:	Microsoft Visual Studio .NET
Database Management System:	Microsoft SQL Server 2000

4.3 Run Time Requirements

Following are the tools and technologies that needed to run and deploy this system:

4.3.1 Hardware Requirements

Processor:	Any processor with speed 300MHz or faster
RAM:	128MB (256MB or higher is better)
Hard Disk Spaces:	20GB (bigger hard disk spaces is better because the system database will keep growing due to the growing of amount of books in stock and the users population.)

4.3.2 Software Requirements

Operating System (OS):	Microsoft Windows NT, 2000 or XP Series
Web Server:	Microsoft Internet Information Services 6.0 (IIS 6.0)
Web Browser:	Any web browsers (Internet Explorer is highly recommended)
Authoring Tool:	Microsoft Visual Studio .NET
Database Management System:	Microsoft SQL Server 2000

4.4 Chapter Summary

The functional and non functional requirements for the proposed system had been identified in this chapter. The functional requirements for this system are User Identification Function, Search Books Function, Reservation Function, View Books Sales Ranking Function, Rate Books Function and Sales Report Generation Function.

The non functional requirements for this system are Reliability, Maintainability, Speed, User Friendly, Robust and Learn ability.

The hardware and software requirements for this system had also been determined in this chapter.

Chapter 5: System Design

5.1 System Architecture

The E-Book Store for University of Malaya adopts the Two-Tier Client/Server Architecture because Pekan Buku is a medium business. The users that will access to the proposed system simultaneously are predicted less than 100 people. This amount is affordable for the Two-Tier Client/Server Architecture.

Besides that, the proposed system is not real time information processing system. The proposed system is a normal web based system that only requires minimal operator intervention. So the Two-Tier Client/Server Architecture is an ideal architecture for this proposed system. The cost for implementing this architecture is not too expensive yet this architecture is easy to implement.

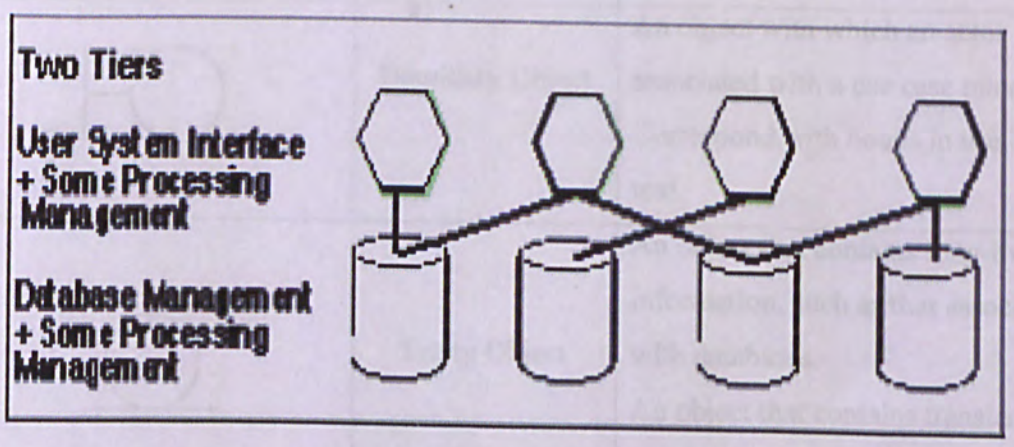


Figure 5.1 Two-Tier Client/Server System Architecture

5.2 System Functionality Design

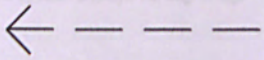
5.2.1 Sequence Diagram

Sequence diagram is a diagram that focuses on the time ordering of the messages that go back and forth between objects. The development team uses sequence diagrams in deciding where to assign operations on classes based on the methods that they assign to objects on the diagram. (Scott Kendall 2001).

Below are the basic symbols used in sequence diagram, their name and meanings:

Table 5.1 Description of the Sequence Diagram Components

Symbol	Name	Meaning
	Actor	A role that a user can play with regard to a system. An entity that resides outside the system.
	Boundary Object	An object with which an actor associated with a use case interacts. Correspond with nouns in use case text.
	Entity Object	An object that contains long-lived information, such as that associated with databases. An object that contains transient data such as search results. Correspond with nouns in use case text.
	Lifeline	Represents the life and perhaps the death of an object.

	Focus of Control	Shows the period of time during which the given object is in control of the flow.
	Object Messages	Shows the actions that objects perform on each other and on themselves.
	Return Messages	Shows the results that return from the other objects.

The following shows all the sequence diagrams for this system:

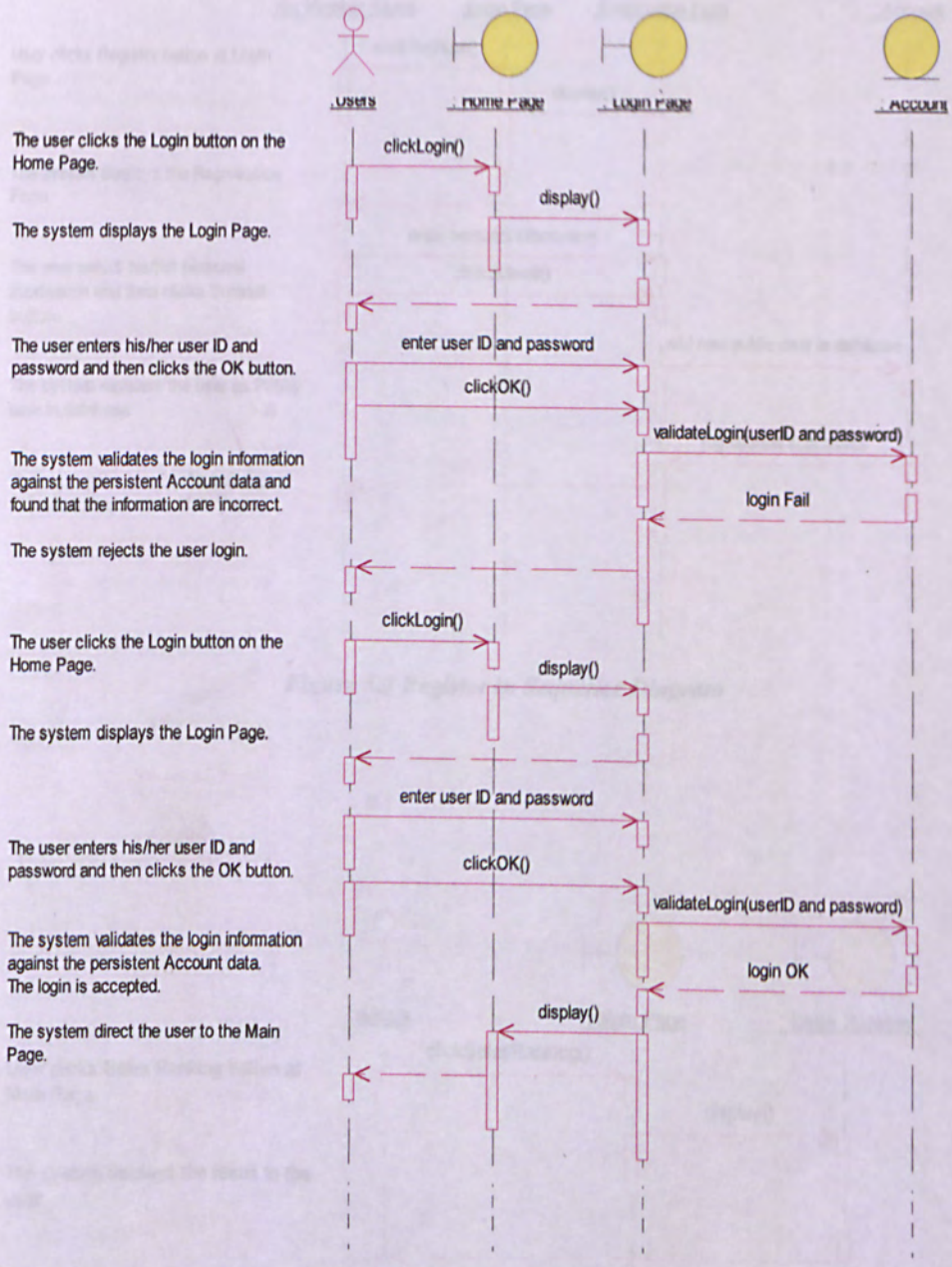


Figure 5.2 Login in Sequence Diagram

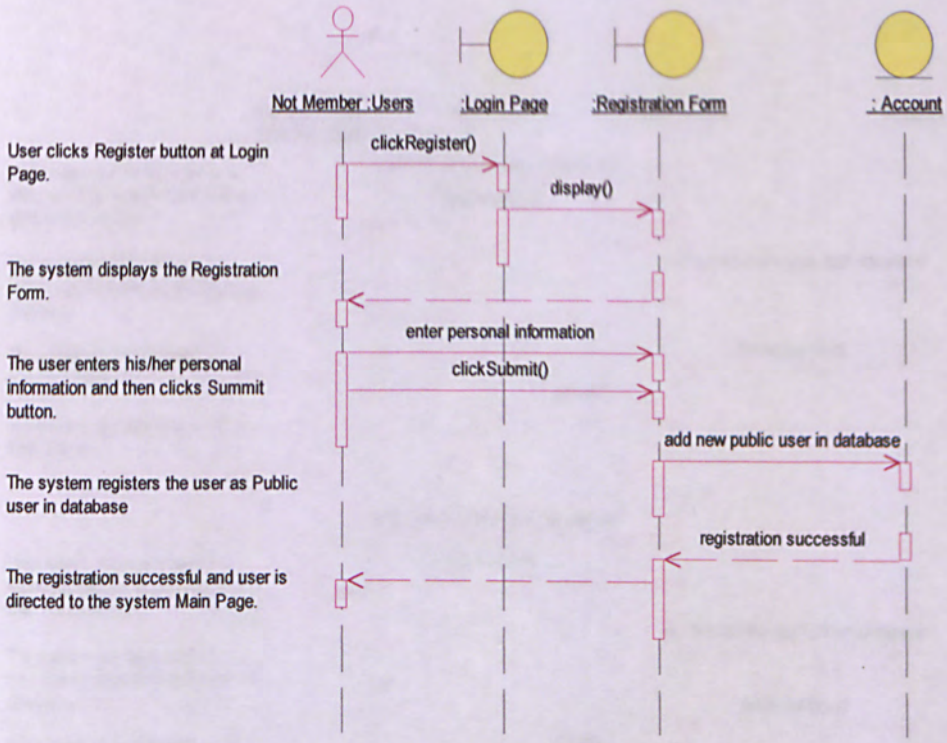


Figure 5.3 Register in Sequence Diagram

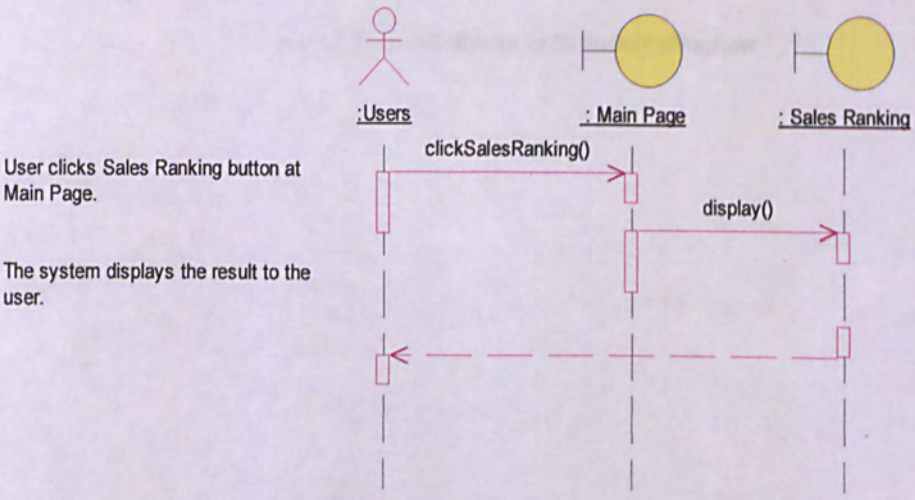


Figure 5.4 View Books Sales Ranking in Sequence Diagram

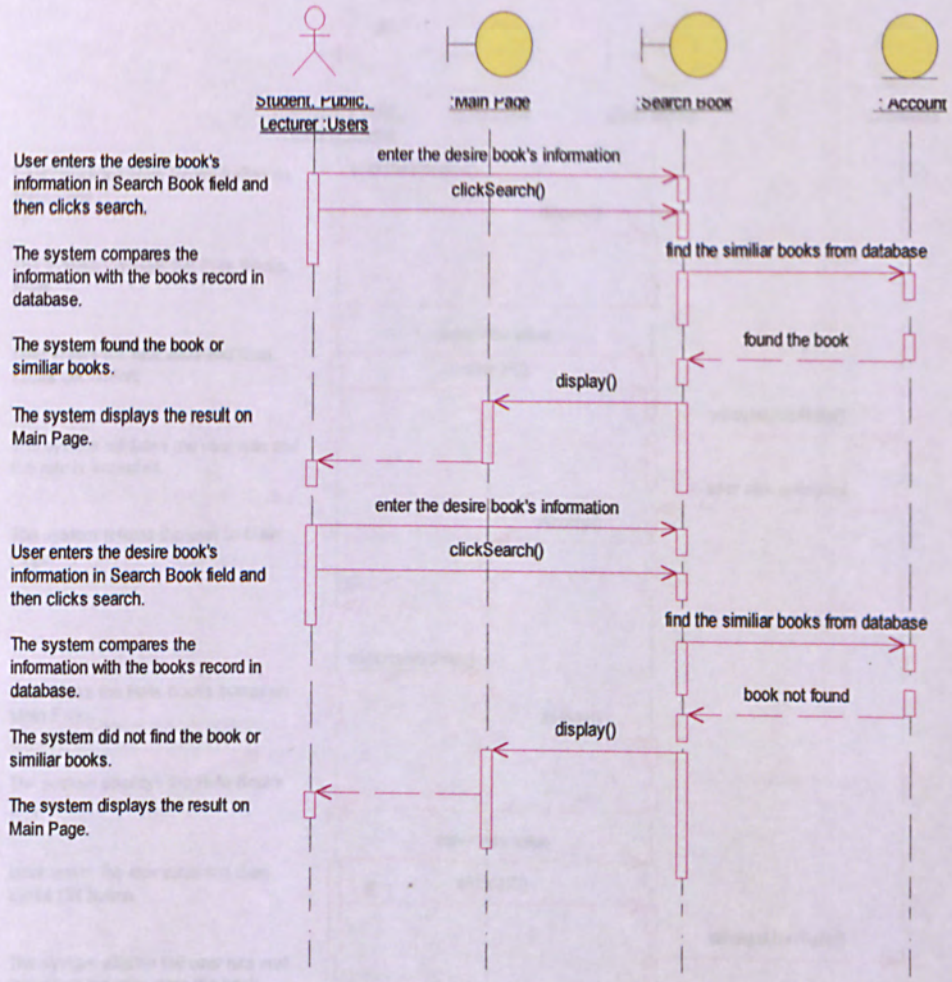


Figure 5.5 Search Books in Sequence Diagram

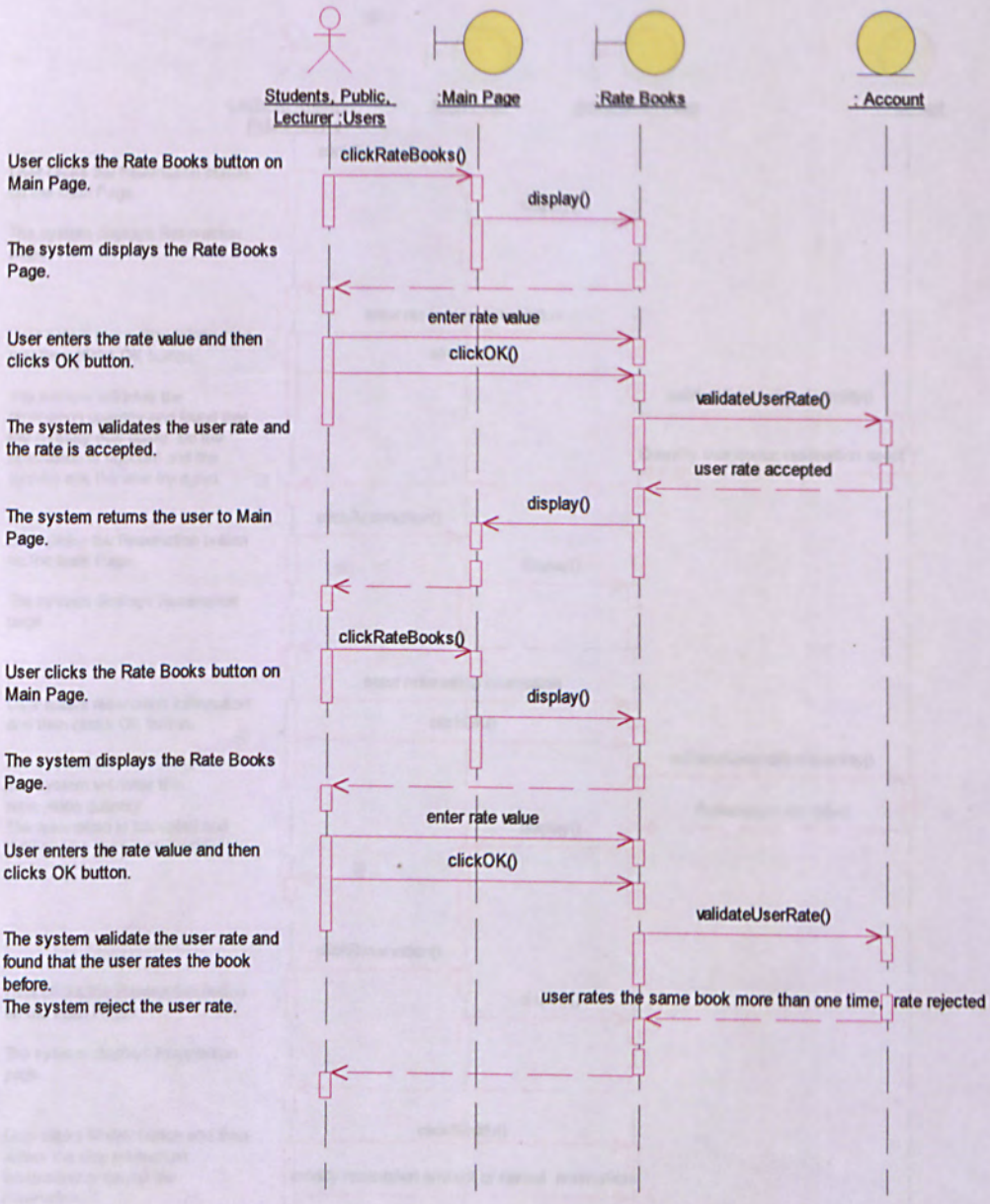


Figure 5.6 Rate Book in Sequence Diagram

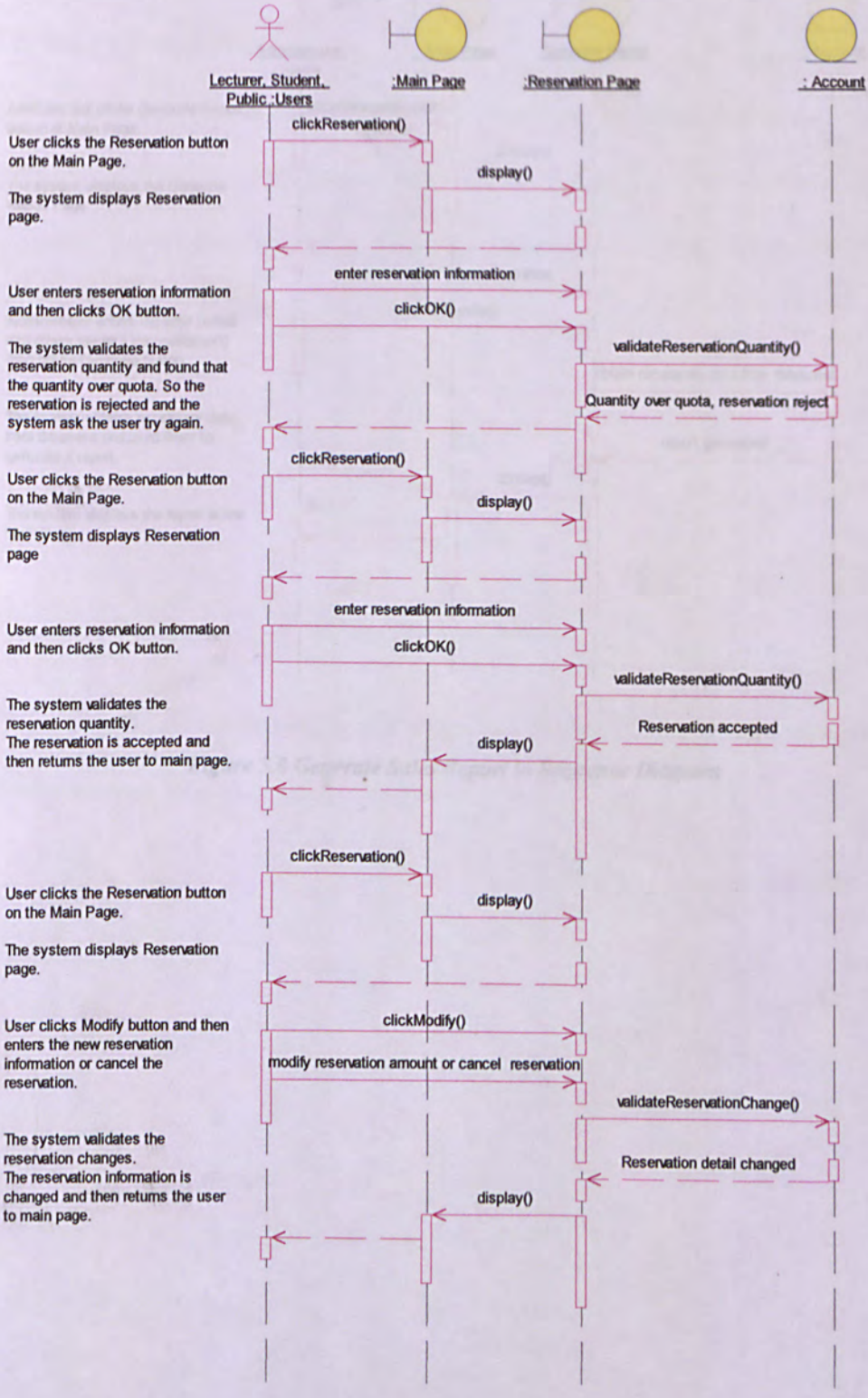


Figure 5.7 Reservation in Sequence Diagram

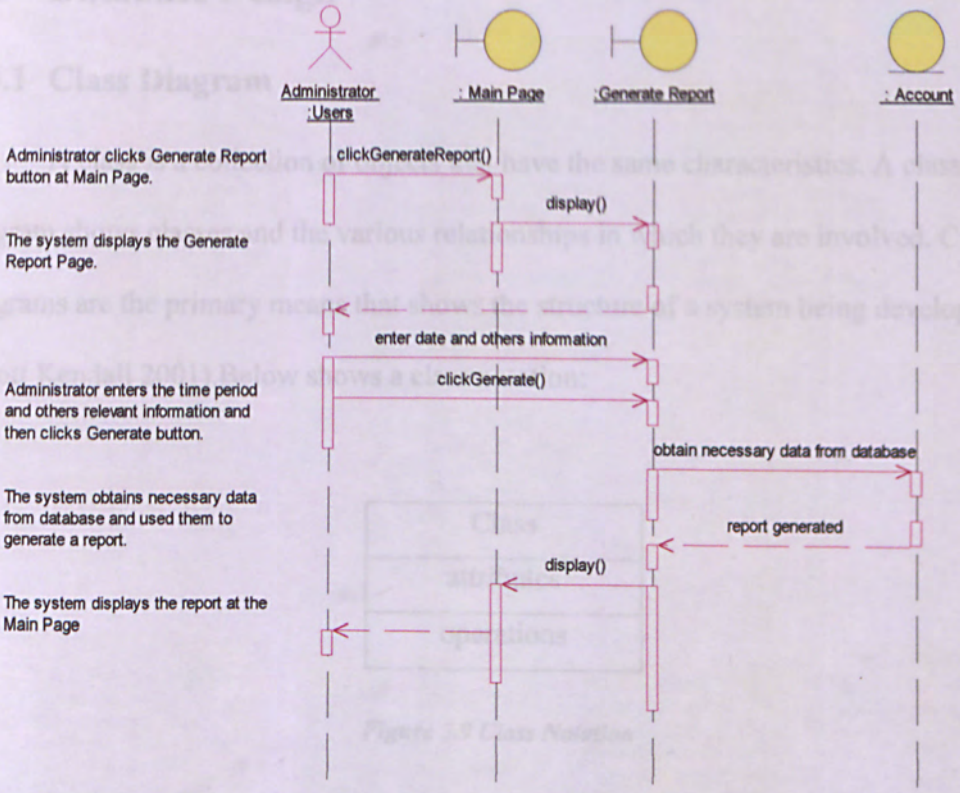


Figure 5.8 Generate Sales Report in Sequence Diagram

5.3 Database Design

5.3.1 Class Diagram

A class is a collection of objects that have the same characteristics. A class diagram shows classes and the various relationships in which they are involved. Class diagrams are the primary means that shows the structure of a system being developed. (Scott Kendall 2001).Below shows a class notation:

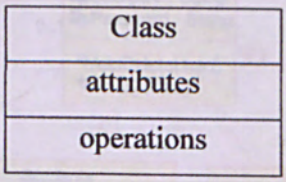


Figure 5.9 Class Notation

Attributes are the properties that describe a class while the operations are the methods that used to manipulate the attributes.

Following is the class diagram for the E-Book Store for University of Malaya:

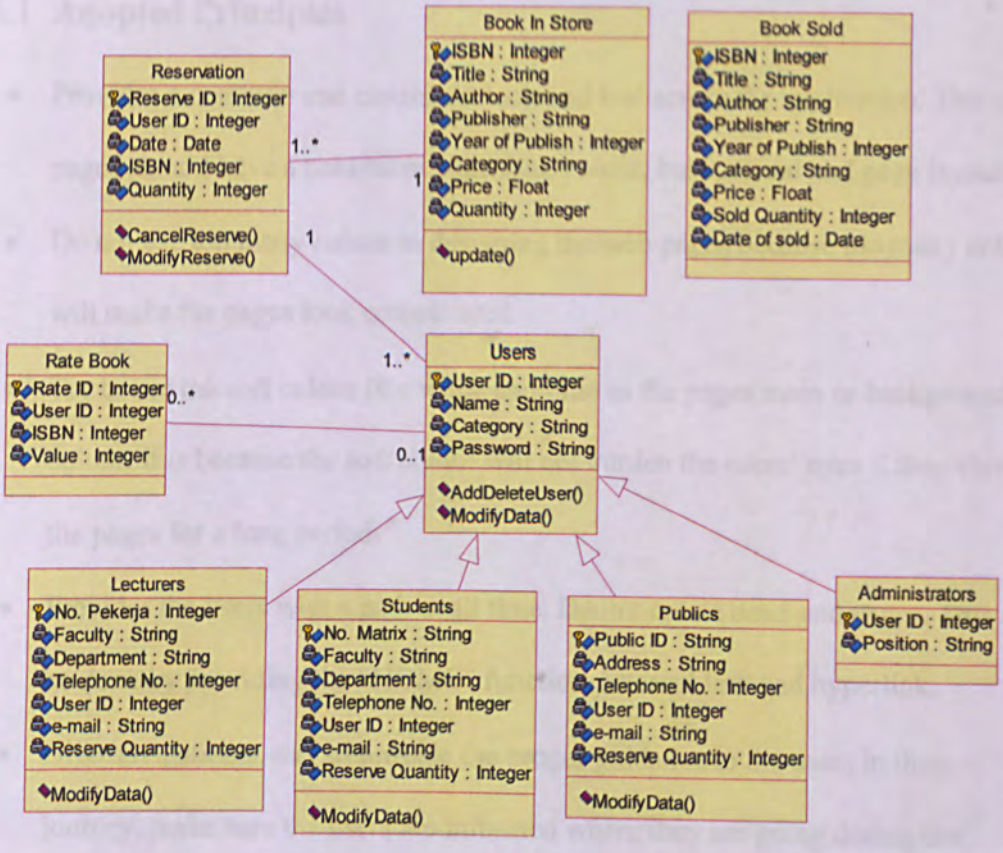
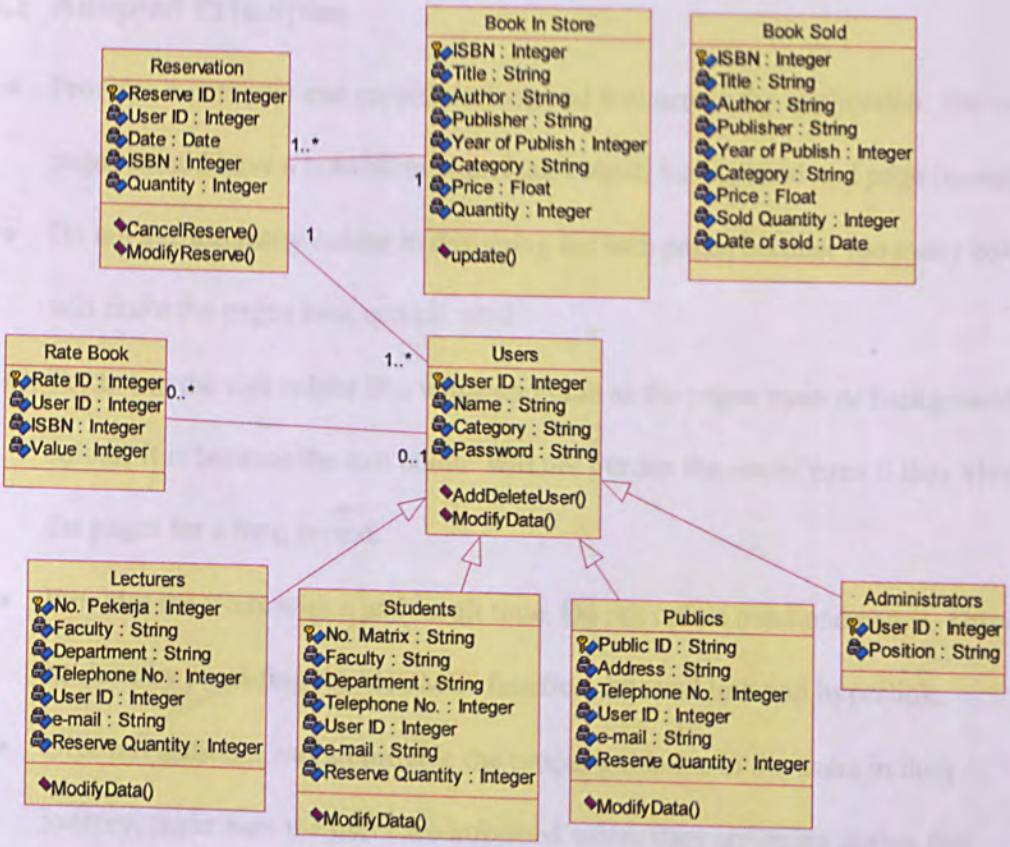


Figure 5.10 Class Diagram for E-Book Store of University of Malaya

Explanation for the classes' relationship:

- Users can choose not to rate a book or rate a book with one vote per book.
- One book may not be rated by users or be rated by many users.
- Users can reserve one book or many books per time.
- A particular reservation can only be done by one user.
- One reservation can contain one or many books.
- One book can only be reserved by one reservation at one time.

Following is the class diagram for the E-Book Store for University of Malaya:



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Interface Design

Adopted Principles

Provides a common and consistent look and feel across the application. The web pages should have a consistent page font, colour, background and page layout.

Do not use too many colour in designing the web pages because too many colour will make the pages look complicated.

Try to use the soft colour like white and blue as the pages main or background colour. It is because the soft colour will not burden the users' eyes if they view the pages for a long period.

Provides the users with a path at all time. Do not create dead-end pages. This can be done by providing the "HOME" function, internal link and hyperlink.

Give navigational way to provide the proper guidance to the users in their journey, make sure the users are informed where they are going during the navigation.

Try to make the web page's contains short in order to avoid the users from scrolling.

Do not put too many things or information in one page because the page will becomes complex if it contains too many things or information.

5.4 Interface Design

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- Try to make the web page's contains short in order to avoid the users from scrolling.
- Do not put too many things or information in one page because the page will becomes complex if it contains too many things or information.

5.4.2 User Interfaces for E-Book Store for University of Malaya

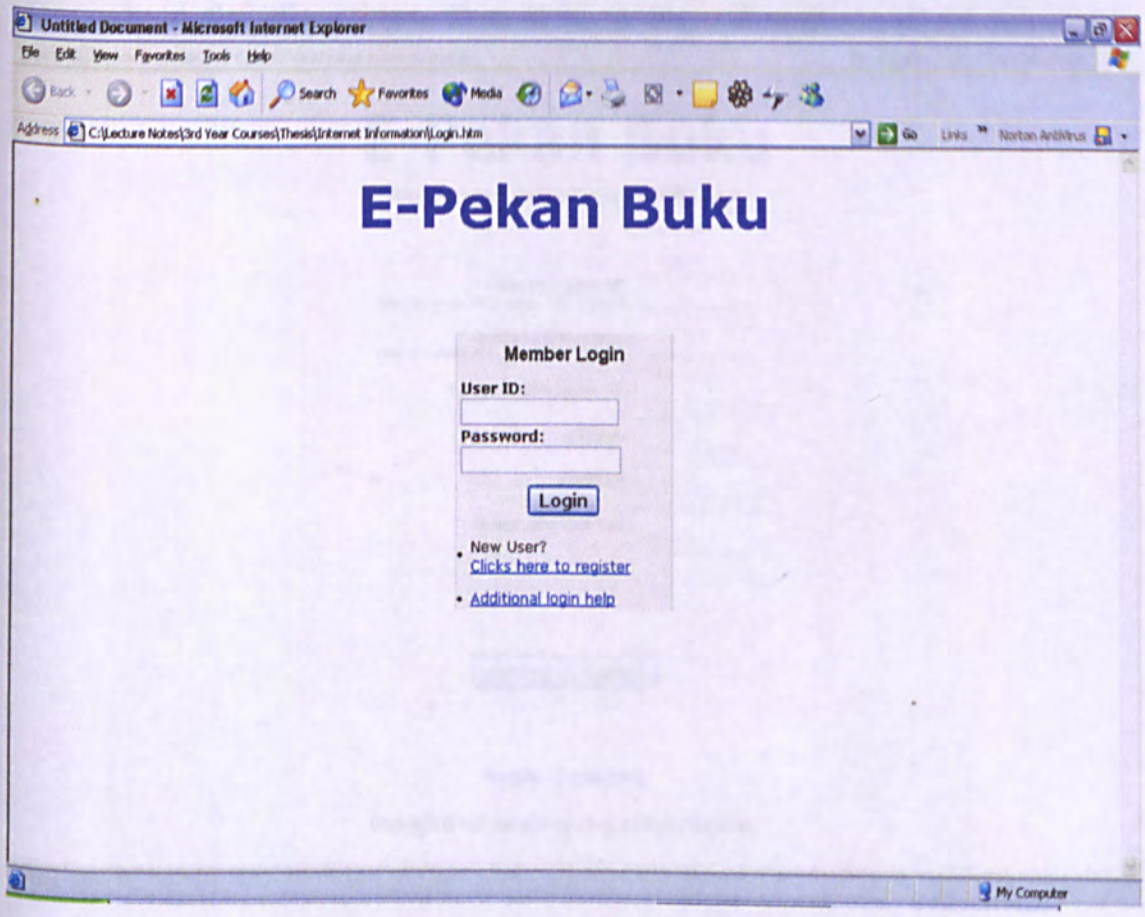

Figure 5.11 Login Page for the Proposed System

All system users using this page to login to the system. The non system users or non system members should register before they can login to the system and using the system services.

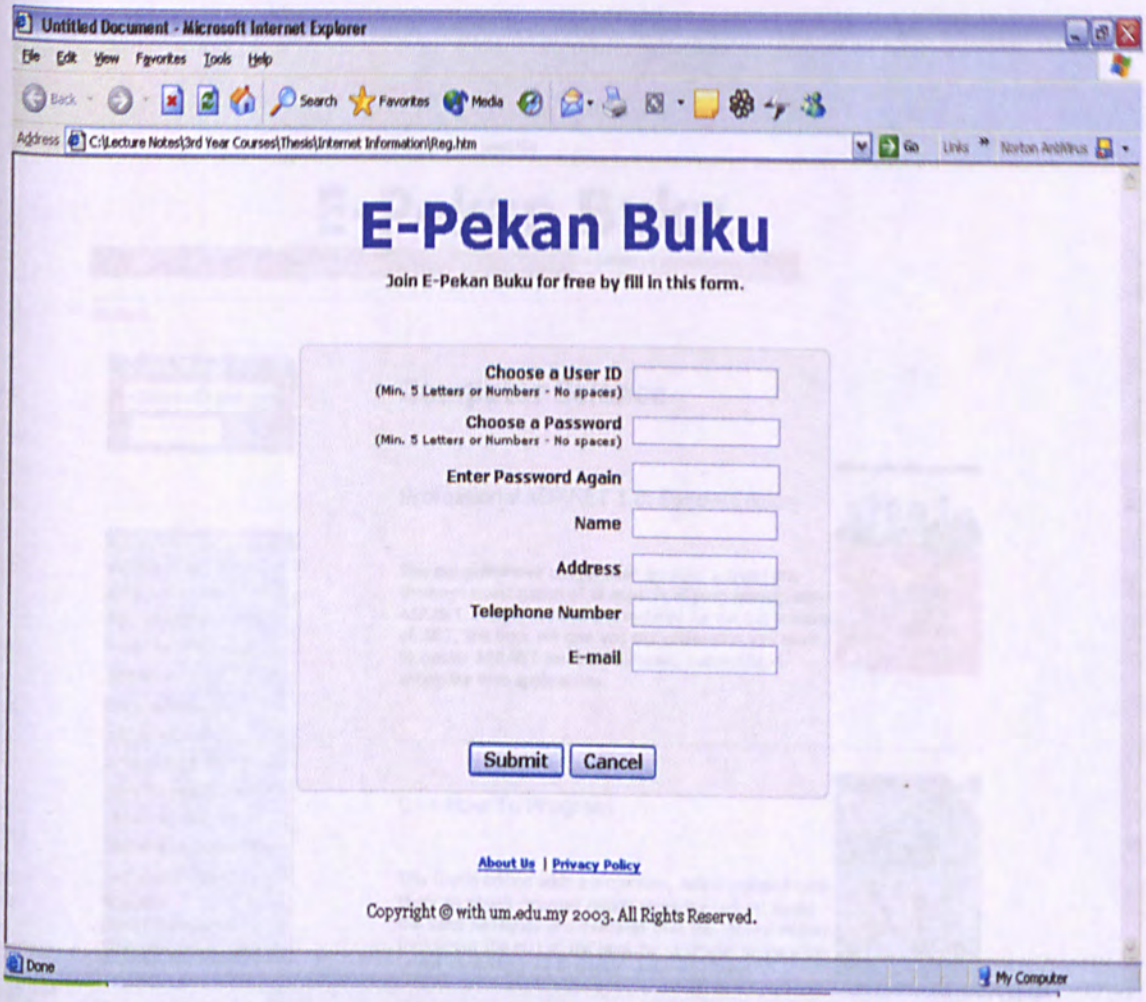

Figure 5.12 Registration Form

The non system users or non system members doing their registration at this page. After registration, user will become the member of this system and will be classified as "Publics". Then, user will be directed to the system main page.

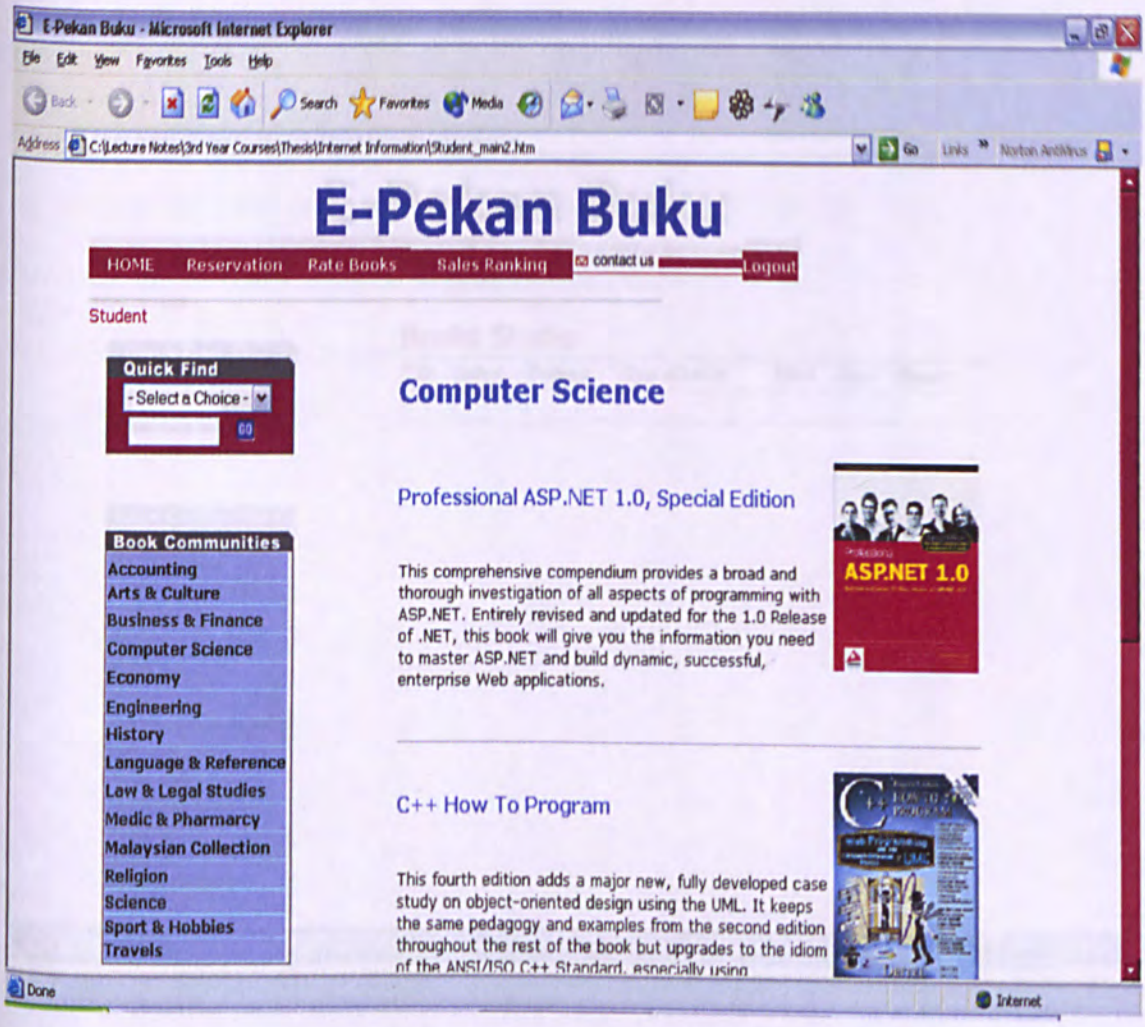

Figure 5.13 Student Main Page

Generally, the user interfaces for students, lecturers and publics are same except the tag at the upper corner of left hand site. The tag will specify the current web page is being accessed by whom. These three different groups of users can use the same services that provided in web page but with different limitations.

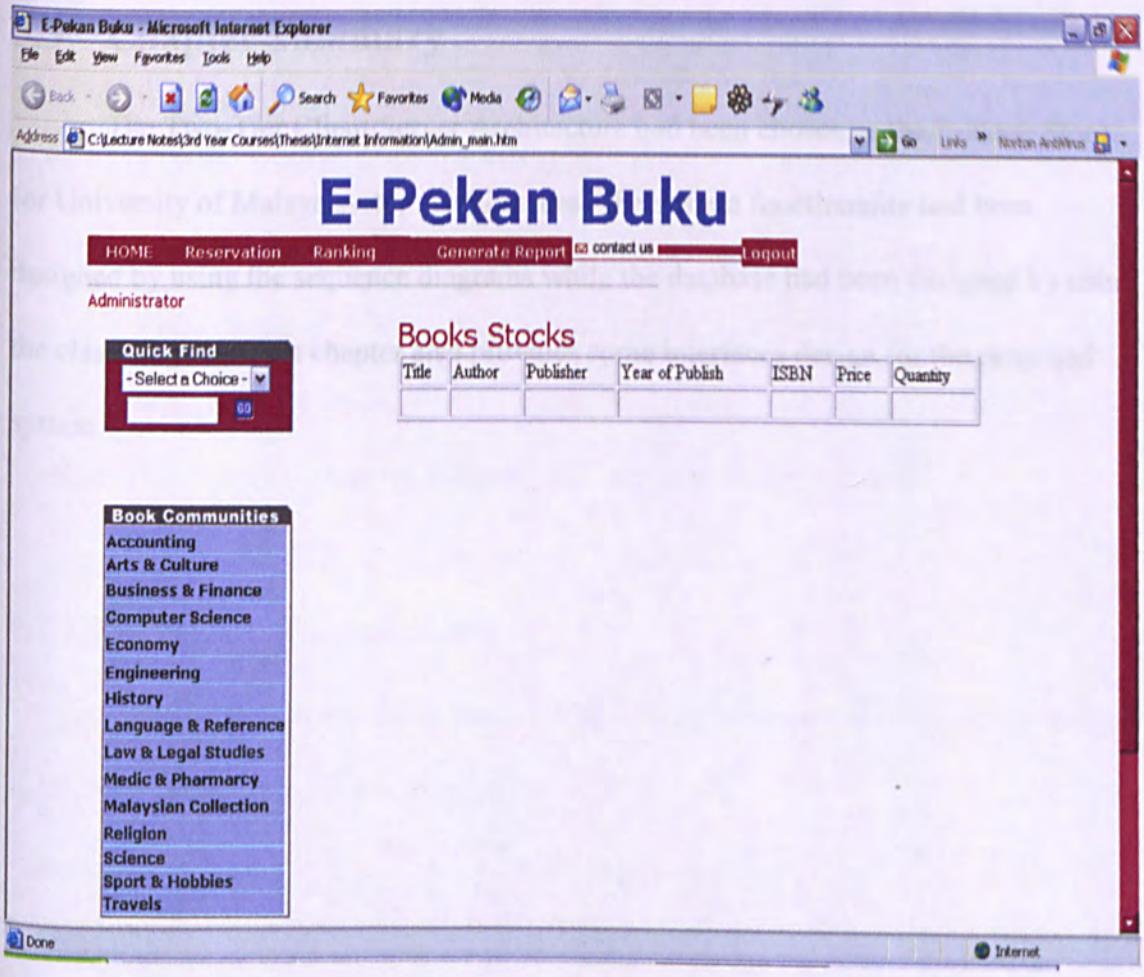

Figure 5.14 Administrator Main Page

This administrator main page is slightly different from the students, lecturers and publics main page. This page shows the current books stocks of the system to administrator. Administrator can generate books sales report in this page.

5.5 Chapter Summary

The Two-Tier Client/Server Architecture had been chosen as the E-Book Store for University of Malaya system architecture. The system functionality had been designed by using the sequence diagrams while the database had been designed by using the class diagram. This chapter also provides some interfaces design for the proposed system.

Chapter 6: System Implementation

6.1 Development Environment

The development environment refers to the workplace environment where the proposed system is being developed. It covers both the hardware and software configuration during the development process. Following are the hardware and software configuration for developing the E-Book Store for University of Malaya:

6.1.1 Hardware Configuration

The following are the hardware tools that used for system implementation of the E-Book Store for University of Malaya:

Processor:	Intel Pentium IV 1.4GHz
RAM:	512MB RD RAM
Hard Disk Spaces:	40GB
Peripherals:	16x DVD ROM drive, 3.5" Floppy disk drive, VGA colour monitor, mouse and keyboard

6.1.2 Software Configuration

There are two types of software that had been using during the development process which are: Documentation tools and Application Development Tools. Following are the description for the software:

6.1.2.i. Documentation Tools

Software Tool:	Function:
Microsoft Project Professional 2002	Used to plan the project schedule and do the related activities such as drawing the Gantt Chart for the project.
Rational Rose Enterprise Edition 2002	A type of CASE tool that used to perform the system design tasks such as drawing the Use Case Diagram, Sequence Diagrams and Class Diagram.
Microsoft Word 2002	Used to prepare all the word documentations.

6.1.2.ii. Application Development Tools

Software Tool:	Function:
Microsoft Windows XP Professional	Operating System.
Microsoft Internet Information Services 6.0 (IIS 6.0)	Web Server.
Internet Explorer 6.0	Web Browser.
Microsoft Visual Studio .NET	Codes Generator, Editor and Debugger for web page coding.
Microsoft SQL Server 2000	Database Management System
Active Server Pages .NET (ASP .NET)	Web Programming Language.
Macromedia Flash MX	Animating Graphic Generator.

6.2 Platform Development

6.2.1 Setting up Operating System

The system hard disk is formatted first before installing the Microsoft Windows XP Professional. This step is important in order to make sure that the system is free from virus infection and also to remove all the previous operating system settings. After that the operating system (OS) was installed. The installation process is easy because the Microsoft Windows XP Professional providing a rich Graphical User Interface instructions to guide the user along the installation process. The OS is set properly by default, so no additional configuration setting tasks are required to perform. If user needs some additional components, he/she has to add in those particular components from the OS installer manually.

6.2.2 Setting up Web Server

The default installation of Microsoft Windows XP Professional does not include the installation of Microsoft Internet Information Services 6.0 (IIS 6.0). So user has to install it from the OS installer manually by choosing the **"Add/Remove Windows Components"** at the **"Add or Remove Program"**. The **"Add or Remove Program"** is located in the **"Control Panel"**. After installed the IIS 6.0, user will get a new folder called **"Inetpub"**. All the files that related to the web server are located in this folder. The users can access the system through the following URL:

http://localhost/Thesis/System%20Pages/home.html

6.3 Database Implementation

6.3.1 Setting up Database

After installing the Microsoft SQL Server 2000, a new database named **"EPekanBuku"** is created. Inside this database, all relevant data tables are created and the data types are specified according to the functional requirements and logic. These tables are connected together according to their relationships.

6.3.2 Database Connection

ActiveX Data Objects .NET or commonly known as ADO .NET is used to establish a connection to the database. After the connection is made, data can be selected, inserted, updated or deleted from the database. In order to establish a database connection, the following statement is stored in the system's **"Web.config"** file:

```
<appSettings>
      <add key="DbConn"
value="server=KEONG;database=EPekanBuku;uid=sa;pwd=123456"/>
      <!-- <add key="DbConn"
value="server=KEONG;database=EPekanBuku;Trusted_Connection=Yes"/> -->
      <!-- <add key="DbConn"
value="server=localhost;database=EPekanBuku;Trusted_Connection=true"/>
-->
</appSettings>
```

Figure 6.1 Database Connection Statement in "Web.config" file

The statement above specifies the name of the server that the SQL Server located on, the database's name, user id and password. This statement is needed in establishing the connection to database. This statement is "Write Once, Use Many Time". When an ASP .NET web page need to connect to the database, the following statement must be included:

```
<%@ Import Namespace="System.Data" %>
<%@ Import Namespace="System.Data.SqlClient" %>

.....
.....
.....

Dim sc As SqlClient.SqlConnection
sc = New
SqlClient.SqlConnection(ConfigurationSettings.AppSettings("DbConn"))
sc.Open()

.....
..... (relevant SQL query statements)
.....

sc.Close()
```

Figure 6.2 Database Connection Statement in a particular ASP .NET web page.

This statement should be included in each ASP .NET web page that will manipulate data from database. Developer will not able to obtain data from database if this statement absents. Developer can obtain the data that he/she needs by writing a relevant SQL query statements within the statement above.

6.4 Program Development

6.4.1 Coding Approach

Coding is the process of translating the program design specifications into a machine readable format (machine codes) by using some appropriate programming languages. There are two types of coding approach, which are "top-down" and "bottom-up". The "bottom-up" coding approach is based on coding some complete lower level modules and leaving the high level modules merely as skeletons that are used to call the lower modules; whereas the "top-down" approach is the reverse way.

The "bottom-up" approach is used to develop this system. The advantages of this approach are: testing can be carried out on some of the functions as soon as it is completed and critical functions can be coded first to test their efficiency.

6.4.2 Coding Principles Applied

- **Reusability**

  A principle that emphasizes to create the program codes that can be reused by subsequent and related programs or other programs. By doing so, the coding time can be reduced as well as the system development productivity can be improved. This principle has been applying through the system development process and the sample of the reusable code is shown in the Figure 6.2.

- **Readability**

  Readability is important for the ease of the future enhancement. Several strategies are used in applying readability in the codes, including using meaning variables and labels name, comments and proper identification. The program codes are also aligned in a proper form in order to improve the readability.

- **Modularity**

  E-Book Store for University of Malaya system development process has applying this principle by using the "Code Behind" technology that provided by the ASP .NET language during the coding process. "Code Behind" technology separates the system logic codes from the web page layout codes (html codes). It

put the system logic codes into a separate file that binds together with the web page file. Inside this "Code Behind" file, developer can write the functions that handle the web page events.

6.4.3 Samples Codes

Following shows some important codes of this system:

```
Dim sc As SqlClient.SqlConnection
Dim str As String
Dim rs As SqlClient.SqlCommand
Dim rsa As SqlClient.SqlDataReader

sc = New
SqlClient.SqlConnection(ConfigurationSettings.AppSettings("DbConn"))
sc.Open()

str = "select * from book where category='w' "

rs = New SqlClient.SqlCommand(str, sc)
rsa = rs.ExecuteReader()
.........
.........

sc.Close()
```

Figure 6.3 Query Statement for "select"

```
Dim sc As SqlClient.SqlConnection
sc = New
SqlClient.SqlConnection(ConfigurationSettings.AppSettings("DbConn"))
sc.Open()

Dim ss As String
Dim com As SqlClient.SqlCommand

ss = " insert into book (isbn, title, author, publisher, yearofpublish,
category, price, status) values('" & isbn.Text & "', '" & title.Text &
"', '" & author.Text & "', '" & publisher.Text & "', '" & year.Text &
"', '" & category.SelectedItem.Value & "', '" & price.Text & "', '" &
status.SelectedItem.Value & "' ) "

com = New SqlClient.SqlCommand(ss, sc)
com.ExecuteNonQuery()
sc.Close()
```

Figure 6.4 Query Statement for "insert"

```
Dim sc As SqlClient.SqlConnection
sc = New
SqlClient.SqlConnection(ConfigurationSettings.AppSettings("DbConn"))
sc.Open()

Dim ss As String
Dim com As SqlClient.SqlCommand

ss = " update book set author = '" & author.Text & "', publisher='" &
publisher.Text & "', yearofpublish='" & year.Text & "', category='" &
category.SelectedItem.Value & "', price='" & price.Text & "', status='"
& status.SelectedItem.Value & "' where isbn='" & isbn.Text & "' "

com = New SqlClient.SqlCommand(ss, sc)
com.ExecuteNonQuery()
sc.Close()
```

Figure 6.5 Query Statement for "update"

```
Dim sc As SqlClient.SqlConnection
sc = New
SqlClient.SqlConnection(ConfigurationSettings.AppSettings("DbConn"))
sc.Open()

Dim ss As String
Dim com As SqlClient.SqlCommand

ss = "delete reservation where reserve_id='" & intid & "' "

com = New SqlClient.SqlCommand(ss, sc)
com.ExecuteNonQuery()
sc.Close()
```

Figure 6.6 Query Statement for "delete"

```
If IsPostBack = False Then

            Dim sc As SqlClient.SqlConnection
            Dim rss As SqlClient.SqlCommand
            sc = New
SqlClient.SqlConnection(ConfigurationSettings.AppSettings("DbConn"))
            sc.Open()

            rss = New SqlClient.SqlCommand(" select * from reservation
where user_id= '" & Session("user_id") & "' ", sc)

            rbgrid.DataSource = rss.ExecuteReader()
            rbgrid.DataBind()
            sc.Close()

End If
```

Figure 6.7 Bind the Data Retrieved from Database with the Data Grid

6.5 Debugging Techniques

Microsoft Visual Studio .NET has a built-in debugger. The debugger allows developer to insert "Break Point" in any part of the codes. Then developer can run the system and trace the codes line by line until the "Break Point" is reached. This tracing allows the developer to check the value of variables and tracks the program defect. When the "bug" is found, developer can stop the tracing immediately and starting to fix the "bug".

ASP .NET also has a built-in error detection function. If an error found during program execution, the program execution will be halted and an error message together with the line number where the error occurred will be displayed. Developer can perform the debugging task according to the given information.

6.6 Chapter Summary

This chapter discusses the hardware, software and other tools that are needed and how to configure them in order to transform the proposed system from the "paper work" into the real functioning system. Reusability, Readability and Modularity are the important principles that should be applied during the coding process. Some important program codes and the debugging techniques also stated in this chapter.

Chapter 7: System Testing

7.1 Testing Objectives

The main objective of testing is to uncover different types of errors that exist while executing the system. System testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. However, testing cannot show the absence of defects, it can only show that software defects are present. (Pressman, 1992)

Testing provides a method to uncover logical error and to test the system reliability. Types of tests used are depend on what is being tested, components, group of components or the whole system.

7.2 Testing Process

The testing process of the E-Book Store for University of Malaya system was tested in parallel with the completed development of each module to check validation rules as well as other run time constraints. Following shows the testing process for E-Book Store for University of Malaya system:

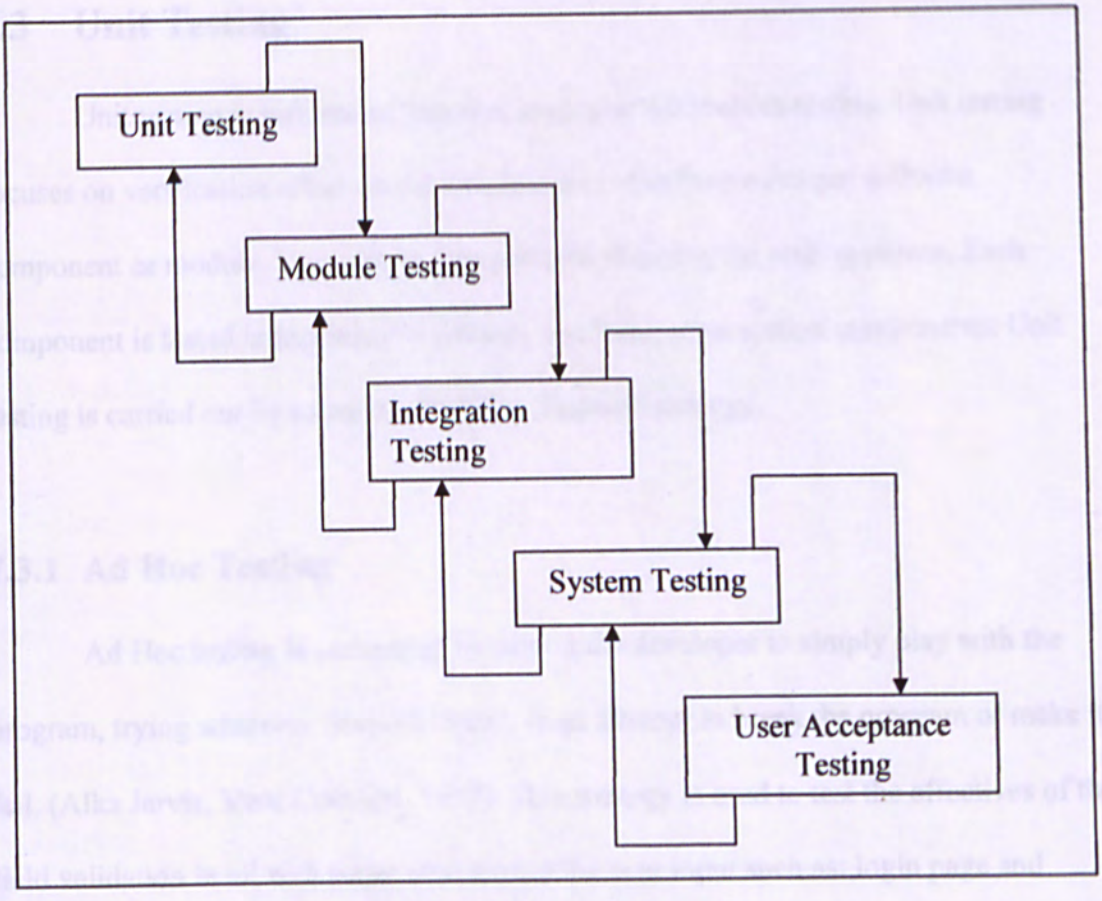

Figure 7.1 Testing Process

The testing process starts with Unit Testing, later moves to Module Testing and so on until finally reach the User Acceptance Testing. The arrow returning from the below boxes indicates that previous testing stage may have to be repeated because of some problems occur.

7.3 Unit Testing

Unit testing is referred as function testing or component testing. Unit testing focuses on verification effort on the smallest unit of software design: software component or module. Unit testing was performed during the coding phrase. Each component is tested independently without involving other system components. Unit testing is carried out by using the "Ad Hoc Testing" strategy.

7.3.1 Ad Hoc Testing

Ad Hoc testing is performed by asking the developer to simply play with the program, trying whatever comes to mind, in an attempt to break the program or make it fail. (Alka Jarvis, Vern Crandall. 1997). This strategy is used to test the effectives of the field validation in all web pages which need the user input such as: login page and registration page.

7.4 Module Testing

E-Book Store for University of Malaya system consists of a few modules which correspond to each main function in this system. These modules are Login function, Search Books function, Reservation function and Rate Books function. Each module is being developed initially as an independent module. Upon completion, the module will be tested for its performance and reliability by giving it a run time test whereby input will be keyed in to the correspond module in order to run all the functionality available in the module.

After all the modules have been tested individually, they are being integrated as a sole E-Book Store for University of Malaya system. The figure following depicts the flow of the approach adopted for the testing of each module.

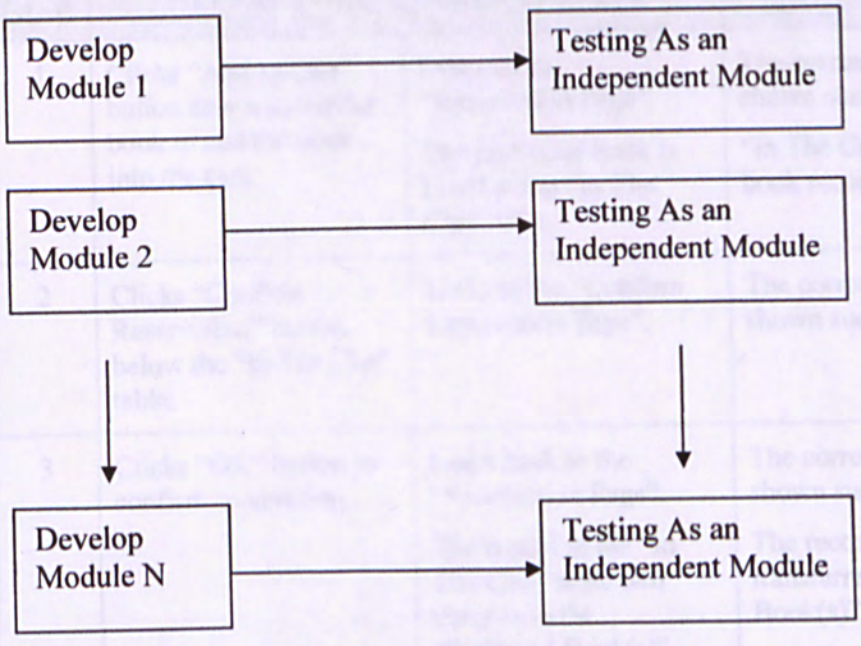

Figure 7.2 Module Testing Flow

The table following shows the test case for the system's Reservation module. This is a typical module testing sample.

Table 7.1 Test Case for System's Reservation Module

Step	Test Procedure	Expected Output	Test Result Analyzing
1	Clicks "Add to Cart" button near a particular book to add the book into the cart.	Links to the "Reservation Page". The particular book is listed out at "In The Cart" table.	The correct web page was shown successfully. "In The Cart" table has the book record.
2	Clicks "Confirm Reservation" button below the "In The Cart" table.	Links to the "Confirm Reservation Page".	The correct web page was shown successfully.
3	Clicks "OK" button to confirm reservation.	Links back to the "Reservation Page". The record in the "In The Cart" table will transfer to the "Reserved Book(s)" table.	The correct web page was shown successfully. The record had been transferred to "Reserved Book(s)" table.

7.5 Integration Testing

When the individual modules are working correctly and meet out objectives, these modules will be combined into a working system. This integration is planned and coordinated so that when a failure occurs, developer will have some idea of what caused it. The purpose of integration testing is to test the integration of overall performance of the system. The criteria taken in accounts are:

- **Interface integrity**

  Internal and external interfaces are tested as each modules to check if there is any lost of data across interfaces.

- **Functional validity**

  Tests designed to uncover functional errors are conducted.

- **Information content**

  Tests designed to uncover errors associated with local or global data structures are conducted.

- **Performance**

  Tests designed to verify performance bounds established during software design are conducted.

7.6 System Testing

System testing is a series of different tests designed to fully exercise the software system to uncover its limitations and measure its capabilities. The objective is to test an integrated system and verify that it meets specified requirements. System testing also concerned with validating that the system meets functional and non-functional requirements.

7.7 User Acceptance Testing

Acceptance testing, or sometimes called as alpha testing is the final stage of testing whereby the system is tested before being accepted by the user for operational use. Acceptance testing reveals errors and omissions in the system requirements definition because the acceptance testing involves testing from the user and the simulated test data are not be using any more. The real data exercises the system in different ways from the test data. During the acceptance testing, the functionality of the system is demonstrated to the user and the users may experience the systems handle on.

7.8 Chapter Summary

Testing is an important part in the software development because the potential errors of a system will be revealed after a series of testing is performed. A series of testing had been performed on E-Book Store for University of Malaya system. These testing are: Unit Testing, Module Testing, Integration Testing, System Testing and User Acceptance Testing.

Chapter 8: System Evaluation and Conclusion

After goes through the implementation and testing phase, the final phase of developing E-Book Store for University of Malaya is the evaluation phase. System evaluation is a process where system developer evaluates the system after the system has been fully developed.

8.1 System Strengths

The following are the strengths of E-Book Store for University of Malaya:

- **Simple and User Friendly Interfaces**

  The system interfaces uses a series of light and soft colour as its main colour. These colours would not burden the users' eyes even they view the web page for a long time. The Graphical User Interfaces (GUI) designs for this system are similar with other common e-book stores. So, the users will familiar with this system in a very short period. The novice users will feel comfortable with this system because this system does not using the jargons in its GUI.

- **Effective User Login and User Identification System**

  All types of users using a same login page to login to their account. The system is able to identify the privilege users (administrators and lecturers) from the normal users (students and public) by using the "Double Authentication" login method.

- **Effective Search Books Functions**

  Users can find their desire books quickly by using the search engine in this system. Users just have to provide a little information or even incomplete information to the search engine, the search engine will be able to list out all the books that match the given information. Furthermore, the users can also narrow down the search result by using the "Advanced Search" function in this system.

- **Pre-reservation System**

  The users who status are student or lecturer can use this system to pre-reserve the books that are not available in Pekan Buku. The students or lecturers are no need to pay extra charges or deposit for their pre-reserved books. This service is free. They just need to provide the information about the pre-reserve book to the system during the pre-reservation.

- **Fast Web Page Rendering Speed**

  The web page rendering speed for this system is faster than other web-based system. It is because this system is using the "frame" in its design. Besides that, the images files in this system are also lesser than other commercial systems. This will directly increase the web page rendering speed.

8.2 System Limitations

There are some limitations in E-Book Store for University of Malaya due to time constraint, facilities constraint, limitation of skill and the project scope.

- **No Online Transaction Service**

  This system does not support online transaction service. This means, users cannot buy the books directly from this system by using their credit card. This limitation is due to the project scope. Most of the students in University of Malaya do not own a credit card. Besides that, develop a online transaction service involve extensive coordination of different parties and highly system security is required. This is not easy to achieve due to the limitation of resources and programming skill.

- **No Automatic E-mail Generation**

  This system will not automatic generate an e-mail to sent to the user in order to inform he/she about the reservation that had been made. This system also does not generate an e-mail that used to inform users about their reservation expire date is near. However, users can check their reservation information by login to their account.

- **No Proper Report Generation Function**

  This system cannot generate a proper report regarding the reservation and pre-reservation that had been made by the users. However, administrator can view the reservation and pre-reservation records by login to his/her account. But administrator will not able to print out these records.

8.3 Future Enhancement

Below are some of the future enhancements suggested for E-Book Store for University of Malaya:

- **Online Transaction Service**

  In order to fulfill the public requirement, this service should be added. By adding this service, this system will become a "complete" e-book store system and it will also be able to compete with other e-book store systems. Users can directly buy cheaper books from Pekan Buku via this service.

- **Automatic E-mail Generation Function**

  By adding this function, the system will generate and sent an e-mail to the user's e-mail account after the user made a reservation or pre-reservation. The system will generate and sent another e-mail to the user's e-mail account to inform users when the user's reservation or pre-reservation is nearly expiring.

- **Report Generation Function**

  This function will allow administrator to generate a report in a printable format regarding the users' reservation and pre-reservation. The report should be able to customize according to the administrator need.

- **Automatic Update Function**

  This function will help administrator to maintain and update the system database by automatically remove the expired reservation records from the database.

8.4 Problems Encountered and Solutions

The following are the major problems encountered from the beginning of the project through the end of the system development process:

- **Lack of Programming Skill and Knowledge About the ASP .NET**

  ASP .NET is a brand new web page programming language and it has a lot of different from the previous version of ASP language. Although the programmers familiar with ASP, but they also have to learn this language from the ground because this language is not just an upgrade version of ASP. ASP .NET provides many powerful new features such as: data grid, input validator, auto post back and etc. All these features have their own syntax, semantic and functionalities.

Solutions: Programmers have to learn these features' syntax, semantic and functionalities one by one in order to mastering them. Besides that, a lot of useful information about ASP .NET can be found at the Internet.

- **Event Handling Issues**

  Although this system is a common system, but some problems occur during the process of transforming the requirements from proposal into the real system's functions. These problems are related with the event handling issues. Many types of responses should be considered regarding to a particular user request in order to built a user friendly system.

  Solutions: Studies other systems to see how the systems handle a particular user request. Obtain the comments and opinions from the end users about the event handling issues.

- **Lack of End Users' Evaluation**

  Since this system is not uploaded yet on a real server, the actual end users' evaluation cannot be gained. The public responses also cannot be obtained because this system is not evaluated by the public yet.

  Solution: Asks the end users to try out this system via a "localhost" as many as possible. Then, get the responses from them and evaluates the system by using these responses.

8.5 Knowledge and Experience Gained

Many knowledge and experience are gained throughout the development of E-Book Store for University of Malaya. These knowledge and experience are useful for future career life. Following are the knowledge and experience that had been gained:

- **Project Planning Skill**

  By developing this system, the project planning skill can be obtained. Developer has to plan a schedule and phases for the project starts from the system being developed until the system is finished developed and delivered. A good project planning and management can make sure the system delivered on time and within budget. Besides that, a good project planning can minimize the risks of project failure.

- **Mastery of ASP .NET Language and Other Related Software**

  After finish developing this system, developer properly can master the ASP .NET. It is because this system is a pure ASP .NET application. This project cannot be delivered if the developer failed to master the ASP .NET. Besides that, developer also gained an experience on using the Microsoft SQL Server 2000 because all the data manipulation in this system is dealing with Microsoft SQL Server 2000. Developer is getting familiar with the SQL query statements after developed this system.

- **Hands-On Experience**

  Developer can gain some hands-on experience from developing this system. He/she can applies the skills, concepts and theories that had learned such as project management skill, object-oriented concept and testing theories during the system development process. He/she can practice the knowledge that learned from books during the system development.

- **Finding Solutions and Information from Internet**

  Developer will realize that the Internet is full of information and solutions regarding to the programming language that he/she used in the system development. He/she can find the solutions for the problems that he/she faced during the system development from the Internet. He/she can also ask the help from the experts at the Internet if he/she failed to find the solutions for the problems from the Internet.

8.6 Overall Conclusion

Overall, E-Book Store for University of Malaya system has achieved and fulfilled the objectives and functional requirements as determined during system analysis. This system provides the Pekan Buku services on-line to the students, lecturers and public. The users can use this system to search books, reserve and pre-reserve books, rate books and view books' ranking. This system also meets the non functional requirements like maintainability, speed, user friendly, robust and learn ability.

E-Book Store for University of Malaya system has its own strengths as well as some limitations. The limitations occur due to the time constraint, facilities constraint, limitation of skill and the project scope. However, E-Book Store for University of Malaya is just in the first version of its implementation. This system can be further enhanced in order to turn it become a complete, powerful and versatile e-book store system. This system can be edited or customized in order to meet the needs of the users.

Finally, many knowledge and experience had gained after developing this system. The skills, concepts and theories that had learned like system analysis, system design, project management skill, object-oriented concept and testing theories were literally put into practice during the development process. These knowledge and experience are useful and valuables for future career life.

Appendix

Survey for Pekan Buku University of Malaya

Faculty :

Department :

Year and Semester :

Please tick (√) in the bracket for your desire answer.

1. Do you ever visit Pekan Buku before?

   Yes [ ] No [ ]

2. Do you have your own credit card?

   Yes [ ] No [ ]

3. Do you ever using the Internet before?

   Yes [ ] No [ ] (go to question 6)

4. Do you ever visit any on-line book store (for example: Amazon.com) before?

   Yes [ ] No [ ]

5. Do you ever buy any thing from the Internet or do any on-line transaction?

   Yes [ ] No [ ]

6. Do you wish Pekan Buku to provide its services on-line?

   Yes [ ] No [ ]

7. If Pekan Buku provides its services on-line, please choose the services that you wish to obtain from the list below: (You may choose more than one services.)

A.	Search books	[ ]
B.	Reserve books	[ ]
C.	Books sale ranking	[ ]
D.	Rate the books	[ ]
E.	On-line transaction using credit card	[ ]
F.	Others (please specify)	[ ]

Thank you for your co-operative.

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User Manual

Table of Contents

Chapter 1: Introduction

Welcome to E-Book Store for University of Malaya. E-Book Store for University of Malaya is a web-based application that provides Pekan Buku (official book store in University of Malaya) services on-line to the users. Users can use this system to search books (within Pekan Buku), reserve and pre-reserve books, rate books and view books' ranking. This system is user friendly and easy to use. The users will know how to use each function of this system after finish reading this manual.

1.1 About This Manual

This manual contains instructions that guide reader on how to use the system's functions. It is well organized to cover all the functionalities of the system. Screenshots are provided to enhance reader's understanding. This manual also lists out the hardware and software requirements that should be fulfilled in order to run this system properly.

Chapter 2: Hardware and Software Requirements

2.1 Server Side Requirements

The following specify the hardware and software requirements for server that used to run this system:

Hardware Requirements

Processor:	Intel Pentium 4, 1.4GHz or higher
RAM:	Minimum 128MB, 256MB is highly recommended
Hard Disk Spaces:	10GB or higher

Software Requirements

Operating System (OS):	Microsoft Windows XP Professional
Web Server:	Microsoft Internet Information Services 6.0 (IIS 6.0)
Web Browser:	Internet Explorer
Programming Language:	Active Server Pages .NET (ASP .NET)
Authoring Tool:	Microsoft Visual Studio .NET
Database Management System:	Microsoft SQL Server 2000

2.2 Client Side Requirements

The following specify the hardware and software requirements for user who want to use this system:

Hardware Requirements

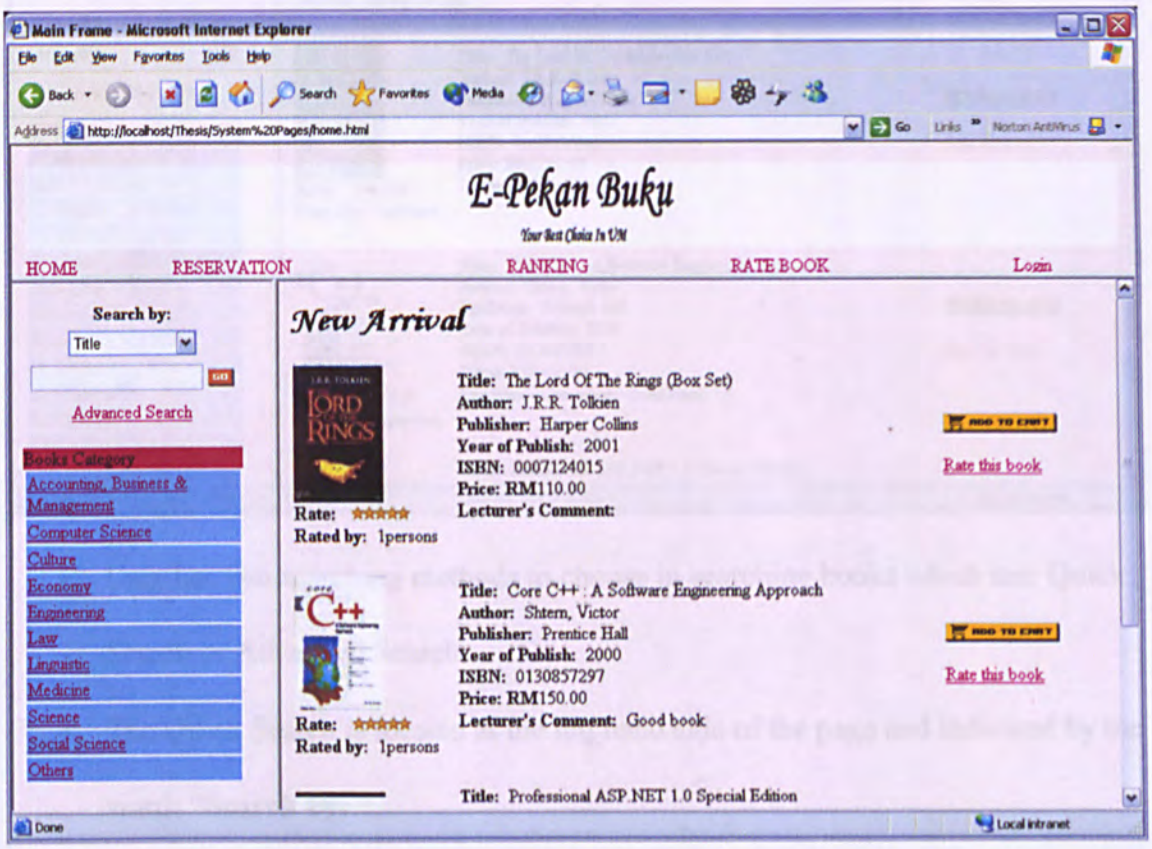
Processor:	Any processor with speed 133MHz or faster
RAM:	64MB or higher

Software Requirements

Operating System (OS):	Microsoft Windows 98 or later series.
Web Browser:	Any web browsers (Internet Explorer is highly recommended)

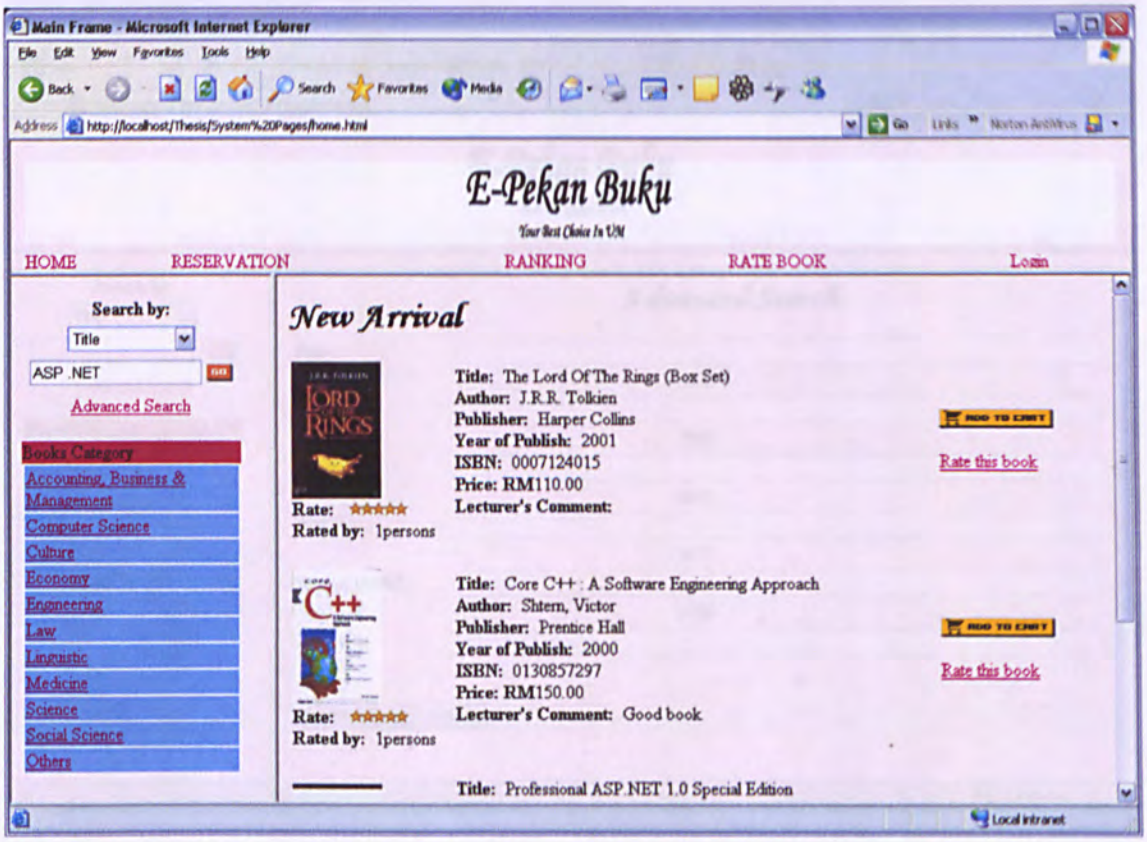
Chapter 3: Using the E-Book Store for University of Malaya

3.1 System Main Page



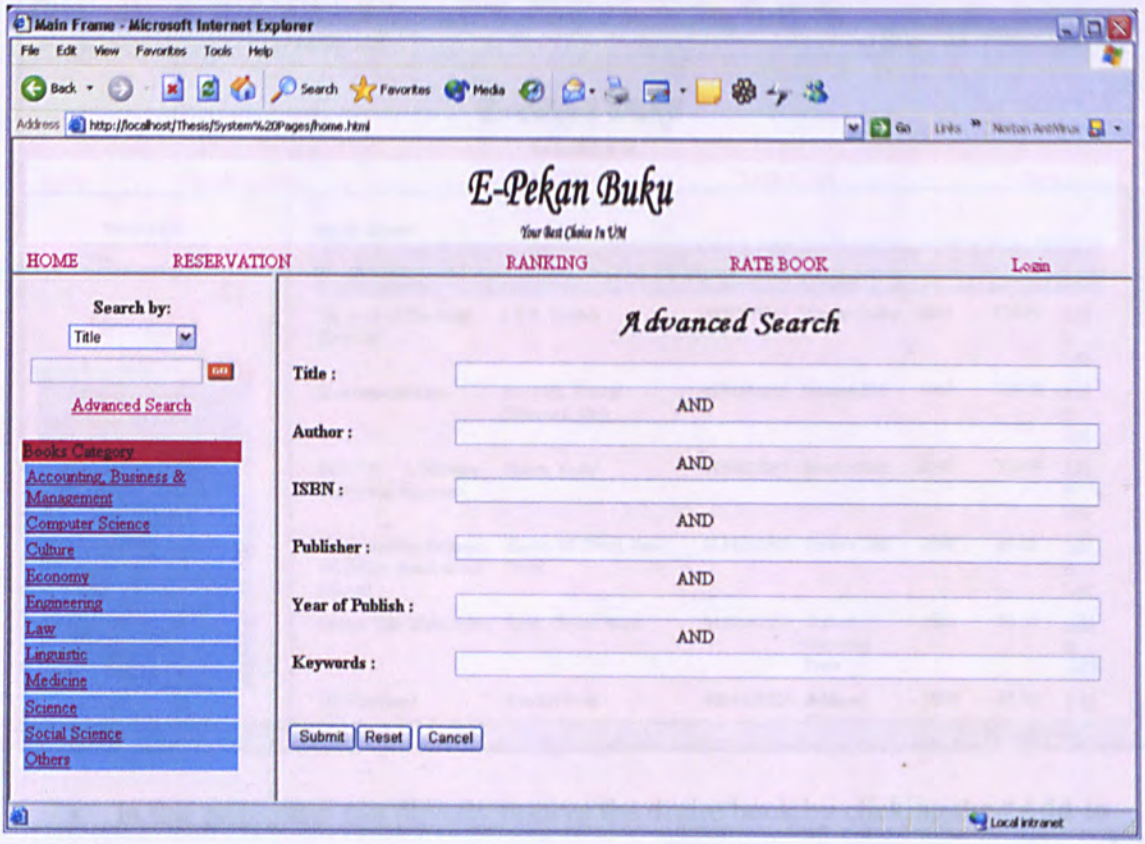
- This is the system main page. Within this page, user can search books, browsing into each book category or view books' ranking.
- User can also reserve books or rate books but this two functions required user to login first before he/she can do so.

3.2 Search Book Functions

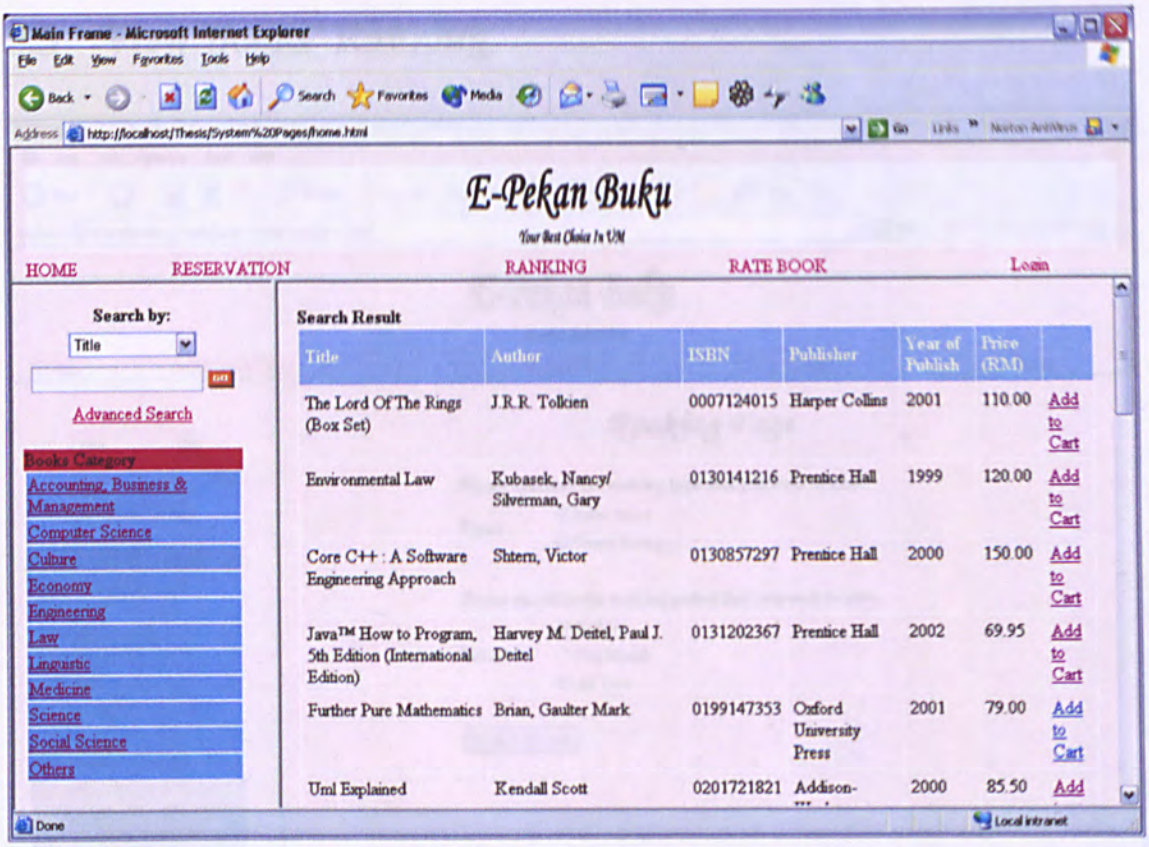


- User has two searching methods to choose in searching books which are: Quick Search or Advanced Search.
- The Quick Search is located at the left hand side of the page and indicated by the word: "**Search by:** ".
- When using Quick Search, user has to choose one books' information that used in searching from the choices of: Title, Author, ISBN, Publisher, Keyword or Year of Publish. Then user enters the relevant information with the choice that had been chosen. For example, in this screenshot, the user wants to search a book that title is ASP .NET. After enters all these information, user has to click the "**GO**" button in order to start the search.

- Screenshot below shows the Advanced Search method.

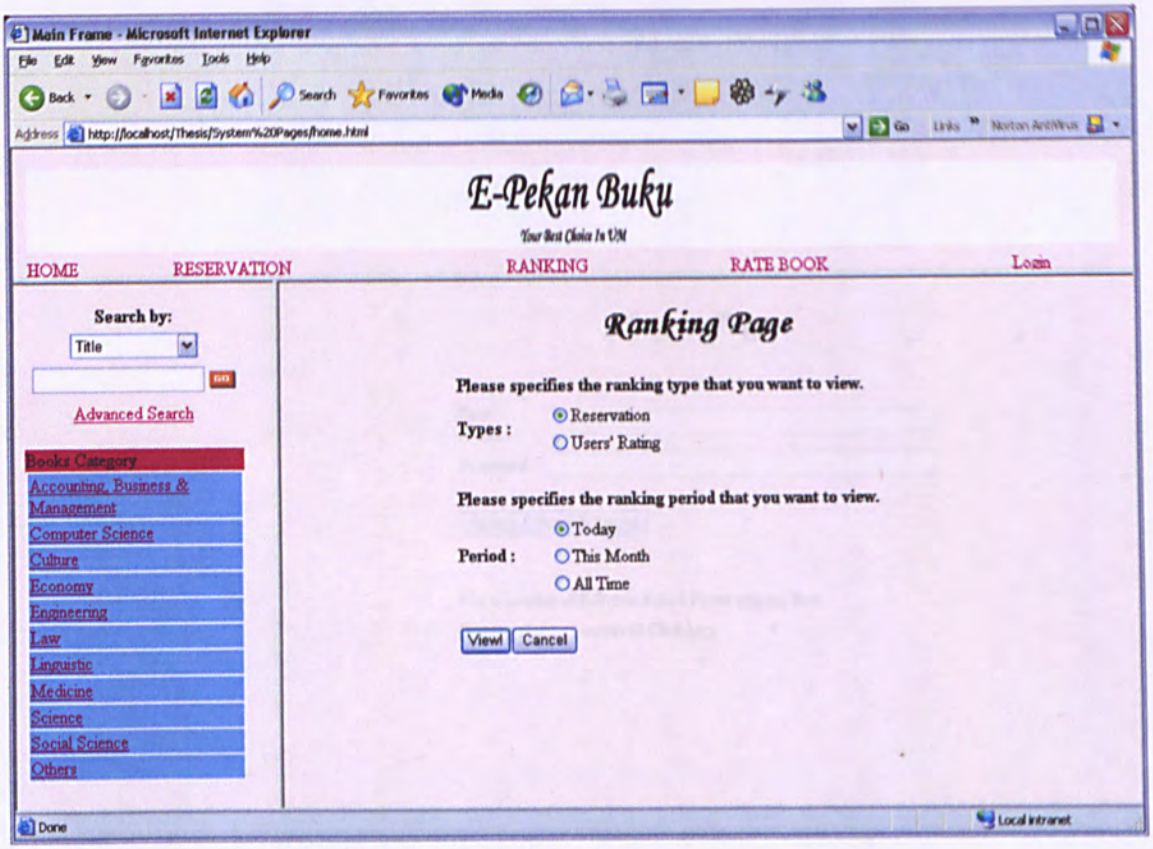


- In this page, user can enter whatever information that he/she got about the books that he/she wants. The search engine will list out all the books that fulfilled all the information that given by user.
- The following page shows a typical search result.



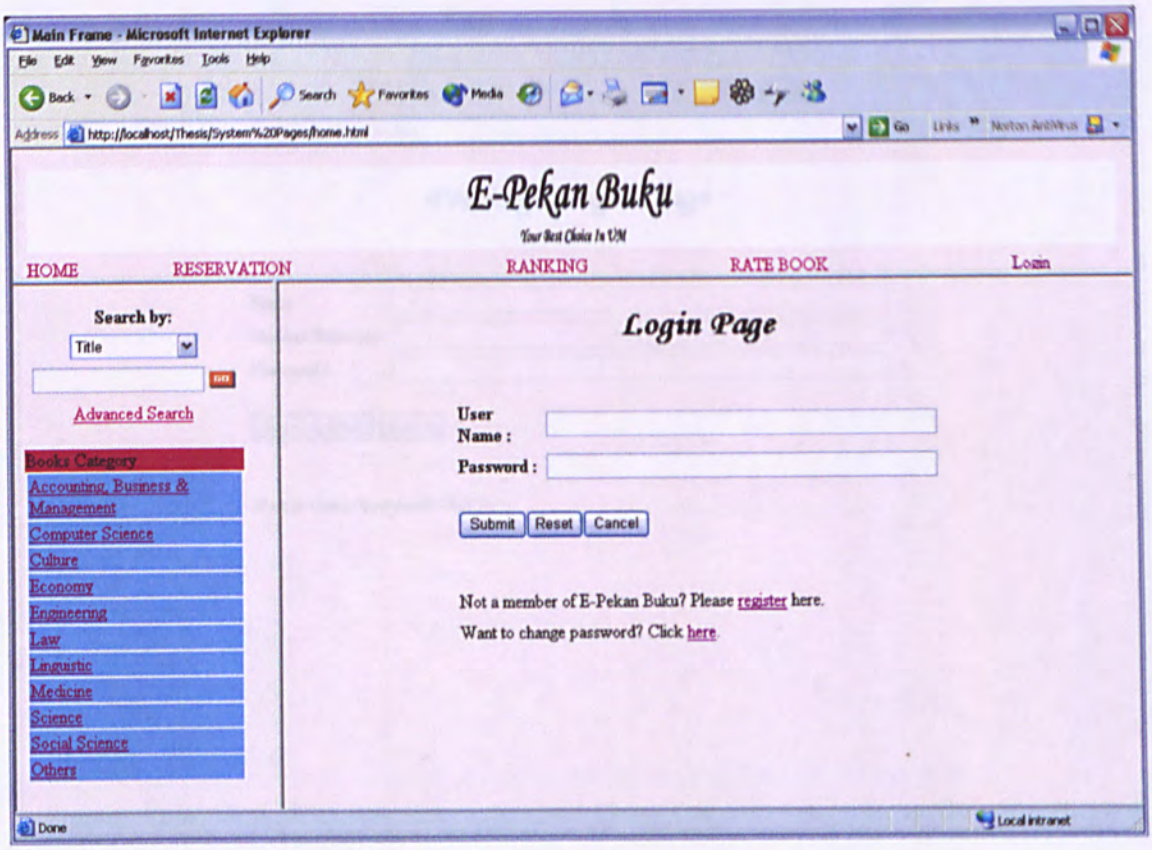
- In this page, user can directly reserve the desire book by clicking the "**Add to Cart**" hyperlink. This link will direct user to the Reservation page but before that user has to login first.

3.3 View Books' Ranking



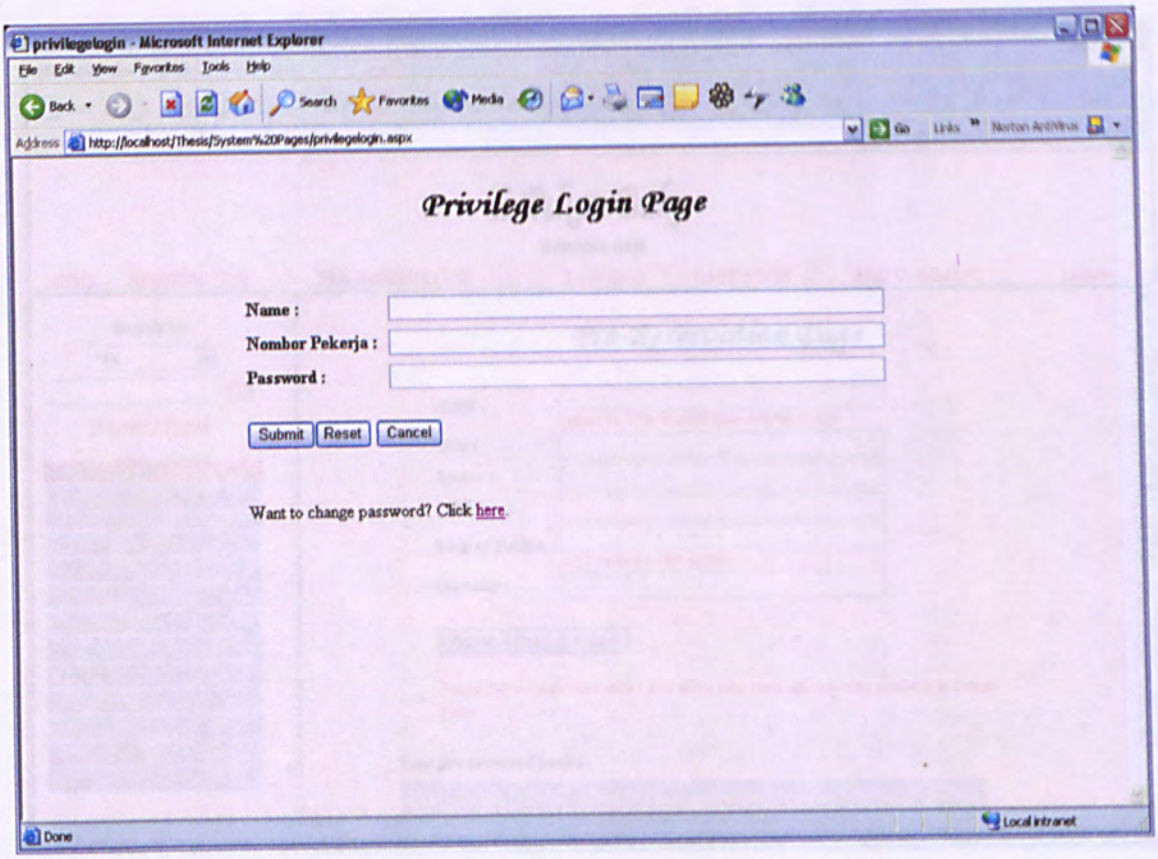
- User has to specify what type of books' ranking that he/she wants to view and the related period. Then clicks "**View!**" button to see the chosen ranking.

3.4 Login Page



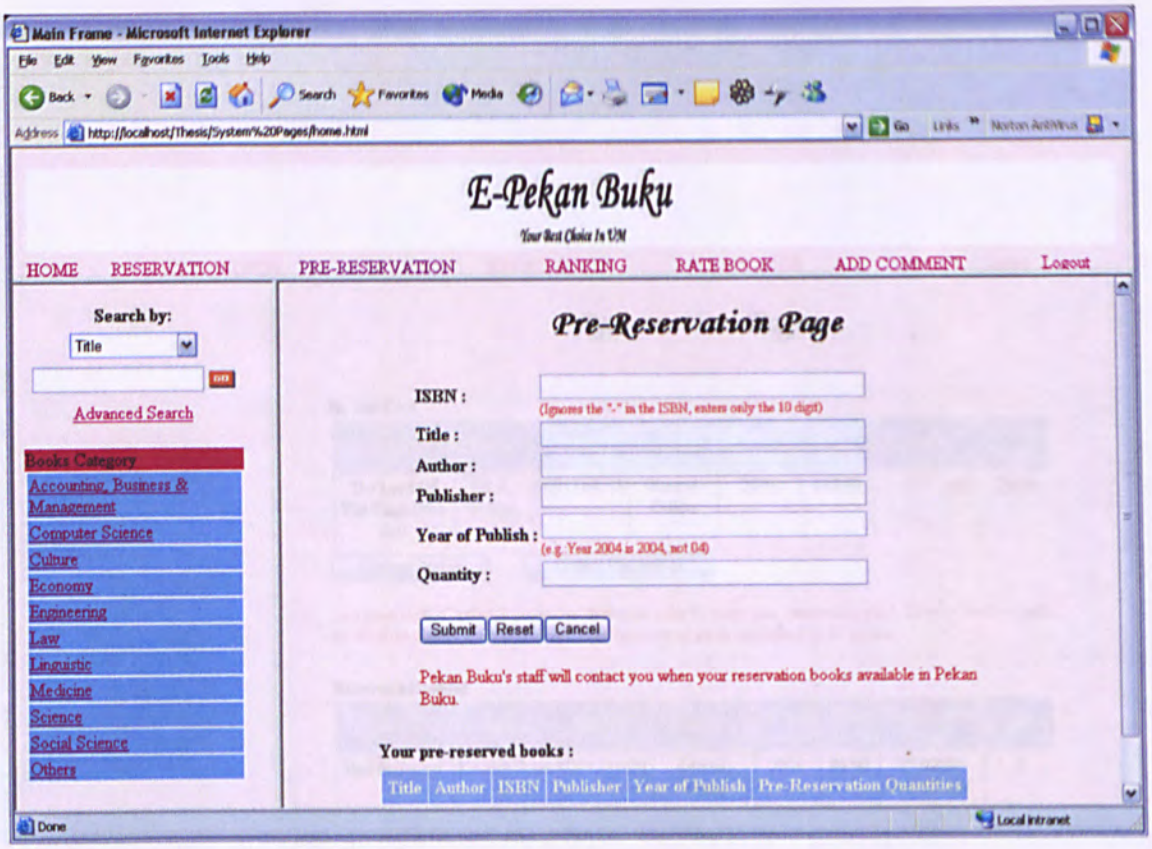
- All the system users use this page to login to their account.
- Non member can click the "**register**" hyperlink to register as a system user.
- System users can change password by clicking the "**here**" hyperlink.

3.5 Privilege Login Page



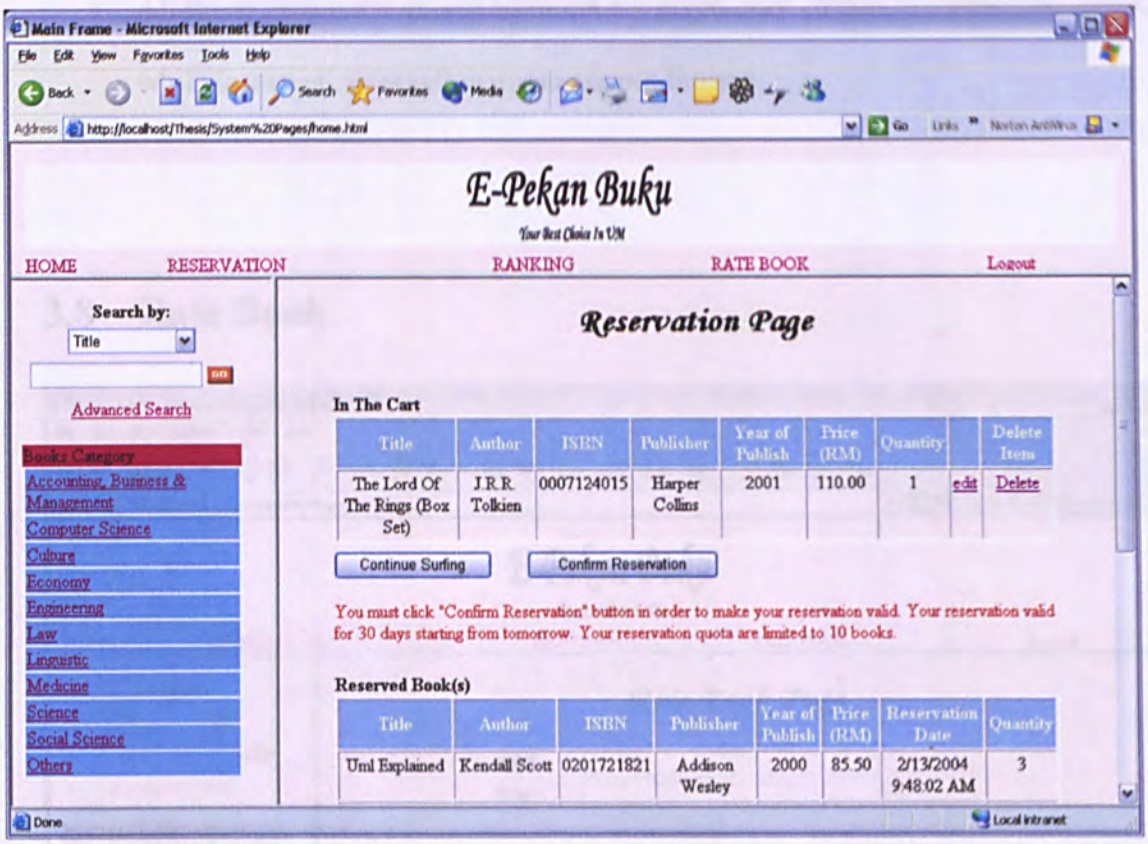
- For lecturers and system administrator, after login from the Login Page, they have to login one more time in this Privilege Login Page.
- They can change their privilege password at this page by clicking the "**here**" hyperlink.

3.6 Pre-Reservation



- This function is only available for University of Malaya Students and Lecturers.
- User can pre-reserve the books that are currently not available in Pekan Buku.
- He/she just needs to enter whatever information that he/she got at this page and then clicks the "**Submit**" button.
- Pekan Buku will try to get the books that specified by the user. Once the books arrived, Pekan Buku staff will contact that user.

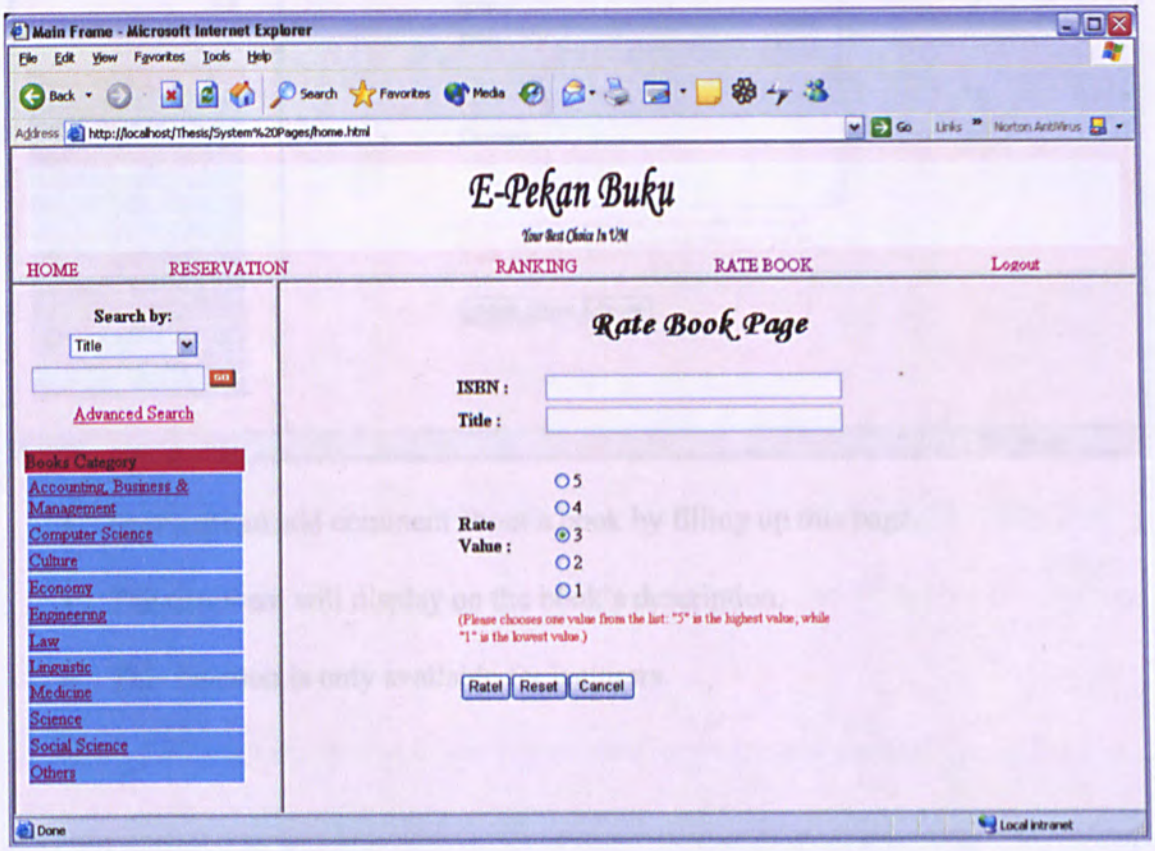
3.7 Reservation



- "In The Cart" table shows the books that user wants to reserve but not confirm yet. All the books in this system that user chose to "Add to Cart" will list out in this table.
- User can delete the books from "In The Cart" table by clicking the "**Delete**" hyperlink. User can also edit the books' quantity in this table by clicking the "**edit**" hyperlink.
- Once user clicks "**Confirm Reservation**" button, the system will ask user to re-confirm his/her choice.
- If user confirms his/her reservation, all the books in "In The Cart" table will be transferred to the "Reserved Book(s)" table and user is not allow to edit the books' quantity in the "Reserved Book(s)" table.

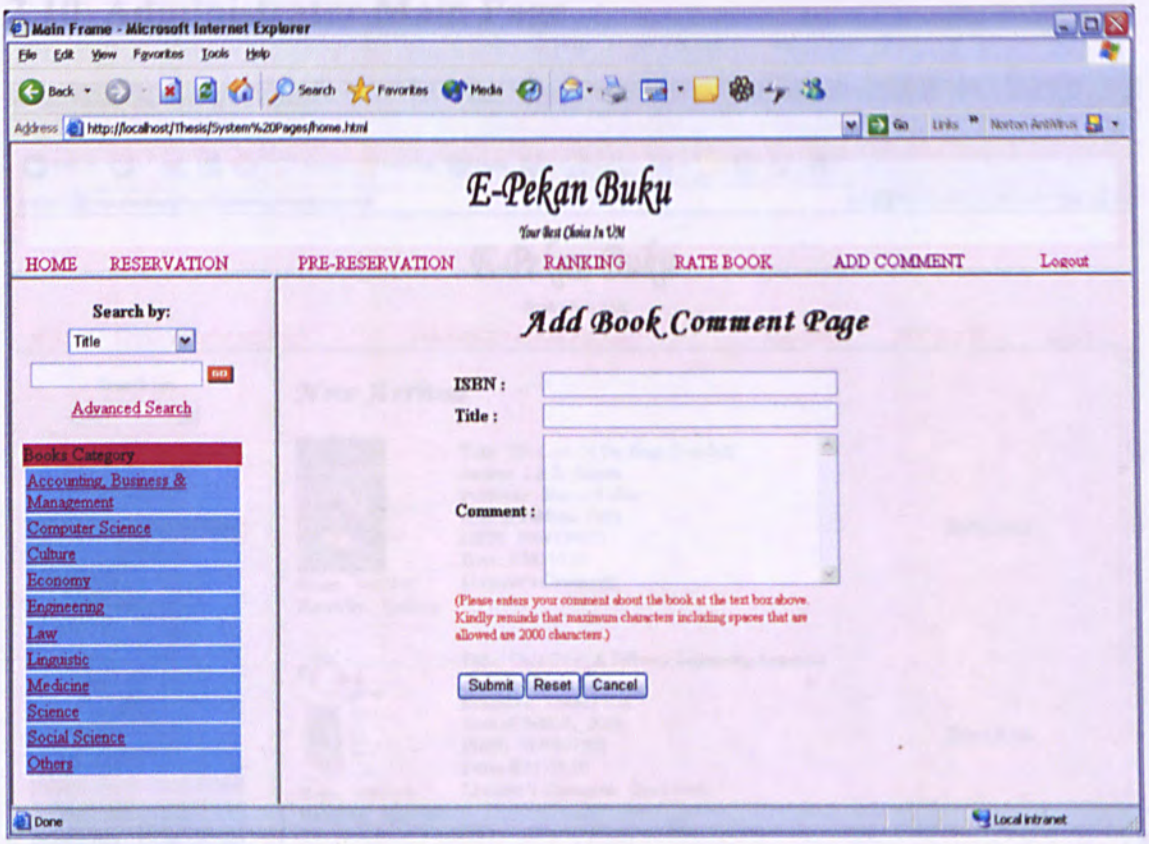
- Else, nothing will happen.
- All the system users except lecturers are given only 10 books reservation quota, while lecturers' reservation quota are not limited.

3.8 Rate Book



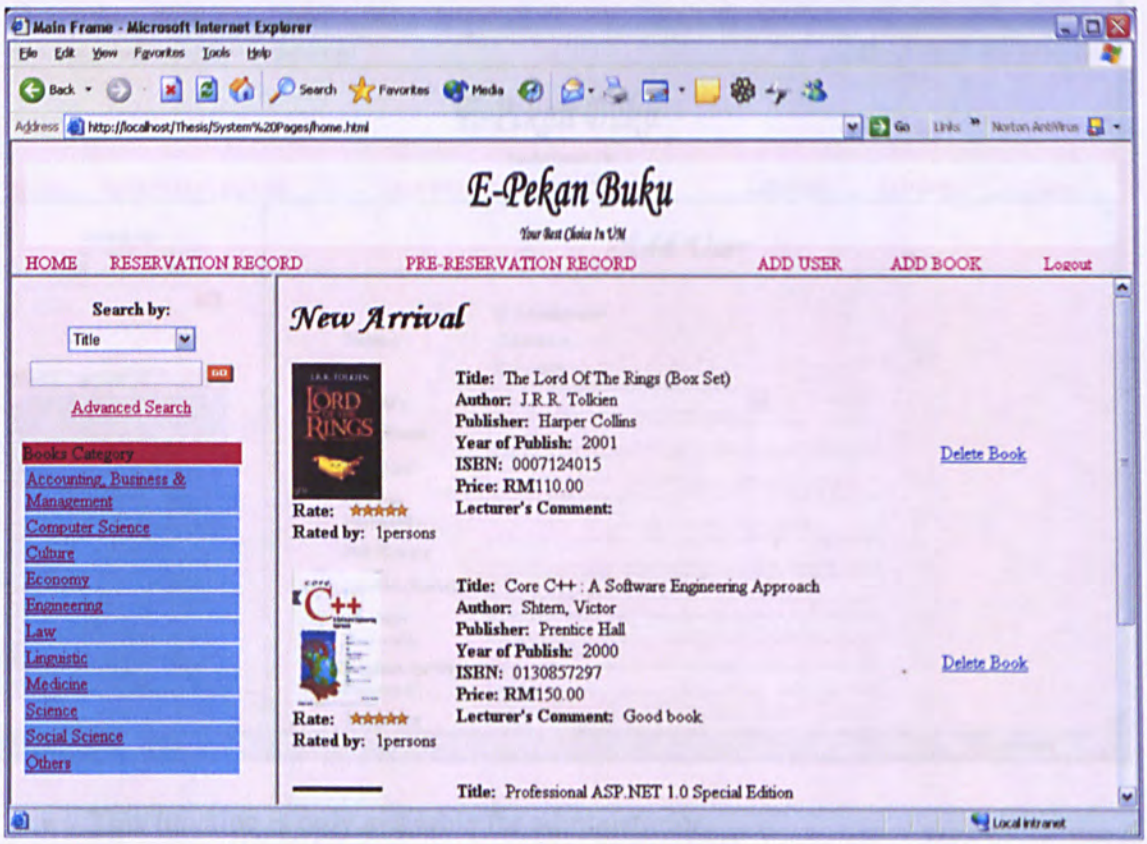
- User can rate the book that he/she likes by filling up this page.
- User cannot rate the same book more than 1 time.

3.9 Add Book Comment



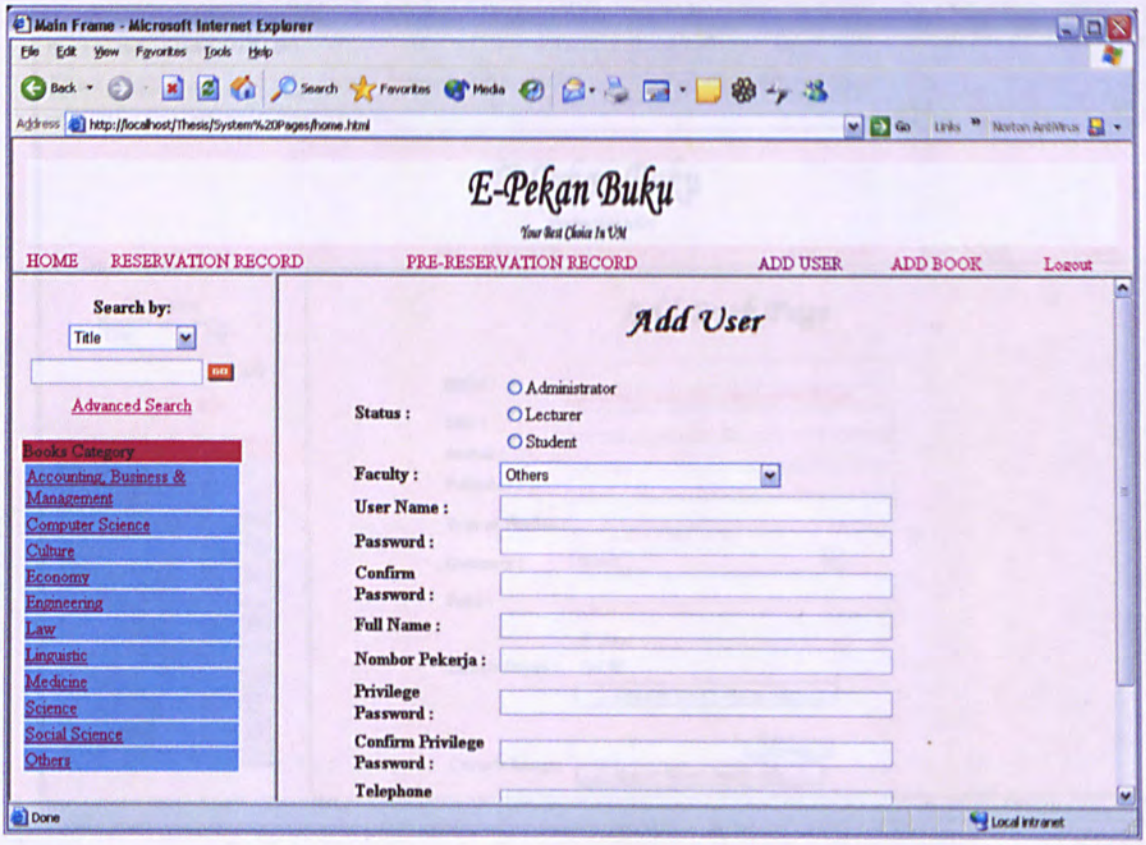
- Lecturer can add comment about a book by filling up this page.
- The comment will display on the book's description.
- This function is only available for lecturers.

3.10 Administrator Main Page



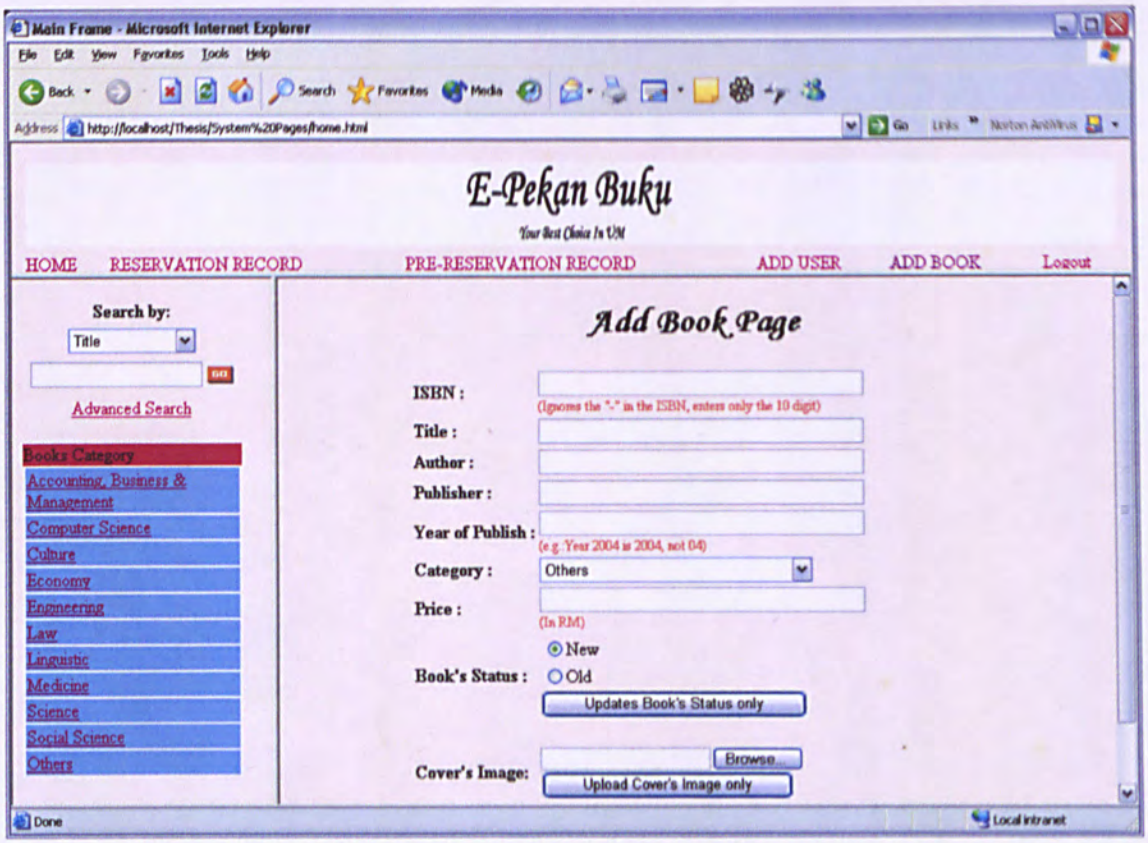
- Administrator can view reservation record or pre-reservation record by clicking the related hyperlink.
- Administrator can also delete the obsolete book from the system by clicking the "**Delete Book**" hyperlink.
- Administrator can add a new user or new book into this system by clicking the related hyperlink.

3.11 Add New User



- This function is only available for administrator.
- Administrator uses this function to add a new user who status is administrator, lecturer or student into the system.

3.12 Add New Book



- This function is also only available for administrator.
- Administrator uses this function to add a new book into the system or updates an existing book's information.
- Administrator also uses this function to upload the book's cover image into the system.