FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY UNIVERSITY OF MALAYA

SESSION 2001 / 2002

BOOK PROCESSING SYSTEM (BPS) FOR BOOKSTORE

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A graduation project submitted to Faculty of Computer Science and Information Technology, University of Malaya, in partial fulfillment of the requirements for the Degree of Bachelor of Information Technology.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest gratitude and thanks to my project supervisor, Cik Rafidah Md Noor, for her invaluable assistance, advice and guidance throughout this project development. Also, special thanks to Mr Woo Chaw Seng, my project moderator, who has given me a lot of advices in developing this project.

Besides, I would like to thank Mr. Lim who is the owner of Walk-in rent-a-book bookstore, Ms. Lee who is the captain for Star Bookstore and Mr. Tan who is the owner for San-san Video Centre. Thanks for their kindness to let me did survey in their shop and shared their experience with me during interviewing section.

I would like to present my utmost gratitude to my parent too, who has always supported me in whatever I am undertaking.

Last but not least, much appreciation is attributed to all my fellow course mates, for their willingness to share a lot of opinions and experiences throughout the project development.

Thank you.

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ABSTRACT

The objective of this project is to develop a computerized Book Processing System (BPS) for the bookstore which still runs their operation manually. The target is the bookstore that main activity is renting novel, comic, and etc besides selling newspaper or magazine. BPS is comprised from the different modules such as circulation module (rent, return, sell and fine for missing or overdue), book master, customer master (member or non-member), report generation and maintenance module.

The main function of this BPS is to do the transaction between staff and customer while customer desire to rent, return, buy, reserved or has been fined for missing or overdue. Secondly is to handle membership fee and maintain customer information in database. Besides that, the system is used to store book information and other information to facilitate the administrator to maintain the business. In this case, report generation is one of the functions for BPS. The others function like search, help, promotion, backup database and change password will be provided also.

For the methodology, traditional Waterfall model approach is selected for the development BPS. This method is adopted because ease of implementing. In addition, it supports rapid application and reduces the risk involved. Besides, the BPS is developed using Visual Basic 6.0 and Microsoft Access 2000 on the Window 2000 platform. Microsoft Visio is used to draw the flow chart and additional software will be used to create the bar code of the book too.

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CHAPTER 1: INTRODUCTION

Nowadays, renting bookstore is become more popular, provide renting service and selling magazine or newspaper for customer. Some of the bookstore are using the traditional way to conduct their daily business operations. This traditional way or business trend usually has resources such as the pieces of displaying books or serving services. However, it becomes a tedious and inefficient to manage and handle these entire operations.

Since they still operations their business manually, this Book Processing System (BPS) is created for them to facilitate their operational functions and becomes computerized. The system will upgrade and simplify the process of traditional business operations to computerized system. It is hope that the BPS will benefit the bookstore. This is easier them when they want to extend their business later. Through the system, they will get a more convenience working environment and success to manage their work more systematically.

1.1 System Introduction

This is a Book Processing System for a bookstore to keep track of sales and store the necessary information. This system is set to improve customer service and to upgrade the efficiency of the original manual system.

The overall view of the system is concerning of the ways of storing information, process transaction, process member fee, configuring new customer, and cataloging new book that were bought by the shop for rent. User will have instant access to book status, view book information, view supplier information, view chargeable rental and book price, view member fee, new print sales report, search book, etc. Price charges and catalog lists can easily performed quickly and easily, allowing for a highly flexible

CHAPTER 1: INTRODUCTION

Nowadays, renting bookstore is become more popular in providing renting service and selling magazine or newspaper for customers. There are a lot of the bookstores using the traditional way to conduct their daily business operations. This traditional way or business trend need many resources such as large spaces for displaying books or serving services, man power to do theses jobs, cost and internal management to handle these entire operations.

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and customizable order entry system. Customers will be divided into member and non-member. All customers will be allowing to booking the book that is not available for the moment.

We can also keep track of transactions. Tracking of this activity could be interpreted as total rental, total annual fee, member deposit that received, etc. The information would be very useful for the management whereby they could view total income and profit in their shop. Besides, they could view which books sale/rent the most/which doesn't, which would mean more input could be placed in books which under performed.

Besides, this BPS could be manipulated by the shop owner to produce reports. For example, if he/she would like to know which customer profiles are rent a particular book category for demographical/statistical survey. By looking at how a particular book category seems to be most popular, the shop owner could take steps into buying more books of this particular category to boost its shop revenue.

We can say that the Book Processing System provides more accurate information, provides a good service to customer, reduces duplicate information, data integrity is maintained and many more. This system uses Microsoft Access as the database and Visual basic as the front-end application.

1.2 Objective

This Book Processing System is created for a bookstore. The main purpose of the program is to take down orders by customers, keep track of transaction, key in new books that have been bought, to key in new customers, key in suppliers information and also mortification of book information or member information.

Listed below are the main objectives in developing the Book Processing System:

1) Keep track of transaction
2) Improve efficiency in storing information
3) Improve customer service and business image
4) Reduce mistake and operational cost

At the end of developing the system, the objectives are once again evaluated to ensure that most of the objectives listed earlier are fulfilled. These objectives set as a guideline for developing the Book Processing System.

1.3 Scope

The project will focus on the book renting/returning system for a bookstore. A database must be easy to implement and maintain for the system especially the capability and availability to support the huge amount of data loading.

Besides that, BPS will show all the book information, customer information, supplier information and operational report in an attractive screen display. These detailed information including member account number, barcode of book, member fee and etc. It would allow user to operate all activities through the display form. These data should direct capture and store in the database correctly and safety.

1.4 Target

Target for this BPS is the medium/small size of bookstore which main activity is renting but not selling. In addition, user target are owner for the bookstore who acts as administrator and staffs of bookstore. For the moment, customers of the bookstore are not allowed to use this system. This is because the main objective to develop this

system is to transfer the manual system to computerized system to facilitate the bookstore's owner but not the customer.

By introducing this BPS, I hope that it will be applied in the real business world. When this BPS is become stable and be used widely and tested no problem, it should be modified to enable the online function based on the network system. This is important since networking is become more popular around us especially when the business is become bigger and bigger by franchising their business.

1.5 Project Schedule

To facilitate the whole project runs on time, a project schedule is planned to foresee the smooth running of the development of this project. Below is drawn a Gantt Chart for the building of the proposed Book Processing System for a bookstore. The schedule is planned such that it coordinates all the aspects of the project so that it will be finished by the proposed time allotted.

Activity / Month	Jun '01	Jul '01	Aug '01	Sep '01	Oct '01	Nov '01	Dec '01	Jan '02	Feb '02
research & data gathering									
system analysis									
system design									
coding									
module testing									
system testing									
documentation									
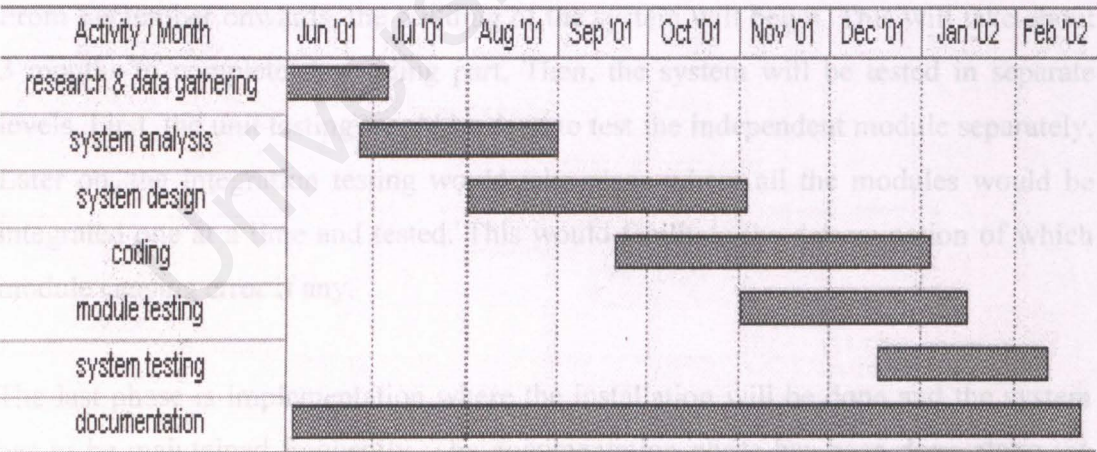
Figure 1.1: Gantt Chart

As what is shown in the Gantt Chart, research and data gathering was first conducted during the first month. In this stage, a few informal interviews were done with some

of the customers of bookstores to get their response regarding the idea of doing this Book Processing System. Meanwhile, the requirements definition was defined as discussions were held with my supervisor as to what requirements were needed to fulfill the needs of this project.

The next phase was that of the system analysis. During this phase, several algorithms and techniques were analyzed. The software and tools to be used were determined. These were very time-consuming as researching had to be conducted to find out what exactly was needed. Decisions were made regarding the most effective way to develop the system.

Later on the system design was carried out starting from the month of August. This phase basically required the user interface, database and the system flow chart to be designed. A report would be generated at the end of the system design phase. Other phases will only follow once the research and development phase has been completed.

From September onwards, the building of the system will begin. This will take about 3 months to complete the coding part. Then, the system will be tested in separate levels. First, the unit testing would be done to test the independent module separately. Later on, the integration testing would take place where all the modules would be integrated one at a time and tested. This would facilitate the determination of which module causing error if any.

The last phase is implementation where the installation will be done and the system has to be maintained frequently. The documentation phase has been done along the development because every step during the development is important to be recorded. This is to facilitate the user since they can refer to the documents or user manual if they face any problem while they are using the system.

1.6 Expected Output

Basically, this BPS is comprised by different modules which are circulation module, book-master module, maintenance module, membership module, report generation, search and help function. By linking those modules, I expect I will get the output screen such as sales/transaction, book management, member, report and utilities.

Transaction screen is created to record all the business activities like book renting and returning. Furthermore, book management is set to manage all book information like key in new price or rental, register new book, modify book information etc while member module is used to store member information whether is member. In addition, it will handle the deposit and overdue payment collected from member.

Reports can be divided into income report and operation report. We can check and print out report daily, weekly or monthly as we like. Utilities functions as login user, change password, setup new user etc. Besides, there will be a search function provided to check the status of book or to check member information. This is to facilitate user if customers want to search the books they like.

CHAPTER 2: LITERATURE REVIEW

The main purpose of literature review is to guide the students using the best way to access and analysis information regarding to their research topic. It also helps students to recognize relevant information and other research material accordingly to the guiding concept. It also helps to develop their information seeking and critical appraisal skill.

2.1 Existing Bookstore System

The operation of a bookstore system, both computerized and manual is the integration of the inventory control system and the transaction processing system or sales processing system.

2.1.1 Manual System

For manual system, all the inventory control and transaction processing are done manually. The maintenance of inventory, for example, whenever there are new stock coming in, the title of the new stocks is recorded into paper documents or record card. Same respect goes to transaction processing. When a transaction takes place and is completed successfully, record is made. In the end of the month, stock checking is made to determine whether the balance of physical stocks equivalent to the number recorded in files.

These are certain drawbacks with the manual system, for example, it is costly and impossible to detect errors or mistakes at the time the mistakes incurred. It would only discover in the end of the month when shortage exists. For an instance, if an employee

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There are certain drawbacks with the manual system, for example, it is costly and unable to detect human mistakes at the time the mistakes incurred. It would only discover in the end of month when shortage exists. For an instance, if an employee

mistakenly recorded a quantity of goods sold which is larger that it should, it would

not be discovered until in the end of the month.

Besides, it is not a good way of providing the sufficient information for the purpose

of stock control. Again, it is only possible to check whether the stock which is

currently available enough to cater for the demand of customers in the end of the

month when stock check is done or in event where the physical stock itself finish.

The way of keeping the record is vulnerable to threats such as fire and flood. More

over, since there is no adequate control placed to avoid the problems, the value of

stocks can be easily modified by unauthorized person for their personal gain.

As a summary, below are a few of these drawbacks:

✓ If in future, the staffs want to look back into previous orders that have been

   made, retrieving this information from previous files is time consuming and in

   case of wrong filing by the staff, it would be really troublesome to go through

   all the files especially if there are thousands of them!

✓ Difficulty in keeping track of inventory control.

✓ Data of books/customers could be lost if the staff does not organize his/her

   filing cabinet. This would lead to unhappy customers and cost to the employer.

✓ When it comes to reporting or conducting a survey, all the information has to be

   collected manually and this would lead to a great downtime and cost.

2.1.2   *Computerized System*

For computerized system, inventory control is easily done if the system is powerful enough to detect the quantity of stock when it reaches a certain level where it needs to be top-up. Every transaction is recorded into the database which enable the users to keep track every transaction performed. At the same time, the inventory record is updated for new transaction. Therefore, the inventory is always keeps up-to-date without having to be done in the end of the month. Furthermore, the processing costs and the manual works are reduced as well as the manual work.

In spite of the efficiency of computerized system over manual system, it has several disadvantages. First, the system would not be able to detect any shortage in the event of theft. Second, human mistakes would still occur even if it would be less compared with manual system.

If the system is not designed in a way that is powerful enough to provide security to prevent unauthorized access, employees might have the opportunity to perform unlawful event that would undermine the efficiency of the system. As a result, adequate control or regulation should be imposed to the internal employees who will have chances in using the system.

2.1.3 *Bar code*

A bar code (often seen as a single word, *barcode*) is the small image of lines (bars) and spaces that is affixed to retail store items, identification cards, and postal mail to identify a particular product number, person, or location. The code uses a sequence of vertical bars and spaces to represent numbers and other symbols. A bar

code reader is used to read the code. Bar codes and readers are most often seen in supermarkets and retail stores, but a large number of different uses have been found for them. They are also used to take inventory in retail stores, to check out books from a library, to track manufacturing and shipping movement, to sign in on a job, to identify hospital patients, and to tabulate the results of direct mail marketing returns.

There is no one standard bar code; instead, there are several different bar code standards that serve different uses, industries, or geographic needs. Since 1973, the Uniform Product Code (UPC), regulated by the Uniform Code Council, an industry organization, has provided a standard bar code used by most retail stores. The European Article Numbering system (EAN), developed by Joe Woodland, the inventor of the first bar code system, allows for an extra pair of digits and is becoming widely used. POSTNET is the standard bar code used in the United States for ZIP codes in bulk mailing.

While developing this BPS, I will generate the bar code using Barcode Maker which is a shareware. The following table summarizes the most common bar code standards.

Bar Code Standard	Uses
Uniform Product Code (UPC)	Retail stores for sales checkout; inventory, etc.
Code 39 (Code 3 of 9)	Identification, inventory, and tracking shipments
POSTNET	Encoding zip codes on U.S. mail
European Article Number (EAN)	A superset of the UPC that allows extra digits for country identification
Japanese Article Number	Similar to the EAN, used in Japan

(JAN)	
Bookland	Based on ISBN numbers and used on book covers
ISSN bar code	Based on ISSN numbers, used on periodicals outside the U.S.
Code 128	Used in preference to Code 39 because it is more compact
Interleaved 2 of 5	Used in the shipping and warehouse industries
Codabar	Used by Federal Express, in libraries, and blood banks
MICR (Magnetic Ink Character Recognition)	A special font used for the numbers on the bottom of bank checks
OCR-A	The optical character recognition format used on book covers for the human readable version of the ISBN number

Table 2.1: Summary of bar code standard

2.2 Transaction

2.2.1   *What is Transaction?*

In computer programming, a transaction usually means a sequence of information exchange and related work (such as database updating) that is treated as a unit for the purposes of satisfying a request and for ensuring database integrity. For a transaction to be completed and database changes to be made permanent, a transaction has to be completed in its entirety.

A typical transaction is a catalog merchandise order phoned in by a customer and entered into a company by a customer representative. The order transaction involves checking an inventory database, confirming that the item is available,

placing the order and confirming that the order has been placed and the expected time of shipment. If we view this as a single transaction, then all of the steps must be completed before the transaction is successful and the database is actually changed to reflect the new order. If something happens before the transaction is successfully completed, any changes to the database must be kept track of so that they can be undone.

A program that manages or oversees the sequence of events that are part of a transaction is sometimes called a transaction monitor. Transactions are supported by SQL, the standard database user and programming interface. When a transaction completes successfully, database changes are said to be committed while when a transaction does not complete, changes are rolled back.

2.2.2   *Transaction Processing*

Transaction processing is the means by which most business data is captured and maintained. There are 2 types of transaction processing. The most familiar of these is the processing of *input transactions* such as customer orders, course registration, time cards, payments, and etc. each of these transactions inputs new data into the information system. Another type is the *output transactions* which trigger responses from or confirm actions to those who eventually receive those transactions. Examples of output transactions are customer invoice, paycheck, payment receipt, airline tickets and etc. In each case, the output transaction confirms an action or triggers a response.

Transaction processing includes more than the processing of input and output transactions. Because of the importance of complete and accurate data capture of transactions, there is a historical reporting requirement for most transaction-processing systems. These reports provide information on all transactions processed and serve as an audit trail that confirms transaction processing and ensures that the data can be recaptured in case it gets lost somewhere in the system.

Computer-based information systems generally support transaction processing for clerical and service knowledge workers. To some extent, the clerical tasks performed by these workers can be replaced by automation, which is faster and more accurate. These workers can, in turn, assume more stimulating and productive assignments. It should be noted that the reduction of clerical tasks is frequently offset by an increase in data-entry tasks and clerks to perform these new tasks. On e-trend in automated transaction processing is on-line support. On-line systems displace fewer workers because clerks must operate the computer terminals that are on-line with the computer. The advantage of on-line transaction processing is that data can be captured and processed immediately.

Because of the large volume of data that must be captured and stored by most firms, transaction processing is the most visible type of information system support. Computer-based transaction processing systems represent the first generation of information system applications. This generation is frequently referred to as electronic data processing (EDP). [Whitten, 1986]

2.3 Platform

An operating system is a program that needs to load into the computer to manage all

the other programs in a computer. It is loaded by using a bootstrap program. The

other programs are called applications. The applications make requests for services

through a defined application program interface (API) and users can interact

directly with the operating system through an interface such as a command

language. The operating system was included as one of the major computer

platforms. The platforms which include both hardware and software, that we are

considering is referred to operating system.

An operating system can perform many services for applications. The operating

system determines the sequence of the application should run in multitasking

operating system where multiple programs can be running at the same time. It also

manages the sharing of internal memory among multiple applications. Operating

system can offload the management of batch jobs such as printing, so that the

initiating application is freed from this work. It handles input and output to and

from attached hardware devices, such as hard disk, printers and dial-up ports.

2.3.1 *Windows 98*

Windows 98 (called "Memphis" during development and previously called

"Windows 97" based on an earlier schedule) is a widely installed product in

Microsoft's evolution of the Windows operating system for personal computers. Windows 98 expresses Microsoft's belief that users want and should have a global view of their potential resources and that Web technology should be an important part of the user interface.

Windows 98 also provides a 32-bit file allocation table (FAT) allows us to have a single-partition disk drive larger than 2 Gbytes. Other features in Windows 98 include:

✓ Support for Universal Serial Bus which make it easy to plug in new devices

✓ Support for Digital Versatile Disc

✓ Support for a new industry-standard form of power management called Advanced Configuration and Power Interface (ACPI)

2.3.2 *Windows Me*

Windows Me (Millennium Edition) is the operating system released commercially September 14, 2000. Windows Me was developed specifically for the home user, just as their Windows 2000 version was developed specifically for the business user. Microsoft claims that this Windows 98 update (which has a very similar look-and-feel to the earlier version) combines a more intuitive interface for the new user with added functionality for the experienced user.

Windows Me is to be the last operating system based on the Windows 95 kernel. Due to the designed to be backwards compatible with Windows 98, Windows Me will work with the earlier version's applications and drivers. Improvements over

Windows 98 include functions to enhance system stability and error correction (what Microsoft is calling "PC health").

PC health features:

✓ System restore, which allows users to return to a prior (functioning) configuration when encountering problems.

✓ System file protection, which prevents accidental overwriting of critical system files.

✓ Auto-update, which automatically downloads Microsoft updates.

2.3.3 *Windows 2000*

Windows 2000 (W2K) is the latest commercial version of Microsoft's evolving Windows operating system (although a new version, Windows XP, is now available for limited beta testing). Previously called Windows NT 5.0, Microsoft emphasizes that Windows 2000 is evolutionary and "Built on NT Technology." Windows 2000 is designed to appeal to small business and professional users as well as to the more technical and larger business market for which the NT was designed. For many Windows 95 and Windows 98 users, Windows 2000 may be regarded as a step to take when purchasing their next computer.

The Windows 2000 product line consists of four products:

✓ Windows 2000 Professional, aimed at individuals and businesses of all sizes. It includes security and mobile use enhancements. It is the most economical choice.

✓ Windows 2000 Server, aimed at small-to-medium size businesses. It can function as a Web server and/or a workgroup (or branch office) server. It can be part of a two-way symmetric multiprocessing system. NT 4.0 servers can be upgraded to this server.

✓ Windows 2000 Advanced Server, aimed at being a network operating system server and/or an application server, including those involving large databases. This server facilitates clustering and load balancing. NT 4.0 servers with up to eight-way SMP can upgrade to this product.

✓ Windows 2000 Datacenter Server, designed for large data warehouses, online transaction processing (OLTP), econometric analysis, and other applications requiring high-speed computation and large databases. The Datacenter Server supports up to 16-way SMP and up to 64 gigabytes of physical memory.

Windows 2000 is reported to be more stable (less apt to crash) than Windows 98/NT systems. A significant new feature is Microsoft's Active Directory, which, among other capabilities, enables a company to set up virtual private networks, to encrypt data locally or on the network, and to give users access to shared files in a consistent way from any network computer.

Notable features of the Windows 2000 products are:

✓ A fully-customizable administrative console that can be based on tasks rather than files, applications, or users

✓ A new file directory approach called Active Directory that lets the administrator and other users view every file and application in the network from a single point-of-view.

✓ Dynamic Domain Name Server (DNS), which replicates changes in the network using the Active Directory Services, the Dynamic Host Configuration Protocol (DHCP), and the Windows Internet Naming Service (WINS) whenever a client is reconfigured.

✓ The ability to create, extend, or mirror a disk volume without having to shut down the system and to back up data to a variety of magnetic and optical storage media.

✓ A Distributed File System (DFS) that lets users see a distributed set of files in a single file structure across departments, divisions, or an entire enterprise.

Close integration with and support for Microsoft's Message Queue Server, Microsoft Transaction Server, and Internet Information Server (IIS).

2.4 Database

A database is a collection of data that is organized so that its contents can easily be accessed, managed, and updated. The most prevalent type of database is the relational database, a tabular database in which data is defined so that it can be reorganized and accessed in a number of different ways. A distributed database is

one that can be dispersed or replicated among different points in a network. An

object-oriented programming database is one that is congruent with the data defined

in object classes and subclasses.

Databases contain aggregations of data records or files, such as sales transactions,

product catalogs and inventories, and customer profiles. Typically, a database

manager provides users the capabilities of controlling read/write access, specifying

report generation, and analyzing usage. Databases and database managers are

prevalent in large mainframe systems, but are also present in smaller distributed

workstation and mid-range systems such as the AS/400 and on personal computers.

Structured Query Language is a standard language for making interactive queries

from and updating a database such as IBM's DB2, Microsoft's Access, and database

products from Oracle, Sybase, and Computer Associates.

2.4.1   *Database Management System*

A database management system (DBMS), sometimes just called a database

manager, is a program that lets one or more computer users create and access data in

a database. The DBMS manages user requests (and requests from other programs)

so that users and other programs are free from having to understand where the data

is physically located on storage media and, in a multi-user system, who else may

also be accessing the data.

In handling user requests, the DBMS ensures the integrity of the data (that is, making sure it continues to be accessible and is consistently organized as intended) and security (making sure only those with access privileges can access the data). The most typical DBMS is a relational database management system (RDBMS). A standard user and program interface is the Structured Query Language (SQL). A newer kind of DBMS is the object-oriented database management system (ODBMS).

A DBMS can be thought of as a file manager that manages data in databases rather than files in file systems. In IBM's mainframe operating systems, the non-relational data managers were (and are, because these legacy application systems are still used) known as access methods.

A DBMS is usually an inherent part of a database product. On PCs, Microsoft Access is a popular example of a single- or small-group user DBMS. Microsoft's SQL Server is an example of a DBMS that serves database requests from multiple (client) users. Other popular DBMSs (these are all RDBMSs, by the way) are IBM's DB2, Oracle's line of database management products, and Sybase's products.

IBM's Information Management System (IMS) was one of the first DBMSs. A DBMS may be used by or combined with transaction managers, such as IBM's Customer Information Control System (CICS).

2.4.2   *Database Administrator*

A database administrator (DBA) directs or performs all activities related to maintaining a successful database environment. Responsibilities include designing, implementing, and maintaining the database system; establishing policies and procedures pertaining to the management, security, maintenance, and use of the database management system; and training employees in database management and use.

A DBA is expected to stay abreast of emerging technologies and new design approaches. Typically, a DBA has either a degree in Computer Science and some on-the-job training with a particular database product or more extensive experience with a range of database products. A DBA is usually expected to have experience with one or more of the major database management products, such as Structured Query Language, Systems, Application and Products in Data Processing, and Oracle-based database management software.

2.4.3   *Microsoft Access 2000*

Microsoft Access is a Windows-based database management system. It is one of the programs in the Microsoft Office. Access is the desktop database choice of thousands of users for many reasons. Access is "at home" with home users who want to store and retrieve personal data easily. Access also works very well in business environments with multiple users.

One of the most commonly praised attributes of this data-storage and retrieval system is its easy-to-understand graphic interface for creating queries, forms and

reports – something that many larger, more complicated database systems lack. In other words, even inexperienced programmers can use Access to turn a stack of invoices, a card file of customer names, a ledger and an inventory list into a relational database that makes entering, updating and reporting information as easy as clicking a button. Creating applications with Access has become a popular inroad for people who want to move into the field of computer development and programming. [Harkins, 1999]

Below stated are some benefits from using Access:

✓ **Sample databases –** Microsoft includes sample databases to help developer learn about real-world tables, forms, queries and reports and how they are interconnected to form a data management system.

✓ **Wizards –** Microsoft makes creating an Access database very easy. We can choose from several examples of databases in the database wizard for such storage uses as contact information, inventory control, a ledger and so on. We can create and then modify these databases to meet our own needs.

✓ **Keys to understanding the structure –** after we decide ht to create and relate our tables, we can easily view all the relationships in our database with the graphical interface in the Relationships window. This makes one of the toughest parts of relational database design much easier and more manageable.

✓ **Microsoft Office integration –** we can use Access with Word, Excel and other Microsoft Office applications to create mail merges, charts and other helpful uses for our data.

✓ **Easier programming** – we can use relatively simple code with macros to automate repeated tasks or try more complex and flexible code with VBA (Visual Basic for Applications). Access provides graphical shortcuts and hints to help make writing code easier.

✓ **Common standards** – when we are ready for the big time, we can rest assured that Access uses standards that help its applications scale up to work within larger environments. Access uses objects and SQL (Structured Query Language) to make its code adaptable to other applications.

Here is a list of some of the things that we can do with Access:

✓ Open tables and enter data into them.

✓ Manipulate and perform calculations on the data.

✓ Format the data (e.g. for currency, decimals)

✓ Perform financial, mathematical and statistical calculations.

✓ Design screen forms for data entry and/or for browsing the data in a table.

✓ Design reports for displaying information in a variety of styles.

✓ Link tables, i.e. set relationships between tables.

✓ Automate tasks.

✓ Access the internet/intranet and view related information on the Worldwide Web or in an organization's database. [Sellappan, 1999]

2.5 Programming Tools

2.5.1   *MySQL*

MySQL (pronounced "my ess cue el," not "my sequel") is an open source relational

database management system (RDBMS) that uses Structured Query Language

(SQL), the most popular language for adding, accessing, and processing data in a

database. Because it is open source, anyone can download MySQL and tailor it to

their needs in accordance with the general public license. MySQL is noted mainly

for its speed, reliability, and flexibility. Most agree, however, that it works best

when managing content and not executing transactions.

The MySQL relational database system was first released in January, 1998. It is

fully multi-threaded using kernel threads, provides application program interfaces

(APIs) for C, C++, Eiffel, Java, Perl, PHP, Python, and Tcl, allows for many

column types, and offers full operator and function support in the SELECT and

WHERE parts of queries.

The development team working on future releases of MySQL plan to unveil

MySQL 4.0 in mid-2001. Its features will include a new table definition file format,

enhanced replication, and more functions for a full-text search. Later, MySQL

developers hope to add fail-safe replication, a port of MySQL to BeOS, and an

option to periodically flush key pages for tables with delayed keys. Over time,

MySQL plans to be fully ANSI 92/ANSI 99- compliant.

MySQL currently runs on the Linux, UNIX, and Windows platforms. Many

Internet startups have been especially interested in MySQL as an alternative to the

proprietary database systems from Oracle, IBM, and Informix. Yahoo's news site

uses MySQL.

2.5.2   SQL

SQL (Structured Query Language) is a standard interactive and programming language for getting information from and updating a database. Although SQL is both an ANSI and an ISO standard, many database products support SQL with proprietary extensions to the standard language. Queries take the form of a command language that lets you select, insert, update, find out the location of data, and so forth. There is also a programming interface.

2.5.3   *Visual Basic 6.0*

Visual Basic is a programming environment from Microsoft in which a programmer uses a graphical user interface to choose and modify pre-selected sections of code written in the BASIC programming language. Since Visual Basic is easy to learn and fast to write code with, it's sometimes used to prototype an application that will later be written in a more difficult but efficient language.

The Microsoft Visual Basic development system is the most productive tool for creating high-performance components and applications. It offers developers the ability to create robust applications that reside on the client or server, or operate in a distributed n-tier environment. Visual Basic is also widely used to write working programs. Microsoft says that there are at least 3 million developers using Visual Basic.

Visual Basic 6.0 uses the Windows 2000 Developer's Readiness Kit for fast access to in-depth, step-by-step training and technical resources. We can build highly reliable, self-repairing applications using the new Visual Studio Installer. Finally, we can create desktop and shared solutions that easily scale up to SQL Server 7.0 using the new Microsoft Data Engine (MSDE) for Visual Studio. Below are some significant features for Visual Basic 6.0.

✓ **High-performance native-code compiler**

Create applications and both client- and server-side components that are optimized for throughput by the world-class Visual C++ 6.0 optimized native-code compiler.

✓ **Access to all enterprise data sources through ODBC, OLE DB, and Microsoft ActiveX Data Objects (ADO)**

Visual Basic 6.0 introduces ADO as the powerful new standard for data access. Included OLE DB drivers include SQL Server 6.5+, Oracle 7.3.3+, Microsoft Access, ODBC, and SNA Server.

✓ **Integrated Visual Database Tools**

Visual Basic 6.0 provides a complete set of tools for integrating databases with any application. Database features include design tools for creating and modifying SQL Server 6.5+, Oracle 7.3.3+ or above, and AS/400 databases.

✓ **Automatic data binding**

Virtually no code is needed to bind controls to data sources. Setting just two properties in the Properties window connects the control to any data source.

✓ **Data Environment designer**

Visually create reusable record set command objects with drag-and-drop functionality. Bind to multiple data sources for data aggregation and manipulation.

✓ **Drag and drop creation of data-bound forms and reports**

Using the new Data Environment designer, developers can quickly drag-and-drop custom data-bound controls to create forms or reports with the new Data Report designer. Creation of custom data hierarchies is as easy as filling out a dialog box and dragging the command to the form.

✓ **Middle-tier testing and deployment tools**

Interactively debug Microsoft Transaction Server–packaged components, and package and deploy components to remote servers.

✓ **Visual Basic Web Class designer**

Create server-side applications and components that are easily accessible from any web browser on any platform.

2.6 <u>Analysis on Existing System</u>

There are three systems were studied in the attempt to find out the popular features that are favored by the user. Due to the business secrecy and confidentiality, most of the bookstores owner not allowed me to do the further research on their system. Thus I found another similar system ('VPOS' used by Hong Kong Movie) that I thought the concept they used for developing this system was same with bookstore renting system.

2.6.1   System used by Walk-in rent-a-book bookstore

Walk-in rent-a-book bookstore is a middle size bookstore with collection more than

50,000 of books. The types of books include comic, magazine, novel whether in

Chinese or English language. The book order system used by this bookstore is runs

on MS-DOS and created on five years ago. The functions of this system are record

book inventory, process book renting/ordering/searching/reserve, print out report

and handle membership information. In the main menu of the system, I can find the

book inventory, membership database, rental billing, inquiry/report and system

utilities.

The most important part is rental billing. Each transaction will go through this part

when a book rent out or return from customer. Actually, each book has its identified

barcode; User just needs to scan the barcode, the price and rental for the book (there

are two rental rate where one is for member and another one is for non-member)

will be shown on the screen. Same with sales, receipt will be printed out while a

magazine or newspaper is sold that involve payment. For those magazine or

newspaper without barcode (these items are for sell only), user differentiates them

by using certain code. Same with scanning, user just key in the code and the price

will be popped out on the screen. All the transaction is done based on the barcode

not based on the customer's code, this is different with the VPOS system.

Besides that, customers are allowed to reserve the book that is not available at the

moment. The staff can search and check the status of book through the book

inventory. All the information of the books is stored in this database. For

membership database, its function is same with book inventory, all members

information will be stored here. For membership, they just need to pay the member

fee and will be given discount 10% to 20% when doing transaction at the bookstore.

Furthermore, report is used to print out the activities report whether is daily cash bill

report, monthly cash bill report or yearly cash bill report. On the other hand, inquiry

is created for checking the collection status, book inventory/rental information and

book inventory by barcode. Finally, the system utilities include re-index data files

and re-create index file. This function seldom used by the user because it is used

only when something unpredictable happens such as power suddenly cut off.

Strengths

✓ It is easier to handle the system.

✓ The hardware requirements for the system is very low.

Weakness

➤ We can't trace the history of books. This means that we would not know a book

   is used to rent by who or who has being rent this book.

➤ This system is not user friendly because its runs on Ms DOS.

➤ Customer has to pay deposit every time they want to rent a book.

2.6.2   'VPOS' used by Hong Kong Movie

I chose VPOS as my research target is because of the renting concept used in this system that I thought is similar with renting book although VPOS is used for renting video tape. VPOS is used by all the video centers that obtained movies from Hong Kong Movie. This system is written used Delphi and runs on Windows platform. Same with other bookstore system VPOS provides the functions are sales, tape management, customer database, reports, utilities and help.

The sales function is operates based on customers information which includes customer, transaction date, issue/return for member, issue/return for non-member, quick return, change adjustment, customer history, tape history, daily tape issue register, daily income summary report and etc. When a customer desires to rent a tape, he/she has to tell the staff what is his/her customer code and his/her information will be popped out when the staff key in the customer's code. Then the staff will scan the tape which also consists of barcode like a book.
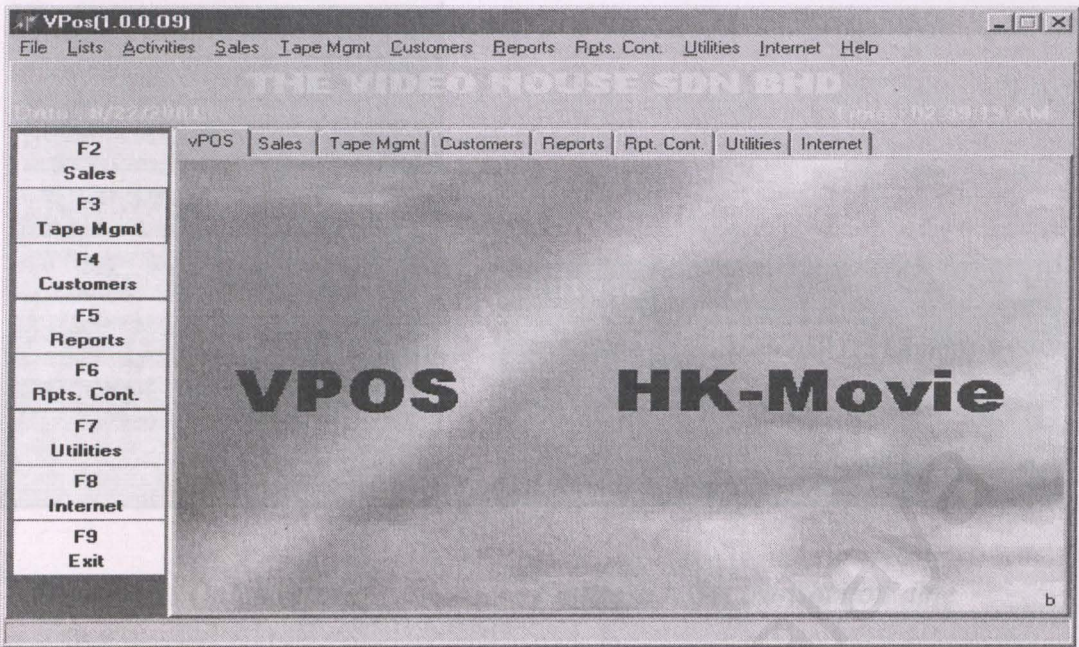
Figure 2.1: VPOS main page

Quick return is created to faster the return process without involves payment on the spot. This means that the tape has been returned will be scanned and recorded in database only but the payment will not be calculated on the spot. The customer has to clear their payment whether pay or receive the extra money during next transaction period. This quick return function is very useful when there is a lot of tapes have to be returned at the same time especially at the peak hour.

The *set transaction date* is created to correct the transaction date if the date is wrong maybe caused by the software or hardware problem. The date is important when calculate any payment. Thus, a message box will pop out before start using the VPOS to make sure that the date is correct. We can also check the history for a customer or a tape. By looking at tape history, the staff will know that a certain tape is used to rent by which customer.
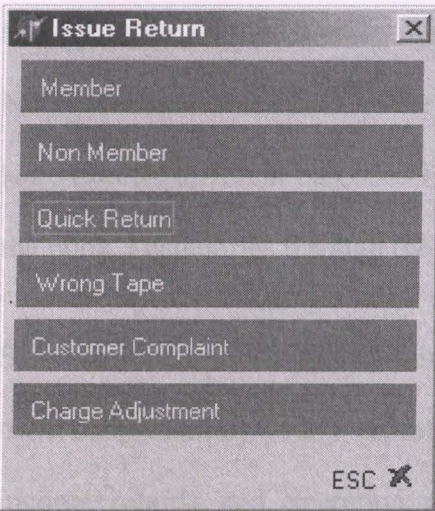
Figure 2.2: Quick return   *Figure 2.3: Set transaction date*
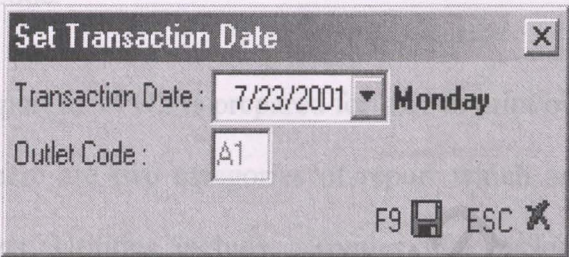
In addition, the customer database is used to store customer information. Customers will be divided into member and non-member. Member can be divided into many types again depends on the amount of deposit they paid. The staffs are included in this category. Each customer has its own account balance and overdue payment record, deposit payment/refund record, joining payment record and annual/monthly fee payment/refund record. When a customer rent/return the tape, all the above information will be shown on the screen.

The tape management acts similar with book inventory. All the activities have done on the tape will be recorded. The tape is named by the different way compared with the system used by Walk-in rent-a-book bookstore. For VPOS, all the tapes with the same title will be started with a same code, and then follow by a second code to depict a certain tape. Thus, we can recognize the same title of the tape with its first code. These code also distributed follow by the types of movie such as drama and cartoon have their own code to represent the categories of movie. Despite of the

same title, the method used by Walk-in rent-a-book bookstore is randomly stick the

barcode sticker at the back of the book, so each book although with same title will

have exactly different barcode. Therefore, we wouldn't get any information about

the book's categories through the barcode.

Same with other bookstore system, report in VPOS is prepared for user to print out

their daily/monthly/yearly report. There are two categories of report which are

income reports and operation reports. Utilities include activities like backup

database, restore database and synchronize database where is used for maintaining

and implementation purpose. The last part is HELP function. A help file is created

to help user if they face problem while using the system.

Strengths

✓ *Quick Return* function is very effective and save time.

✓ Customers pay deposit for once only and they will be divided into different

  groups based on the amount they paid for deposit.

✓ We can trace the history of book and history of customer.

✓ *Set transaction date* is an extra function to reduce the probability of problems if

  the date in the computer is changed caused by software/hardware error.

Weakness

➢ VPOS has been updated too many times until some functions/icons duplicated

  or useless.

2.6.3   *System used by Star Bookstore*

The system used by Star Bookstore is written using Visual FoxPro and runs together with Chinese Star. This is because headquarter of this bookstore is at Taiwan and this program is written by Taiwanese using Chinese version. Due to the business confidentiality, I have no opportunity to review or survey on the system. Thus, I just allowed to survey on membership registration and the rules for renting book.

There is no deposit required for the customer either member or non-member who rents book. For non-members, they are not allow to rent a book outside which means that they have to read the book in the bookstore on the spot. The time is no limited for them to finish the book. Thus, they just paid the rental for the book only. For members, they can bring back the book and the rental for each book will automatically deduct from the member fee they paid earlier. Rental for member is definitely cheaper than non-member!

Same with VPOS, members are categorized into different groups according to the amount they paid during registered for membership. There are 4 categories for the membership where the fee is in the range RM30 to RM200. Limitation of the books which they can rent also based on the amount of the member fee. Anyway, maximum 10 books (including magazine) are allowed to be handled by a member. While the member's fee less than RM10, they have to top-up the member fee. During this period, they can change their member category by add more money or less than before.

Member will be given a member card which is used when they desire to do

transaction in the bookstore. Member just key in their password and then his/her

information will be shown on the screen. Then the staff will scan the bar code of the

book to do the following transaction. Below is an example of the member card and

the logo for Star Bookstore.

Figure 2.4: Star Bookstore logo   **Figure 2.5: Sample member card**

If there is late return from member, 20% of the rental will be charged per day. There

is no holiday or rest day for the shop, therefore everyday in a year is included in

counting the fining. If a book is not returned within two months, the book is

considered sold out to the relevant member.

Strengths

✓ No deposit is required, this is an attractive method to absorb new customer.

Weakness

➢ The system is written in one language only and user has to run the Chinese Star

program together with this program. Besides, this program is not suitable for

those who are not Chinese literate.

2.6.4   Conclusion

As a summary, the functions of the system can be divided into customer module, book/tape management, report and circulation/transaction module. Activities of circulation module are the most important part to record a transaction. It's includes the activities like rent/issue, return book and payment. It's like a bridge to connect customer and book with the system. Then the book inventory or tape management together with customer's database has the similar role that is store the relevant information.

Search function is designed for both systems. This means that this function is important for the bookstore. In addition, report is created to summarize the activities done in bookstore. Through the report, the owner of the bookstore will know his/her business performance and then do planning or maintenance to maximize his/her benefits.

From the VPOS system, they used different bar codes to differentiate two books with same title. Besides, user can check the history of book and history of customer. I thought this is a good method to manage the books and customer information. Other than this, the membership management used by Star Bookstore is a good idea for me to develop my system too.

CHAPTER 3: SYSTEM ANALYSIS & METHODOLOGY

System analysis is simply a tool which is available under many circumstances to identify and remedy problems. Systems analysis may take a variety of forms. At the core of it all is the user and his interaction with an organization and its data. Systems analysis can be applied to a great variety of situations. Systems analysis can be applied to a great variety of situations. Systems analysis is applied to an unlimited number of environments, including the business world and the area of information studies. However, the same basic elements of systems analysis apply to different settings, and people in different environments may share the same misunderstandings of the meaning and purpose of systems analysis. [Osborne, 2000]

3.1   Analysis on System Objective

As I mentioned in chapter one, there are four objectives of develop this Book Processing System for a bookstore. First objective is to keep track of sales for maintenance purpose. This objective is the most important because wrong information will lead to wrong action taken by user. For example, if the amount of books shown in bookstore is less than usual, then the owner perhaps will order the same book again from supplier to replace the lost one. However, the book actually is rented by someone, but due to human error, there is no record for tracing. Thus, computerised system is created to facilitate the user for tracing the record just by clicking a button.

The second and third objectives is improving performance of bookstore by improving storing information, business image and customer service. For the manual system, customers always complaint that the service provided is very slow and wasted their time. If this BPS is used by the users, they wouldn't face the same problems again. This is because search function is provided in this system, there is unnecessary to find

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The second and third objectives is improving performance of bookstore by improving storing information, business image and customer service. For the manual system, customers always complaint that the service provided is very slow and wasted their time. If this BPS is used by the users, they wouldn't face the same problems again. This is because search function is provided in this system, there is unnecessary to find

out a book one by one like the manual system. Again, this will improve the efficiency of the works and then improve the business image among the customers.

The last objective is to reduce mistakes and operational cost. As a business person, profit is the most important thing in his mind. Therefore, reduce errors means reduce the operational cost and then maximize the profit. Although there is no guarantee that computerized system is hundred percent consistent or free of error, at least the opportunity of occurring errors is less than manual system! In addition, this BPS is designed as user-friendliness as possible to make sure that user can handle the system as easier as they can.

As a summary, these objectives became a guideline to me while developing this BPS. During the development, I always reviewed and evaluated these objectives to make sure that all requirements are fulfilled.

3.2   System Methodology

3.2.1   Why Methodology?

Over the years, many systems development methodologies have evolved. A system development methodology does not just provides a set of modeling techniques, it also defines the stages of a system development project, specifies the task to be carried out in and the output expected from each stage, provides guidelines for project management and control. [Robinson, 1995] A good methodology characteristics are:

✓ easy to use to average analysts and programmers.

✓ covers all phases of system development.

✓ relevant to the type of application being developed.

✓ well quality documentation is available.

✓ good vendor support in terms of training and consultancy.

Besides, a good methodology caused the effective way of doing things is defined before the project and becomes the framework to development staff. Among the numerous benefits offered by a good methodology are: [Holloway, 1989]

1) Provides a standard framework that the developer does not have to reinvent the wheel for each project.

2) Each method/tool in the methodology results in the successful completion of each development task.

3) Reviews procedures are available to identify any errors, inconsistencies and discrepancies during development.

4) Increases the system quality by forcing the developer to produce flexible systems and adequate documentation.

5) Provides better understanding of user needs and validation of user needs.

6) Provides the management with tools to review project progress and checklist to access tasks and deliverables.

7) Improves communication among management, analysts, programmers, users and other stakeholders by providing a communication base.

8) Facilitates planning and controlling the project.

3.2.2 *Waterfall Model*

Many process models are described in the system development. Some are prescriptions for the way software development should progress, while others are descriptions of the way software development is done in actuality. One of the models to be proposed is the waterfall model, illustrated in *Figure 3.1*, where the stages are depicted as cascading from one to another. [Pfleeger, 2001]

Requirements Analysis

System Design

Program Design

Coding

Testing

Operation & Maintenance
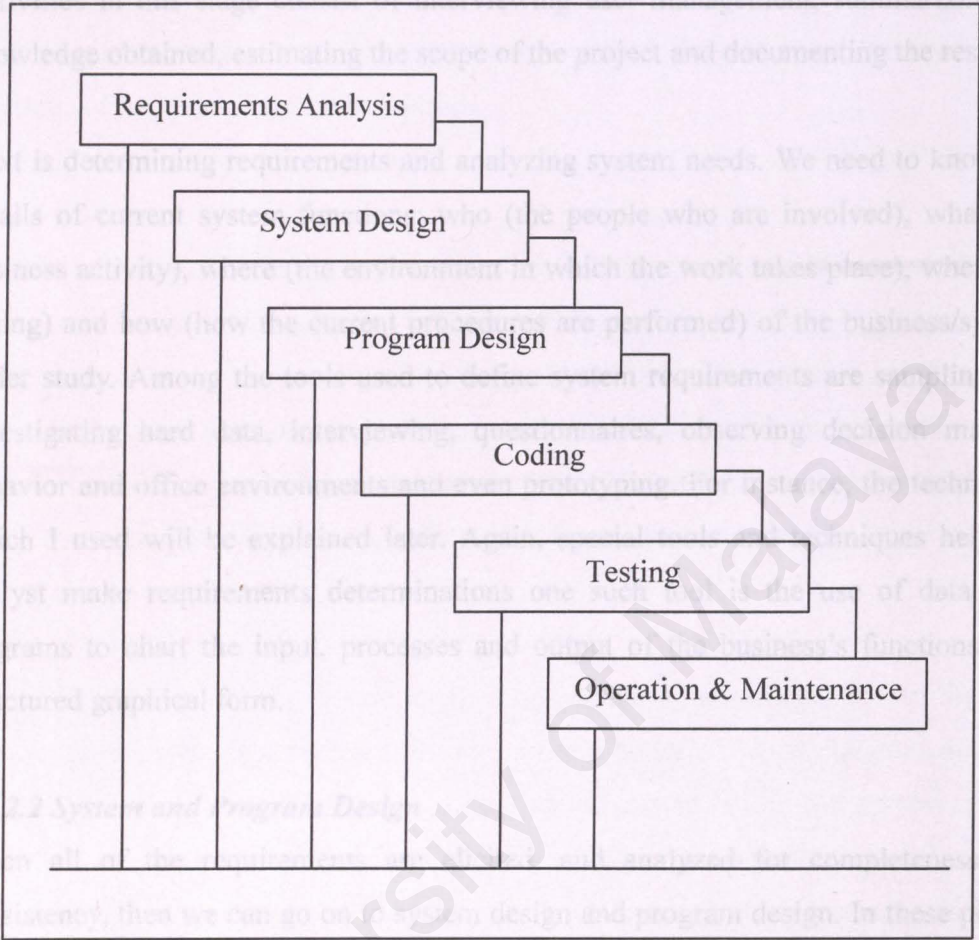
Figure 3.1: Waterfall model

3.2.2.1 Requirements Analysis

The first stage – requirements analysis, requires analyst look honestly at what is occurring in a business and concerns with identifying problems, opportunities and objectives, then analyzes the requirements that system needs. This stage is critical to the success of the rest of the project, since no one wants to waste subsequent time addressing the wrong problem. Identifying objectives is an important component of the first stage. First, the analyst must discover what the business is trying to do. Then the analyst will be able to see if some aspect of information systems applications can help the business reach its objectives by addressing specific problems or opportunities.

Activities in this stage consist of interviewing user management, summarizing the knowledge obtained, estimating the scope of the project and documenting the results.

Next is determining requirements and analyzing system needs. We need to know the details of current system functions: who (the people who are involved), what (the business activity), where (the environment in which the work takes place), when (the timing) and how (how the current procedures are performed) of the business/system under study. Among the tools used to define system requirements are sampling and investigating hard data, interviewing, questionnaires, observing decision makers' behavior and office environments and even prototyping. For instance, the techniques which I used will be explained later. Again, special tools and techniques help the analyst make requirements determinations one such tool is the use of data flow diagrams to chart the input, processes and output of the business's functions in a structured graphical form.

3.2.2.2 System and Program Design

When all of the requirements are elicited, and analyzed for completeness and consistency, then we can go on to system design and program design. In these phases of the waterfall model, I use the information collected earlier to accomplish the logical design of the information system. The accurate data-entry procedures will be designed so that data going into the information system are correct. In addition we should provide effective input by using techniques of good form and screen design. Part of the logical design is devising the user interface. The design phase also includes designing files or databases that will store much of the data.

Computer outputs are normally designed first because output design can affect the design of computer inputs, files and methods. Finally, we have to design controls and backup procedures to protect the system and the data and to produce program specification packets for customers. Each packet should contain input and output

layouts, file specifications and processing details. Besides that, it may also include decision trees or tables, data flow diagrams, a system flowchart and the names and functions of any prewritten code routines.

3.2.2.3 Coding

In the fourth stage (coding) of the model, I will design, code and remove syntactical errors from computer programs. This phase is frequently the most time-consuming and tedious phase of the model. The time required for coding is often longer than it should be because the preceding phases were completed hastily or not at all. If the specifications from preceding phases are unclear, incomplete, inaccurate or otherwise faulty, the coding phase will be complicated and more time-consuming!

3.2.2.4 Testing

As the figure implies, one development stage should be completed before the next begins. After coding is completed, the system will be tested which includes unit and integration testing, system testing and acceptance testing before the system can be used. It is much less costly to catch problems before the system is signed over to customers. A series of tests to pinpoint problems is run first with sample data and eventually with actual data from the current system. Unit and integration testing in the waterfall ends with the milestone "code modules written, tested and integrated;" the intermediate deliverables is a copy of the tested code. Next, the code can be turned over the system tested so it can be merged with other system components (hardware or software) and tested as a larger whole.

3.2.2.5 Operation & Maintenance

The last stage is operation and maintenance. Operation involves training users to handle the system. After the system is installed, it must be maintained, meaning that the computer programs must be modified and kept up-to-date. Maintenance of the system is carried out routinely throughout the life of the system. Much of the

programmer's routine work consists of maintenance and businesses spend a great deal of money on maintenance.

Maintenance is performed for two reasons. The first of these is to correct software errors. No matter how thoroughly the system is tested, bugs or errors creep into computer programs. Bugs in commercial microcomputer software are often documented as "known anomalies" and corrected when new versions of the software are released or in an interim release. In customized software, bugs must be corrected as they are detected. The other reason is to enhance the software capabilities in response to changing organizational needs. [Kendall, 1999]

3.2.2.6 Advantages and disadvantages

Advantages	Disadvantages
1) allows for departmentalization and managerial control. A schedule can be set with deadlines for each stage of development and a product can proceed through the development process.	1) does not allow for much reflection or revision. Once an application is in the testing stage, it is very difficult to go back and change something that was not well-thought out in the concept stage.
2) each phase of development proceeds in strict order, without any overlapping or iterative steps. Development moves from concept, through design, implementation, testing, installation, troubleshooting, and ends up at operation and maintenance.	
3) Its simplicity makes it easy to explain to customers who are not familiar with software development	

Table 3.1: Advantages and disadvantages for Waterfall model

3.3   Fact Finding Techniques

As a system analyst, we need an organized method of collecting facts. Especially, we need to develop a detective mentality, to be able to discern relevant facts! Effective fact finding techniques are crucial to the application of system analysis and design methods during system project. Fact finding is performed during the study, definition, evaluation, design and implementation phases of the system development life cycle.

To support development activities, we must collect facts about the knowledge workers, the business, data and information resources and information system components. There are four common fact finding techniques: sampling, observation, questionnaires and interview. However, the techniques that I used were collecting facts from existing documents and files and also refer to relevant newspapers or magazines, internet surfing and conducting interviews.

As a conclusion, the following step-by-step strategy was used during the system analysis:

1) Learnt all as possible as I can from existing documents, sample thesis and internet.
2) Observed the system in action but not ask questions. Just watched and took notes during observation.
3) Conducted the interviews. Because I have already collected most of the pertinent facts by low-user-contact methods, I used interview to verify and clarify the most difficult issues and problems. [Whitten, 1986]

3.3.1   Using Existing Documentation

A good analyst always gets facts first from existing documentation rather than from people, thus do reference at library and document room became my first step to collect facts. Particularly when we are studying an existing system, we can develop a pretty good feel for the system by studying existing documentation, forms and files.

Because it would be impractical to study every occurrence of every form, I used sampling techniques to get a large enough cross section to determine what can happen in the system.

For instance, do reference at library and document room and also refer to newspapers and magazines which can provide many facts and details with little or no direct personal communication. In order to ensure that an adequate number of documents have been studied, this technique helped me collected a representative subset of the documents and minimize the chance of not identifying exceptional events. Finally, all documentation collected had been analyzed to determine how up-to-date it is.

By using this technique, a lot of references on conference, workshop, journal and symposium can be found from library. Besides that, several pass year thesis documentation which stored at document room have been studied to gain some skills on software development. Furthermore, reference on the latest newspapers and magazines such as In Tech (The Star), Computimes (New Straits Times) and PCWeekly is one of the techniques for me to gain the latest information too. As I reviewed existing documents, I took notes, drawn pictures and used systems analysis and design tools to model what I had learnt about.

3.3.2 *Internet Surfing*

Nowadays, internet is the main source of information. Internet surfing becomes a new sophisticated method for fact finding techniques. To get more information, relevant information on web applications, operating system, database and programming tools are analyzed. Besides that, feed back from some FAQ (Frequent Asked Questions) sessions also helped me to clear up misconceptions or erroneous plans that have been formed.

3.3.3   Conducting Interviews

Interviews are the most popular but time-consuming fact finding technique. Interviews provide system analysts the opportunity to collect information from individuals and face-to-face. The most important element of an information system is people. No other fact finding technique places as mush emphasis on people as interviews. There are two types of interviews, unstructured and structured. The type which I used was structured interview because it is more efficiency for system analysis and design.

Several interviews and surveys have been conducted with users and customers to find out the lacks of existing system and potential improvement on it. Before interviewing, I had prepared a specific set of questions. After determining the need for an interview, I arranged for appointments with the interviewees, carefully prepared the interview questions, conducted the interviews and summarized the results.

3.4   Requirements Specification

Requirements describe a system's behavior. As the system acts on data or instructions, objects or entities move from one state of being to another. This means that in any given state, the system satisfies a set of conditions. When the system acts, it may change its overall state by changing the state of an object. The requirements express the system and object states and the transitions from one state to another. In particular, the requirements describe the activities of the system, such as reaction to input and the state of each entity in the system before and after the activity occurs.

This is a phase where the requirements for developing the Book Processing System would be addressed and to suit the requirements of the staffs working in the bookstore. By addressing this phase clearly, we would be able to proceed with the analysis and design of the BPS in a more precise manner. To solve the problems with manual

system or improve existing computerized system, requirements specification is done. The requirements specification describes everything about how the system is to interact with its environment includes physical environment, interfaces, users and human factors, functionality, documentation, data, resources, security and quality assurance.

3.4.1   Software Requirements
The minimum operating system that the bookstore must acquire before the developed system can be implemented is Windows 98. The other applications are not compulsory.

3.4.2   Hardware Requirements
CPU: Pentium II 300MHz
Storage medium (HDD): 50 Mbytes
Memory: 64MB RAM
Peripherals: monitor, printer, keyboard, mouse, scanner, bar code scanner

All the above is the minimum hardware requirements the bookstore must acquire before the developed system can be implemented.

3.4.3   Summary of Software
The BPS will be developed based on Windows 2000 where Windows 2000 acts as operating system. Visual Basic 6.0 will be used as programming language to interact with its environments. In addition, Microsoft Access 2000 is used as database system for storing and manipulating data during system development.

3.5   Functional Requirements

A functional requirement describes an interaction between the system and its environment. For example, to determine functional requirements, we decide what states are acceptable ones for the system to be in. Further, functional requirements describe how the system should behave given certain stimuli.

3.5.1   Search Function

Users will be able to search the books available in the bookstore by title, author, subject categories, keyword and even list all books in the bookstore. The search result will be displayed in a list of which further detailed description could be displayed by a single click of the mouse on the title chosen.

3.5.2   Barcode Generation

An unique and meaningful barcode will be generated to represent each book instead of using ISBN.

3.5.3   Payment Function

This function is most important in daily operation in a bookstore. When there are sales occur, renting/returning books or even any activities involve payment, user needs to go through this function to record the activities. This means that each transaction occurs in the bookstore will be recorded and stored in database.

3.5.4   Report Printing

This function is designed for bookstore owner to print out either daily, weekly, monthly or yearly report. These kinds of reports are very useful and important for users while make any decision on his/her business such as cut cost if the sales is not so good.

3.5.5   Membership

The BPS will offer membership to privileged customers who meet certain criteria. If the customers have joined the membership, they will be able to enjoy privileges to rent/buy certain books at special discounts.

3.5.6   Graphical User Interface (GUI)

The system has provided a frame (toolbar) wherever eases the user to access to any part of the system. The system also provides a user friendly interface with Windows, Icon, Menu and Pointing Device features. A simple language icon is used for a better understanding of the function.

3.6   Non-Functional Requirements

This session would define the constraints and the restrictions or system properties imposed on the system that limits our choices for constructing a solution to the problem. These constraints usually narrow our selection of language, platform or implementation techniques or tools. These are important since they form as part of the system requirements that would affect the design of the system. The importance of the factors are described as below.

3.6.1   Efficiency/Usability

An efficient system provides a good response time to all user requests. Appropriate user interface and sufficient documentation will lead to the usability of the system. Users can perform many tasks in the hypertext documents by clicking on the hypertext and images using mouse. Typing is minimized. Messages and images are displayed as guidance along the operation of BPS. This is also referring to the extent to which the program satisfies its specification and fulfils the customer's needs and the bookstore owner's objectives.

3.6.2   *Reliability*

The bookstore should set out the acceptable failure rate in order to be reliable. The acceptable failure rate is the failure of the system which will not affect much on the operation of the bookstore and should be recovered within 24 hours time. The failure produced should not be costly too.

3.6.3   *Robustness*

This requirement is referring to the ability of the bookstore to continue operation in spite of unexpected problems. BPS is able to detect errors in the user input by having a validation for the input field.

3.6.4   *Interoperability*

Interoperability is the ability of the system to be integrated into other systems. The BPS is designed to be interoperability so as to be able to integrate with the existing system in the bookstore irrespective of whether it is a manual or computerized system.

3.6.5   *Modularity*

This is a key factor to good programming. The system was decomposed from higher level into lower level modules so that distinct functions of objects could be isolated from one another. This characteristics makes testing and maintenance much easier.

3.6.6   *User-friendliness*

The system should be able to accommodate each level of user, able to give a user friendly interface, appropriate error handling and high degree of understandability.

3.6.7   Speed

It should at least process a transaction successfully in 30 seconds to provide an efficient BPS. Moreover, at least one response should also be produced in 30 seconds.

3.6.8   Maintainability

The sites of the BPS must be maintainable from time to time, in order to provide updated information to customers, for example, the new releases and promotion. This can be done using the administration module whereby ONLY the administrators are authorized to maintain the system. Modularity of the program design will lead to easier modification in the future.

3.6.9   Learnability

The training time for the user to be proficient in the use of the system must be less than two working days.

CHAPTER 4: SYSTEM DESIGN

System design is the stage of system development where the system requirements are translated into the system characteristics.

4.1   Program Design

One methodology for system design based on the principles of the data flow oriented-design is the structure chart. The structure chart can be derived from the earlier design considerations and is then ready to be translated into the structured programming.

BPS is divided to two types of access. There are:

(a)   owner

Owner of the system can access the entire system, which consists of all modules such as circulation modules, book master module, membership module, maintenance modules, report modules, search and help function.

(b)   staff

Staff can access the entire system except the maintenance and report modules.

Figure 4.1: System access categories

CHAPTER 4: SYSTEM DESIGN

System design is the stage of system development where the system requirements are translated into the system characteristics.

4.1   Program Design

One methodology that I have used is based on the principles of the data flow oriented-design method or structured design. Data flow oriented has its origins in earlier design concepts that stressed on modularity, top-down design and structured programming.

BPS is divided to two types of access. There are:

(a)   owner

Owner of the system can access the entire system, which consists of all modules such as circulation modules, book master module, membership module, maintenance modules, report modules, search and help function.

(b)   staff

Staff can access the entire system except the maintenance and report modules.
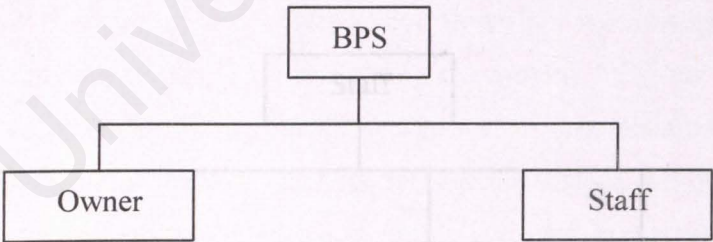
Figure 4.1: System access categories

4.1.1 System Architecture

The system architecture is closely parallel the user task flows. Below is a high-level diagram of the system architecture.
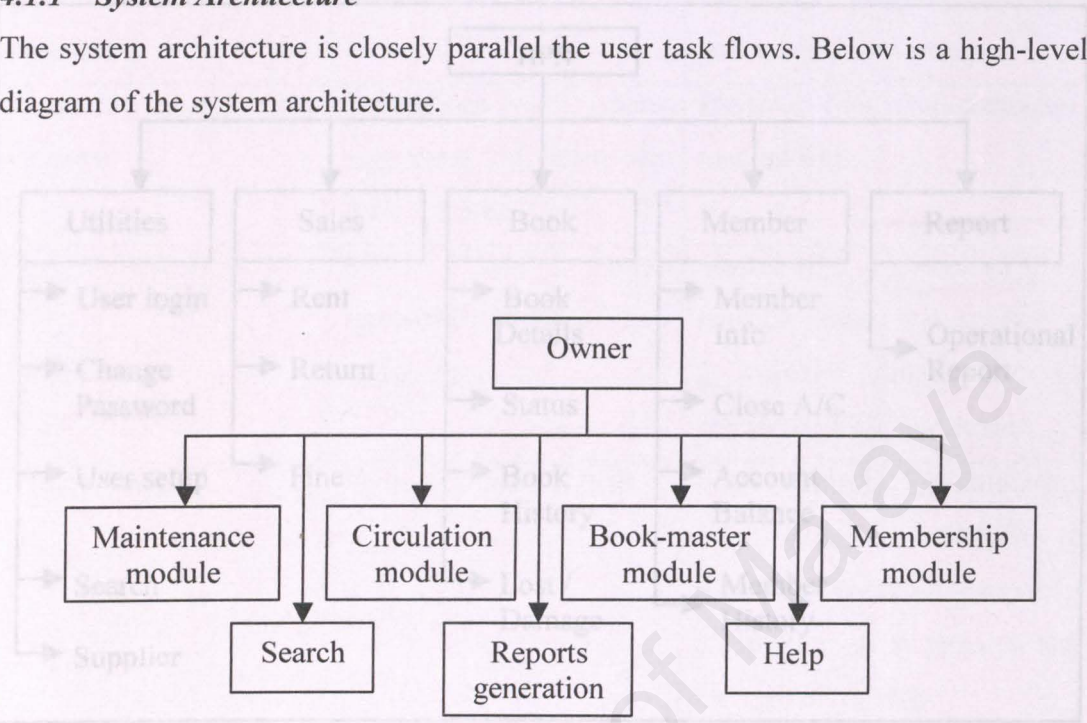
Figure 4.2: Structure chart for owner of the system

Figure 4.3: Structure chart for staff

```
                              ┌──────────┐
                              │   BPS    │
                              └────┬─────┘
        ┌──────────┬──────────────┼──────────────┬──────────────┐
        ▼          ▼              ▼              ▼              ▼
  ┌──────────┐┌──────────┐ ┌──────────┐  ┌──────────┐  ┌──────────┐
  │ Utilities││  Sales   │ │   Book   │  │  Member  │  │  Report  │
  └──────────┘└──────────┘ └──────────┘  └──────────┘  └──────────┘
   ▶ User login  ▶ Rent     ▶ Book         ▶ Member      ▶ Operational
                              Details        Info          Report
   ▶ Change      ▶ Return   ▶ Status        ▶ Close A/C
     Password
                  ▶ Fine    ▶ Book          ▶ Account
   ▶ User setup                History        Balance

   ▶ Search                 ▶ Lost /        ▶ Member
                              Damage          History
   ▶ Supplier
```
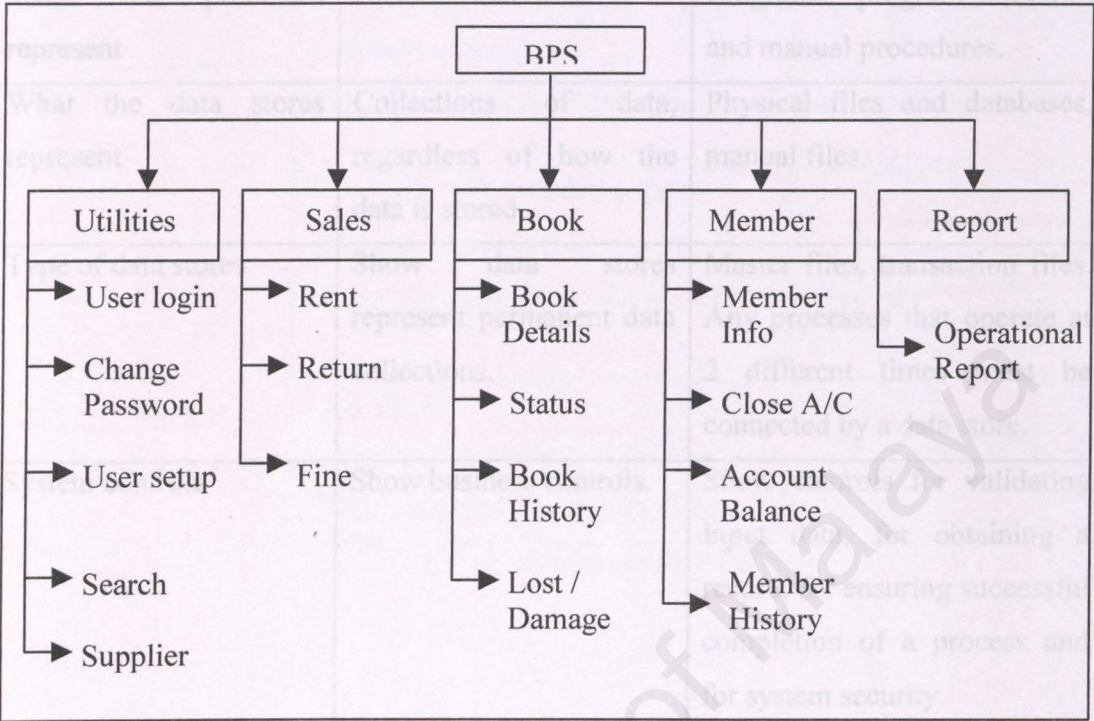
Figure 4.4: Main modules hierarchy chart

4.1.2   *Data Flow Diagram (DFD)*

DFD graphically characterize data processes and flows in a business system. The data flow approach emphasizes the logic underlying the system. DFD are categorized as either logical or physical. A logical DFD focuses on the business and how the business operates while a physical DFD shows how the system will be implemented, including the hardware, software, files and people involved in the system. *Table 4.1* shows the difference between logical and physical DFD. [Kendall, 1999]
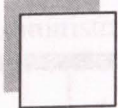
Design Feature	Logical	Physical
What the model depicts	How the business operates	How the system will be implemented.

What the processes represent	Business activities	Programs, program modules and manual procedures.
What the data stores represent	Collections of data, regardless of how the data is stored.	Physical files and databases, manual files.
Type of data stores	Show data stores represent permanent data collections.	Master files, transaction files. Any processes that operate at 2 different times must be connected by a data store.
System controls	Show business controls.	Show controls for validating input data, for obtaining a record, for ensuring successful completion of a process and for system security.

Table 4.1: Comparison between logical and physical DFD

4.1.2.1 *Developing DFD for BPS*

By using combination of only four symbols, a developer can create a pictorial depiction of processes that will eventually provide solid system documentation. There are a double square, an arrow, a rectangle with rounded corners and an open-ended rectangle as shown in *Figure 4.6*. These symbols help me to determine the boundaries of the BPS.

Symbols	Meaning
	Double square - as external entity - source or destination of data.

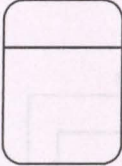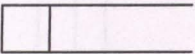|	
→	Arrow - as flow of data. - shows movement of data from one point to another.
	Rectangle with rounded corners - represent a process. - show the occurrence of a transforming process.
	Data store - represent a manual store such as a filing cabinet or a computerized file or a database.

Table 4.2: Symbols used in DFD

DFD of BPS consists of:

a) Context Diagram

b) Diagram 0 (the next level)

c) Child Diagram (more detailed levels)
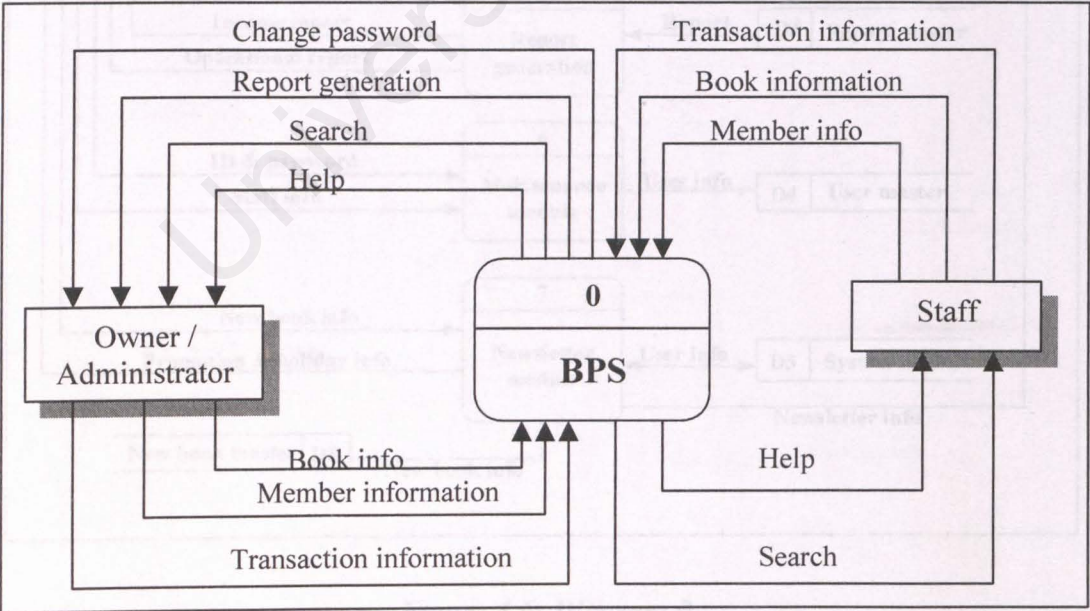

Figure 4.5: Context Diagram
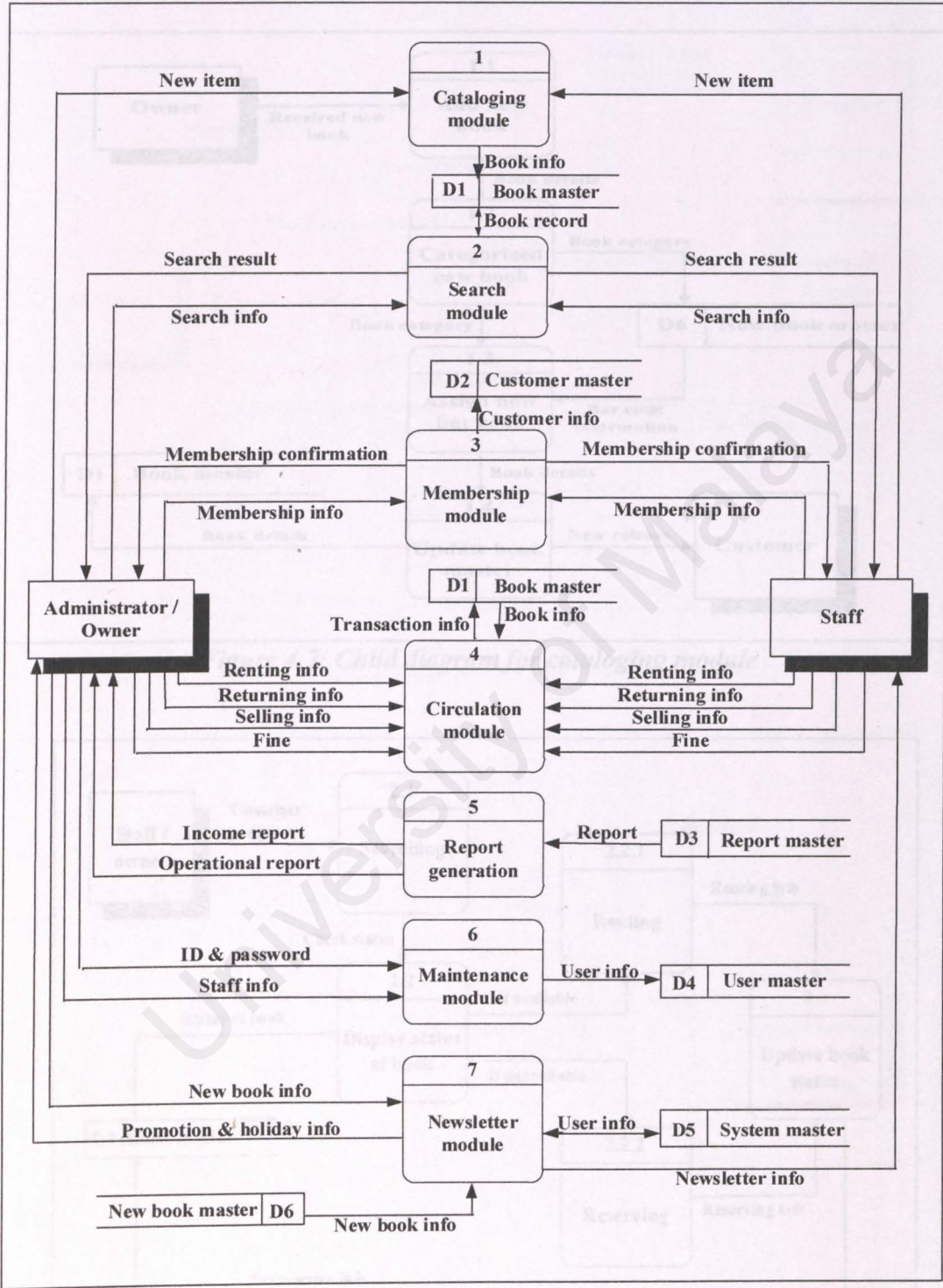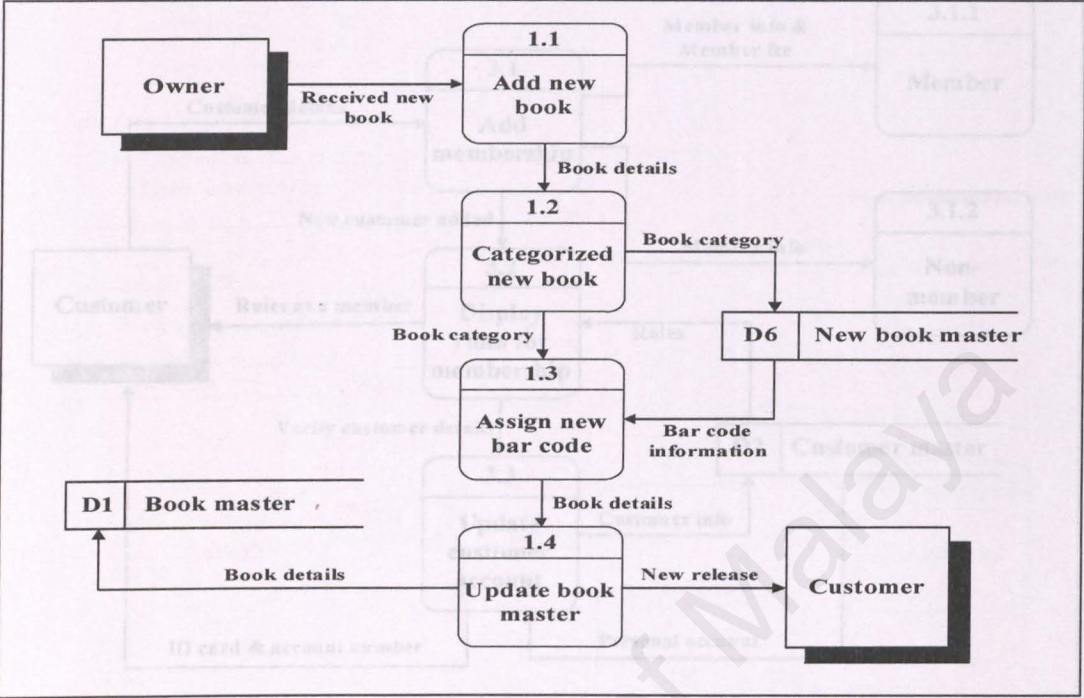
Figure 4.6: Diagram 0

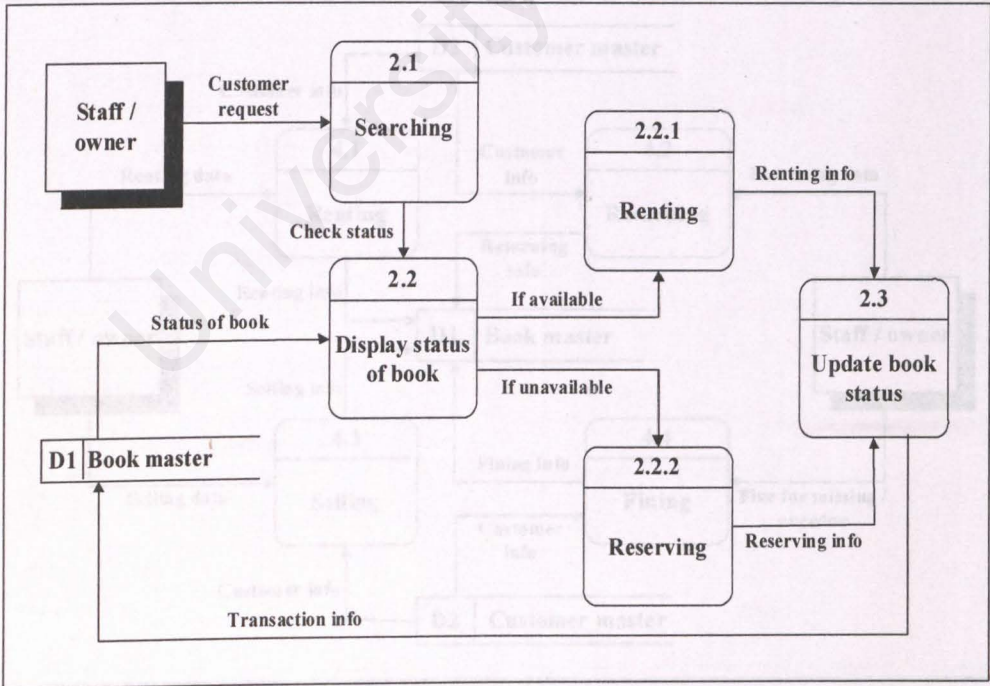*Figure 4.7: Child diagram for cataloging module*

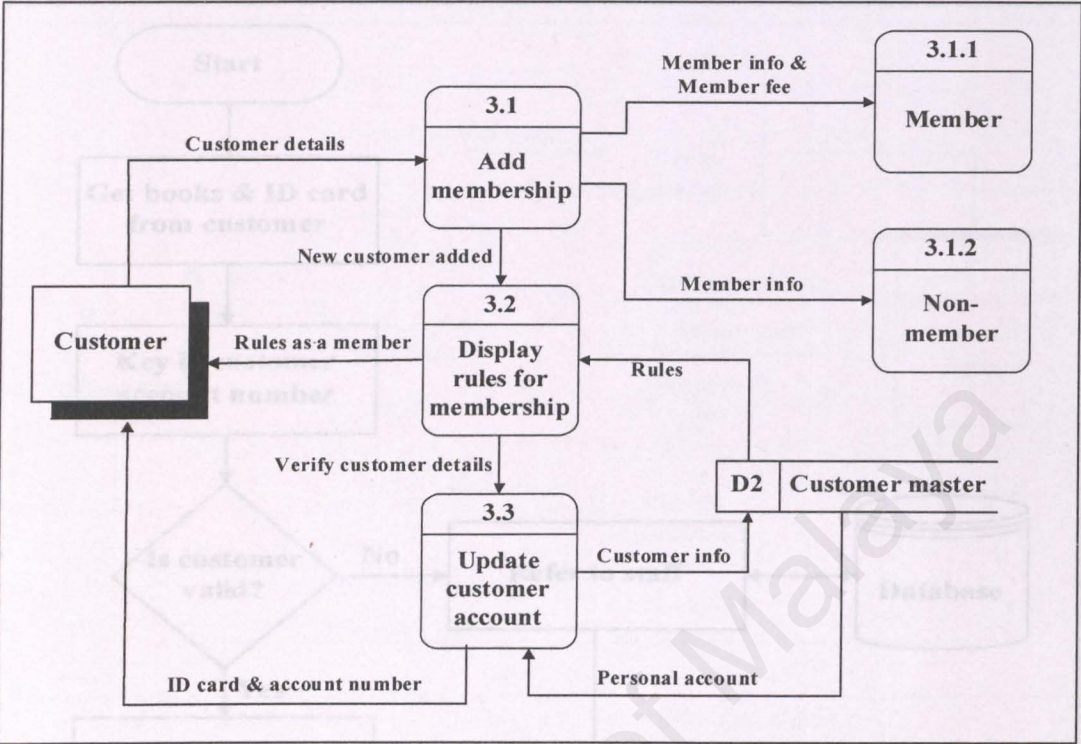*Figure 4.8: Child diagram for search module*

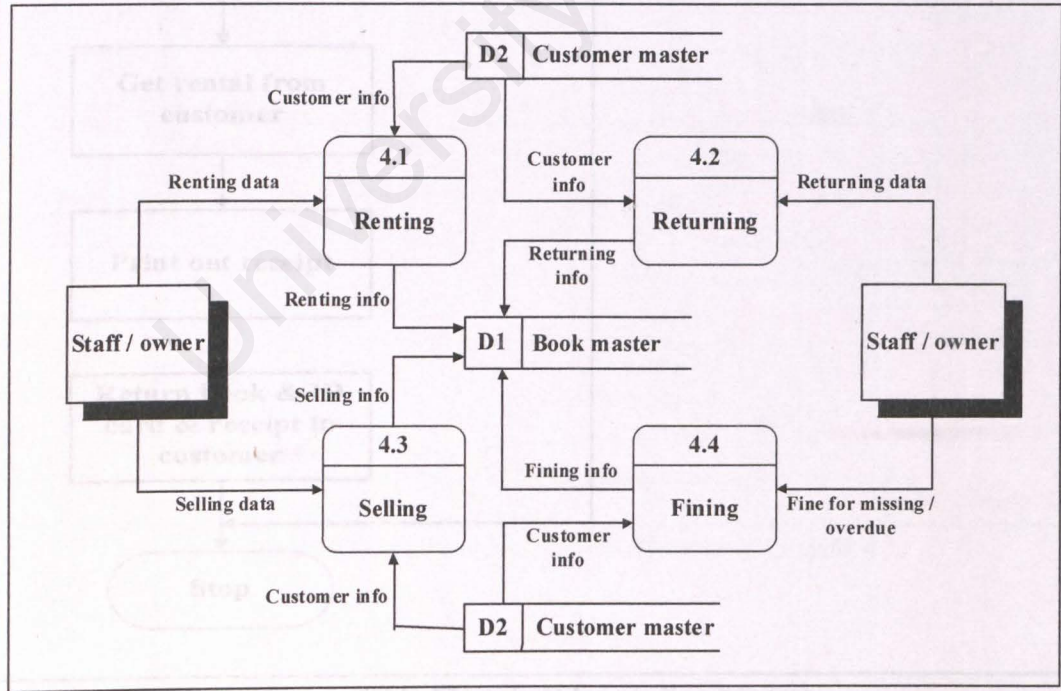*Figure 4.9: Child diagram for membership module*
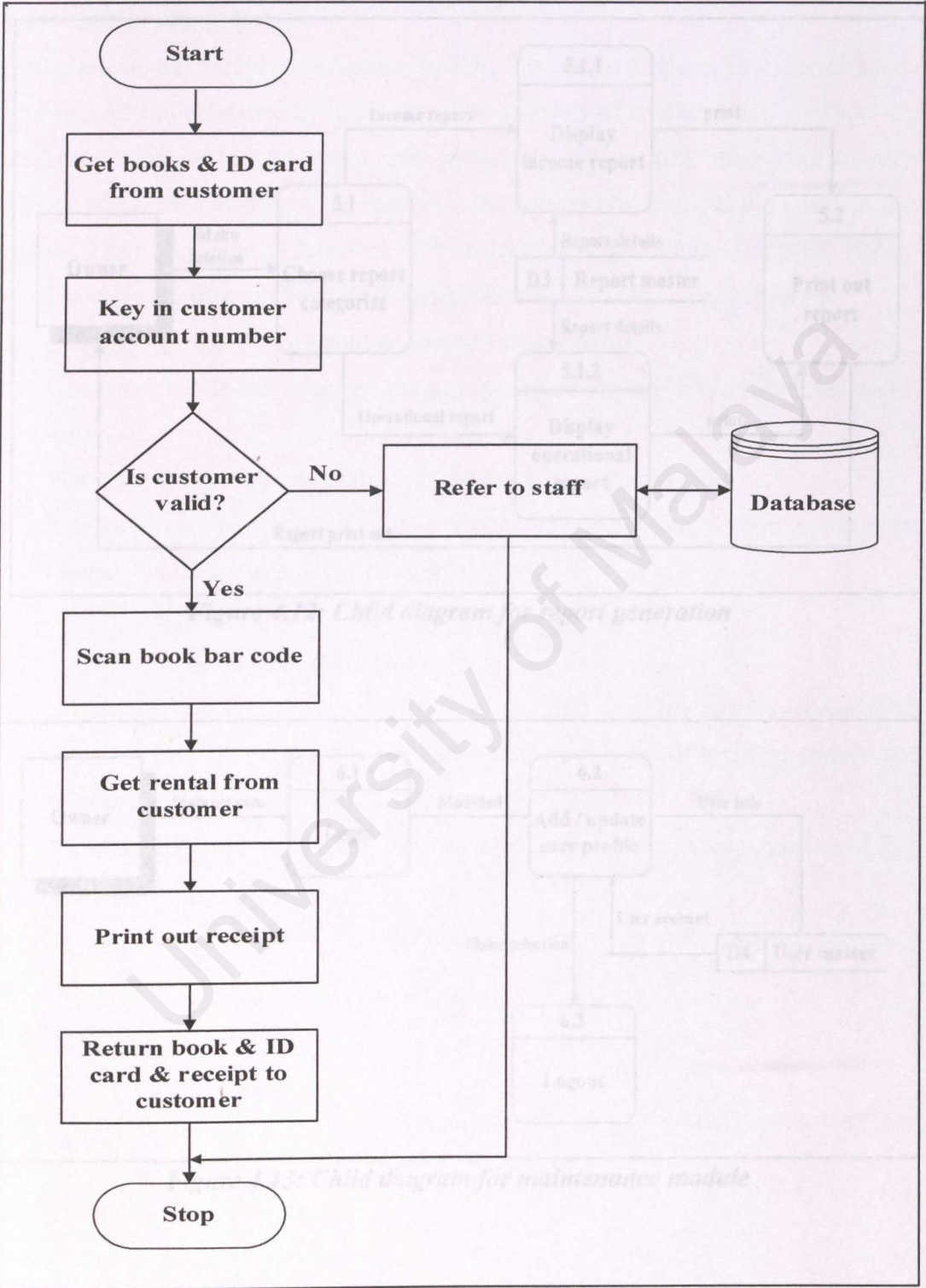

Figure 4.10: Child diagram for circulation module

Figure 4.11: Flowchart for renting process
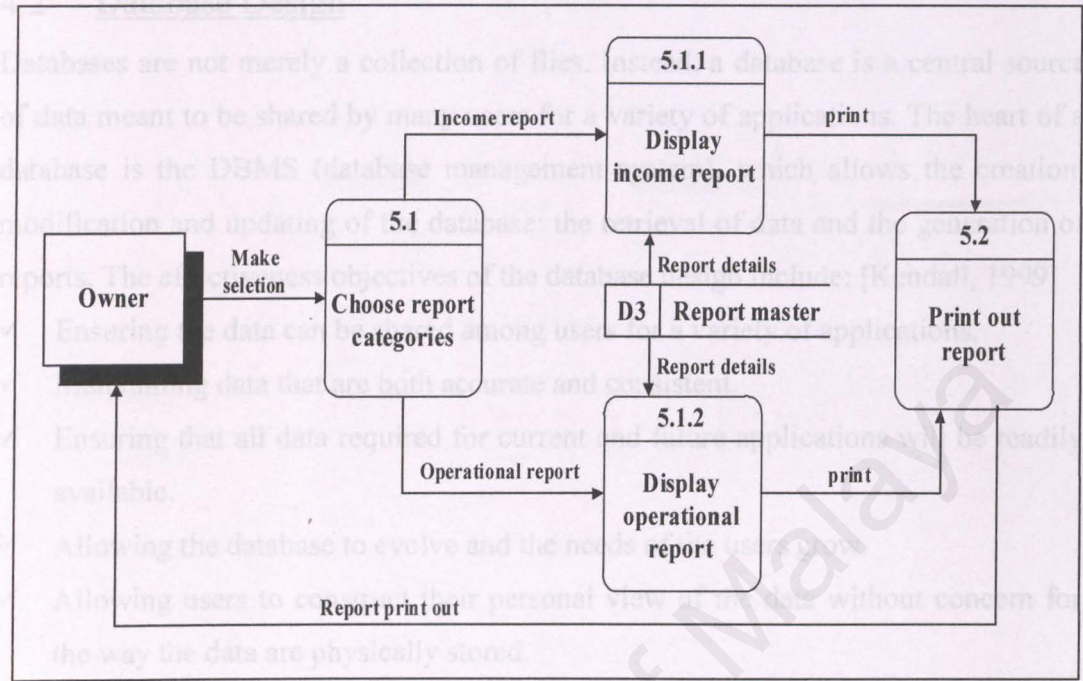
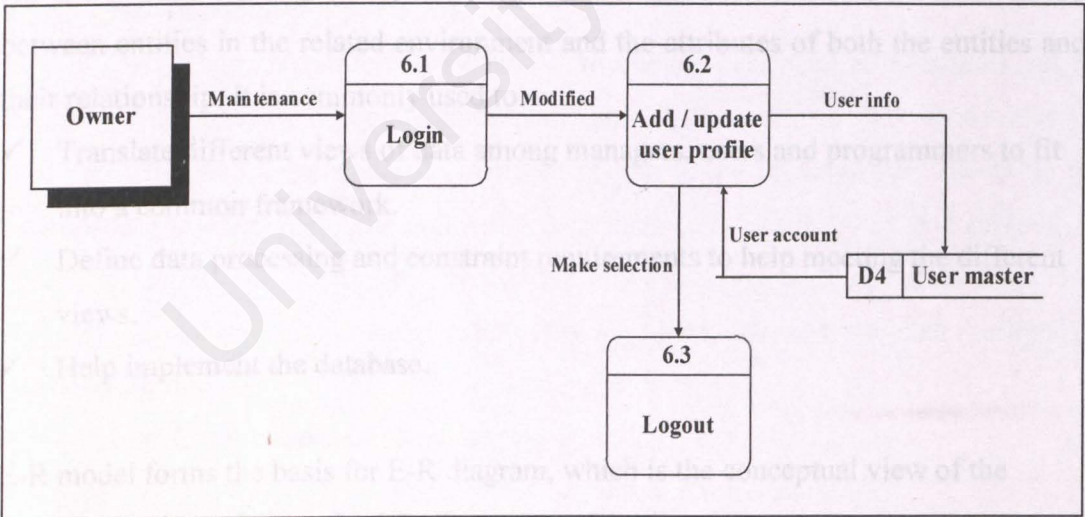*Figure 4.12: Child diagram for report generation*

Figure 4.13: Child diagram for maintenance module

4.2   Database Design

Databases are not merely a collection of flies. Instead, a database is a central source of data meant to be shared by many users for a variety of applications. The heart of a database is the DBMS (database management system), which allows the creation, modification and updating of the database: the retrieval of data and the generation of reports. The effectiveness objectives of the database design include: [Kendall, 1999]

✓ Ensuring the data can be shared among users for a variety of applications.

✓ Maintaining data that are both accurate and consistent.

✓ Ensuring that all data required for current and future applications will be readily available.

✓ Allowing the database to evolve and the needs of the users grow.

✓ Allowing users to construct their personal view of the data without concern for the way the data are physically stored.

4.2.1   Entity-Relationship (E-R) Model

An E-R model is a logical representation of the data. It illustrates the relationship between entities in the related environment and the attributes of both the entities and their relationship. It is commonly used to:

✓ Translate different views of data among managers, users and programmers to fit into a common framework.

✓ Define data processing and constraint requirements to help meeting the different views.

✓ Help implement the database.

E-R model forms the basis for E-R diagram, which is the conceptual view of the database by the end users. In E-R diagram, we have

✓ rectangle - refers to the entity sets.

✓ diamond – refers to the relationship set
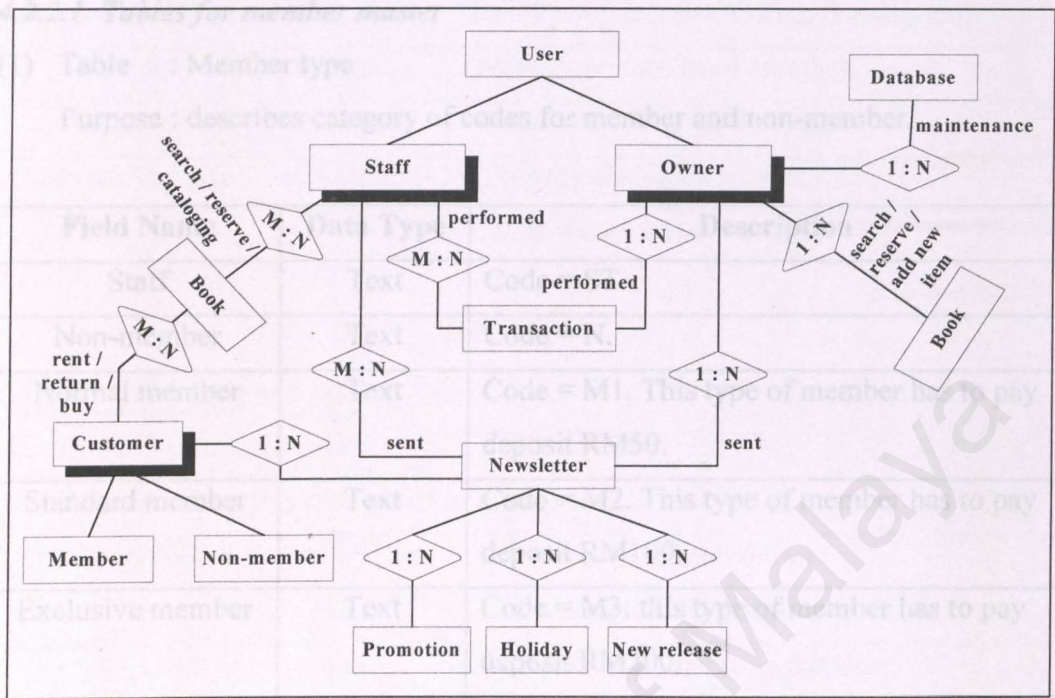
✓ line – links entity sets to relationship sets.

Figure 4.14: E-R Diagram

4.2.2 Data Dictionary

The data dictionary is a reference work of data about data (that is metadata). As a document, the data dictionary collects and coordinates specific data terms and it confirms what each term means to different people in the organization. The DFD is an excellent starting point for collecting data dictionary entries. For this project, I have divided all the tables into customer, book and management categories. In addition to providing documentation and eliminating redundancy, the data dictionary may be used to:

✓ validate the DFD for completeness and accuracy.

✓ Provide a starting point for developing screens and reports.

✓ Determine the contents of data stored in files.

✓ Develop the logic for DFD processes. [Kendall, 1999]

4.2.2.1 Tables for member master

(1) Table   : Member type

Purpose : describes category of codes for member and non-member.

Field Name	Data Type	Description
Staff	Text	Code = ST.
Non-member	Text	Code = N.
Normal member	Text	Code = M1. This type of member has to pay deposit RM50.
Standard member	Text	Code = M2. This type of member has to pay deposit RM100.
Exclusive member	Text	Code = M3. this type of member has to pay deposit RM200.

Table 4.3: Member type table

(2) Table   : Member

Purpose : describes customer details.

Field Name	Data Type	Description
* A/C No	Text	Member personal ID.
Member Type	Text	Code that differentiate each class of members.
Name	Text	Member name.
NRIC	Text	Member IC number.
Sex	Yes/No	Sex for member.
DOB	Date/Time	Date of birth for member.
Handphone	Text	Handphone number for member.
Telephone	Text	Telephone number for member.
Add1	Text	Member first address.
Add2	Text	Member second address.
Join date	Date/Time	Member join date.

Registration fee	Currency	Fee paid by member during registration.
Overdue	Currency	Overdue amount from member.
Onhand	Number	Number of books hold by member.
Account Balance	Currency	Account balance for member.

Table 4.4: Member table

4.2.2.2 Tables for book master

(1) Table   : Book category

Purpose : describes categories of books.

Field Name	Data Type	Description
CNo	Text	Code describes Chinese novel.
CMa	Text	Code describes Chinese magazine.
CCo	Text	Ode describes Chinese comic.
ENo	Text	Code describes English novel.
EMa	Text	Code describes English magazine.
ECo	Text	Code describes English comic.
MNo	Text	Code describes Malay novel.
MMa	Text	Code describes Malay magazine.
MCo	Text	Code describes Malay comic.

Table 4.5: Book category table

(2) Table   : Title master

Purpose : describes all information of a title.

Field Name	Data Type	Description
* Title Code	Text	Identified code to describe a title.
Show Type	Text	Code to describe this title.
ShowType Desc	Text	Describe the show type.
Title	Text	Title of book.

Author	Text	Author name.
Book Category	Text	Code to describe category of book.
Total of Book	Number	Total of this title in bookstore.
Is Series	Yes/No	Describe whether this title is series.
Supplier	Text	Supplier name.
Publisher	Text	Publisher name.

Table 4.6:Title master table

(3) Table   : Book master

Purpose : describes all information of a book.

Field Name	Data Type	Description
* Barcode	Text	Identified code to describe a book.
* ISBN	Text	Book ISBN number.
Book Category	Text	Code to describe category of book.
Title	Text	Title of book.
Author	Text	Author name.
Book Code	Text	Code to describe book with certain title.
Title Code	Text	Code to describe certain title.
Catalog Date	Date/Time	Date the book is published for issue.
Volume	Number	Volume for the book.
Status Code	Text	Code to describe status of book.
Price	Currency	Price of the book.
Show Type	Text	Code to describe the book.

Table 4.7: Book master table

(4)   Table : Status

Purpose : describes book status.

Field Name	Data Type	Description
Rented	Text	Code = R to described book has been rented.
Available	Text	Code = A to describe book is ready for rent.
Lost	Text	Code = L to describe book is lost.
Damaged	Text	Code = D to describes book is damaged.

Table 4.8: Status table

(5)   Table : Lost book

Purpose : describes lost book information.

Field Name	Data Type	Description
Document No	Text	Identified number for the record.
* Barcode	Text	Barcode for the book.
Title	Text	Title for the book.
Lost Date	Date/Time	Date registered as lost.
A/C No	Text	Member who lost the book.
Non member	Text	Non member name who lost the book.
Remark	Text	Additional description.

Table 4.9: Lost book table

(6)   Table : Damaged book

Purpose : describes damaged book information.

Field Name	Data Type	Description
Document No	Text	Identified number for the record.
* Barcode	Text	Barcode for the book.
Title	Text	Title for the book.
Remark	Text	Additional description.

Table 4.10: Damaged book table

4.2.2.3 Table for circulation process

(1) Table : Book Issued

Purpose : describes renting and returning process of a book.

Field Name	Data Type	Description
* Bar code	Text	Bar code of the book.
A/C No	Text	Member who rented the book.
Member Type	Text	Describes category of member.
Issue Date	Date/Time	Date of renting.
Return Date	Date/Time	Date of returning.
Due Date	Date/Time	Date to return the book.
Days Limit	Number	Days the book can be rented out.
Rental	Currency	Rent rate.
Late Charge	Currency	Charge for late return.
Overdue	Currency	Ovedue charge when late returned.
Deposit	Currency	Deposit paid by non member.

Table 4.11: Book issue table

4.2.2.4 Tables for management

(1) Table   : Security

Purpose : describes user information.

Field Name	Data Type	Description
User Id	Text	ID assigned to every staff.
Level	Text	Level of user.
Password	Text	Login password for every staff.

Table 4.12: Security table

(2) Table : Supplier

Purpose : Describes supplier information.

Field Name	Data Type	Description
Company Id	Text	Id assign for certain supplier.
Company Name	Text	Supplier name or company name.
PersonInCharge1	Text	Contact person name.
PersonInCharge2	Text	Optional contact person name.
Telephone	Text	Supplier telephone number.
Fax No	Text	Company fax number.
Handphone1	Text	Handphone number.
Handphone2	Text	Handphone number.
Add1	Text	Company address.
Add2	Text	Company address.
Add3	Text	Company address.
Website	Text	Company website.
Email1	Text	Company email address.
Email2	Text	Optional email address.

Table 4.13: Supplier table

(3) Table   : Holiday

Purpose : Describe rest day of bookstore.

Field Name	Data Type	Description
Holiday Date	Date/Time	Date for rest day.
Description	Text	Describe the event for holiday.

Table 4.14: Holiday table

4.3   User Interface Design

The user interface design is based on the Graphical User Interface (GUI) approach, some of the Human-Computer Interface (HCI) general principles of designing an interactive system have been considered and applied. The rules recommended by Shneiderman (1992) have been used as the fundamental of user interface design principles. Listed below are the rules taken while designing the user interface of BPS. There are: [Shneiderman, 1992]

✓ **Strive for consistency**

Consistent sequences of actions should be required in similar situations; identical terminology should be used in prompts, menus and help screens; consistent commands should be employed throughout. Exception such as deletion confirmation message and number of echoing password should be

✓ **Informative feedback**

For every action, there should be some system feedback. Visual presentation of the objects of interest provides a convenient environment for showing changes explicitly.

✓ **Simple error handling**

System should be designed as much as possible to so the user would not make a serious error. If an error is made, the system should detect the error and offer comprehensible mechanisms for handling the error. The user should not have to retype the entire command but rather should need to repair only the faulty part. Erroneous commands should leave the system state unchanged or the system should give instructions about restoring the state.

✓ **Reduce short-tem memory load**

The limitation of human information processing in short-term memory requires that displays be kept simple, multiple pages display be consolidated and window motion frequency be reduced. Where appropriate, on-line access to command-syntax forms, abbreviations and other information should be provided.

4.3.1   Graphical User Interfaces (GUIs)

Graphical User Interfaces (GUIs) allow direct manipulation of the graphical representation on the screen, which can be accomplished with keyboard input, a joystick or a mouse. Direct manipulation requires more system sophistication than the other interfaces.

Icons are used extensively when running on a PC. By double-clicking the left mouse button rapidly, the user selects an icon to run the corresponding program. Icons are often arranged within larger windows, called program groups or folders. When a program group icon is selected, the window opens up, displaying the group icons. The creation of GUI interfaces poses a challenge, since an appropriate model of reality or an acceptable conceptual model of the representation must be invented. [Kendall, 1999]

4.3.2   Screen Design
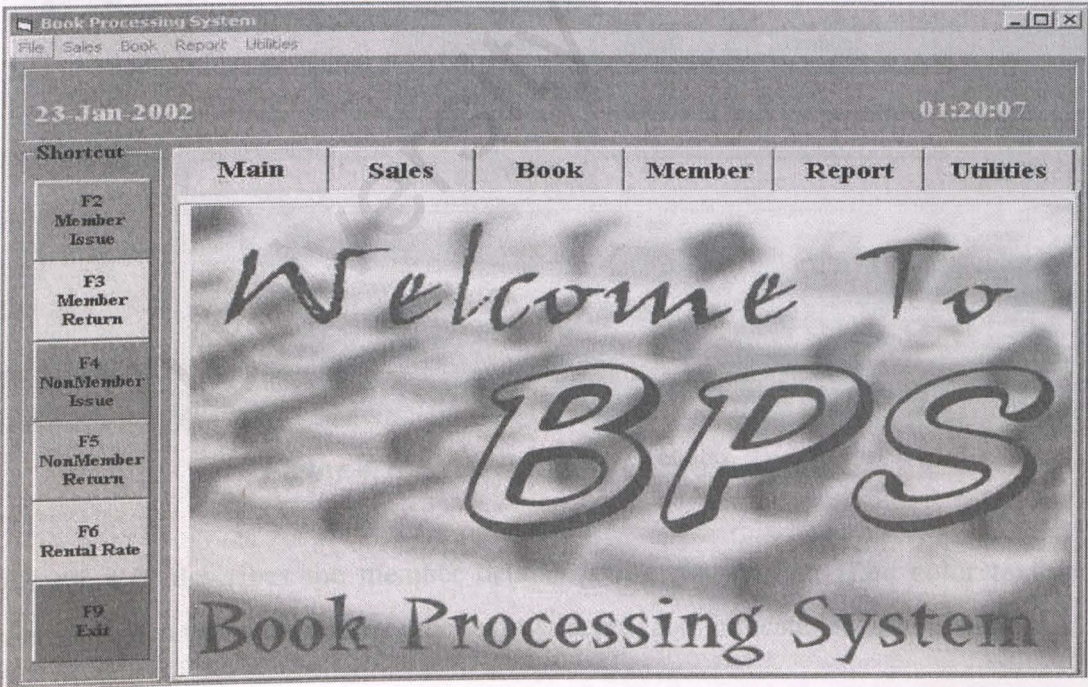
Figure 4.15: Main page for BPS

Figure 4.15 shows the first page for BPS while user starts to use the system. The header is indicates name of the relevant bookstore, the date and time. There are total five modules in the page which are *Sales, Book, Member, Report and Utilities.* Besides, there are some shortcut keys at the left side of the page to facilitate the user to access certain functions.

Figure 4.16: New member registration page

Figure 4.16 describes the member details during registration. Blue color textbox means system will auto generate the text while red label indicates required fields.

Figure 4.17: Title master page

Figure 4.17 is a title master entry screen. While there is a new book comes in the bookstore, all information about the book will be key-in in this page.

CHAPTER 5: SYSTEM IMPLEMENTATION

5.1 Introduction

Implementation is the phase where by the design is convert into a working prototype. Implementation should have the primary goal of writing a code that is easy to understand and easy to modify. Code Each stage of coding construct should be simple and straightforward and at the end of the each module, a straightforward coding style should be adopted.

System implementation is a bottom up approach that will initially focus on database creation. Once the database is created, the system interface will then be design. The system interfaces that mention here is totally different from the user interface in the system design phase. In the system implementation, system interface is focusing more on the field, data type and error messages. During system implementation, we are looking forward into few aspects, which are system development environment includes development tools, implementation and maintenance measures.

5.2 Development Environment

Environment used for developing a system that has a certain vital degree of impact on the development of a system. Therefore, the choice of hardware and software selected and the combination of these two aspects could make an important difference in the project schedule and could also determine the success of the project.

5.2.1 Hardware used for System Development

✓ 800 MHz AMD Athlon Processor

✓ 256 MB SDRAM

✓ 20.0 GB Hard Disk

✓ Other standard PC components

CHAPTER 5: SYSTEM IMPLEMENTATION

5.1   Introduction

Implementation is the phase where by the design prototype is turn into a working prototype. Implementation should have the primary goal of producing software that is easy to understand and easy to modify. Single entry, single exit coding constructs should be used, standard indentation of constructs should be observed, and a straightforward coding style should be adopted.

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5.2.1   Hardware used for System Development
✓ 800 MHz AMD Athlon Processor
✓ 256 MB SDRAM
✓ 20.0 GB Hard Disk
✓ Other standard PC components

5.2.2 Software used for System Development

Application	Purpose	Description
Microsoft Window 2000	System requirement	Operating system
Ms. Visual Basic 6.0	System development	Coding the whole system
Ms. Access 2000	Database	Store and manipulate data
SQL	Database	Retrieve data from database
ODBC	Database	Connect database with VB
Data Report	Reporting	Create report in VB.
Ulead PhotoImpact 7	User interface design	Text and image design
Barcode Maker 3	Barcode generation	Generate and print out barcode

Table 5.1: Software used for system development

5.2.3 Documentation Tools for Reporting

✓ Microsoft Visio 2000

✓ Microsoft Word 2000

✓ Microsoft Project

✓ HyperSnap-DX

5.3 System Development and Implementation

5.3.1 Coding Methodology

Coding involves the activity of writing the modeled program into computer code by using an appropriate programming language. The two approaches used for designing system are the function-based approach and the object-based approach. The function-based or decomposition approach is a top-down approach. It decomposes a system into hierarchy of modules such that the higher level modules describe the system in general terms while the lower-level modules describe the system in specific terms.

Thus in this approach, the system development begins at a high-level (or general) description and then down to a low-level (or detailed) description.

The object-based or composition is a bottom-up approach. It builds a system using modules called objects. The objects are self-contained modules that encapsulate both data and methods (or functions or procedures) in the sense that data within an object are manipulated by the methods within the object. Higher-level objects are then built using the lower-level objects. Finally, the entire system is built.

BPS is developed using top-down approach, where the entire system is divided into different modules. As the breakdown goes deeper, each module consists of sub-modules and functions. Each individual function will form the basis where the coding initiates. This approach ensures that every module is developed and tested completely and individually. BPS is broken up into simpler modules and well-defined interfaces, as it will be more modular. The reason why modularity is desirable is because a modular system is easy to understand and maintain.

A module is said to be cohesive if all the instructions in the module perform a single task or small set of related tasks. A module that performs several different tasks is not cohesive. In BPS, every module is well-defined to perform certain task, as cohesive module is structured and easy to code, debug and maintain. Example new member is adding in the *Member* form while updating member details is applied in *Member List* form.

Coupling refers to the degree of dependence between modules. Two modules are coupled if each depends on the other for its proper functioning. This means if that is a bug in one module is modified, the other may also need to be modified. High coupling between modules is therefore not a desirable design characteristic. In BPS, low coupling between modules is being practiced.

5.3.2   Using Option Explicit in Visual Basic

Microsoft Visual Basic 6.0 is used as programming language for the development of the whole system. During the stage of coding using Visual Basic, the very first thing was to setup the *Require Variable Declaration* option that causes the *Option Explicit* statement to be placed in the *General Declarations* section of all new modules and forms in the system. Unlike language C, Visual Basic allows the use of variables without explicitly declaring them.

By turning on this option, if a form or module contains an undeclared variable, an error message will prompt out if statement that contains this variable tries to be executed. The integrated debugger will highlights the offending variable and aborts the compilation of the program. The prompt out message helps avoiding errors in code that might be caused by typographical errors. For example, a declaration of a variable by using following statement:

   Dim strSQL As String

If in a following statement, the variable name was mistyped without "L", Visual Basic will catch the error rather than continuing with unpredictable results. The following statement will cause an error if *Option Explicit* is used, otherwise, the program continues without having set the value of the intended variable.

   *Dim strSQ = "SELECT * FROM Member"*

Without *Option Explicit* statement, the previous line of code would create an additional variable, or in another words, two variables: *strSQL* and *strSQ* exit in the program.

5.3.3   Connection to Database

ODBC (Open Database Connectivity) is used as connection tools to connect data source from Microsoft Access to the forms in Visual Basic instead of using ADODC (ActiveX Data Objects Data Control). Although ADO Data Control lets user move

from record to record in the database and the data are automatically displayed in the data aware controls, it requires developer to add an ADODC in every form that needs to retrieve or store data into database and bind each field of the data source into the form one by one. If there is changes occurred in the data source, then developer has to change the related binding fields one by one too. It's really time consuming to do like that. Thus, ODBC is chosen for this purpose.

First, we need to set the ODBC driver from the *control panel* in Windows *setting* and then add *user DSN* to connect to our database. In coding part, we just need to write a module file to set connection to our database for entire system. It's no need to set connection in each form separately like what is required to do with ADODC. However, ADO Data Control is chosen to connect datagrid control with database for displaying data.

5.3.4 *Using SQL Queries*

SQL is written for accessing and manipulating database. Regardless of using ODBC or ADODC, SQL is a necessity in programming which involving database. Sample of SQL statement is as below:

> *SELECT * FROM Member WHERE MemberType = "ST"*

This statement means select all fields from the table named Member where the member type field contains ST.

5.3.5 *Good Programming Practices*

Good programming practices are used whenever possible. Examples of such practices are:-

✓ Choose meaningful name for variables top-down refinement.

✓ Assign meaningful name for the controls used in the form.

✓ Avoid using global variable if possible and try to avoid side effects.

✓ Preserve consistent formats that aid readability.

✓ Write comments besides coding statement to enhance user understanding of why and what you are writing in the code.

5.3.6 *Debug Strategies*

(a) Using command prompt

If a program is not performing well, which means the program occurred some errors. The command prompt has been used to view the error message occurred in coding. This is useful in order to debug the program.

(b) Review the algorithms

If a program is running well but the result is not what as intended, perhaps a logic error or database error has occurred. Reviewing algorithms and computations for their correctness and efficiency is needed for this problem. Sometimes, by using different algorithms, the efficiency of the program will be increased.

(c) Defensive programming

In defensive programming, *If* statements are put at the beginning of methods to check that if preconditions really holds. If not, an error message is printed. By this way, errors caused by a supposedly impossible situation can be alerted. This method is effective in revealing errors in places where it is sure everything is correct.

(d) Using breakpoint

When there is an error occurred in certain command, such as failed to save record, then a breakpoint can be placed at the save command event to trace where is the source of error. All relevant statements in the *save* procedure will be running as usual

until the debugger find out the statement which contains the error. This method will tell developer which statement is causing the error.

5.3.7   *Enhancing Maintainability during Development*

Many activities performed during software development enhance the maintainability of a software product. The activities are as below.

(a) Analysis activities

The analysis phase of system development is concerned with determining user requirements and constraints, and establishing feasibility of the system. Form the maintenance view point, the most important activities that occur during analysis are establishing standards and guidelines for the project. Setting of milestones to ensure that the project is produced on schedule. Specifying quality assurance produces to ensure development of high-quality documents. Identifying system enhancements that will most likely occur following initial delivery of the system; and estimating the resource (personnel, equipment, floor space) required to perform maintenance activities.

(b) Standards and guidelines

Various types of standards and guidelines can be developed to enhance maintainability of system. Standard formats for requirements documents and design specifications, structured coding conventions, and standardized formats for the supporting documents such as the test plan, the principles of operation, the installation manual, and the user's manual contribute to the understandability and hence the maintainability of system. The quality assurance group can be given responsibility for development and enforcing various standards and guidelines during system development. Management can ensure that milestones are being met, and that

documents are being developed on schedule in conjunction with the design specifications and the source code.

(c) Design activities

Architectural design is concerned with developing the functional components, conceptual data structures, and interconnections in a software system. The most important activity for enhancing maintainability during architectural design is to emphasize clarity, modularity, and ease of modification as the primary design criteria. Given alternative ways structuring a system, the designers will choose a particular structure on the basis of certain design criteria that may be explicitly stated or implicitly understood. The criteria may include coupling and cohesion of modules, efficiency considerations, interfaces to existing software, and other factors.

Ease of modification and minimization will usually result in a system that is easier to maintain than one designed using efficiency in execution time and minimization of memory space as the primary design criteria. Design concepts such as information hiding, and top-down hierarchical decomposition are appropriate mechanism for achieving a clearly understandable, modular, and easily modified system. For ease of understanding, and for ease of verifying completeness and consistency of the design, standardized notations such as data flow diagrams, structure charts should be used. These forms of design documentation aid the software maintainer who must understand the system development well enough to modify it and revalidate it.

Detailed design is concern with specifying algorithmic details, details of the interfaces among routines and data structure. Standardized notations should be used to describe algorithms, data structures, and interfaces.

(d) Implementation activities

Implementation should have the primary goal of developing system that is easy to understand and easy to modify. Single entry, single exit coding constructs should be used, and a straightforward coding style should be adopted. Easy of maintenance is enhanced by data encapsulation techniques. In addition, standard prologues in each routine should provide the author's name, the date of development, the name of the maintenance programmer, and the date and purpose of each modification. In addition, input and output assertions, side effects, and exceptions and exception handling actions should be documented in the prologue of each routine.

(e) Supporting documents

Have two particularly important supporting documents that should be prepared during the system development in order to ease maintenance activities. These documents are the maintenance guide and the test suite description. The maintenance guide provides a technical description of the operational capabilities of the entire system, and hierarchy diagrams, module, including its purpose, input and output assertion handling actions should be specified in the maintenance guide.

A test suite should accompany every delivered system development. A test suite is a file of test cases developed during system integration testing and user acceptance testing. The test suite should contain a set of test data and actual results from those tests. When it is modified, test cases are added to the test suite to validate the modifications have not introduced any unexpected side effects. Execution of a test suite following system modification is referred to as regression testing.

Documentation for the test suite should specify the system configuration, assumptions and conditions for each test case, the rationale for each test case, the actual input data for each test, and a description of expected results for each test.

CHAPTER 6: SYSTEM TESTING

6.1   Introduction

System testing is an important element of software quality assurance and represent and in assuring the quality of the developing system. Testing is defined as the overall review of system's specification, design and coding. Unless the architecture and requirement analysis is done, and the system implementation has been carried out properly and in correct manner, the system needs to be tested thoroughly before it is carried out.

Testing is taking place through the development of Book Processing System to ensure that the programs are executed correctly ad conforms to the requirements specified. At each stage, the system developer need to make sure that at the end of the products should meet the user requirements. Testing provides a method to correct logic error and for testing system reliability. So, testing must be planned properly in order to reduce the unnecessary work, to reduce the cost and the most efficient way will be selected.

6.2   Testing Techniques

There are two testing techniques applied in the testing stage of the system: White Box Testing and Black Box Testing.

6.2.1   White Box Testing

White Box Testing is a test case design method that uses the control structure of the procedural design to derive test cases. Using White Box Testing technique test case with the following characteristics can be derived:

✓ Guarantee that all independent paths within a module have been exercised at least once.

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6.2.1 *White Box Testing*

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✓ Guarantee that all independent paths within a module have been exercised at least once.

✓ Exercise all logical decisions on their true or false sides.

✓ Exercise all loops at their boundaries and within their operational bounds.

✓ Exercise internal data structures to assure their validity.

6.2.2 *Black Box Testing*

Black Box Testing focused on the functional requirements of the system. It enables the developer to derive sets of inputs conditions that will fully exercise all functional requirements for an application. Black Box Testing was not used as an alternative to White Box Testing technique; rather this technique is used as a complementary approach that is likely to uncover a different class of errors. Black Box Testing attempts to find errors in the following categories:

✓ Incorrect or missing functions.

✓ Interface errors.

✓ Errors in data structures or external database access.

✓ Performance errors.

✓ Initialization and termination errors.

6.3   Testing Process
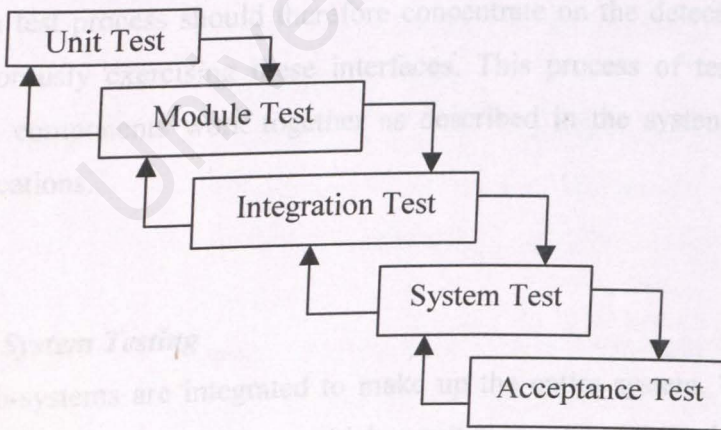
Figure 6.1: Testing process

6.3.1   Unit Testing

Individual components of process are tested to ensure that they operate correctly. Each component is tested independently without other system components. Unit testing is done in a controlled environment whenever possible, so we can feed a predetermined set of data to the component being tested and observe what output actions and data are produced. In addition, we can check the internal data structures, logic and boundary conditions for the input and output data.

6.3.2   Module Testing

A module is a collection of dependent components such as a collection of procedures and functions. A module encapsulates related components so it can be tested without other system modules.

6.3.3   Integration Testing

This phase involves testing collections of modules, which have been integrated into sub-system. Sub-system may be independently designed and implemented. The sub-system test process should therefore concentrate on the detection of interface errors by rigorously exercising these interfaces. This process of testing verified that the system components work together as described in the system and program design specifications.

6.3.4   System Testing

The sub-systems are integrated to make up the entire system. The testing processes concerned with ending errors, which result from unanticipated interactions between sub-system and system components. It also concerned with validating the system so that it meets the functional and non-functional requirements.

6.3.5 *Acceptance Testing*

This is final stage in the testing process before the system is accepted for operational use. The system tested with data supplied by the system procurer rather than simulated test data. Acceptance testing may reveal errors and omission in the system requirements definition because the real data exercise the system in different ways from the test data. Acceptance testing may also reveal requirements problems where the system's facilities do not really meet the user's need or the system performance is unacceptable.

6.4   Unit Test

Module	Expected Result	Actual Result	Remarks
Change Password	Check the old password and the only new password can be updated.	Old password is valid and new password is updated.	This module is considered done.
New User Setup	Check the required input data and if all match add new user.	New user to be added.	This module is considered done.
Book Category	Load book category information when combo box button is clicked.	Load book category and display in the combo box.	This module is considered done.
Title Master	Input all required data, if any blank and invalid type error message prompted.	Error Message is prompted for blank input data and invalid type.	This module is considered done.

Book Master	Load book details based on the title master from search input	Load book title information and display in the book master form.	This module is considered done.
Book Management - Lost Book - Damaged Book	All the items or features involved must be worked to its predefined tasks and also parameter passed.	All the items are worked without any error.	This module is considered done.
Member Type	Load member type information when combo box button is clicked.	Load member type and display in the combo box.	This module is considered done.
Membership Profile - Add Member - Close Account - Account Balance	Input all the required data, if any blank and invalid type error message prompted.	Error Message is prompted for blank input data and invalid type.	This module is considered done.
- Member List - Member History - Book History	All record displayed when the account number or barcode is chosen.	All record displayed appropriately.	This module is considered done.
Transaction - Book Issued - Book Returning	All items or features involved must be worked to its predefined tasks and parameter passed.	All the items are worked without any error.	This module is considered done.

Rental rate	Input all required data, if any blank and invalid type error message prompted.	Error Message is prompted for blank input data and invalid type.	This module is considered done.
Supplier Profile	Input all the required data, if any blank and invalid type error message prompted.	Error Message is prompted for blank input data and invalid type.	This module is considered done.
Search - Book Search - Member Search	All record displayed if input data is matched	Record is displayed for relevant search.	This module is considered done.
Reporting	Generate all record with selected date.	Report incorrect, date can't be selected.	Still solving.

Table 6.1: Unit and module testing

6.5   Integration Test

When we are satisfied that individual components are working correctly and meet our objectives during unit testing, we combine them into a working system. The system is again viewed as a hierarchy of components, where each component belongs to a layer of the design. The BPS integration test is worked from the bottom up. Each component at the lowest level of the system hierarchy is tested individually. Then, the next components to be tested are those that call the previously tested ones. Example the *Member List* form is tested only followed by *Member* form if M*ember* form is tested successfully during unit testing. For *Book Master* form also, it can't be tested unless the *Title Master* form is testing successfully. [Pfleeger, 2001]

6.6   System Test

Testing the system is very different from unit and integration testing. To ensure that the system does what the user wants it to do, we first must understand where faults in the system come from. A software fault causes a failure only when accompanied by the right conditions. That is, a fault may exist in the code, but if the code is never executed, or if the code is not executed long enough or in the appropriate configuration to cause a problem, we may never see the system fail. Although we would like to find and correct faults as early as possible, system testing acknowledges that faults may still be present after integration testing.

Test procedures should be thorough enough to exercise system functions to very user. If the tests are incomplete, faults may remain undetected. The sooner we detect a fault, the better; faults detected early are easier to fix. Thus, complete and early testing can help not only to detect faults quickly, but also to isolate the causes more easily. [Pfleeger, 2001]

6.7   Acceptance Test

To running this testing, a few users were asking to test my system. One of the users, who have testing my system, is the Programmer of one of the Software Company. Although she do not have any knowledge about Visual Basic 6.0, but she still consider qualified to test my system. As a result, for the user interface evaluation, most of the users feel that BPS is a user-friendly and easy to use. Since it is a Windows based application and provides a graphical user interface, users felt that it is easy to use by just click the button to proceed particular task. The system also provides a feedback and error message prompted to the user. The user would not get confuse and difficult to understand the meaningful icons provided by the system. The system consistency, functionality and flexibility have attracted the user to use the system. As a conclusion, this Book Processing System has met the user requirements.

CHAPTER 7: SYSTEM EVALUATION

7.1   Problem Encountered & Solutions

7.1.1   Difficulties in Determining the Appropriate Technology

As there are many alternatives of tools available in the market, to select a suitable tool
that is critical to the project needs to be considered. Besides the cost, the
availability of a technology or tool, its learning curve and hardware and software
requirements for running the tools were major considerations during the stage of
selecting an appropriate tool.

To solve this problem, advices and comments from lecturers, course mates, seniors
and IT professional (expert from programming) were sought. Besides, lots of reading
and research from Internet and some reference books regarding the matter also helped
to clarify some doubts.

7.1.2   Difficulties in Determining the Scope of the Project

It was really difficult to determine the scope of the project due to the interdependence
nature of the that system and lack of experience in developing similar system. The
inability to distinguish which of the system features are essential, either desired or
unnecessary has made scoping the project a complicated task.

In order to scope the project wisely, which is suitable for a final year student,
discussions were held with the supervisor to find the best solution to the problem
that would assist to scope the system properly.

CHAPTER 7: SYSTEM EVALUATION

7.1   Problem Encountered & Solutions

7.1.1   Difficulties in Determining the Appropriate Development Tools

As there are many development tools available in the market, choosing a suitable tool was a critical process because all tools have their own strengths and weaknesses. The availability of a technology or tool, its learning curve and hardware and software requirements for running the tools were major considerations during the stage of selecting an appropriate tool.

To solve this problem, advises and comments from lecturers, course mates, seniors and IT professional (expert from programming) were sought. Besides, lots of reading and research from Internet and some reference books regarding the matter also helped to clarify some doubts.

7.1.2   Difficulties in Determining the Scope of the Project

It was really difficult to outline the scope of the project due to the interdependence nature of renting system and lack of experience in developing similar system. The inability to distinguish which of the system features are essential, either desired or optional, has made defining the project scope a complicated task.

In order to define the project scope, which is suitable for a final year student, discussions are held with project supervisor to find the best solution to the problem during the initial stages of the system planning.

7.1.3   Difficulties in Defining System Requirements

The difficulties in searching relevant and important information had made the system requirements' definition an intricate task. Unlike some other systems where the domain experts and requirements can be found easily (for example in the faculty or campus) or plenty of real-life workable systems available on the Internet (online shopping for example) in which requirements can be derived from, the project has neither of these advantages. Although the similar system is exit in the market, due to the business privacy, we are not allowed to review the existing system. It is not easy to obtain correct requirements for the project without assistance from domain experts or observation to a real system.

Thus, the solution to the problem was no other than deriving requirements from own idea, research papers from the relevant user and tried to expose the real system as possible as I can by joining as member in the relevant bookstore. These requirements are then reviewed and analyzed to determine the correctness and relevancy.

7.1.4   Difficulties in Programming and Coding the System

Most of the programming problems were encountered in the early stage of system development. This is because of lack of experience and no prior knowledge of the Visual Basic, SQL queries coding and also because of having no experience or skill in utilizing the chosen development tools proficiently and efficiently.

As the development proceeded as time goes by, most of the problems are overcome for gaining a better grip and understanding in mastering these languages and tools through frequent usage of these languages and tools. Better confidence was built as more experimentation with these languages and tools through trail-and-error approach and by exchanging knowledge with more experienced friends. Besides, by referring

to samples obtained from Internet, e-books and MSDN Library for Visual Basic 6.0 has also been a very helpful resource for the system application development.

7.2   System Strengths

7.2.1   Targeted for Popular Windows Platform

Book Processing System is targeted on the Microsoft Windows platform, which is the most common and popular operating system used by small business application.

7.2.2   Simple and User Friendly Interface

Book Processing System is developed by using Graphical User Interface based development tools, thus all forms are kept simple. This is to provide a user-friendly system to the user for fast learning and ease of use. Command button, text box, combo box, datagrid and other control objects are used to allow user to execute command with ease. An action is just a click away and the user just needs minimal knowledge of mouse and keyboard to use this system.

7.2.3   Searching Capability

A good information retrieval system is designed such that it is easy to use even for a novice user. This system allows searched by using title, book categories, barcode, author, member name, member account number or member IC number, to retrieve record from database.

7.2.4   *Display Process Message*

There are a lot of processes between the system and its database. Therefore, it is important to inform the user what the system will do when clicking on any command button. Statement is written in the status bar as a reminder to tell user what will happen when certain command button is clicked. Then, system has the capability to inform user when certain process is done and record is inserted into database successfully by prompt out message like "Record is updated!" Without this message, user might think that the system is faulty if nothing is returned when a command button is executed.

7.2.5   *Flexible Rental Rate*

For profit purpose, administrator might need to increase the rental rate or decreased the day limit for renting if certain book or magazine is new arrived or popular. Thus, user can change the rental rate without changing book rental rate one by one. This is because rental rate for this system is determined by *show type*. *Show type* is used to categorized same title or same type of books in same category. User just needs to change the rental rate for certain show type in the *rental rate* form instead of changing the rental rate book by book in the *book master* form.

In addition, rental rate for the system is also vary according to *member type*. For example, *normal member* and *non-member* will be assigned different rental rate for the same book. As summary, rental rate is determined by *member type* and the *show type* of the book. In book issue process, the system will first check the *member type* and *show type* of the book and then relevant rental rate will be found from rental list. For example, same *member type* but different *show type* of the book even the same category of the book will provide different rental rate, day limit and overdue charge.

7.2.6   Title Master Function

Title master form is created for the purpose to record all the titles from comic, novel and magazine that are in the bookstore. This is different with *book master* form where book master is used to record all books (even the same book) in the bookstore. When a new book is added into database, if there is already a record for the same title, especially for those comic and magazine which is series, user just need to find out the book details from *title master* and then update *book master* form.

If the *title master* form doesn't exit, then user has to key in the same details again when a book is added into *book master* form when cataloging a new book. Furthermore, if there is two books from the same title need to be added into database, then user has to key in the same information for the book for twice. This is a very wasteful time to do that. Thus, *Title master* is very useful to record a new title of book.

7.2.7   *Meaningful and Unique Barcode*

Every barcode is generated from 3 parts like *CCO-0000045-1201* where each part has its own meaning. "CCO" means Chinese language comic, the second part is the title code where this code is auto generated from the system and the last part represents the *book code*. Title code with number 45 means this title is the forty-fifth title for the books in bookstore. In addition, this title code lets user know how many different title of books are already exist in bookstore. "1201" means this comic is for volume 12 and is the first book for this book. Since two same books probably exist in bookstore even though ISBN for both are same, thus the last two numbers ("01") is used to differentiate these books.

7.2.8   *Incorporates Data Validation*

Data validation is done prior to insert record into database. All the files in form will be checked for null value or invalid data type. With this feature, error when inserting record into database or improper record will not occur. Error message will prompt to the user if required filed is blank or invalid data type is entered.

7.2.9   *Real-time Database Information*

Information such as show time, barcode, member account number, member type description, rental rate, day limit, late charge, which changes frequently is never hard-coded for display. Thus, any changes made to these fields in database will be reflected in all the display directly.

7.2.10 Transaction History

Every transaction record will not be deleted throughout this system. This is for keep track purpose. Every member can checked their previous transaction record to make sure they won't reissue the same book if they have forgot what is the book they have rented before. Besides, administrator can also check the book history to find out which category of books is the most popular or which book turnaround rate is the most frequently. With the help of this information, the bookstore can do their future business planning more effective such as make decision to buy books that will bring them maximum profit.

7.2.11 Shortcut Key

A few of shortcut keys are provided for the forms which will be used frequently like *F2* represents *member issue* while *F3* represents *member return*. Those shortcut keys

are display in the main page of the form, thus user can easily select the form either with clicking on the button or just press a shortcut key.

7.2.12 Holiday List

Holiday list is used to store rest day information of the bookstore. If due date of the book issued is on the rest day of the bookstore, then day limit for renting the book will be added one day. The system will check whether the due date is crash with holiday date during book issued process.

7.3 System Constraints

Due to time and knowledge limitation, there are a few system constraints, all of them are discussed below.

7.3.1 Database Backup

If the system database is corrupted, there is no backup for the database and information that stored in database before will be lost. Thus, user can't trace their old record entered before and needs to key in again relevant data into database.

7.3.2 Help Function

Help file is a guide for the new user to use this system. This is because user should avoid to key in data without meaning. Example is data for *book code*, the numbers that key in for *book code* will represent the volume and number of the book such as 0402 will represent this book is volume 4 for this title and is the second of the same book in the bookstore. In other words, the first book with *book code* 0401 for the same title already exists in the bookstore. Thus, help function is useful as a guidance to guide user how to key in meaningful data.

7.3.3 Hard Code

For the book issue and book return function, user still required to key in total of books and total rental / total overdue manually. For a good application, this kind of hard coding should be avoided.

7.4 Future Enhancement

System development is a dynamic process and changes must be expected. For this book processing system, there are still have some improvements. However, one can hardly create a perfect system and BPS is no exception. Here are some suggestions for future enhancements.

7.4.1 Database Backup

Once the system is corrupt, all records in database will be lost and reinstall is needed to do again. This will take a lot of time to enter again all details into database. Furthermore, the transaction record is only entered when the business is running. Therefore, a backup set of database whether in hard disk or floppy disk is needed for restoring the old records.

7.4.2 Archaic Database

For real business manners, as the database become larger, it is impossible to delete previous transaction records to maintain the size of database. Old record is important also for tracing purpose. Thus, an archaic record function should be provided to transfer old record into another database. Then the archaic database should be compressed into smaller size and continue to store in the system. Therefore, any previous record would not be deleted although they are useless.

7.4.3   Boolean Searching

If the amount of member or book records are large in database, Boolean searching method like AND and OR is a good function to be added to the system to faster the searching procedure. As the business is running from day to day and new record is inserted into database, the database sure will become large and large. Thus, Boolean searching method is a need and should be created in future enhancement.

7.4.4   Support Multiple Language

This feature should be designed for user who is not familiar with English especially who is Chinese educated. In addition, if most of the books involving in transaction are in Chinese language, then Chinese character input should be provided and it should be recognized by the system. However, this feature can be added by using Windows 2000 platform since this operating system supports multiple languages.

7.4.5   Set Transaction Date

By theory, all transaction has to be recorded on the date that transaction is happened. However, this is not work practically in real business world. Due to some human errors, user maybe forgot to enter relevant data on the spot. Missing entering record also can be caused by power failure or short of electricity on the transaction date. Therefore, set transaction date allows user to change the transaction date if they desire to key in the previous missing record on the next day when the system is function properly.

7.4.6   Help Function

As I describes earlier, help function is important to guide user to run this application. Therefore, an effective and simple help function should be provided too.

7.4.7   Promotion Function

Due to BPS is a business application, thus this system should allowed user to set a cheaper rental rate during promotion to attract more customers. Perhaps user can key in a special show type for the books that are under promotion and then add the promotion rate in the rental list.

7.4.8   Selling Function

Practically, most of the bookstores that provide renting service will do selling too to increase their profit. They may sell the popular book or magazine or newspaper to attract more customers. Thus, this selling function should be considered as an extra useful function.

7.4.9   Annual Fee

Annual fee should be charged for every member to increase business profit. Thus, the system should provide function to calculate the annual fee. Annual fee should be deducted when a year is passed and added into member account when member renew their annual fee. Therefore, the system should calculate the date automatically and remind user when the annual fee is expired. If a member hasn't pay annual fee when date is expired, then system should avoid member to issue book until they renew the annual fee.

7.5 Knowledge and Experience Gained

From the beginning of this project until the final report, a number of problems have occurred and experiences are learned from there. I have gained a lot of benefit and knowledge throughout this project.

7.5.1   *The Important of All Phases in SDLC*

System analysis is an important phase in System Development Life Cycle (SDLC). This phase captures user requirements and goal of the system. If this phase is wrong defined, it will cause faulty to the system development and following progress. With a complete and thorough system analysis, system that is developed will fulfill all the requirements and achieve its goal.

System testing is also an important phase in SDLC. There is no application error free in the world. However, with the procedures in system testing phase, errors or faults in system can be minimized. The functionality of each module or form can also be tested and confirmed that it meets the user requirements.

7.5.2   *Development Tools Knowledge*

Visual Basic is a very powerful development tool for developing Windows environment information system. It is easy to use and learn and also provides Graphical User Interface. It's become more powerful if we add the SQL queries into coding.

7.6 Conclusion

BPS (Book Processing System) is a system to manage and organize a bookstore business, which concentrate in book renting system. This system also provides a good indexing system for barcode generation and member account number generation. The searching and retrieving of records feature allows user to search a specific record in database. This allows user to find a specific book or member easily because all relevant records are systematically arranged with a good indexing system.

In addition, list feature is designed to list out all records in one page for user review. The system also able to reduce manual work and provide better service than existing system. In overall, the project has achieved and fulfilled the main objective - renting function. In future, the BPS still has capability to enhance. Modification and maintenance process is required to handle change requests. This includes a desire to evolve system functionality.

This project gives me an opportunity to build a full application from scratch. It is a great challenge to develop a system alone. Throughout the development of the system in this project, invaluable knowledge and experience has been gained. These include skills in programming with Visual Basic, SQL, knowledge in manipulating database and knowledge to organize a project. The knowledge which I obtained from university in these 3 years times gives me a strong foundation to take this project as long as to complete it.

This thesis makes me realize that tertiary education provides the foundation of computer science and information technology to undergraduates. There are more things to learn and experience in this fast growing world of information age. One has to constantly update oneself to keep up with the changing technology. As a result, I am better prepared to face future challenges in life.

Eventually, this project has not only widens up the view and perspective of the undergraduates on the importance of Software Engineering but also helps the undergraduates to discover and understand the responsibility as an IT professional. I am confident that the experience that I gained will provide me with a strong foundation for my career and achievements in the near future. Once again, I would like to express my heartiest gratitude to all parties for making this final year project a successful and valuable experience.

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USER MANUAL

Introduction

This manual is prepared for existing or new users of the Book Processing System (BPS). The purpose of this manual is to ensure that the system can be understood and maintained. It utilizes to handle the transaction of books sold to the customers and returned by them. By using this BPS, member maintenance would become easier and can cater for more information.

Basically, this system is divided into 5 modules which are User module, Book module, Sales module, Report module and Utilities module. Customers for the bookstore will be categorized into member and non-member while books will be divided into comic, novel and magazine. The most important module is the Sales module where all transaction is occurred here while the other two modules (Report and Utilities) are provided for additional functions.

Hardware and Software Requirements

The application operates on the hardware that the store must acquire before the developed system can be used, which is Windows 98. The other applications are not essential. The following list is the minimum requirements for using this BPS.

scanner, barcode scanner

USER MANUAL

Introduction

This manual is prepared for exclusive use of users of the Book Processing System (BPS). The purpose of this BPS is to ensure that all transaction are properly recorded and maintained. It will also help to keep track books or magazines issued to customers and returned by them. By using this BPS, member maintenance would become easier and can cater for more information.

Basically, this system is divided into 5 modules which are Member module, Book module, Sales module, Report module and Utilities module. Customers for the bookstore will be categorized into member and non-member while books will be divided into comic, novel and magazine. The most important module is the Sales module where all transaction is occurred here while the other two modules (Report and Utilities) are provided for additional functions.

Hardware and Software Requirements

The minimum operating system that the bookstore must acquire before the developed system can be implemented is Windows 98. The other applications are not compulsory. Stated below are minimum hardware requirements for using this BPS.

CPU: Pentium II 300MHz

Storage medium (HDD): 50 Mbytes

Memory: 64MB RAM

Peripherals: monitor, printer, keyboard, mouse, scanner, barcode scanner

CONTENTS

LIST OF FIGURES

Chapter 1: Getting Started

1.1   Setup ODBC

1. Before starting, some configuration is needed to connect to system database. First, select *Settings* from start menu and then click on *Control Panel* and choose *Administrative Tools*.

2. Click on *Data sources (ODBC)* and below picture will be displayed. In *User DSN* tab, click on *Add* button to add a new user DSN
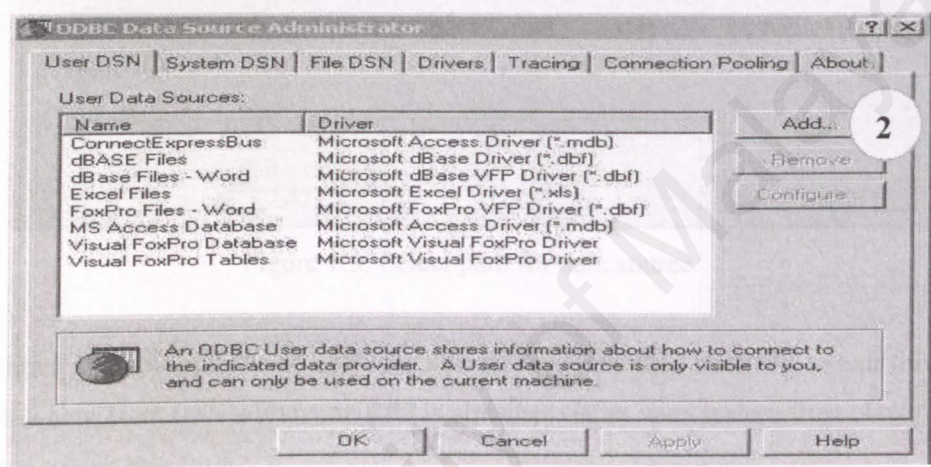
Figure 1.1: Add user DSN

3. After *Add* button is clicked, select *Microsoft Access Driver(*.mdb)* as the driver for this database.
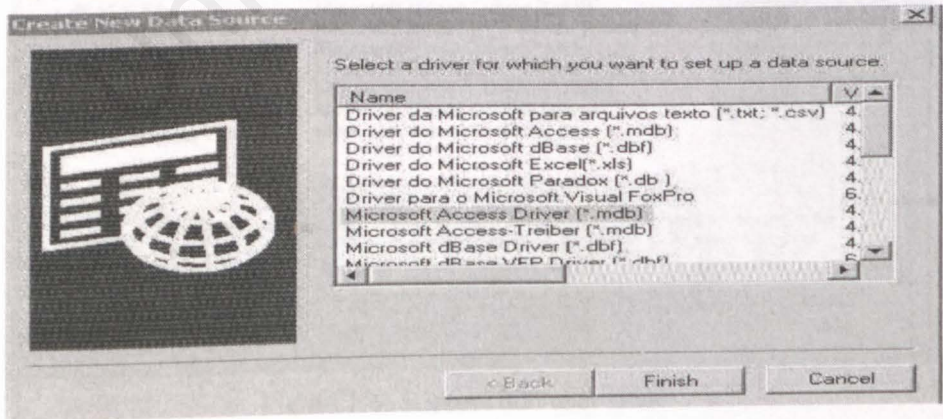
Figure 1.2: Select Microsoft Access Driver

4. After Finish is clicked, below picture will appear. Select the source for database and the correct path is D:\BPS\BPSData.mdb
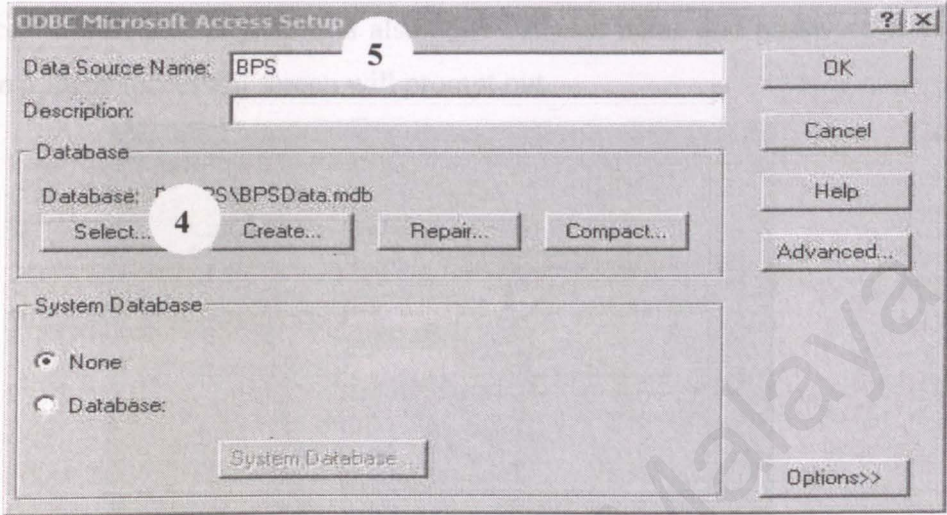
Figure 1.3: Select path for data source

5. Assign a *Data Source Name - BPS* for this database and then click *OK* to exit this form.

6. Now a new *User DSN* with name *BPS* is already exist in your system. Just click *OK* button to exit this form.
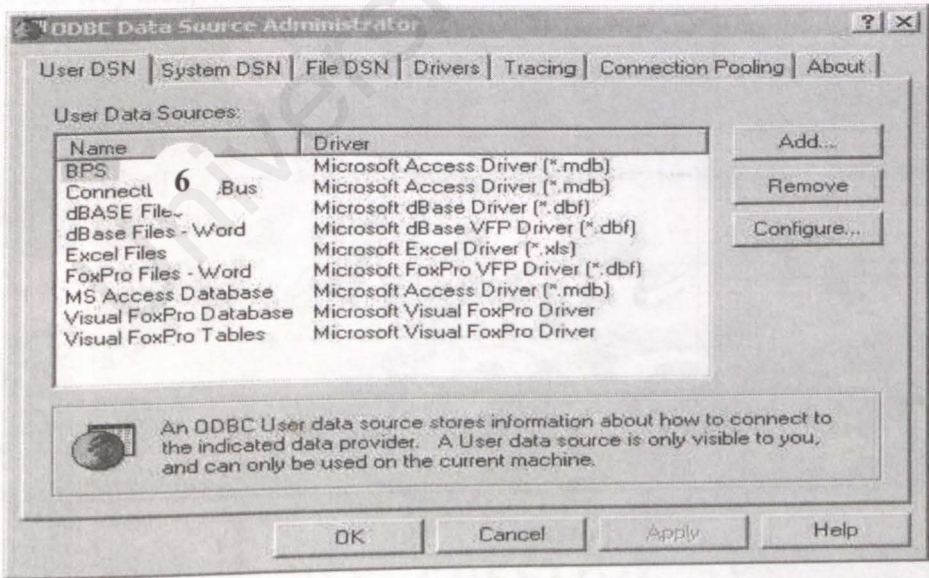
Figure 1.4: Success add user DSN

1.2   Login to BPS

1. Before starting to use this system, you have to login first. The default login name
    is *cch* and default password is also "*cch*". If user name and password is correct,
    then a login successful screen will prompt out.
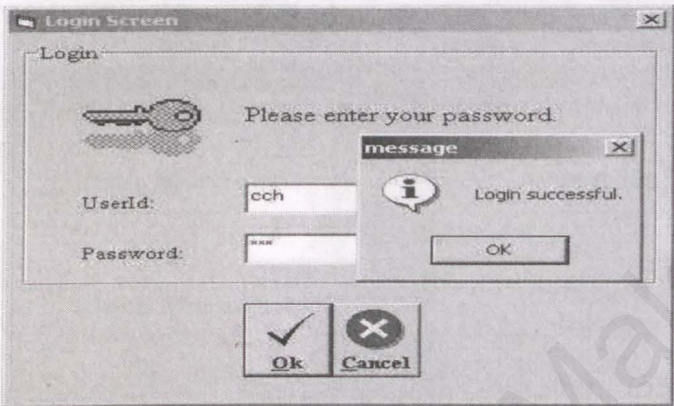
Figure 1.5: Login screen

2. Once you successfully login, the following main screen will appear. There are 3
    sections in this main screen, they are: 1) Menu Bar, 2) Command Tab and 3)
    Shortcut Key area. The functions are similar if either section is selected.
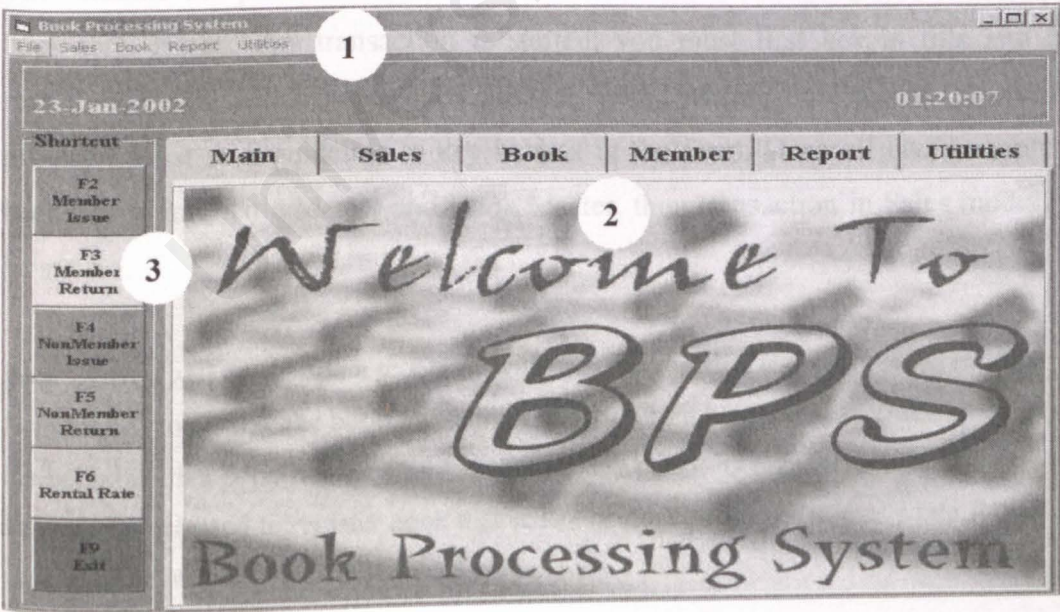
Figure 1.6: BPS main screen

Chapter 2: Book Module
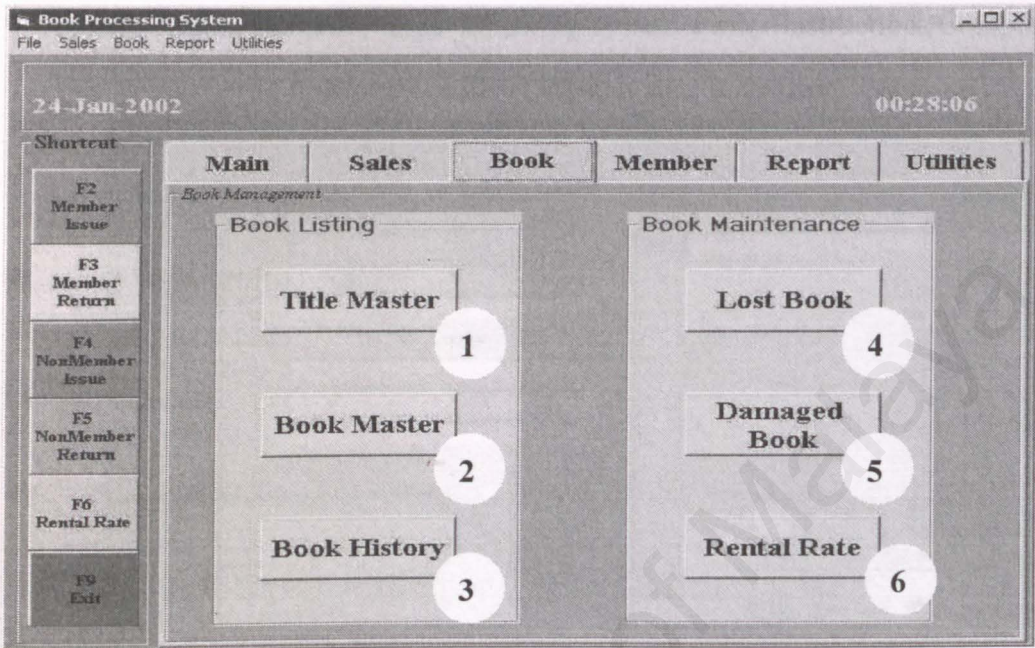
Figure 2.1: Book module main page

This module comprised of 6 forms. Book module is used to register new book for bookstore. Before any transaction is started, you must first key in title and book record into *Title Master* and *Book Master*. While adding new record, you will be provided a list as a guideline to key in data in the form. Once all books record has been key in into Title Master and Book Master, then transaction in Sales module can be started.

Book History will only display record after the first transaction is done in Sales module. This form is used to display the book transaction history. From here, you can check the history of the book like this book has been rented by who and check its popularity too. *Lost Book* and *Damaged Book* used to register book that is lost or damaged by customer while *Rental Rate* used to set rental for every category of books.

1. Before you can key in record into book master, user must update the *Title Master* database section first. Screen below will be displayed. Click *New* to add in new record. Key in the *Show Type* following system owner instruction. Complete the text box and click *Save* to save a new entry.
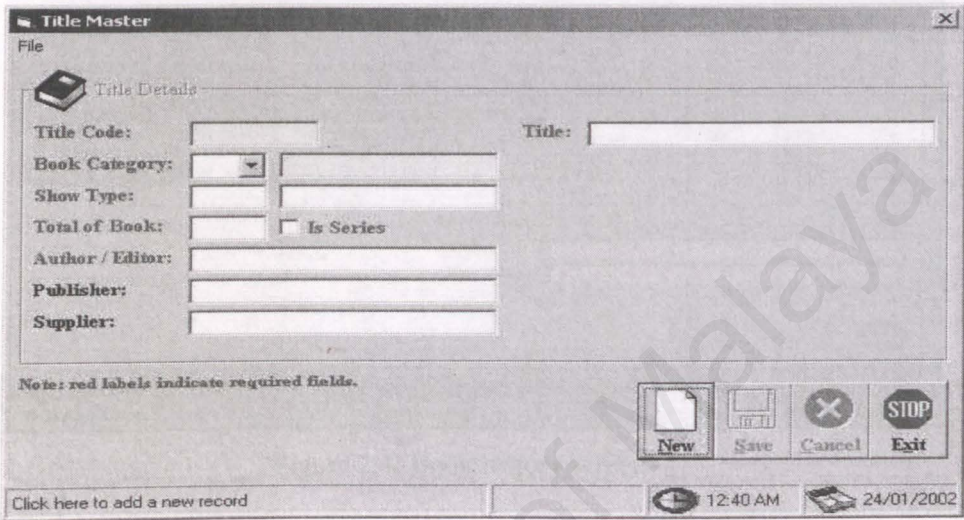
Figure 2.2: Title master screen

2. When *Book Master* button is clicked, the following screen will appear. Click on the binocular icon and you will see the list of Title Master keyed-in earlier. Type in the *Show Type* and *Book Code* as advised by system owner, then *Barcode* will be generated automatically.
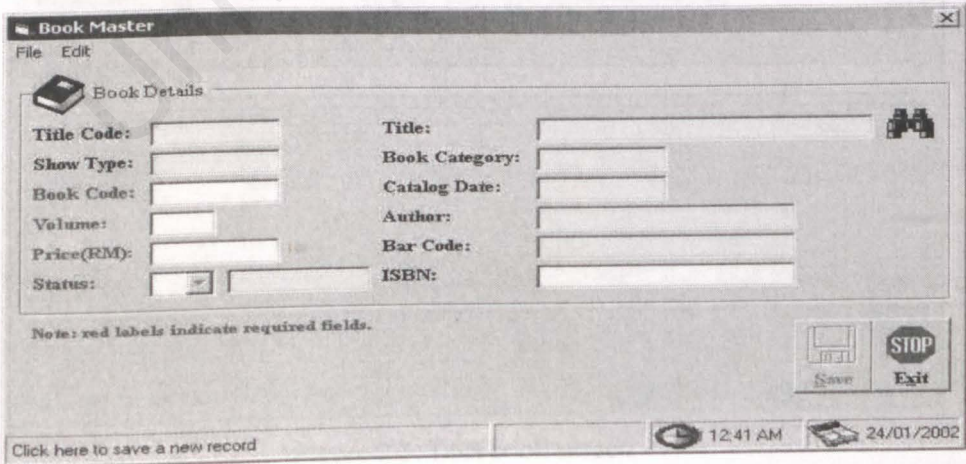
Figure 2.3: Book master screen

3. Once *Book History* is clicked, the following screen will be shown. This screen will only display record after the first transaction is done. You can sort the list by *Issue Date, Return Date, Barcode* and *Title* and also *Search* for record.
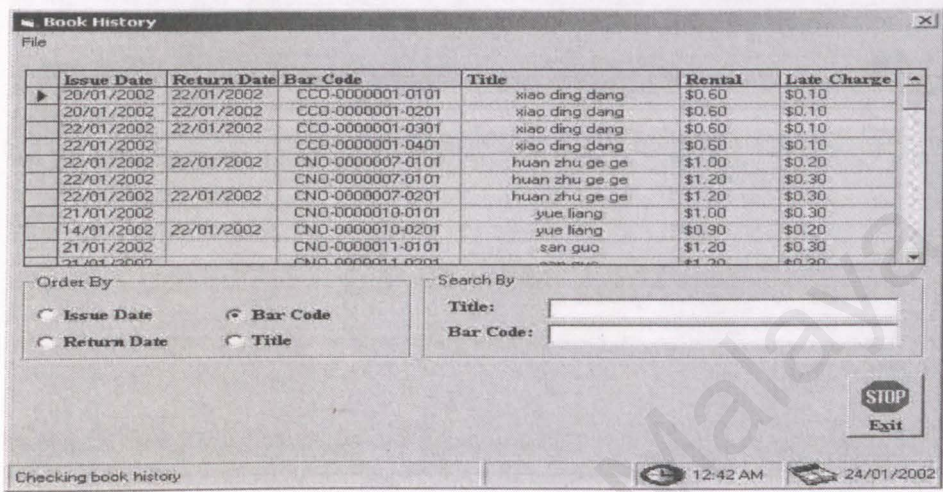
Figure 2.4: Book history screen

4. When you click the *Lost Book* button the following screen will appear. Use this screen to register lost book. Key in all the fields for future reference. Press on the binocular to find a barcode and title.
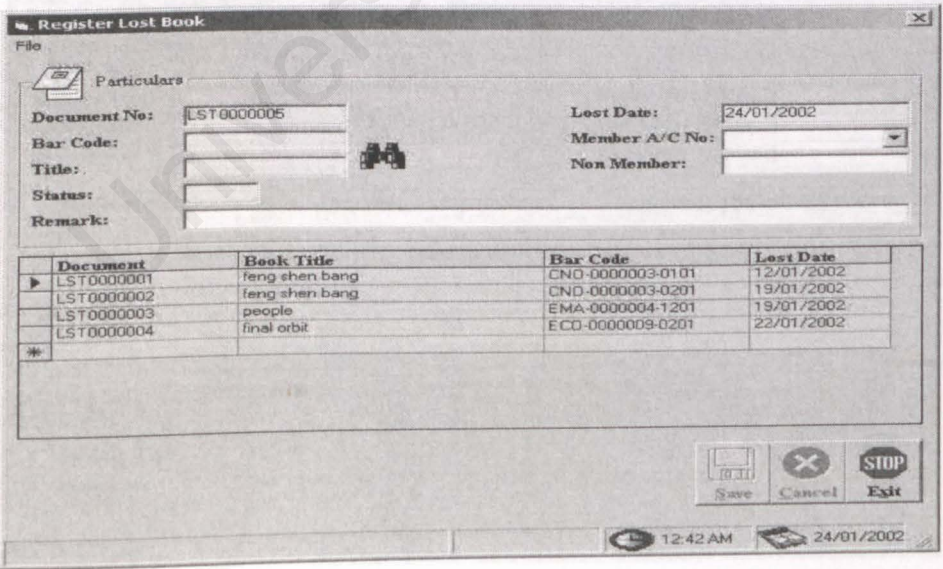
Figure 2.5: Lost book screen

5. *Damaged book* is used to register book that is damaged. It's function almost same with lost book. Document number will auto generated while the form is loaded.

Figure 2.6: Damaged book screen

6. Rental rate is set based on the *Show Code* provided by system owner. You can't key in any show code as you like. Please refer to the list provided by system owner.

Figure 2.7: Rental rate screen

Chapter 3: Member Module
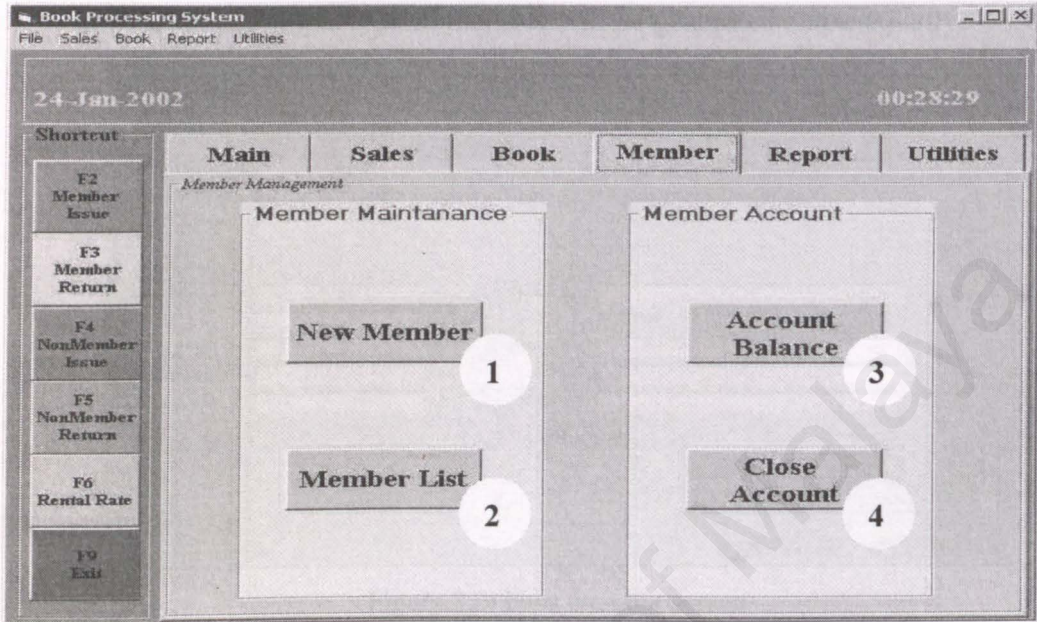
Figure 3.1: Member module main page

This module consists of 4 forms. New Member is used to register new member while Member List used to update member information or display the list of members. Besides, Account Balance is provided for checking member account balance. If a member desire to close his / her account, then this record will be recorded in *Close Account* form. Actually this module is quite important too because member is one of the resource of this system. Transaction only can occurred with existing of member.

1. If a new customer desire to register as member, click on the New Member form and fill in all required information. First select the *Member Type* and all information about this type of member will be generated automatically.

Figure 3.2: New member screen

2. To update or view all members information, just click on Member List button. Click on binocular icon to find a record to be updated.

Figure 3.3: Member list screen

3. Find an account number from the combo box and then key in amount paid by member.

Figure 3.4: Account balance screen

4. Click on the combo box to select an account number to be closed.

Figure 3.5: Close account screen

Chapter 4: Sales Module
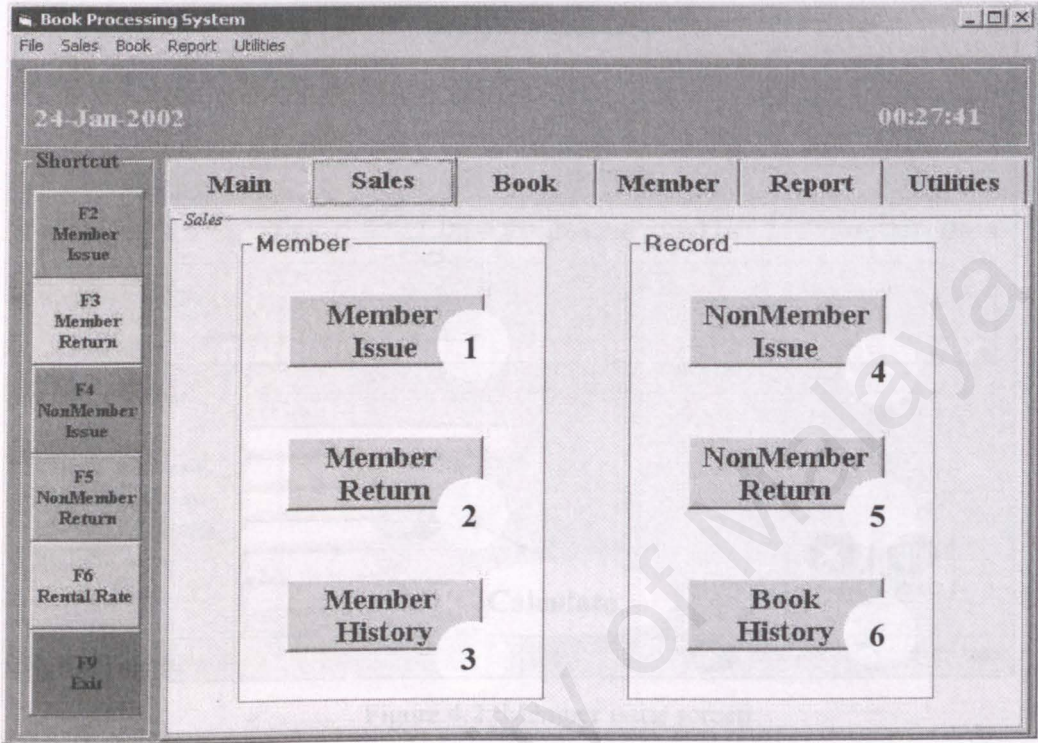
Figure 4.1: Sales module main page

Sales module is the most important part where all transaction is started here and finished here too. Basically, there are two main functions, issue and return according to member type. The other two forms – *Member History* and *Book History* are used to preview or check the previous transaction records.

1. *Member issue* is the form for member issue books.

Figure 4.2: Member issue screen

First, select member account number from the combo box. After the combo box is click, member information will be shown in form. Now, scan the *barcode* into Barcode textbox. If you desire to issue more than one book, then continue scanning the barcode. Then, key in total rental and total amount paid by member. After you finishing scanning, click on the calculate button to count total books on hand and count for new account balance too.

If you wrongly select member account number, then click on *Cancel* button and choose the other member account number. Once you have scan in the barcode, then you can't cancel the issue process.

2. *Member return* is used while member return book.

Figure 4.3: Member return screen

First, select the member account number as what you do with member issue form, all member transaction records will be displayed, then scan in the barcode for book which member desire to return. Same with book issue, continue scanning barcode if member desire to return more than one books.

After barcode is scanning, key in total book returned and also total overdue. The click the *Return* button to calculate new balance for relevant member.

3. Non-member issue is almost same with member issue. After barcode is scanning, click on *Issued* button, the system will calculate total rental, deposit, total book and total amount paid by non-member.
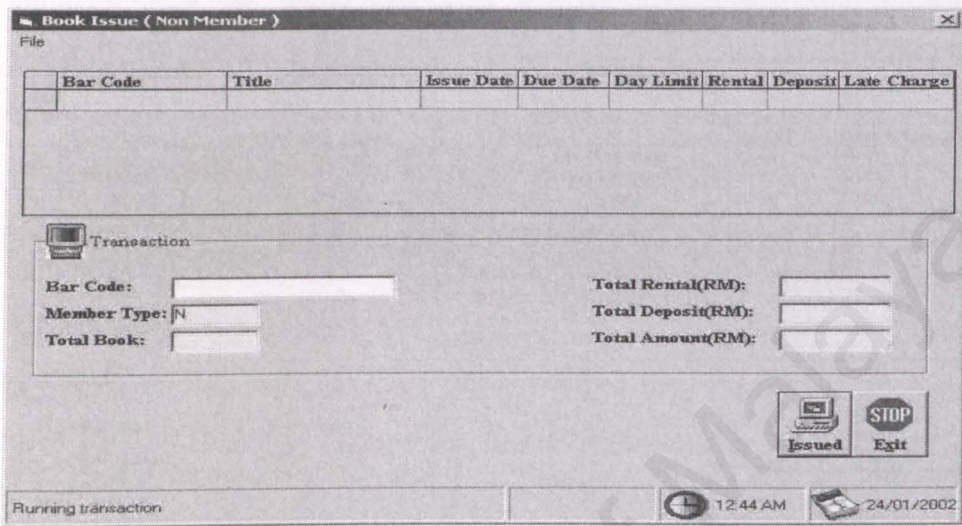
Figure 4.4: Non member issue screen

4. Non-member return also similar with member return process. You need to scan in the barcode and then click on *Return* button.
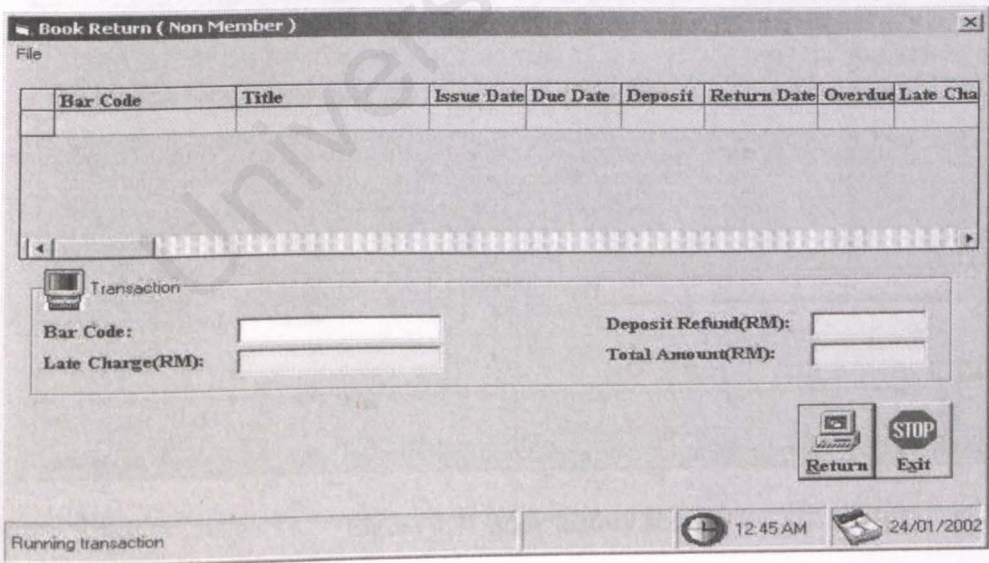
Figure 4.5: Non member return screen

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5. *Member History* only displays records for member. Select account number where you want the list to be shown or clock on option button to sort by order.

Figure 4.6: Member history screen

6. Function *Book History* is same *Member History*. Please refer to *Member History*.
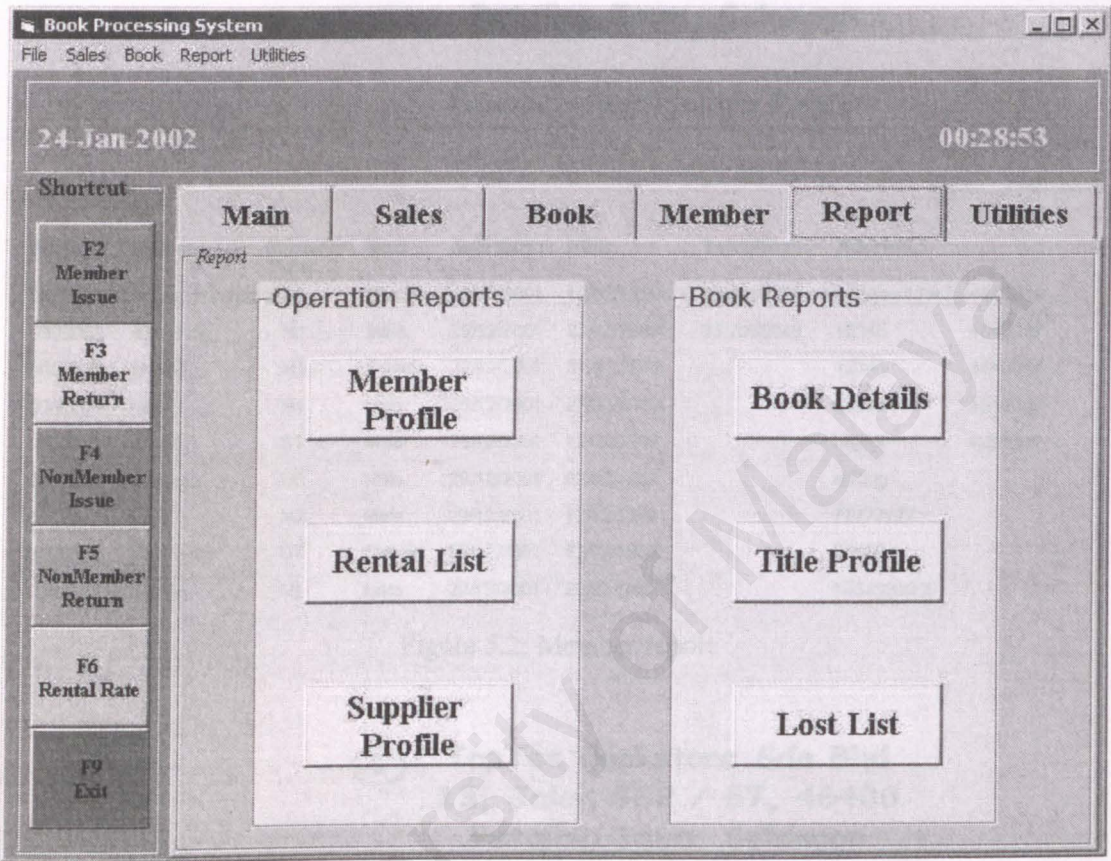

Figure 4.7: Book history screen

Chapter 5: Report Module

Figure 5.1: Report module main page

This module is used to display and print out report generated by system. There are total six reports can be displayed. You just need to click on those command buttons to show the report. If you want to print out report, just click on *Print* button in the report. Below are sample of reports for BPS.

**TopTen Bookstore Sdn Bhd
13, Jalan SS2 / 67, 46400
Petaling Jaya, Selangor**

Member Particulars Report

Page: 1
Date: 24/01/2002

A/CNo:	Name:	Member Type:	Sex:	Join Date:	DOB:	Telephone:	Address:	
0000001	chang chin hung	ST	Female	29/12/2001	12/02/1996	03-4568974	14 jalan 17/43	46400 pj
0000002	soak hing	M1	Male	29/12/2001	23/12/1989	03-7956040	12345	46400 pj
0000003	shiau li	M2	Female	29/12/2001	31/01/1978		12345	46400 pj
0000004	ginny	M1	Male	29/12/2001	23/02/1989		44444444	46400 pj
0000005	shanti	ST	Male	29/12/2001	12/02/1989		bfgfgf	fggfhgff
0000006	keat see	M3	Male	29/12/2001	02/02/1989		m10 jg	
0000007	linda	M2	Male	29/12/2001	12/12/1989		77777777	
0000008	siaw ping	ST	Female	29/12/2001	12/02/1996		88888	
0000009	steven	M1	Male	29/12/2001	23/02/1959		1654999999	

Figure 5.2: Member report

**TopTen Bookstore Sdn Bhd
13, Jalan SS2 / 67, 46400
Petaling Jaya, Selangor**

List of Rental Rate

Page: 1
Date: 24/01/2002

Show Code:	Member Type:	Description:	Rental(RM):	Day Limit:	Late Charge(RM):
M1A1	M1	normal comic for normal member	0.60	7	0.10
M1A2	M1	popular comic for normal member	0.70	7	0.10
M1B1	M1	normal novel for normal member	0.90	7	0.20
M1B2	M1	popular novel for normal member	1.00	7	0.20
M1C1	M1	normal magazine for normal member	4.00	7	0.80
M1C2	M1	popular magazine for normal member	4.20	3	0.80
M2A1	M2	normal comic for standard member	0.60	7	0.10

Figure 5.3: Rental rate report

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TopTen Bookstore Sdn Bhd
13, Jalan SS2 / 67, 46400
Petaling Jaya, Selangor

Book Details Report

Page: 1
Date: 24/01/2002

Bar Code:	Title:	Author:	Catalog Date:	Price(RM):	ISBN:
CCO-0000001-0101	xiao ding dang	Warren	02/01/2002	5.90	
CCO-0000001-0201	xiao ding dang	Warren	07/01/2002	5.90	
CCO-0000001-0301	xiao ding dang	Warren	07/01/2002	5.90	
CCO-0000001-0401	xiao ding dang	Warren	07/01/2002	5.90	
CMA-0000002-1501	tai zhou kang	Katharine	07/01/2002	15.00	
CNO-0000003-0101	feng shen bang	Wu Dan Ru	07/01/2002	7.80	
CNO-0000003-0201	feng shen bang	Wu Dan Ru	07/01/2002	7.80	
CNO-0000007-0101	huan zhu ge ge	Zhang Xiao Xian	15/01/2002	8.90	

Figure 5.4: Book details report

TopTen Bookstore Sdn Bhd
13, Jalan SS2 / 67, 46400
Petaling Jaya, Selangor

Supplier Particulars Report

Page: 1
Date: 24/01/2002

ID:	Company:	Telephone:	Fax:	Contact Person:	WebSite:	Address:
A1	SunShine	03-7956021	03-12356980	Lay Soak Hing	www.sunshine.com	pj
B1	Preston	03-7895023	03-56235964	Ng Bee Ling	www.preston.com	pj
C1	Sasbadi	03-7895652	03-78945612	Lee Ah Meng	www.sasbadi.com	pj
D1	Prentice Hall	03-1234568	03-12345626	Ms Lim	www.prenticehall.com	kl
E1	Linux Hall	05-5982440	05-4562319	how shiau li	www.linuxhall.com	ipoh

Figure 5.5: Supplier details report

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TopTen Bookstore Sdn Bhd
13, Jalan SS2 / 67, 46400
Petaling Jaya, Selangor

Book Titles Report

Page: 1
Date: 24/01/2002

Book Category:	Title:	TitleCode:	Show Type:	Show Type Description:	Author:	Total Of Books:	Supplier:
CCO	xiao ding dang	0000001	A1	normal comic	Warren	4	
CMA	tai zhou kang	0000002	C2	expensive magazine	Katharine	1	
CNO	feng shen bang	0000003	B1	normal novel	Wu Dan Ru	2	
EMA	people	0000004	C1	normal magazine	Larry King	3	
ENO	evolution	0000005	B1	normal novel	Anne Rice	2	
EMA	pc magazine	0000006	C2	expensive magazine	Ray Bradury	4	
CNO	huan zhu ge ge	0000007	B2	expensive novel	Zhang Xiao	4	
ECO	the crow	0000008	A1	normal comic	Stephen King	2	
ECO	final orbit	0000009	A2	normal comic	Tom Brokaw	2	

Figure 5.6: Book titles report

TopTen Bookstore Sdn Bhd
13, Jalan SS2 / 67, 46400
Petaling Jaya, Selangor

List of Books Lost

Page: 1
Date: 24/01/2002

Document No:	Bar Code:	Title:	Lost Date:	Member:	NonMember:
LST0000001	CNO-0000003-0101	feng shen bang	12/01/2002		fgghf
LST0000002	CNO-0000003-0201	feng shen bang	19/01/2002	0000004	
LST0000003	EMA-0000004-1201	people	19/01/2002		Chang Chin Hung
LST0000004	ECO-0000009-0201	final orbit	22/01/2002	0000002	

Figure 5.7: Lost book report

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Chapter 6: Utilities Module
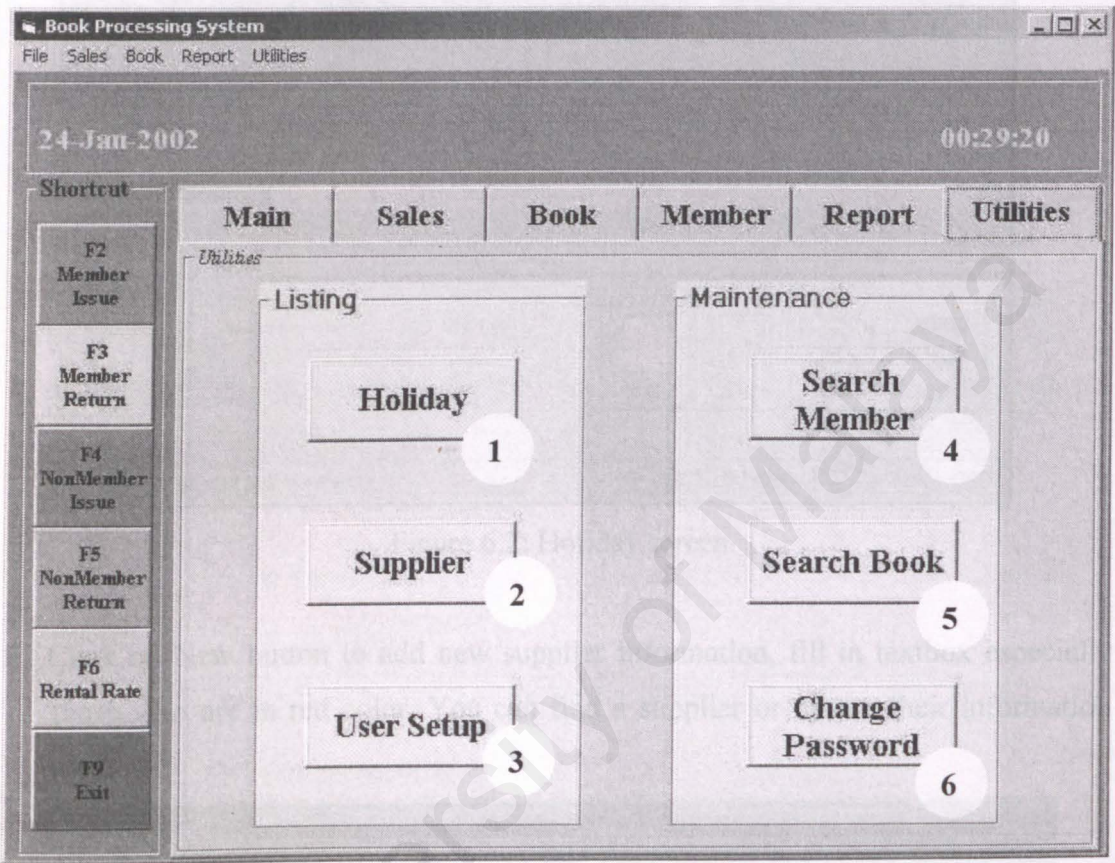
Figure 6.1: Utilities module main page

This module is like additional module and provides extra functions for BPS. *Holiday* form is used to set bookstore rest day and then calculate the due date for returning book while *Supplier* is used to store information of supplier. The *Search* functions let user find certain book or certain member easily. The last part is *User Setup* and *Change Password* where provide security to the system.

1. For *Holiday* form, click on the date and then select a date as bookstore holiday. Then write the description or reason why there is a rest day for bookstore.
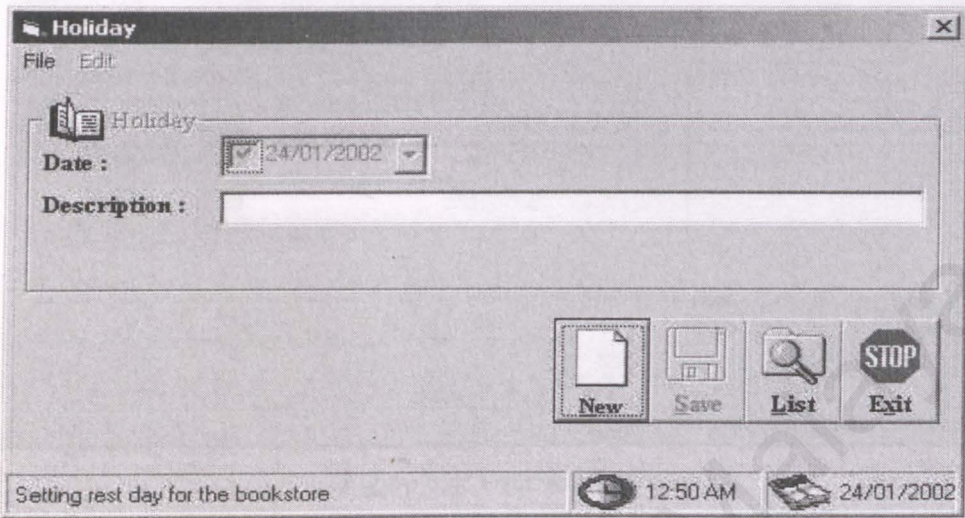
Figure 6.2: Holiday screen

2. Click on New button to add new supplier information, fill in textbox especially those who are in red color. You can find a supplier or update their information anytime.
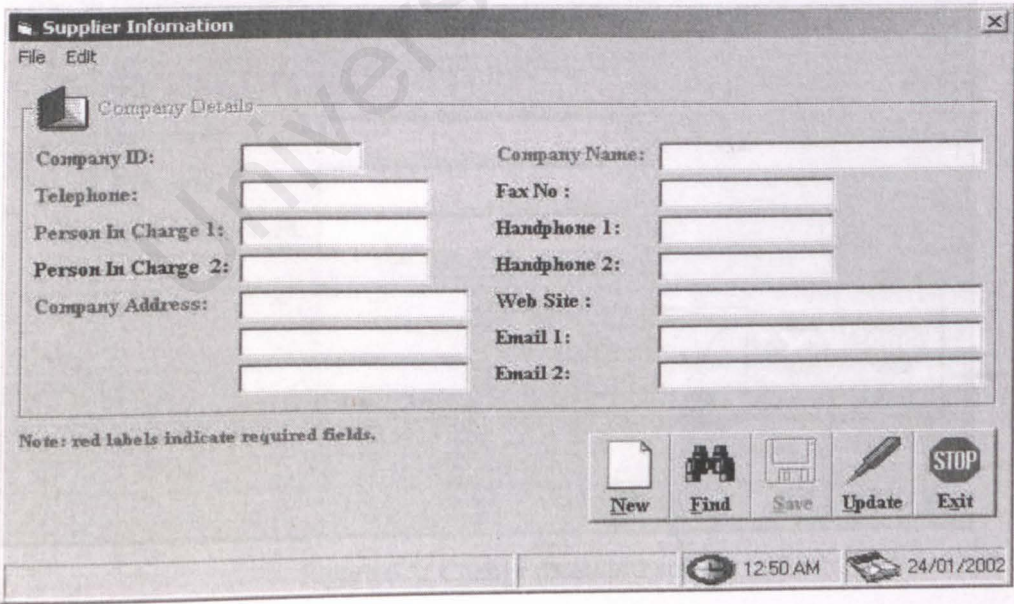
Figure 6.3: Supplier screen

3. Add new user to User Setup. You can add or delete user name or just remain there.
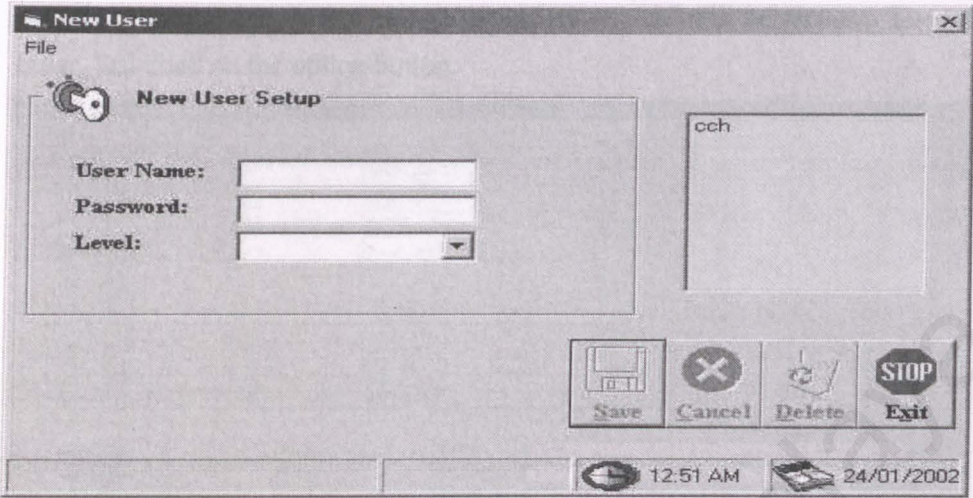
Figure 6.4: User setup screen

4. Change Password. Default user name is cch and password is "cch" too. You can change the userId or password.
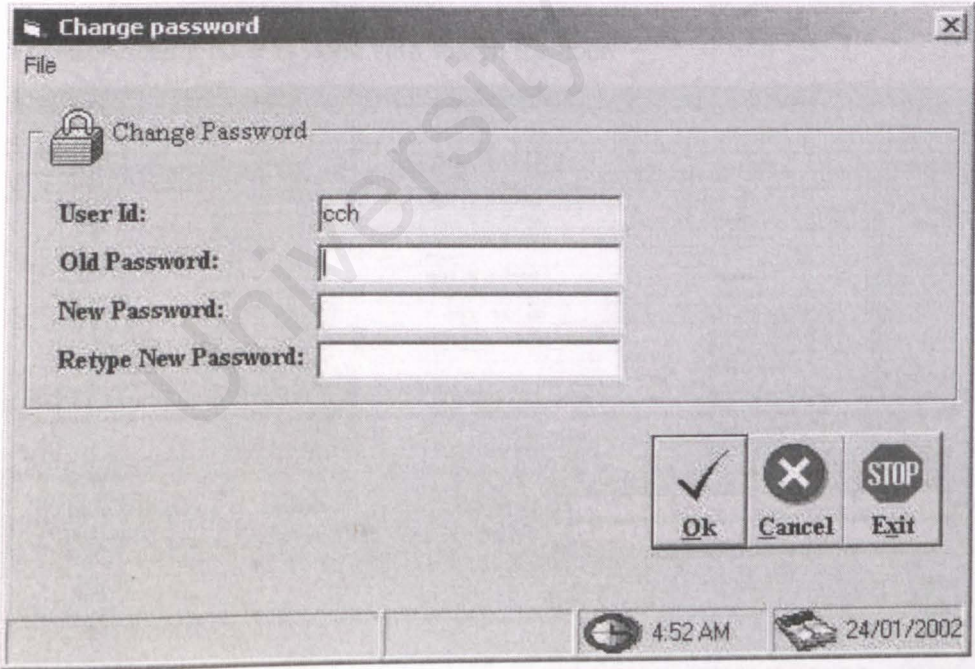
Figure 6.5: Change password screen

5. To search member, just key in the Name, A/C No or NRIC to find a record. If there is no record, a message box with message "record not match" will prompt out. To sort by order, just click on the option button.

Figure 6.6: Search member screen

6. Function search book is same with search member.

Figure 6.7: Search book screen

Quick Reference

- Book Category

Code	Description
CCO	Chinese language comic
CNO	Chinese language novel
CMA	Chinese language magazine
ECO	English language comic
ENO	English language novel
EMA	English language magazine
MCO	Malay language comic
MNO	Malay language novel
MMA	Malay language magazine

- Member Type

Code	Description
M1	Normal member
M2	Standard member
M3	Exclusive member
ST	Staff
Z	Close account
N	Non-member

- Book Status

Code	Description
A	Available
R	Rented
D	Damaged
L	Lost

- Rental Rate

Code	Description
A1	Rate for normal comic
A2	Rate for popular comic
B1	Rate for normal novel
B2	Rate for popular novel
C1	Rate for normal magazine
C2	Rate for popular magazine