BOOKING SYSTEM C RCODE SCANNER

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JUDUL: BOOKING SYSTEM OF ICT EQUIPMENT USING BARCODE SCANNER

SESI PENGAJIAN: 2014/2015

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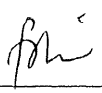

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Universiti Malaysia Pahang (UMP),
Executive Committee Representative.
9th December 2014

STUDENT DECLARATION

I hereby declare that this project entitled "Booking System of ICT Equipment using Barcode Scanner" is the original work in this technical report in my own except for quotations and summaries which have been duly acknowledged that had done by me under supervision of MR Muhammad Idaham Bin Umar Ong, Lecturer of Faculty Computer System & Software Engineering, University Malaysia Pahang.

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Student : MATHANRAJA A/L MANY

Date : 23/12/2014

SUPERVISOR DECLARATION

"I hereby declare that the project entitled "Booking System of ICT Equipment using Barcode Scanner" was read in this technical report and assure that this report is sufficient within the scope and quality for the award of the degree in Bachelor Degree of Software Engineering with Honors."

Signature : .....

Lecturer : MR MUHAMAD IDAHAM BIN UMAR ONG

Date : 23/12/2014

DEDICATION

Special dedication of this Great Memory

To my beloved father, mother and guardians,

Thank you for your unconditional loves.

And who always gives me a courage and support to finish this project.

To my project Supervisor, MR MUHAMAD IDAHAM BIN UMAR ONG,

Thank you for the support, advices, and sacrificed energy, time in helping me to complete this project on time.

To My Friends And all FSKKP Lecturers.

Thank you very much for all your kindness. I really appreciate it.

May God bless the very all of you.

ACKNOWLEDGEMENTS

Firstly, the effort I have taken to complete this project will not possible without the kind support and help of many individuals and lecturers.

I am highly appreciate to Pusat Teknologi Maklumat Dan Komunikasi (PTMK) for providing a good user requirement and guidance throughout the project and also for their support in completing the project.

I would like to sincerely and heartily grateful to my supervisor, Mr Muhamad Idaham Bin Umar Ong for the support and guidance showed to me throughout the documentation. I am sure it would have not possible without his help. Besides, I would like to thank to my course mates in developing the and willingly helped me out with their abilities.

Furthermore, I would like to show my greatest appreciate to my parents who has been gives me warm encouragement and emotional support during this period of time. Thank you for your praise for my healthy and strength in doing this project. Last but not least, I would like to express my gratitude to all lecturers at FSKKP that always support and give your spirit and advice. I heartily appreciate all who involved directly or indirectly.

ABSTRACT

Booking System of ICT Equipment (BSIE) is a web-based system. This system is designed especially for the University Malaysia Pahang community which staff and student of UMP. Before this system being developed, the Booking System of ICT Equipment was integrated with E-Community system and without using barcode scanner. This causes the PTMK staff going through difficulty when the E-Community performances become low. Thus, this system develop to make their operation goes smoothly and can track the quantity equipment available than manually written. Apart from this, this system has reporting function which gives PTMK Staff to filling the daily progress of these activities. Besides this, the PTMK Staff also can download the report either to Excel file or PDF file. This all functions of the system allow the work of PTMK Staff easier.

ABSTRAK

Booking System of ICT Equipment (BSIE) adalah sati system berasaskan web. Sistem in direka terutama untuk warga Universiti Malaysia Pahang yang melibatkan mahasiswa dan pensyarah. Sebelum system ini dibangunkan, Booking System of ICT Equipment (BSIE) berintegrasi dengan sistem E-Community tanpa menggunakan peralatan Barcode Scanner. Hal ini menyebabkan staf PTMK mengalami masalah apabila prestasi sistem E-Community menjadi rendah. Dengan ini, sistem ini dibangunkan untuk membolehkan operasi kerja staf PTMK berjalan dengan lancar dan sekaligus boleh mengesan kuantiti peralatan ICT yang ada daripada tulis secara manual. Di samping itu, sistem ini juga menyediakan fungsi laporan yang membolehkan staf PTMK memfailkan laporan aktiviti harian. Selain itu, staf PTMK juga boleh muat turun laporan tersebut dalam bentuk Excel atau PDF. Dengan fungsi seperti ini, sistem ini memberi laluan kepada staf Ptmk untuk menyiapkan tugasan mereka dengan senang.

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LIST OF ABBREVIATIONS

Abbreviation	Definition
UMP	Universiti Malaysia Pahang
RAD	Rapid Application Development
PTMK	Information Communication And Technology Center
ICT	Information Communication And Technology
BSIE	Booking System of ICT Equipment
SQL	Structured Query Language
PK	Primary Key
FK	Foreign Key

Part 1

INTRODUCTION

In this part, an introduction to scheduling will be presented, followed by the problem statement, the object, the scope of project, literature review of system and comparison on barcode scanner.

1.1 Introduction

This is system named as Booking System of ICT Equipment using Barcode Scanner. This system is developed for Pusat Teknologi Maklumat Dan Komunikasi (PTMK). The system will be web-based system. The users of the system will be UMP staff and UMP student.

The system requires user to register in order to login to the system. User itself can update their profile, view the available ICT Equipment, booking the equipment's as well as cancel the booking if necessary. Whereas, admin responsibility to approve or reject the user request based on availability of equipment and manage the equipments. Admin also shall borrow the equipment's by scanning the item's serial number as well record the returning of the equipment. Admin can search for user's detail and also view the report of availability equipment's.

The advantages of this Booking System for ICT Equipment:

i. Can make the admin work easier to track the available of equipment by viewing the report rather than checking manually by calculating.
ii. Can avoid frustrated on user for waiting long time to borrow the equipment.
iii. Can avoid the admin work from complex when there's wrong input of serial number.

As a conclusion, this system will be helpful for all UMP users in term of performance level and usability which means satisfaction by users. This system will be hand over to the Pusat Teknologi Maklumat Dan Komunikasi (PTMK).

1.2 Problem Statement

The following is the problem statement that has been encountered in existing system at UMP:

i. The staff mistakes in entering long serial causes the transaction of borrowing ICT Equipment takes long time.
ii. The ICT Equipment existing system is integrated and accessible through UMP E-Community thus accessing the existing booking system become problem, if there is performance issue to the main system.
iii. No real time monitoring system that enables admin from Pusat Teknologi Maklumat Dan Komunikasi (PTMK) to verify the exact quantity of ICT Equipment available.

1.3 Objective

The following is the objective to be applied in the system that being developed:

I. To integrate the Barcode Scanner in the system development to minimize human error during input process.
II. To develop a booking system for ICT Equipment without any integration to UMP E-Community.
III. To implement a real time reporting function of availability on ICT Equipment through report generation.

1.4 Scope of Study

I. Focus for the user of ICT Equipment Booking System which are UMP Staff and Student.
II. This system will be developed using ASP.Net platform.
III. Implement Barcode Scanner to read the serial number (ISBN) of the ICT Equipment during transaction of borrowing the equipment.

1.5 Project Organization

In this documentation, there will two highlighted chapter which is Chapter 1 and Chapter2. Chapter 1 is all about introduction for the booking system of ICT Equipment. In Chapter2, there will be the report body which contain use case diagram, sequences diagram, activity diagram, and class diagram. Gantt chart and methodologies that will be used throughout this project also will be described in this documentation.

1.6 Review of Existing System

I. Online Booking Mozaic Restaurant

Mozaic Restaurant provides an online booking of foods for customers. This application is available also in mobile application. This online booking system helps the restaurants to gain more money or revenue and permits them to work efficiently as possible.

For the function available in this Online Booking Mozaic Restaurant. Firstly, users can book the restaurant by select the category of ages, meal service time and the desire booking dates. After that, they will proceed by to select the available time for the meal. And the user need to enter their details information and if they want to request such as prepare cake for birthday party, they can do so in provided special request box. And lastly users will get a booking reference number and if the user want to change anything, they must use the booking number to make a change [1].

Advantages:

a) Customer can access from anywhere to booking to the restaurants. This application is not only limited to web-based.
b) Customer can cancel or update the booking by using the booking number that has been send to the customer email.
c) Customer can booking only on that available time only because this is not 24 hours restaurant.

Limitations:

a) The system is not user-friendly because the interface is totally dull. The interface is only in white colour.

b) Customer might difficult to emphasize on the action that the need to perform because there is no clear description on every pages.

Figure 1.1 Main Page of Booking

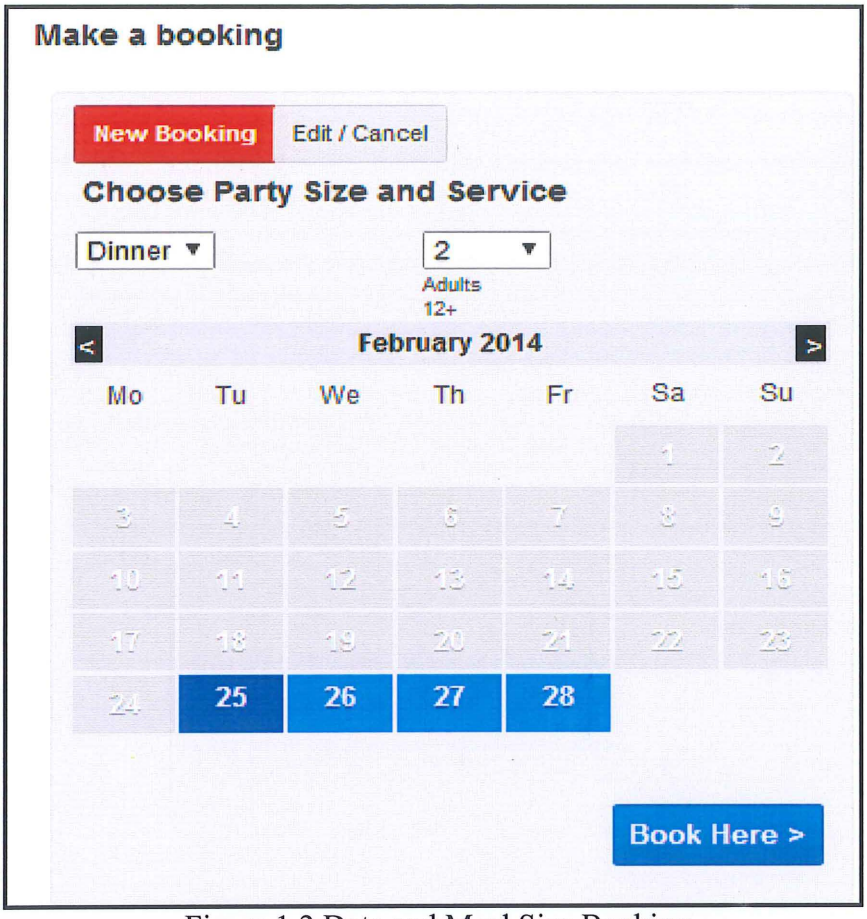


Figure 1.2 Date and Meal Size Booking

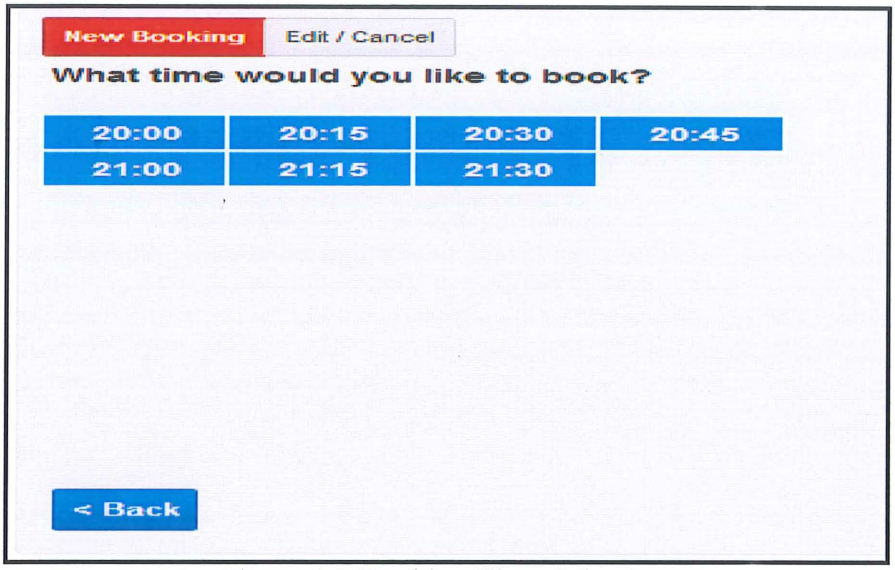


Figure 1.3 Booking Time Selections

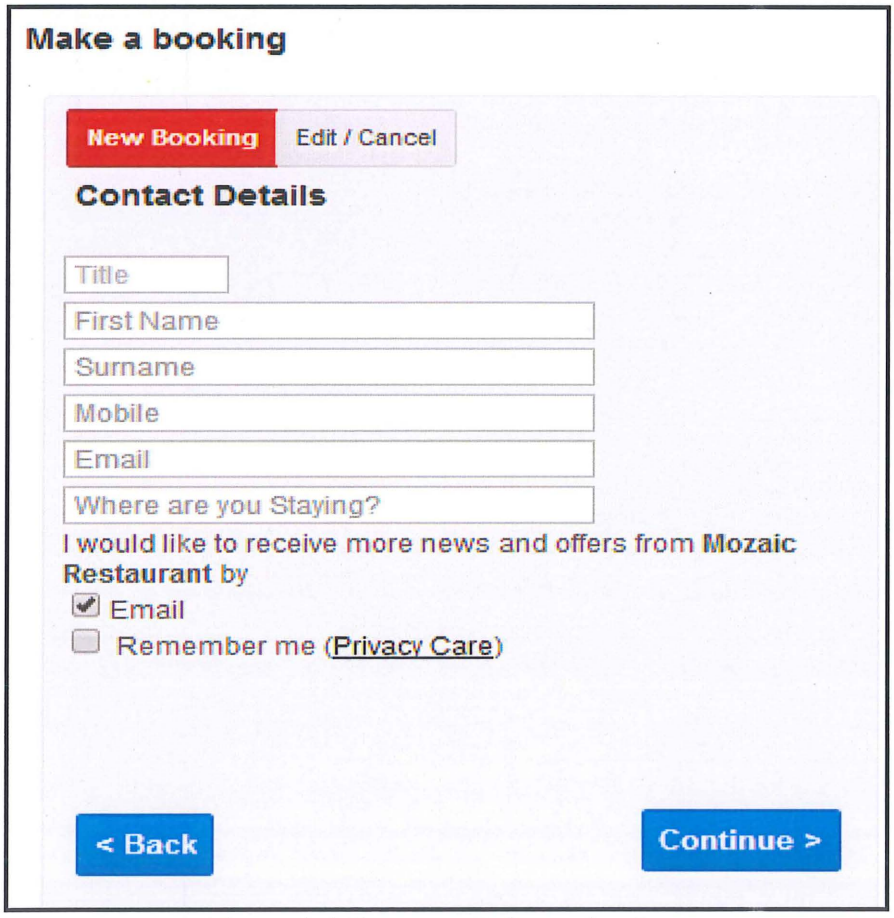


Figure 1.4 Customer Information Page

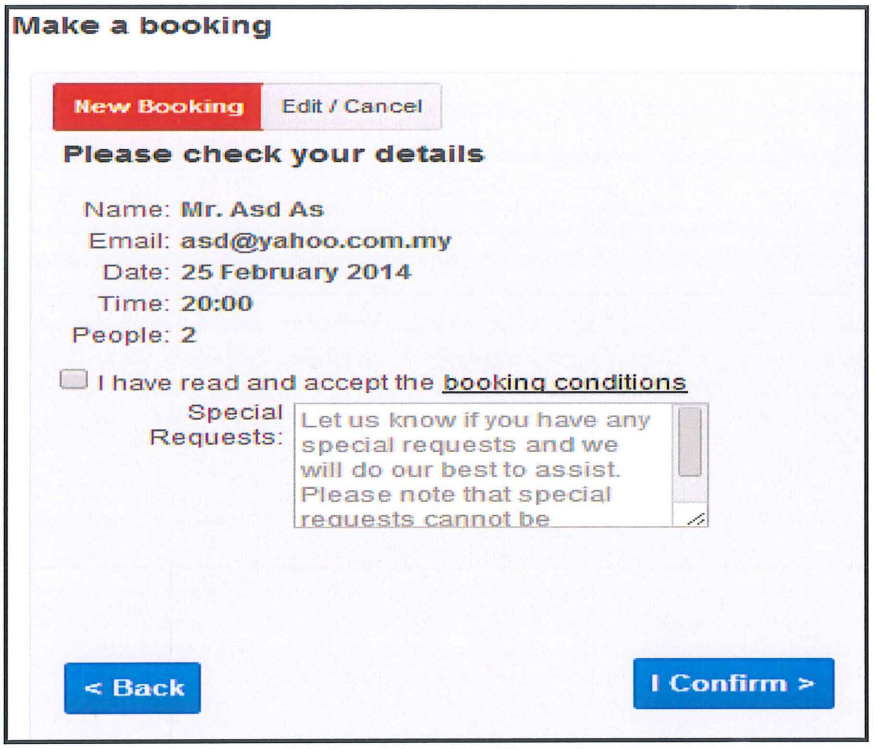


Figure 1.5 Booking Confirmation Page

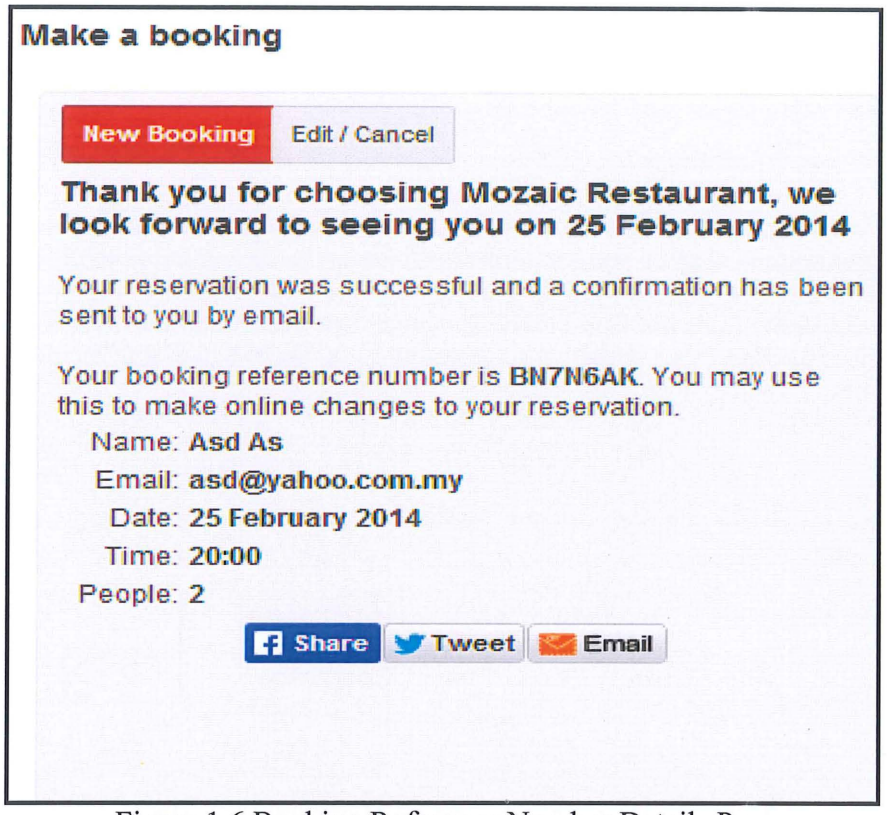


Figure 1.6 Booking Reference Number Details Page

II. Freebookings Online Restaurant Reservations

The freebookings is the most simplest and easiest online booking software that available to use in most of the restaurants. This online booking system also can deliver the correct restaurants as the user wished such as a simply restaurant but with a high in features. Besides that, the system can acquires the users online and able to take the dinner bookings from website in home computers or an application that available in android Google play for the use in the iPad and smartphones [2].

For this system, customer can choose the time and date even table number for the meal that will be book. The customer can edit the details of booking. The confirmation of the reservation will be sent to the customers email. From email, the customer can check the detail and with the reservation number. If any changes want to be made, the customer can do so, by send the email to the restaurant. For the admin use, they will up-to-date the availability of meal for each day with the food will be prepared for breakfast, lunch and dinner. Besides that, the admin responsible to send the reservation number through email, once the customer reservation approved.

Advantages:

a) No need proprietary hardware which means this system can be access from anywhere. There is no limitation only can be access through computer.
b) Admin can manage the availability, where admin can set the number of customers to receive for the days. The admin can manage availability many on public holidays.
c) Customer will have automatic confirmation after they booking for the restaurants. The customer will receive confirmation through their email address with the restaurant customer have been chosen.
d) Customer can get up-to-date the information about the restaurant events, food available on whole weeks and so on.

Limitations:

a) Admin limit the booking available for each day on different quantities which can make customer satisfaction low.
b) The usability of the system is moderate because the interface is not user friendly and the efficiency.

Figure 1.7 Reservation Information Page

Figure 1.8 Meal Service Availability Details Page

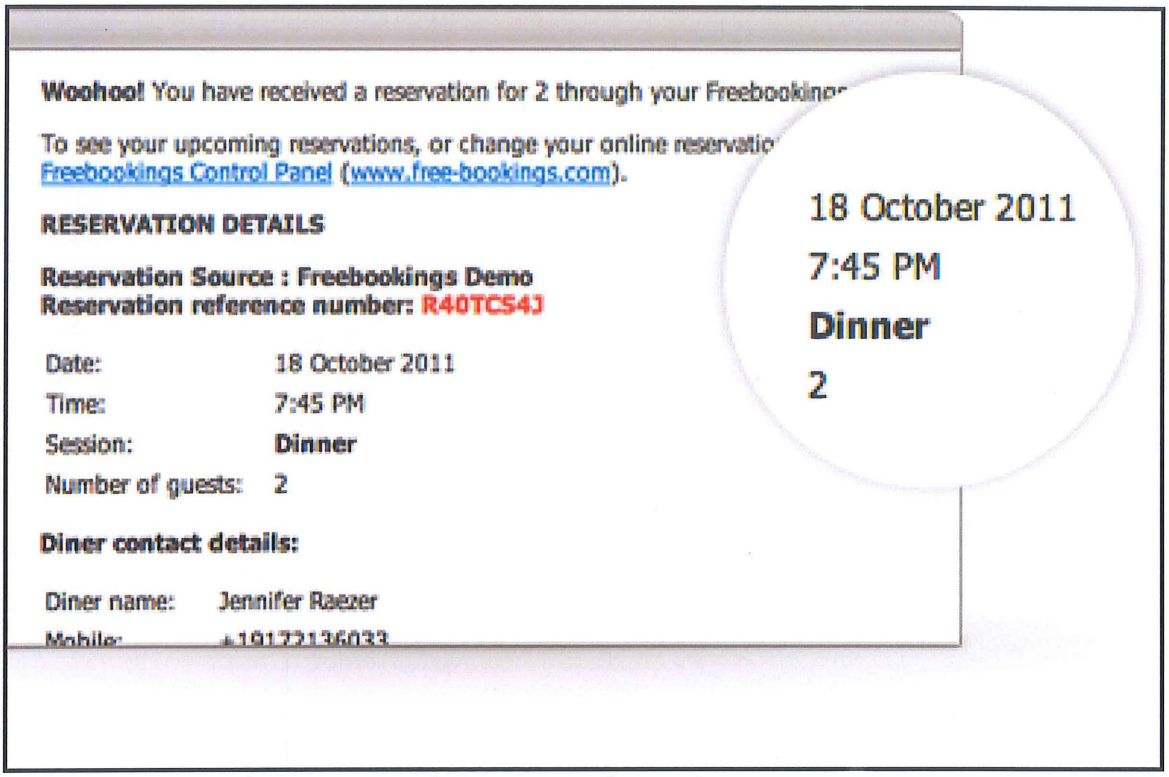


Figure 1.9 Admin Reservation Reference Page

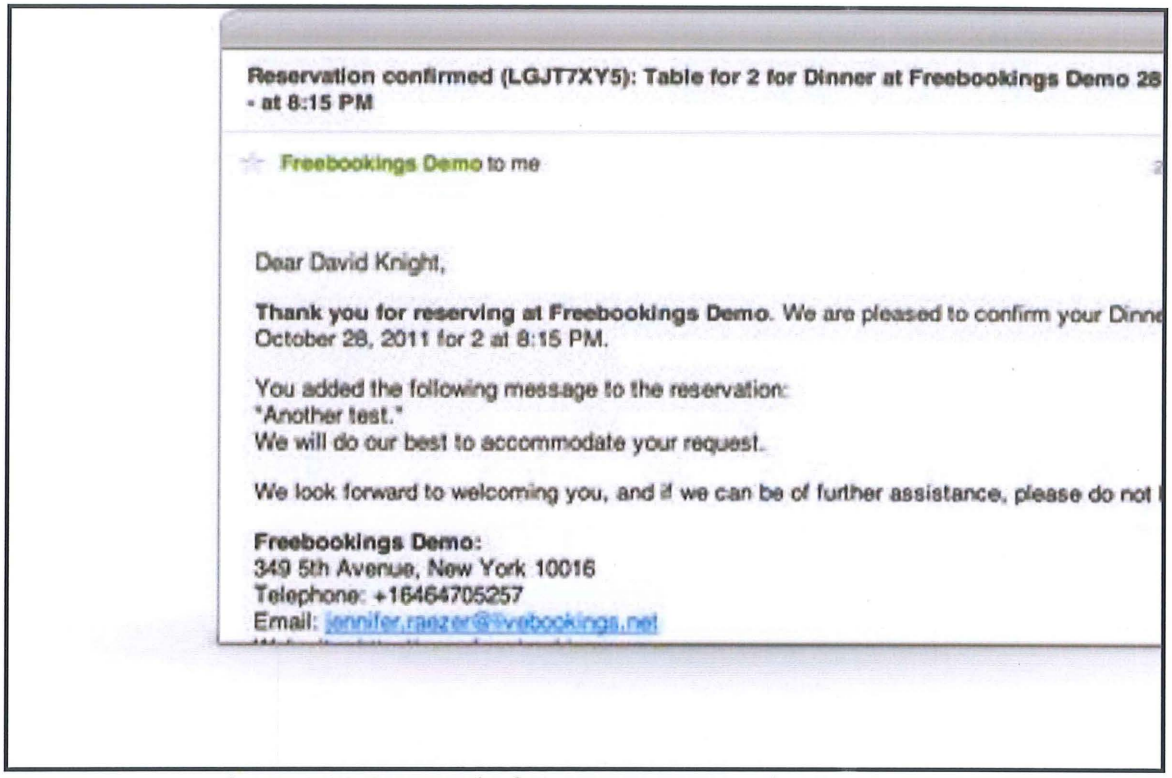


Figure 1.10 Approval of Customer Reservation Page

III. Library Management System By Using Barcode Scanner

This library management system is suitable for medium size of library. This system is to record every transaction or works using computerized way. Barcode Scanner was implemented in this system to make work of library staff easy and save time.

User for this system would be student. Thus, the students shall login to the system after they register as a member or user of this system. User can search for the book available in the system. After they get the book that they want to borrow from the book tray at library, they can scan the book barcode at the scanner. After they scan, the details will go into the student profile and the student can view the book that they borrowed.

Admin for this system will be the library staff and the staff have to login the system in order to perform their actions. The staff can view the report for the day. The staff responsible for the time student come to return the book. The staff will scan the barcode of the book in the system and it will shows that the book was return in the system [6].

Advantages:

a) The student can search the book by title, authors, year published or even genre. This can make them not limited in searching and can save their time in search.
b) The student can borrowed book very fast without waiting in queue for the staff to perform their work.

Limitations:

a) The interface is not user friendly because the system is developed by Microsoft Visual Basic and by its default colour. Users will feel not enjoyed with this system because mostly of the interface.
b) There is no exact description for the system. For example, if the first time user want to search book, the will search by default by title. But there is other features such as search by author. Therefore, if there is a small description can make the user to understand.

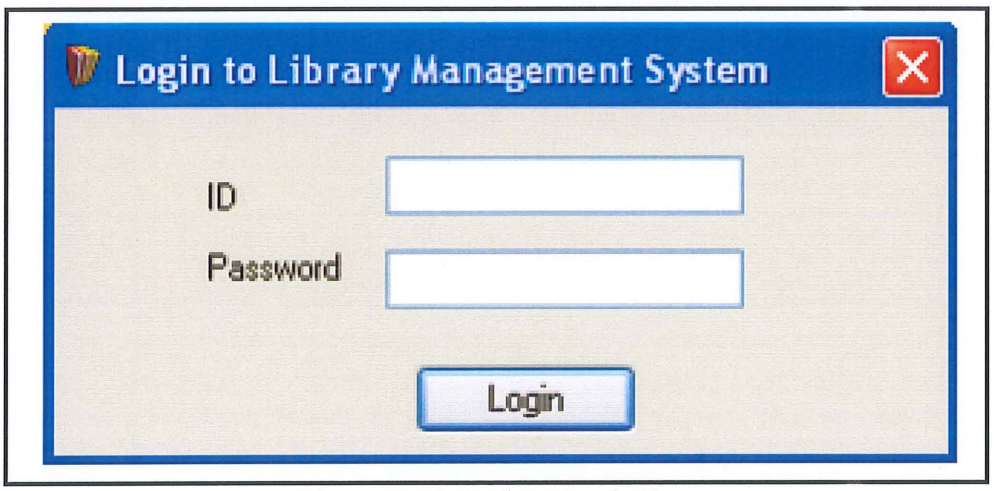


Figure 1.11 Student Login Page

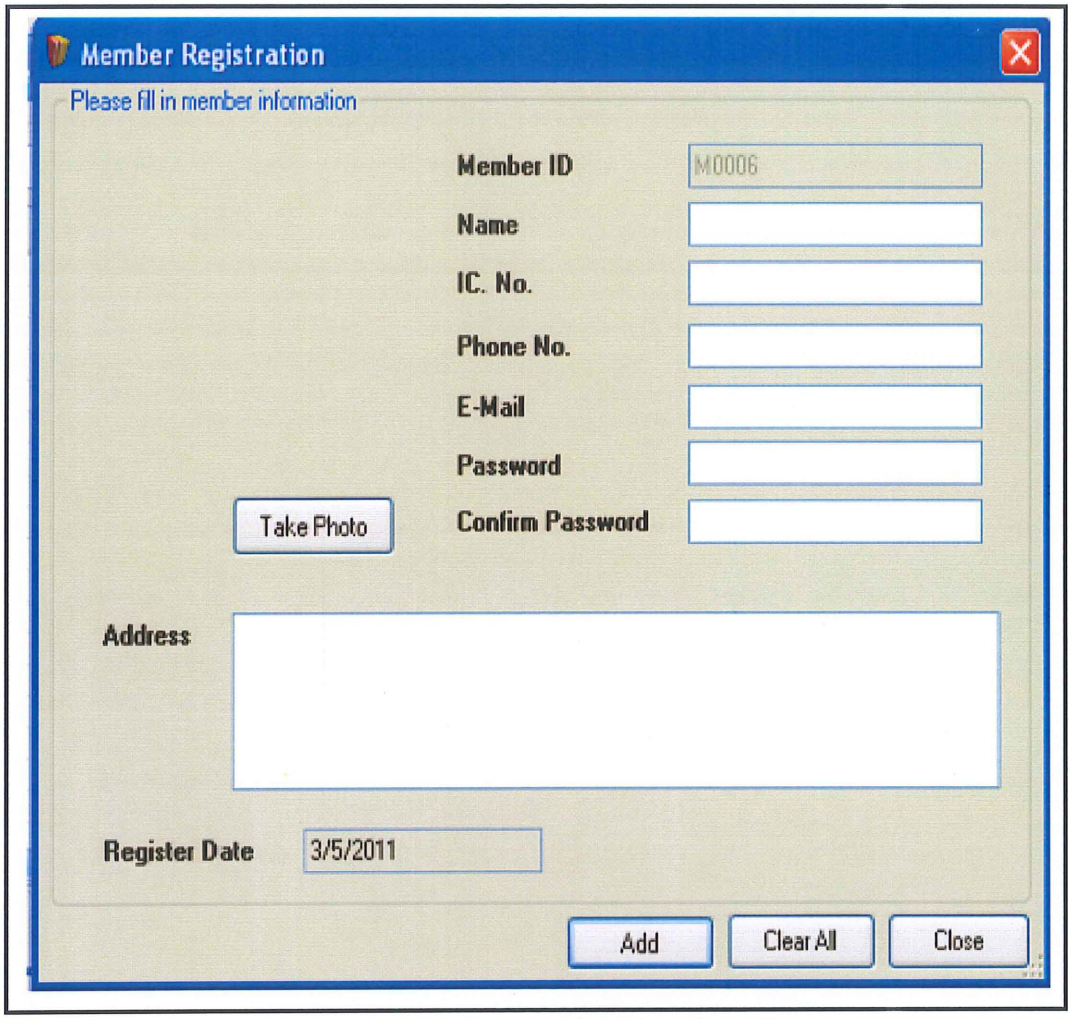


Figure 1.12 Student Registration Form Page

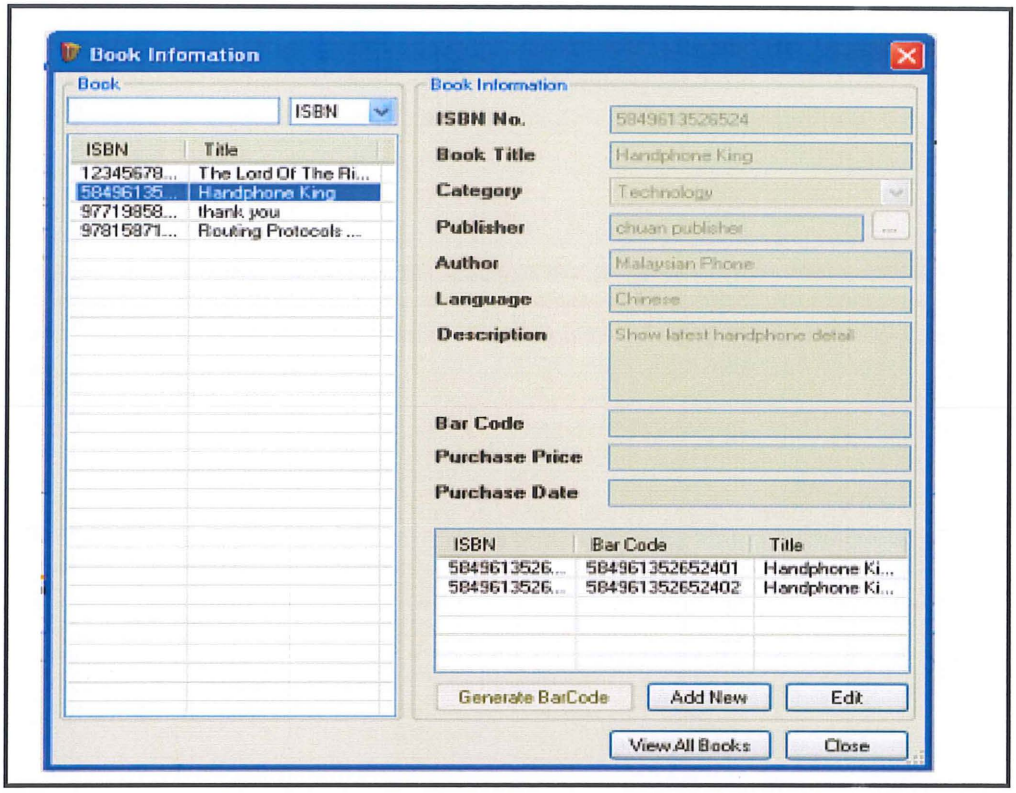


Figure 1.13 Search for Reference Book Page

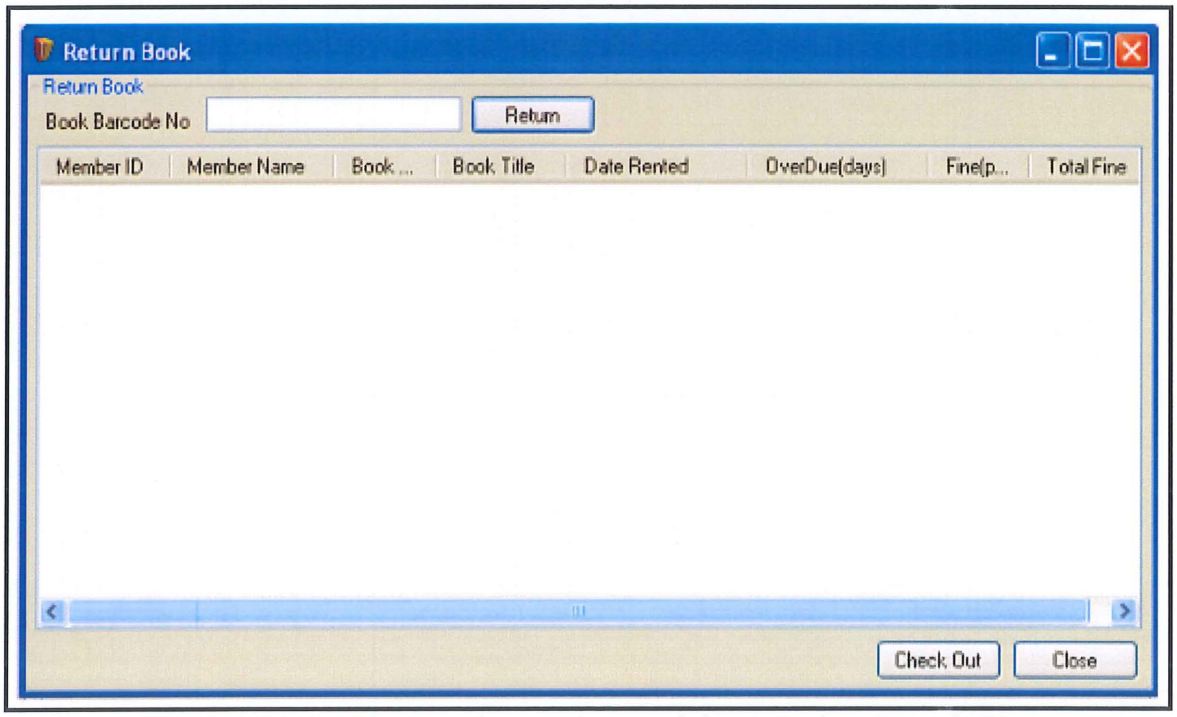


Figure 1.14 Transaction of Returning Book by Scanning Barcode Page

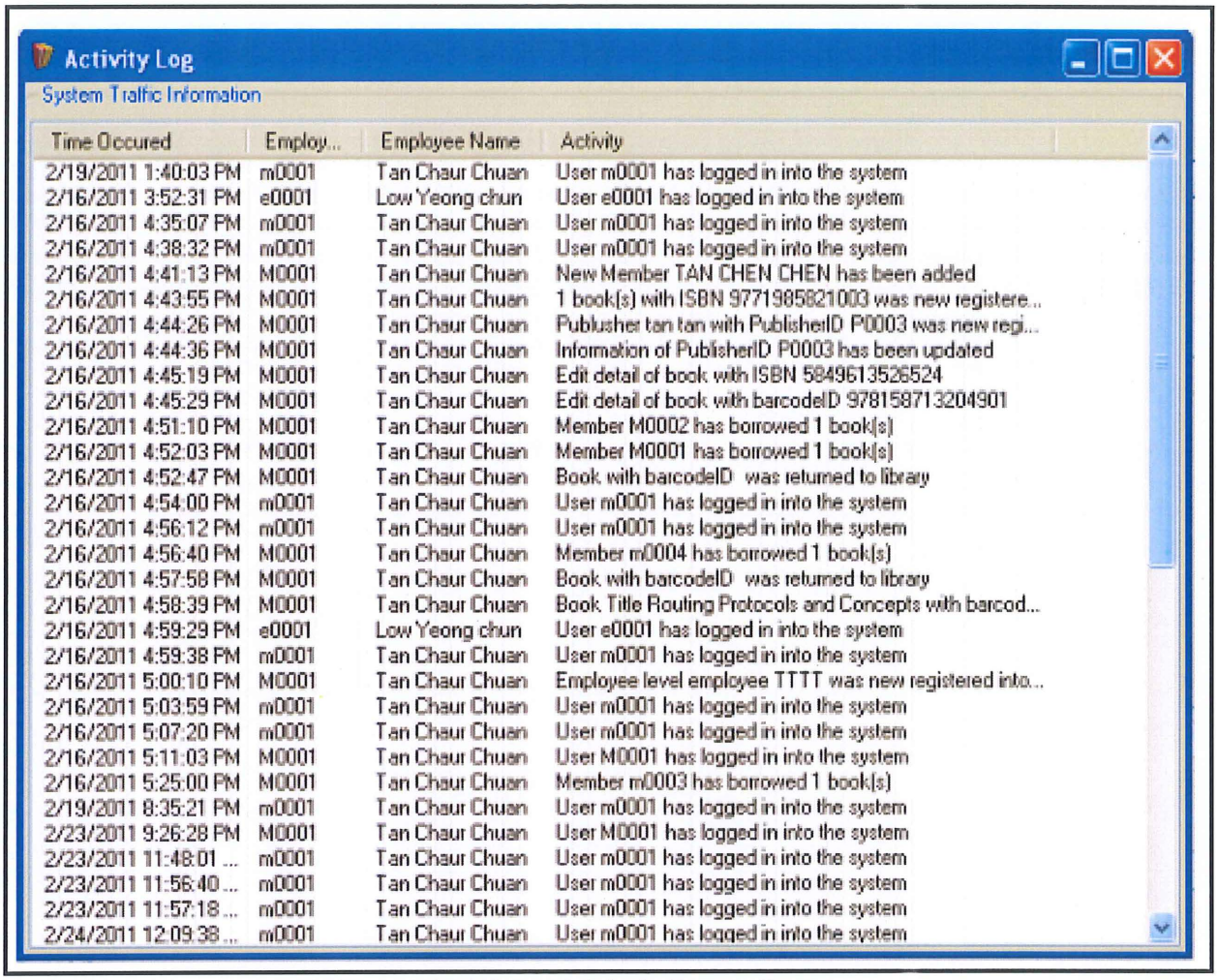


Figure 1.15 View of Admin Report Page

1.6.1 Summary and Comparisons of Features of Three Existing System

Each of the existing system has its own advantages and Limitations of features. Below is the table of comparison for the existing system:

Table1.0 Comparisons of Features for Three Existing System

Features	**Online Booking Mozaic Restaurant**	**Freebookings Online Restaurant Reservation**	**Library Management System By Using Barcode Scanner**
Graphical User Interface	Interface is not using many colours. And layout simple as well.	Interface is using few colours only but there's some images to make attractive.	Interface is not attractive because using the default colour of Visual Basic.
System Stability	In term of database, may not develop using the latest software version.	In term of database, may not develop using the latest software version.	In term of database, the database developed using SQL Data Source that available in Microsoft Visual Basic software.
Interoperability	Window version.	Window Version and mobile devices (in Application).	Window version.
Support	Not support such as Online Help and Online Tutorial provided.	Not support such as Online Help and Online Tutorial provided. But customer can sent an email for any changes that they want to be made for	Support help with simple descriptions is available for assist the user to use this system.

		the reservation.	
Key Features	Using mobile application and only can access to this restaurant only.	Admin can manage the updates by web portal and user use the application in mobile.	Use barcode for borrowing and returning transactions.
Limitations	The system is not user-friendly because totally dull. No clear description for user to perform their action.	User satisfaction is low because limitation of availability quantities meals each day. Usability system is in moderate state because efficiency of the system.	Use interface by default developed by Visual Basic, make not user friendly. No exact description for the system to make user have many search option.

There are many online booking systems available widely in software market. However this software availability, can be said that it have its own outstanding features and drawback when we used it. I have chosen this three online booking system because, I feel it nearly related to my problem that I have discussed. With this, I would like to develop a system that address all these problem.

1.7 Comparison of Barcode Scanner Specification

Table1.1 Comparisons of Three Barcode Scanner Specification

Product Name	**Pen Barcode Scanner**	**Wireless Handheld Laser Scanner**	**Charge Couple Device Barcode Scanner**
Product Image			
Size	Light (small stick that resemble a small pen)	Big (Handheld Scanner)	Heavy
Connectivity Technology	Cable	Wireless	Cable
Light Source	LED	Semiconductor Laser	Hundreds of tiny LED lights arranged in one long row.
Compatibility	Suitable for the use in small office management	Better fit with large and multiple items.	Can be used only in bright situation and suitable for big amount items to be scanned.
Advantages	Easy and light carry to scan the barcode. Can be used anywhere at least have USB port.	Allow to read the barcode from far distance which the staff can scan the item without having to move closer to the items.	Will give more accurate reading because the LED will block out the most of the outside light when we place the scanner directly over the barcode [5].

Limitations	Imprecision and user shaking the pen when using it, make it scan more times, in order for the pen read the barcode accurately and concisely [3].	Might be too heavy to use this without harness and other carrying method. Not all places have wireless connection [4].	The scanner limited to be used in bright location only.
Application	Office Item	Point of Sales(POS)	Inventory Stocking System(in store)

Justification:

I have chosen Wireless Handheld Laser Scanner to be implemented in the Booking System For ICT Equipment. The reason is, it is suitable for use to scan multiple and many items. Besides that, easier for the staff to scan the barcode and the get the serial number from far distance.

1.8 Conclusion

Enhancement to Booking System of ICT Equipment using Barcode Scanner is a one system which can give a benefit for admin to accomplish task easily and save time. The research are done to enable the proposed system to be developed more efficiently and systematic depend on existing system. The next chapter will be focus on the requirements and user design. The methodology to be used through this project also will be detail out in the next chapter. A good methodology will be driven a project to be produce in good quality with delay and exceed budgets.

Part 2

REPORT BODY

In this part, an report to address user requirement, followed by the UML Diagram, the development methodology prototypes of the BSIE, implementation of source code and testing will be presented in this part which in more details to fulfill user needs..

2.1 Requirement Specification

The purpose of this section will be describe briefly on the function and requirement that required by user for Booking System of ICT Equipment using Barcode Scanner. Besides that, I will details all the features required with a clear description of this system, how the system works and provides output to users, the constraints under which it must operates, prototype on interface of the system and provided with common references for the system expectations. This document is provided for both the stakeholders (Pusat Teknologi Dan Maklumat) and developer (Myself). In addition, there will attached user sign off on Software Development Agreement on Appendix.

2.1.1 Scope

This system is being built to be used by UMP staff and student in an effective way than the existing system. The system will give users to booking the ICT Equipment being provided by the Pusat Teknologi Dan Maklumat and return the ICT Equipment on the on the returning dates. Besides that, the admin can approved the booking, manage and updates the ICT Equipment availability.

2.1.2 Business Process

This section will describe on the business process of the client company and it is crucial to elicit the requirement from this processes.

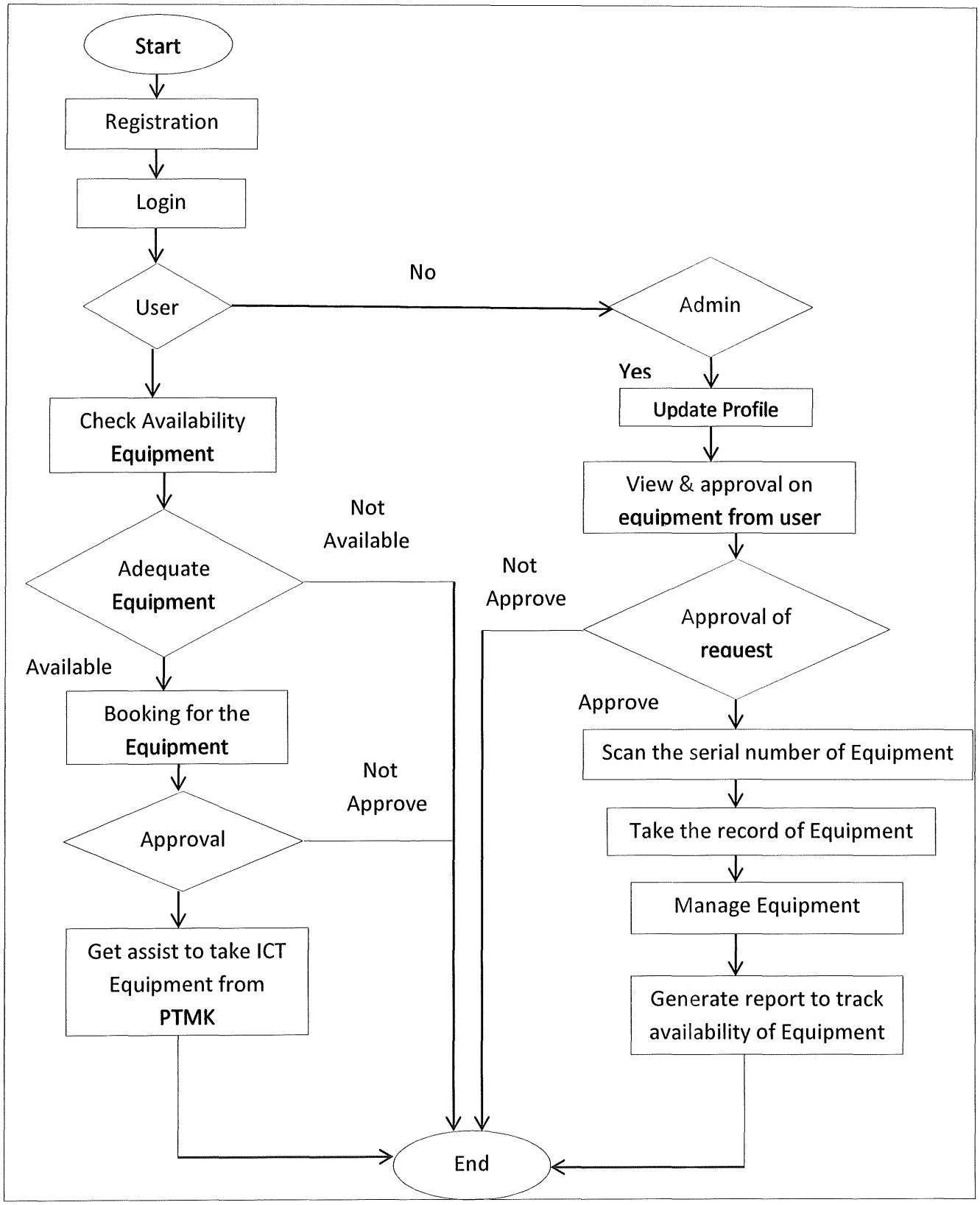


Figure 2.3 Flow Chart of BSIE

2.1.3 Product Perspective

The Booking System of ICT Equipment using Barcode Scanner is online system that accommodates users do booking efficiently, time consuming and simple in perform action on the system whereas for admin can manage returning of the equipment faster, time consuming and gives satisfaction towards users. In addition, Booking System of ICT Equipment using Barcode Scanner do not need to incorporate with other systems since its standalone system (not integrated with E-Community System). Lastly, hopefully the Booking System of ICT Equipment using Barcode Scanner can compete against the existing system. Data Flow Diagram Level 1 will be in Appendix A.

Context Diagram is a high level process that shows the relationship that the system posses with other system (external system) such as external data stores, organizational groups, system and so on. Besides that, the context diagram only consists one process which generalize the function by the arrow in and out from external entities for the entire system [9]. In other words, the context diagram shows the boundaries of the system. This will enable the acquirer of software easy to understand the user requirement that been specified by them because to recognize the context diagram did not require technical knowledge. By providing the context diagram, then the analysts can develop the more detailed structure of diagram which is Data Flow Diagram from level 0 to primitive level.

Data Flow Diagram is a graphical visualization of data movement through the software system. Data Flow Diagram have four components which is [10]:

- Data Flow(straight line which the arrowhead indicate flow direction)
- Process (like square with curved in the edges)
- External Entities (in rectangle)
- Data Store (two horizontal parallel line and eclipse sometimes)

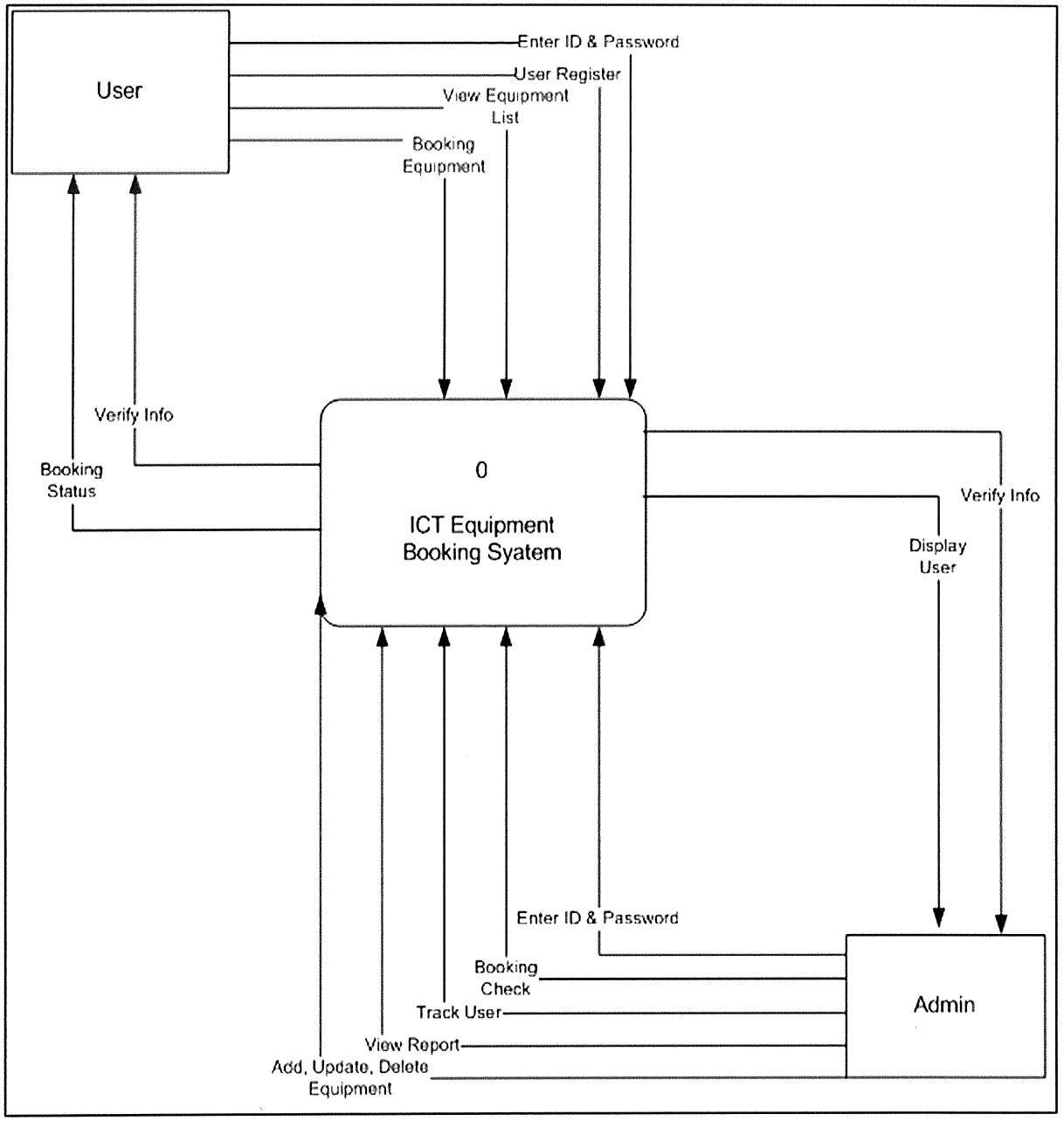


Figure 2.1 Context Diagram of BSIE

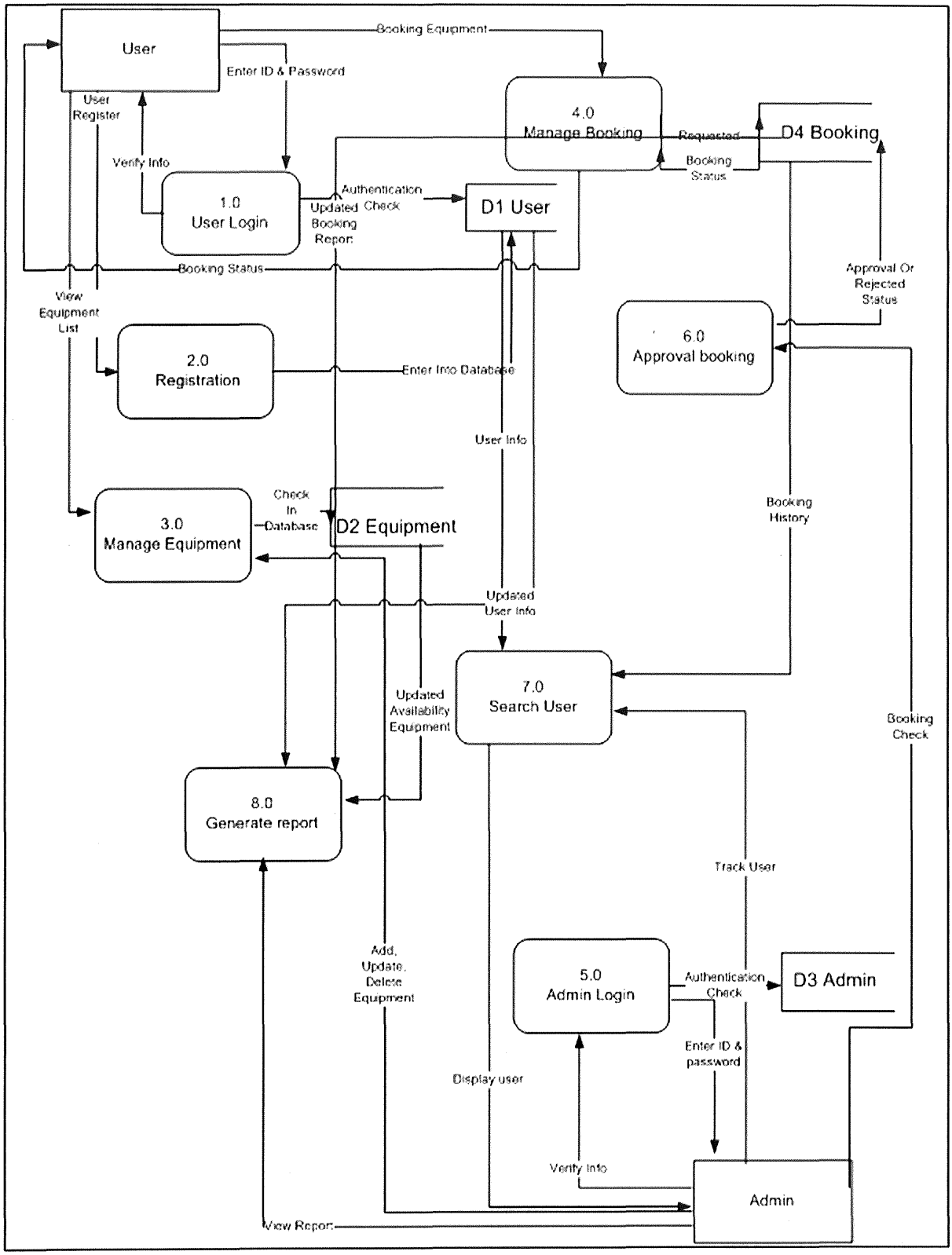


Figure 2.2 Data Flow Diagram of BSIE

2.1.4 System Interface

This system will use .net platform as we will ASP.Net for management and SQL for our database. This platform will provide web service that needed booking the ICT Equipment.

2.1.5 User Interface

All pages of the systems are following a consistent theme and clear structure. The occurrence of errors should be minimized. Error message should be located beside the error input which clearly highlight and tell user how to solve it. If system error, it should provide the contact methods. The system also should provide a feedback form for all users to give comments or asking questions.

Derived from the Shneiderman's Eight Golden Rule of Interface Design and Jacob Nielsen's Heuristics, the following guidelines for Do's and Don'ts that will facilities the user interface design is developed below:

Do's

1. Be consistent!
    - Use the same icons for the same link or activity
    - Links color
    - Button styles
    - Style all pop-ups the same
    - Icon size
    - Providing feedback to the user
    - Using fonts (including fonts size)
2. Layout
    - Anticipate the reading order which means place content or button on the page where user will need them
    - Use consistent and familiar layout
    - Consider framing your page to delineate margins
    - Don't leave empty space
    - Centre the application in the window (don't align at left or right).

3. Color
    - Choose a basic color combination and use it throughout the application
    - Ensure foreground and background element are sufficiently contrasting.
4. Text
    - Limit your font-set in the application
    - Use the same font for the same purpose
    - Choose your main font and stick to it
    - Use variations of your font set to denote type of content (link in different color, sub heading in bold, etc).
5. Navigation
    - Place navigation in the same place throughout an application.
    - Place navigation where users expect to see it (example : next button at bottom right, etc).
    - Place relevant navigation close to its content.
    - Group navigation by suitable themes or actions.
6. Content and naming
    - Create user expectations.
    - Follow through designs to sub-pages.
    - Use languages that the user expects and familiar with it.
    - Call elements by recognizable names.

Don'ts

1. Navigation
    - Hide critical information from the user or force them to interact to see it.
2. Color
    - Use too extreme gradients.
    - Use gradients with very different colors.
    - Use dark shadows.
    - Use colors that don't contrast and strike.
    - Use colors that suitable for color-blind users.

3. Fonts
    - Use many fonts.
    - Use more than one font too often.
4. Layout
    - Overload the user with too many options.
    - Place the same function of button in different places on different pages (relative to the content).

2.1.6 Hardware Interface

The below shows the platform that needed to operate Booking System of ICT Equipment using Barcode Scanner. The table below shows the hardware interfaces along with the description of each interface.

Table 2.0 Table of Hardware Interface

Hardware	**Description**
Laptop (Acer Aspire 4750G)	Acts as a platform for running the Booking System of ICT Equipment using Barcode Scanner.
External HDD (Toshiba 1TB)	For data backup.
Wireless Mouse	For click to action.
Barcode Scanner	For scan the serial number of ICT Equipment for transaction.

2.1.7 Software Interface

Window 8 is the operating system used by the server in order to communicate with the hardware used for this system. Window 8 is needed as a server for the operating system to operate. The interface in the term of message content and format is unnecessary due to well-documented nature of software.

SQL Database is the database used to manage the system that will act as the interface between Booking System of ICT Equipment and server. This software will manage each input and output received by providing access to database.

2.1.8 Memory Constraints

This software might be able to operate with 2 Giga Bytes of main memory and 500GB of hard disk.

2.1.9 Operations

Before run the software, we should define a backup operation. Recovery operation must be specified either in case of database failure and network failure. However, this software shall have an operation to protect database from being corrupted or accidently altered during the system failure.

2.1.10 Site Adaption Requirement

The user interface for Booking System of ICT Equipment will exist in English. This is because, the English language is understandable by all races in Malaysian.

2.1.11 Product Function

Figure 2.3 shows the entire functionality of Booking System of ICT Equipment using Barcode Scanner in high level view.

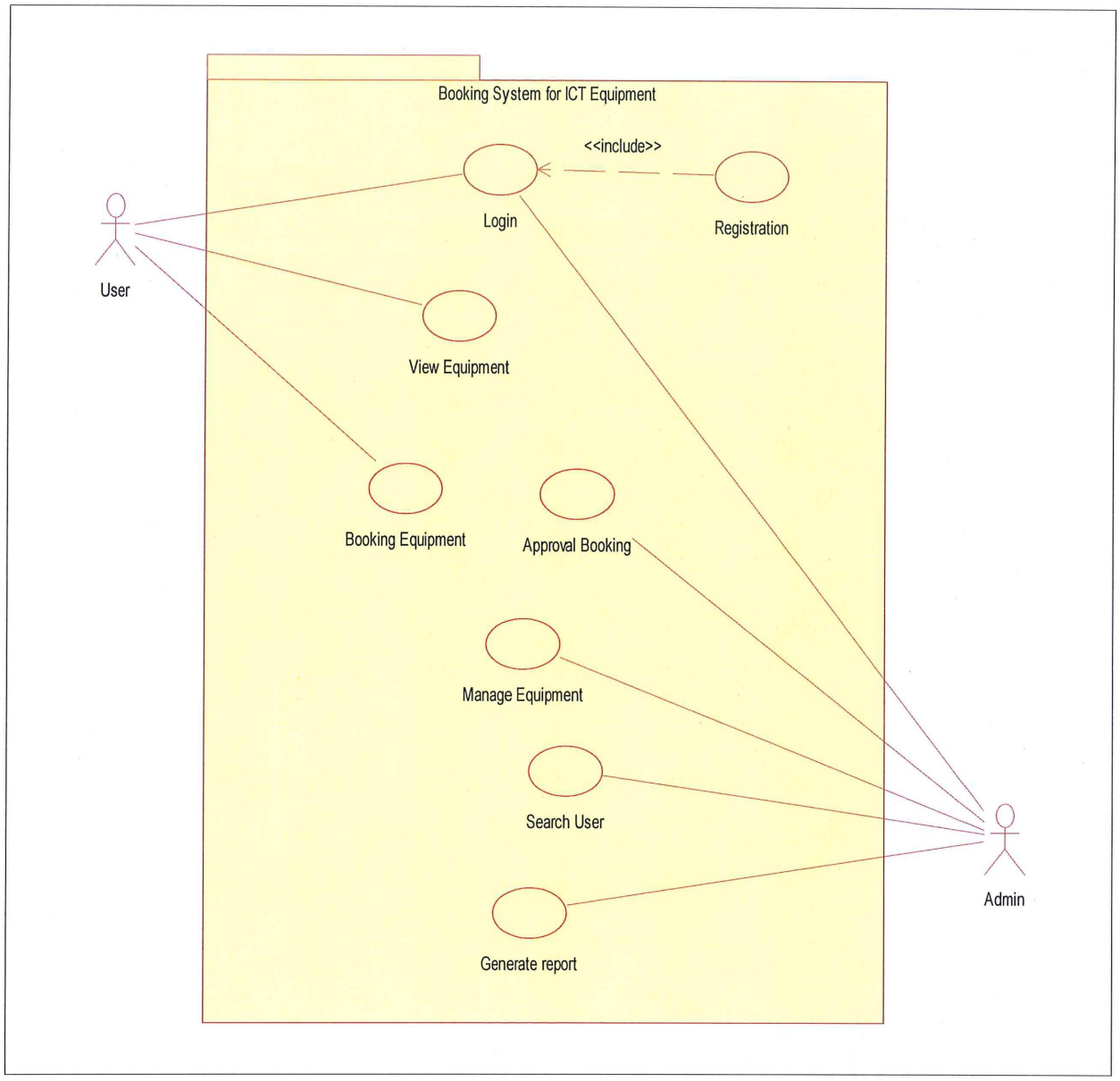


Figure 2.3 Use Case Diagram of BSIE

Firstly, the user need to register into the system (if first time login), otherwise the user can login directly to the system by entering the username and password. Then the user can update their profile (if any changes to be made). After that, the user can view the equipment list available to be booked for the event.

Once they finish view the equipment availability, the user can booking the equipment for the event by fill up the booking form online. After they book, the user need to wait for the approval from the admin on the item that been booked.

Admin need to login into the system in order for them to perform their action. Admin first thing is to view the request on the booking, they received. If the equipment availability is enough, then the admin will accept the booking otherwise reject the booking. Admin also have the responsibilities in add, edit, or delete the ICT Equipment from the list of equipment. If the admin wants to search for the user, they can search by memberID and it will display the user history of borrowed equipment and then the admin can select the equipment to be borrowed by the user and scan the serial number. And lastly, the admin can generate the report in term of availability of equipment, and borrowed equipment list.

2.1.12 User Characteristics

There are some minimum characteristics that the target user must have in order to access this system. They are:

- Skills
    - Computer literate. User must at least know well in using keyboard and mouse to interact with GUI of the system.
- Experience
    - No experience needed, since the interfaces will provide the user with useful and sufficient information to utilize the system.
- Knowledge in browsing
    - As the system is a web-based application, therefore user should be familiar in browsing the internet to access to the system.
- Language
    - User should have a basic language of English to continue using the system.

2.1.13 Constraints

This subsection provides a general description of any other items that will limit the developer's options. There are nine types of main constraints in order to fulfill the basic requirements of this system. The sub-section below will explain briefly the constraints that need to consider when the development of this project is done.

- User (student, staff) must register to have a password and username to access.
- Users must log in using registered and certified memberID and password to access the system.

- User already has experience with other similar system. So, user expectations for this system may different and have high expectations of performance.
- User has poor knowledge of computers: level of guidance provided.
- Poor knowledge of the task which the system will support: level of support at interface provided for how to complete tasks.
- The booking transaction maybe ambiguous which may confuse users who has been their first time to use this system.
- Graphic User Interface (GUI) is only in English.
- User lack patience.
- Poor existing skills (keyboard, mouse): choice of interaction style to use to exploit existing skills considerations.

2.1.14 Assumptions and Dependencies

The factors that affect the requirements being changed to the users are listed as below:

1. Administrator is already created.
2. The end user should have basic knowledge of English and computer usage.
3. Applications are already created and information's available for use.
4. Roles and responsibilities are already established.
5. The system is designed in ASP.Net language, so it is assume to be run on window desktop platform with support from web browser.

2.1.15 External Interface Requirement

2.1.15.1 User Interface

For user interfaces, we have a main menu interface, registration interface, login interface, view ICT Equipment interface, Booking Equipment interface and View Status interface. The user must register his/her information into the database via this system for first time use in Registration Interface. The user must login to the system in the Login Interface for Booking the ICT Equipment and view the ICT Equipment list in a View Equipment Interface. The student can clear the entered information and cancel the booking in the Booking Interface and last can view the status of booking.

2.1.15.2 Admin Interface

For administrator interfaces, we have a main menu interface, login interface, manage equipment interface, search user interface and generate report interface. The administrator can login to system in the Login Interface. The administrator can reject or approve the booking status of the user in Approval booking Interface. Moreover, the administrator also can update and delete the ICT Equipment information in the Manage Equipment Interface. The administrator can generate daily report and graphical analysis according to availability of ICT Equipment and borrowed ICT Equipment on Generate Report Interface.

2.1.15.3 Hardware Interface

At administration site, a scanner barcode is provided for administrator for scanning the barcode on the ICT Equipment that going to be borrowed and returned by the user.

2.1.15.4 Software Interface

There are two main interfaces in the system. They are Booking System of ICT Equipment Interface and Barcode Scanner interface. The Booking System of ICT Equipment Interface is provided for user and administrator. Whereas the Scanner barcode interface is provided for administrator only for scanning the serial number of borrowed and returned ICT Equipment.

2.1.16 Software Product Features

This section will describes on the interfaces actor to another interface in use case diagram with its use case descriptions.

2.1.16.1 System Feature 1: Login System

The following is the use case diagram for Login System:

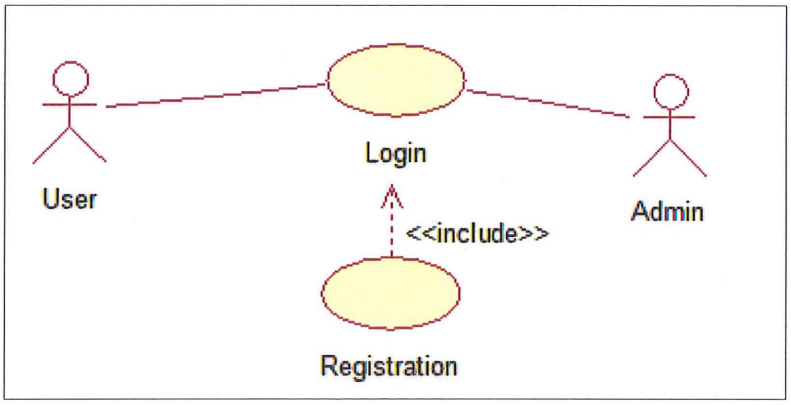


Figure 2.4 Login System Use Case Diagram

The following is the use case description for Login system:

Table 2.1 Login System Use Case Description

Use Case:	**Login**
ID:	100
Scope:	User & Admin Login
Summary:	This use case initiated by student, staff and admin. It provides the capability to register for new student and staff and record the information them into database before they can login into the system. Whereas student and staff registered will not register again since their information is provided in database ready, therefore they just need to login only.
Primary Actor:	User and Admin
Supporting Actors:	System (Booking System of ICT Equipment)
Include:	User Registration
Extend:	NONE

Precondition:	Running Application: The application is running.
Trigger:	User and admin wants to login.
Normal Flow:	The use case begins when the new staff and new student make a new account. 1. Click Registration form button and insert all information needed in the registration form together by creating new memberID and Password. 2. Before starts to proceed to Main Menu , the user and admin need to login first by entering their memberID and Password on the Login column to open Main Menu which under their account. 3. After the login successfully, the Main Menu will be displayed. 4. The use case ends.
Alternate Flow/ Exceptions:	1. Invalid Admin memberID and Password: When the user and admin Login with Invalid memberID and Password. I. The system will prompt a message which stated that "Invalid memberID and Password". Please re-enter the correct memberID and Password. II. The system will wait for a Valid memberID and Password before proceed to Main Menu.
Post-Condition:	Display username: Main menu under the user or admin memberID shall be displayed.
Constraint:	NONE
Rules	1. Registration only for newly staff and student. Registration to get a new account for newly staff and student. 2. Registration is not allowed for admin/student and staff registered, since their memberID and password was in the database ready. Registered user and admin just need to be login

	only.

2.1.16.2 System Feature 2: View Equipment

The following is the use case diagram for View Equipment:

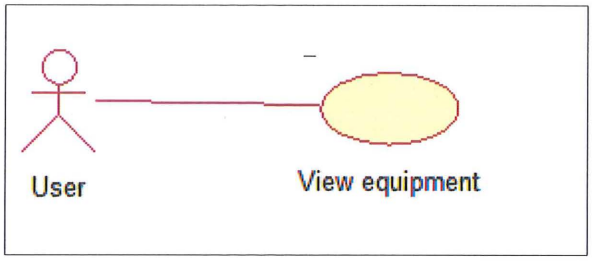


Figure 2.5 View Equipment Use Case Diagram

The following is the use case description for View Equipment:

Table 2.2 View Equipment Use Case Description

Use Case:	**View Equipment**
ID:	200
Scope:	View Equipment List
Summary:	User login to the system and view list of ICT Equipment provided.
Primary Actor:	User
Supporting Actors:	▪ Administrator ▪ System (Booking System for ICT Equipment)
Include:	NONE
Extend:	NONE
Precondition:	User must login into Booking System of ICT Equipment.
Trigger:	User wants to view list of ICT Equipment provided.
Normal Flow:	1. User login to the system. 2. User check the list of ICT Equipment provided. 3. User will be redirect to booking ICT Equipment page (if user wish to do this action after view the equipment list).
Alternate Flow/ Exceptions:	NONE

Post-Condition:	NONE
Constraint:	NONE
Rules	NONE

2.1.16.3 System Feature 3: Booking Equipment

The following is the use case diagram for Booking Equipment:

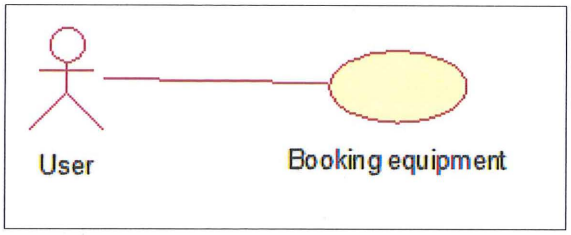


Figure 2.6 Booking Equipment Use Case Diagram

The following is the use case description for Booking Equipment:

Table 2.3 Booking Equipment Use Case Description

Use Case:	**Booking Equipment**
ID:	300
Scope:	Booking Equipment
Summary:	This use case is initiated by the user. User has to login into the system and view the equipment list through the system. Then the user can book the ICT Equipment.
Primary Actor:	User
Supporting Actors:	System (Booking System of ICT Equipment)
Include:	NONE
Extend:	NONE
Precondition:	The user is exist and logging into the system. The user has seen the equipment list.
Trigger:	The user wants to book the ICT Equipment based on the list provided.
Normal Flow:	1. User login into the system by inserting identification account as a user. 2. User can view the system and the equipment list. 3. User book the ICT Equipment based on the list provided. 4. The user need to waiting the ICT Equipment booking to be

	approve of the system (by admin).
Alternate Flow/ Exceptions:	1. The system failed to connect to server. I. Status report will be generated. II. User will force a connection to check the status. 2. The system failed to show equipment list. 3. Browse the system until the equipment list appeared.
Post-Condition:	1. System approved the ICT Equipment that had been booked. 2. System will be response to user request.
Constraint	NONE
Rules	NONE

2.1.16.4 System Feature 4: Approval of Booking Equipment

The following is the use case diagram for Approval of Booking Equipment:

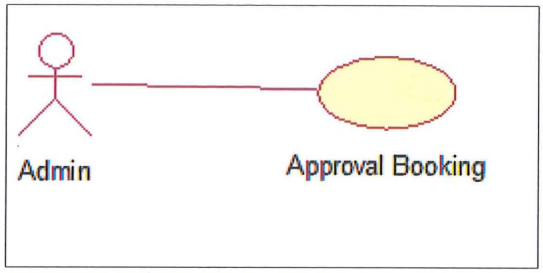


Figure 2.7 Approval of Booking Equipment Use Case Diagram

The following is the use case description for Approval of Booking Equipment:

Table 2.4 Approval of Booking Equipment Use Case Description

Use Case:	**Approval of Booking Equipment**
ID:	400
Scope:	Approval of Booking Equipment
Summary:	This use case is initiated by the Admin. It provides the capability to approve the user booking. Admin must login to enter the system. Name list of user will be display. After make decision based on ICT Equipment availability, Admin make an approval. All approval booking information will be saved in database and can be viewed.
Primary Actor:	Admin
Supporting Actors:	System (Booking System of ICT Equipment)
Include:	NONE
Extend:	NONE
Precondition:	The admin will enter the adminID and password. Then, the admin can view the approval menu to approve the booking or reject.
Trigger:	NONE
Normal Flow:	1. Admin login into the system by inserting identification account as a user. 2. The Admin successful login.

	3. The Admin click button Approval to view details of approve user booking. 4. The Admin will make decision based on ICT Equipment availability 5. The Admin have the rights to reject the booking. 6. The Admin clicks on the "Approve" button. 7. The approval booking will be saved in database 8. The user then can check the booking status.
Alternate Flow/ Exceptions:	1. Reject the applications I. The Admin clicks on the "Reject" button. II. The system will enable user to see the reject of booking status. (Refer Figure 2.37- Appendix B) 2. Invalid memberID and password I. The system displays the "Invalid memberID and password" message. II. The system return to the login form and cannot go for the approval menu. (Refer Figure 2.38- Appendix B)
Post-Condition:	The approved of booking will be saved in the database.
Constraint	NONE
Rules	NONE

2.1.16.5 System Feature 5: Manage Equipment

The following is the use case diagram for Manage Equipment:

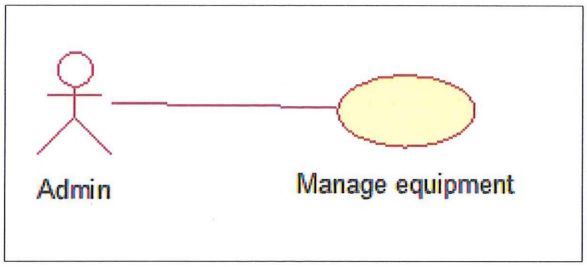


Figure 2.8 Manage Equipment Use Case Diagram

The following is the use case description for Manage Equipment:

Table 2.5 Manage Equipment Use Case Description

Use Case:	**Manage Equipment**
ID:	500
Scope:	Manage Equipment:
Summary:	The admin will make any changes to the current equipment list.
Primary Actor:	Admin
Supporting Actors:	System (Booking System of ICT Equipment)
Include:	NONE
Extend:	NONE
Precondition:	The system is running and admin has login to the system
Trigger:	NONE
Normal Flow:	1. The admin responsibility to update with the ICT Equipment list. 2. The admin can add new items to the equipment list. 3. The admin also can delete the items from the equipment list because may be the items are spoil and cannot be used or borrow to anyone. 4. The admin also will edit the item details from the equipment list. This all action is done to enable the easy view on the equipment list for users.
Alternate Flow/	NONE

Exceptions:	
Post-Condition:	System will released the updated equipment list and show it on the View Equipment list page for users to view.
Constraint	NONE
Rules	Only admin can manage the equipment list to make user to view the list with correct details.

2.1.16.6 System Feature 6: Search User

The following is the use case diagram for Search User:

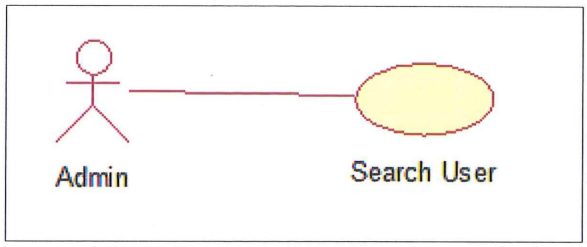


Figure 2.9 Search User Use Case Diagram

The following is the use case description for Search User:

Table 2.6 Search User Use Case Description

Use Case:	**Search User**
ID:	600
Scope:	Search User
Summary:	The admin can search for user history in term of equipment borrowed.
Primary Actor:	Admin
Supporting Actors:	System (Booking System of ICT Equipment)
Include:	NONE
Extend:	NONE
Precondition:	The system is running and admin has login to the system.
Trigger:	NONE
Normal Flow:	1. The use case began after the admin successfully login to this system. 2. The admin can enter userID to search that particular user history of booking. 3. After enter memberID, admin need to click search button. 4. The history will be display for admin view. 5. And admin need to select the equipment to be borrowed by the user, and scan the equipment.

	6. After scan, admin need to print the borrowed slip and give the printed slip to user as prove them borrowed the equipment. 7. Admin can repeat step 2 to step 6 for search different user. 8. The use case ends.
Alternate Flow/ Exceptions:	NONE
Post-Condition:	System will display all the information of the user that had been search by admin.
Constraint	NONE
Rules	NONE

2.1.16.7 System Feature 7: Generate Report

The following is the use case diagram for Generate Report:

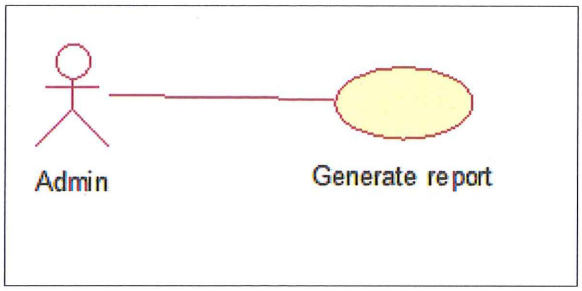


Figure 2.10 Generate Report Use Case Diagram

The following is the use case description for Generate Report:

Table 2.7 Generate Report Use Case Description

Use Case:	**Generate Report**
ID:	700
Scope:	Generate Report
Summary:	This use case initiated by admin. It provides the option of list of availability equipment, and borrowed equipment by day.
Primary Actor:	Admin
Supporting Actors:	System (Booking System of ICT Equipment)
Include:	NONE
Extend:	NONE
Precondition:	Report generated consists of availability of equipment and borrowed equipment by day.
Trigger:	NONE
Normal Flow:	The use case begins when the admin login into the system. 1. For report, when the admin, choose the day, then the day are verify in the database system. If valid, then admin can view the daily report of equipment availability and borrowed equipment. Then admin can print the report by clicked "Print" image button. Or else admin also can download the report for both option in either in Excel files or PDF file by click on the "Excel" image or

	"PDF" image. 2. For graphical chart, when the admin, choose the day, then the day are verify in the database system. If valid, then admin can view the daily graph of equipment availability and borrowed equipment. Then admin can print the report by clicked "Print" image button.. 3. The use case ends.
Alternate Flow/ Exceptions:	When the admin key in invalid day I. System will display not display any report or graph.
Post-Condition:	Homepage: Report generate consist of availability equipment and borrowed equipment list for the day.
Constraint	NONE
Rules	NONE

2.1.17 Performance Requirement

This subsection should specify the following requirements associated with the reliability of the system.

2.1.17.1 Response Time

The system should be able to react and perform well. The speed should depend on the communication interface of the system.

2.1.17.2 Real Time

The system will be saving the information in real time for better reaction and good user interaction. The system should be operate correctly and gives the correct output response on the availability of ICT Equipment in report.

2.1.18 Software System Attributes

Firstly, in term of quantitative attributes, the Booking System of ICT Equipment should have 99.7% availability.

Secondly, the database should be reliable and stable all over the time with 99.99% availability.

2.1.19 Other Requirements

In term of the security for the Booking System of ICT Equipment using Barcode Scanner, other user cannot login into or access to others account.

2.2 Software Design Description

This section will be highlighting the design of the system which is from a high level view to a low level view. This includes client system design and database design. High level view design emphasize on Dialogue diagram. Entity Relationship Diagram, and wireframe along with the interfaces that are applicable. Whereas the low level view design includes data flow diagrams (DFD), sequence diagrams and so on. The database design which is normalize Entity-Relationship Diagram (ERD) will be also included to describe the design of the system database and each entity will contain their own respective data dictionary and this can be found in this section also later on.

The design shall ensure that the system will possess a mentioned human computer interaction property in term of graphical direct manipulation and non-functional requirement such as maintainability. The architecture of the design that the client can only request for data and the server will response in transmitting data and not the other way round. In this project, the Booking System of ICT Equipment using Barcode Scanner will be the client where they request for the data from SQL server and SQL server will in return send the required data.

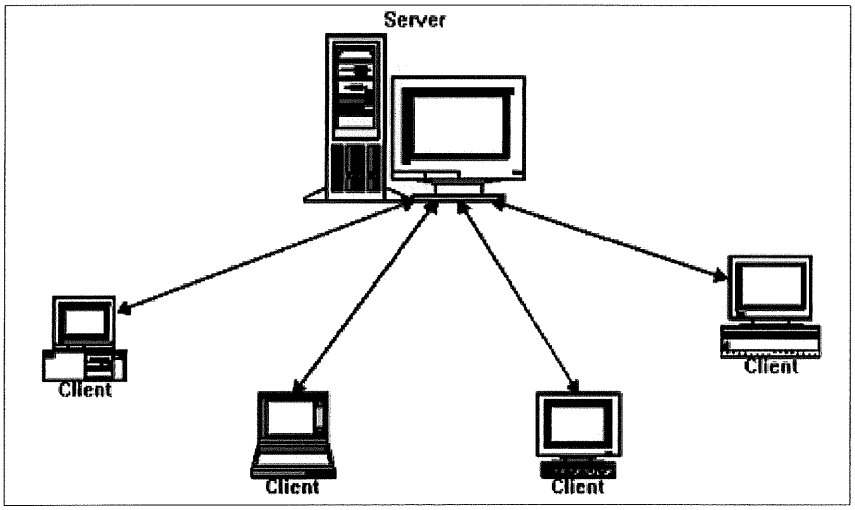


Figure 2.11 Client – Server Architecture

2.2.1 Screen Dialogue

The screen dialogue diagram below describe the design on specify for a high level view design and provide an abstract picture of the entire system that will be developed. The dialogue diagram as below. Screen Dialogue diagram also known as Dialogue Diagram. Dialogue Diagram shows in graphical method of specifying the sequences or flow of the screen of software system. This is very important in planning the flow of the screen on the system being developed because the user will get more in detail of understanding in their requirement been specified.

As a designer, we need to how the users will use the system rather than how we will use the system. We cannot developed a system according to our usability and convenience. This can make user requirement from user not fulfill and at the end the budget will exceed and need countless of changes. The Dialogue Diagram are drawn in square shaped and the square are divided into three part:

- Unique number for screen references.
- Screen title of description.
- References of screen that can be accessed from this page [11].

The Dialogue Diagram in Figure 2.12 shows the accurate design with the details description of flow in the screen of the software product.

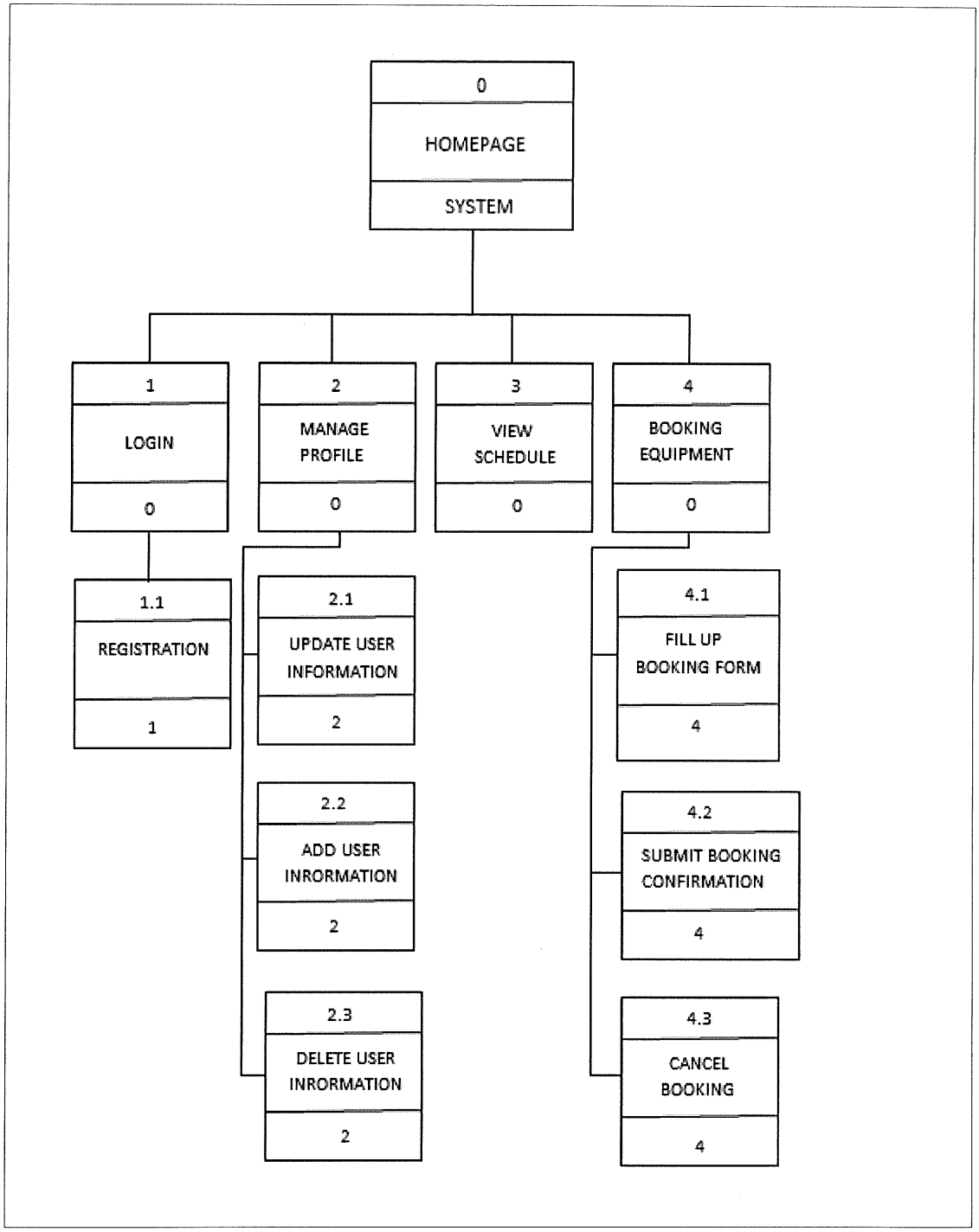


Figure 2.12 Booking System Screen Dialogue Diagram for User

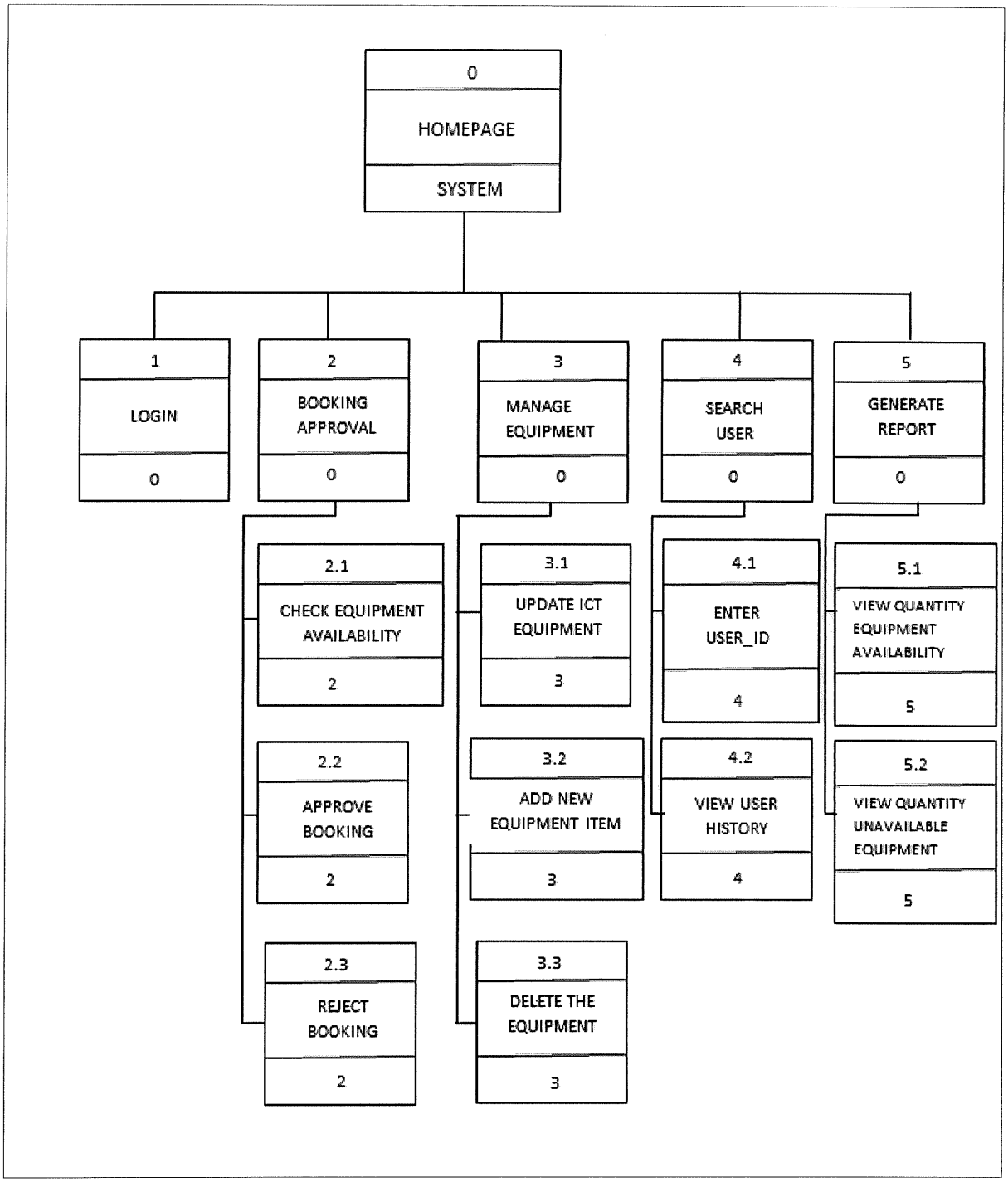


Figure 2.13 Booking System Screen Dialogue Diagram for Admin

2.2.2 Wire Frame

The following design will show certain pages of the wire frame of Booking System of ICT Equipment using Barcode Scanner which consist of six interface which is login page, homepage, view equipment, booking equipment, approval of booking equipment, and generate report. This is the design show that the human computer interaction technique that will be used in graphical direct manipulation technique where user only involved with the graphical interface that can be manipulated directly. In other word, the response time of the graphic is almost instant.

Wire frame is a visual representation guide that exposes how a page in the system or website will look alike. Wire frame can be in the range very unfinished or its similar to sketch appearances to very polishing look of how the website or system will look at hundred percent of completion [12]. The wire frame used to determine the:

- The interface element for the page
- The functionalities that available for that page
- The layout for the content
- The arrangement or the flow of the system

The Figure 2.2.2.1 to Figure 2.2.2.10 exposes the wire frame that been earlier structure to show the user on the specified user requirement. This is consider as prototype of the system.

2.2.2.1 HomePage

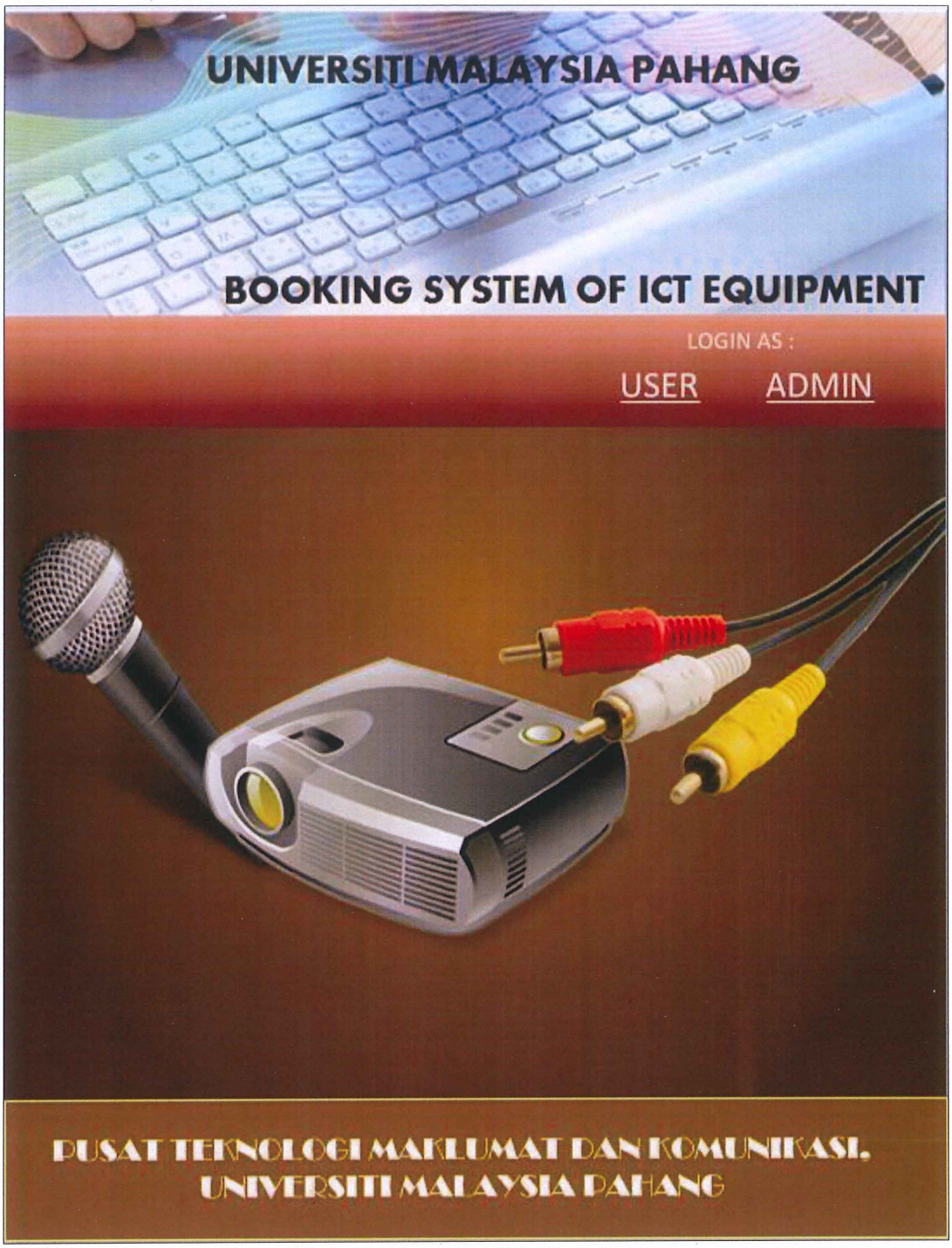


Figure 2.14: Home Page Interface

2.2.2.2 Login

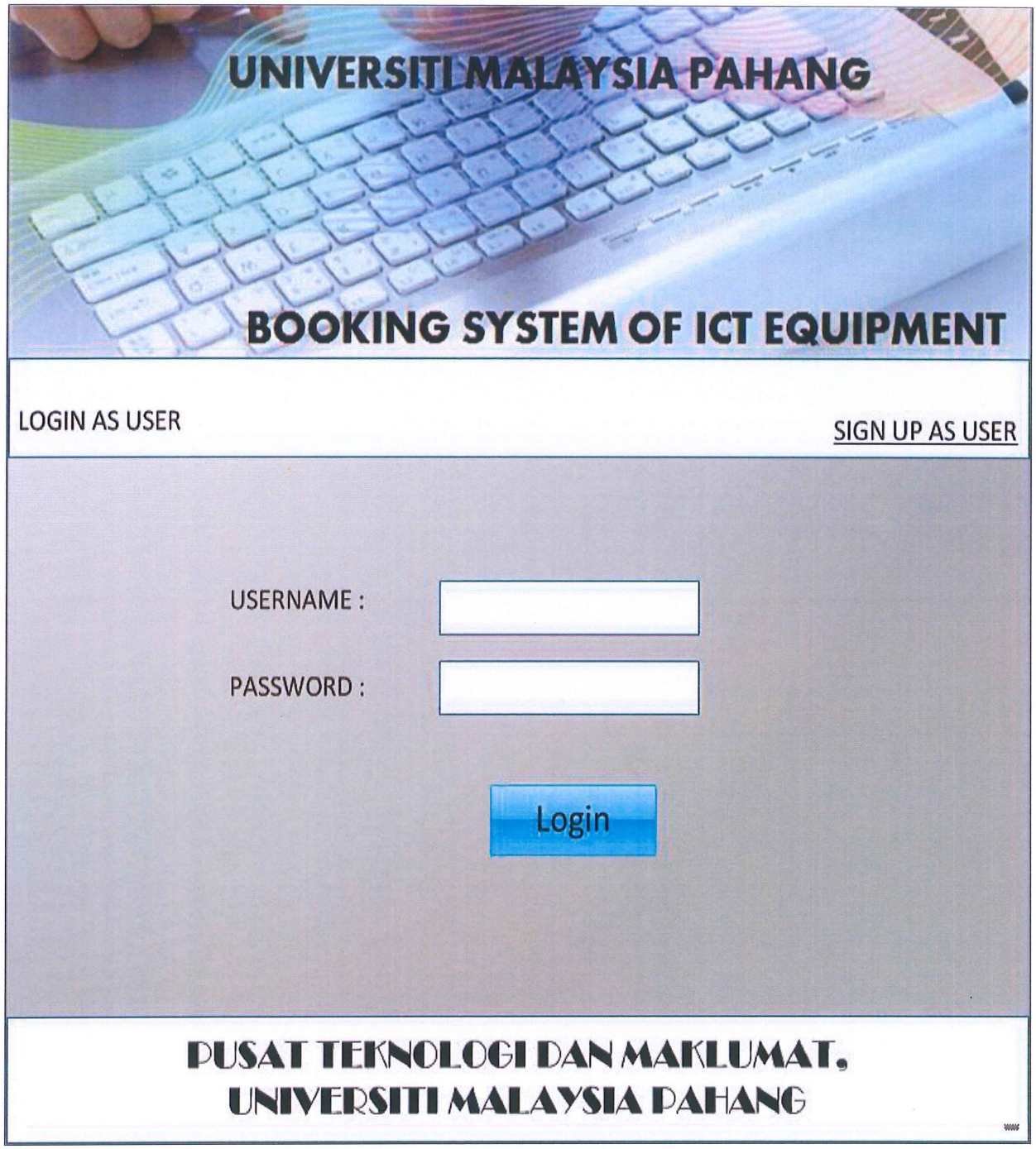


Figure 2.15 Login Interface

2.2.2.3 Main Menu

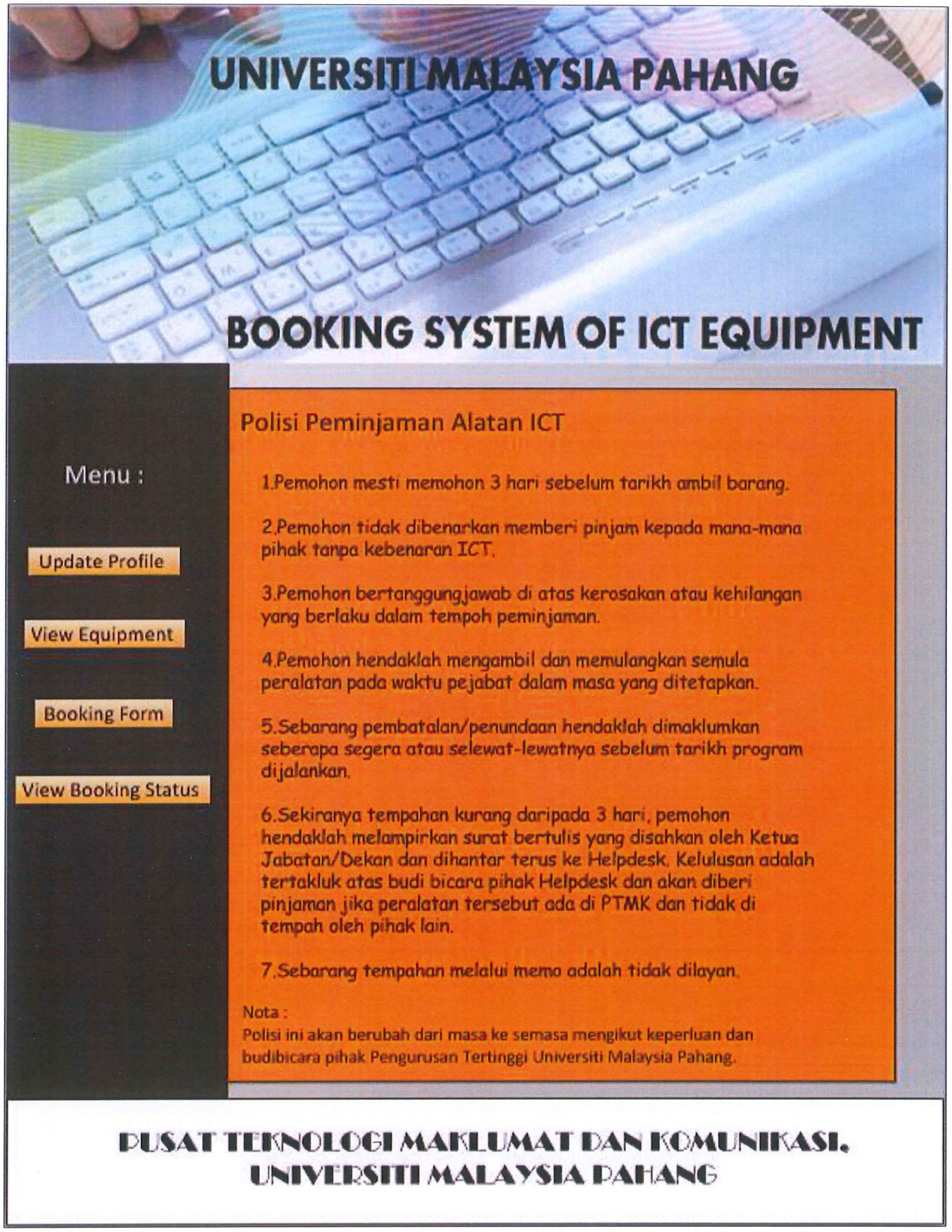


Figure 2.16 Main Menu Interface

2.2.2.4 Update User Information

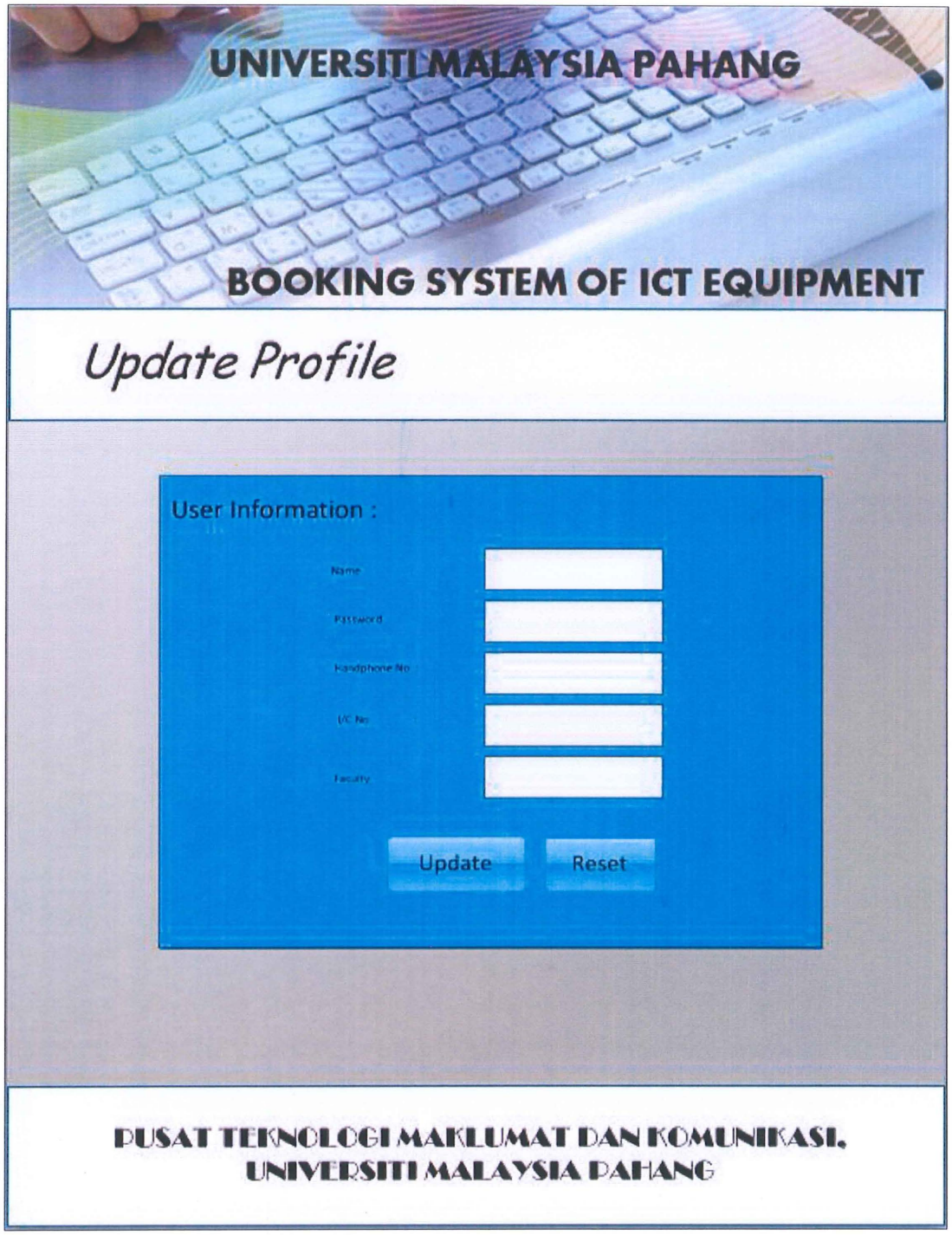


Figure 2.17 Update User Profile Interface

2.2.2.5 Booking Equipment Form

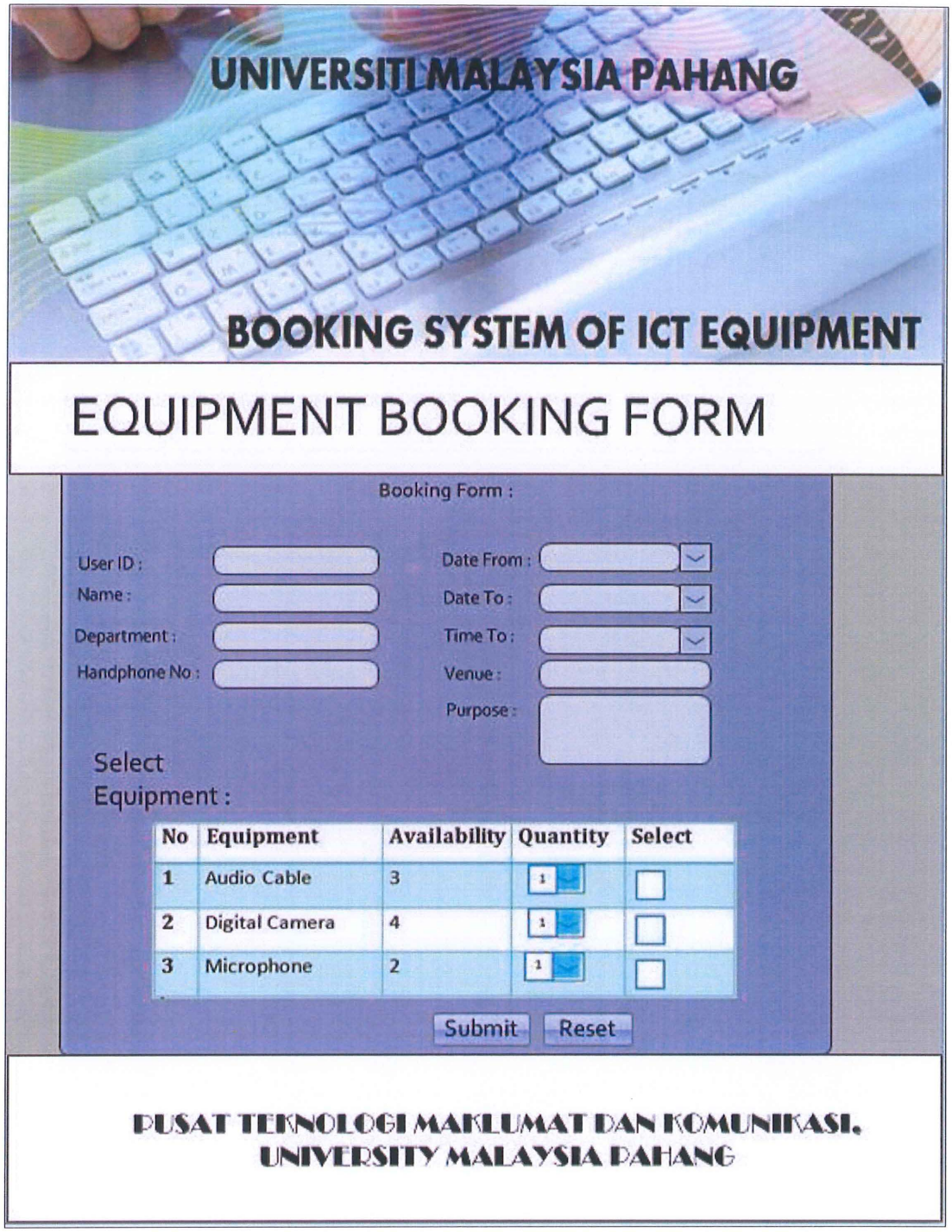


Figure 2.18 Booking Equipment Form Interface

2.2.2.6 View Booking Status

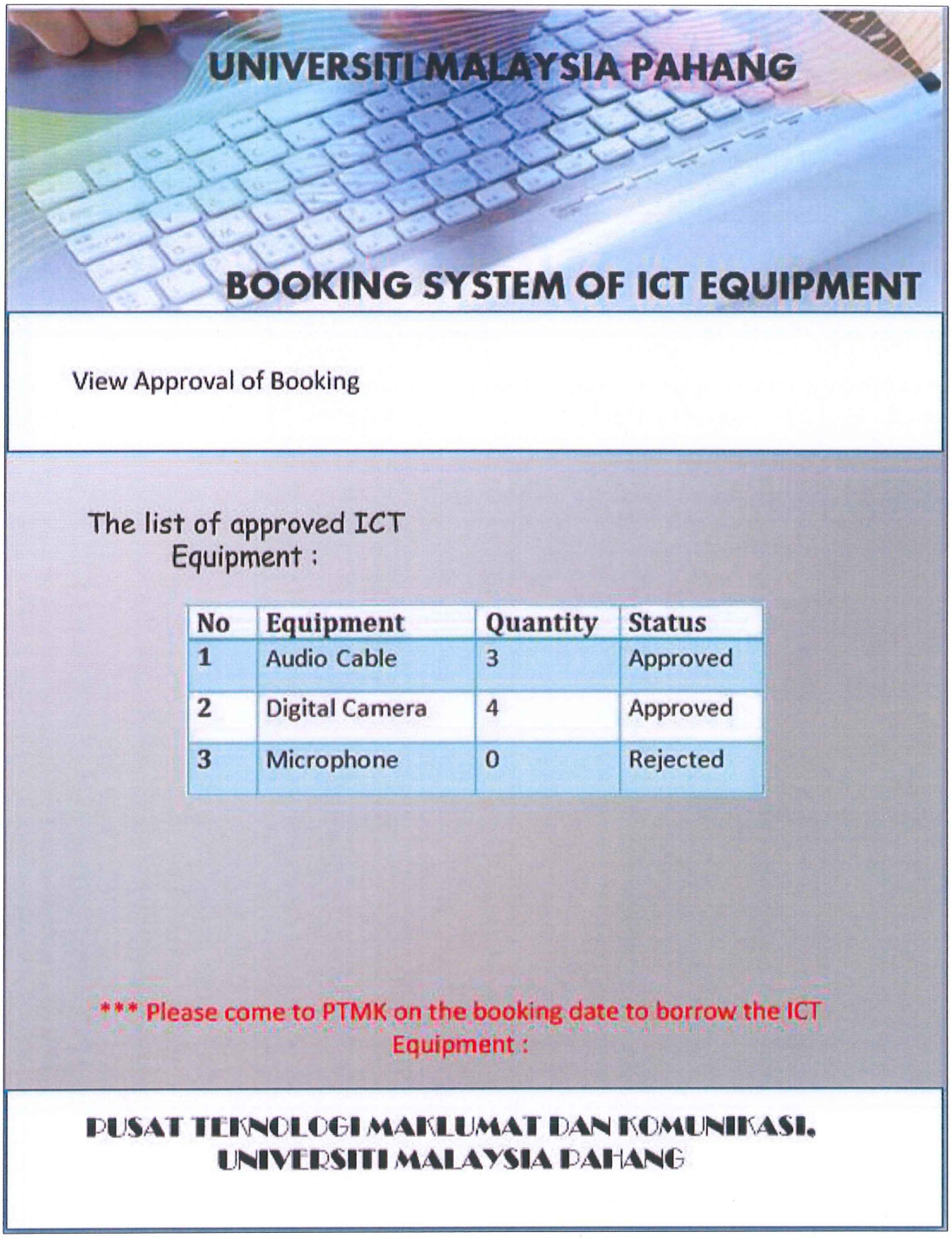


Figure 2.19 View Booking Status Interface

2.2.2.7 Approval Booking Status

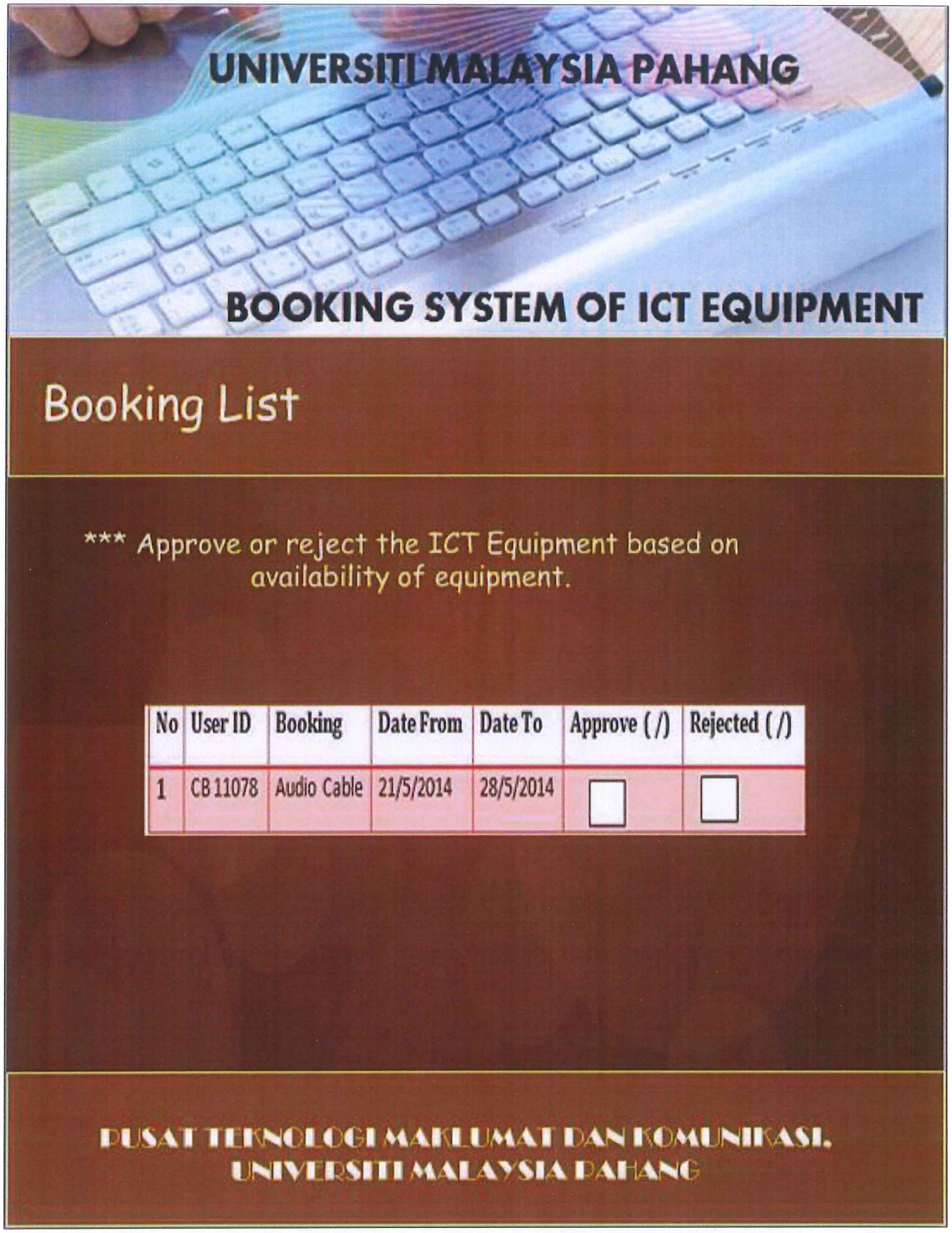


Figure 2.20 Approval of Booking Equipment Interface

2.2.2.8 Key In serial Number

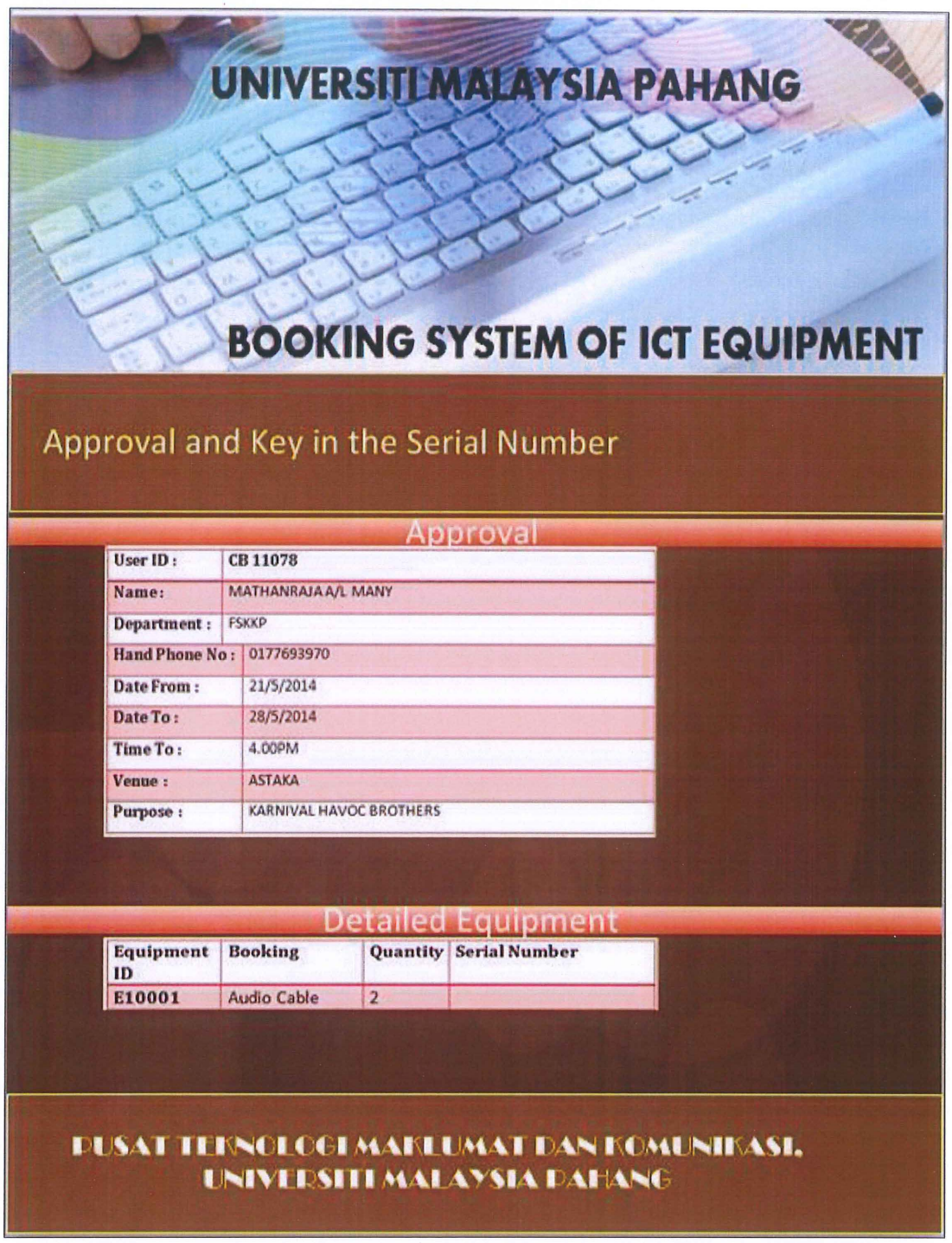


Figure 2.21 Key In Equipment Serial Number When Borrowing Interface

2.2.2.9 Search User

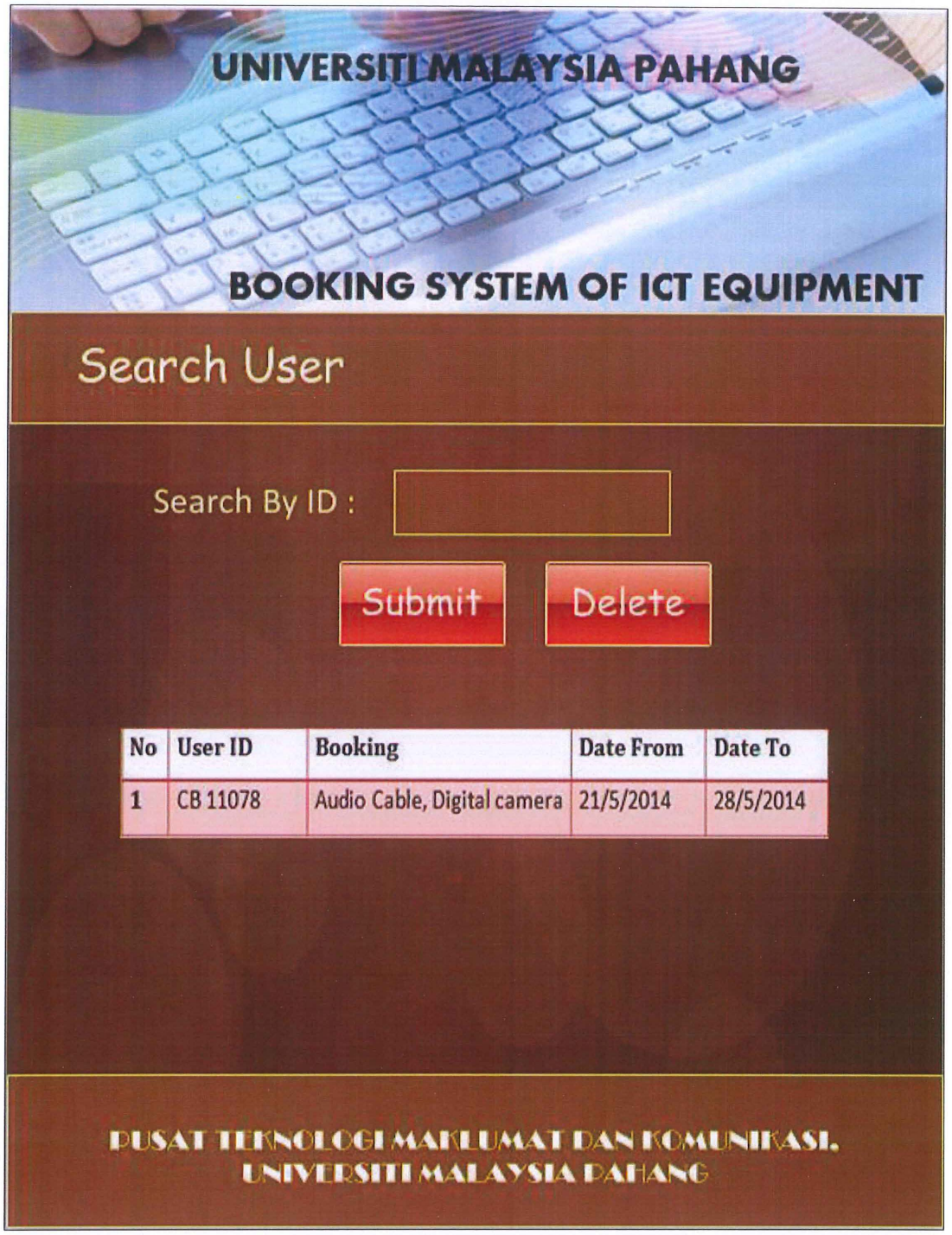


Figure 2.22 Search User Interface

2.2.2.10 Generate Report

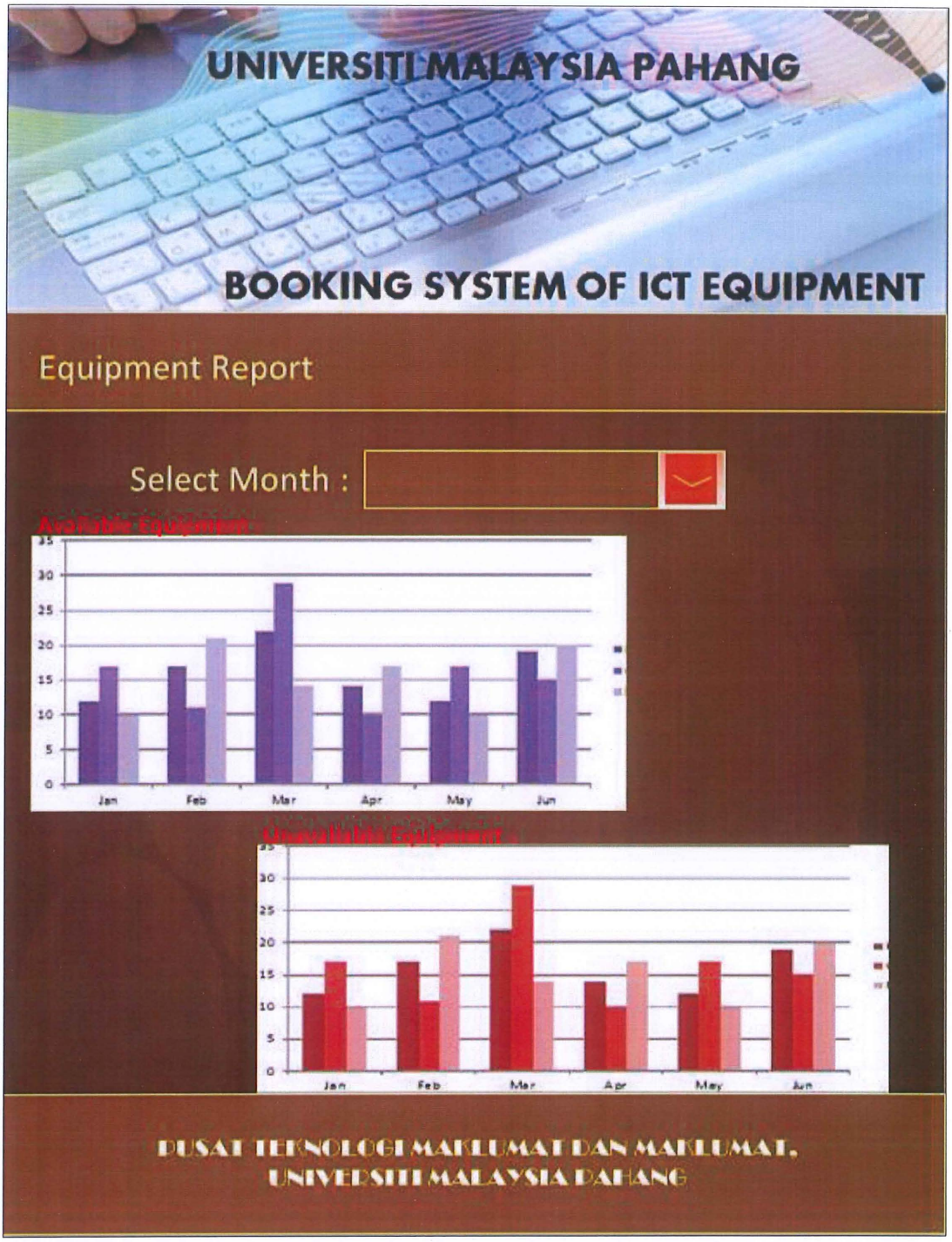


Figure 2.23 Generate Report Interface

2.2.3 Interface BSIE

The following design will show certain pages of the interface of Booking System of ICT Equipment using Barcode Scanner which consist of twenty interface but in this report considered ten interface only which is homepage, login page, booking equipment page, view status page, approval of booking equipment page, search user page, report option page, report for equipment page, and graph for equipment availability page. This is the design show that the human computer interaction technique that will be used in graphical direct manipulation technique where user only involved with the graphical interface that can be manipulated directly. In other word, the response time of the graphic is almost instant.

Interface of BSIE is shown here because it can be references for the users for them to check the user manual. This is because for every interface, there is description that explain in detail the task for each pages and connection with another page (flow of the system interface). Interface is important to emphasis in designing it because interface also known as human computer interface [13]. The attractive, usability, and satisfaction is the human computer interaction that allow the user to more convenience in using the system.

2.2.3.1 HomePage

This page is basically a home page for the Booking System of ICT Equipment.

Figure 2.24 Home Page Interface

There will slide show in this page whereby show the organization of the PTMK staff and their yearly activities. When user click on "Login Here" then will redirect to Login Page and for newly registration member can sign in by click on "Sign Up Here".

2.2.3.2 Login

This page is a Login Page whereby user can login to perform their actions.

Figure 2.25 Login Interface

User need to enter Member ID, password and their category as "Member" or "Admin". If the user input is correct then, the page will redirect user to About Page whereas for admin to Manage User Info Page. If both the member ID and password is invalid or either one is invalid then there will be label shows "Invalid Member ID or Password. Please re-enter."

2.2.3.3 Booking Equipment

This page is a Booking Page whereby user can booked the equipment to be borrowed.

Figure 2.26 Booking Equipment Interface

There will be display a member ID of the user in every page beside the Welcome. Firstly user need to select which categories equipment they wants to borrow. Then in the Equipment name there will be list of equipment of the selected categories and will show for each selected item, the image, name and description for that equipment. User also must enter the venue and purpose for to borrow with selecting the borrow date and the return date of the equipment. After that, if the equipment confirmed to be borrowed, then user need to click on "Add Booking" to display on the table before being sent to admin. I f user wrongly select or did not want to borrow the equipment can delete from the table before click on "Send Booking" to admin. If everything confirm to borrow that equipment, then user can click on "Send Booking" to admin where message box will show "Successfully sent. Please wait for approval".

2.2.3.4 View Status

This page is a View Status whereby user can view status of the booking for the equipment that been booked.

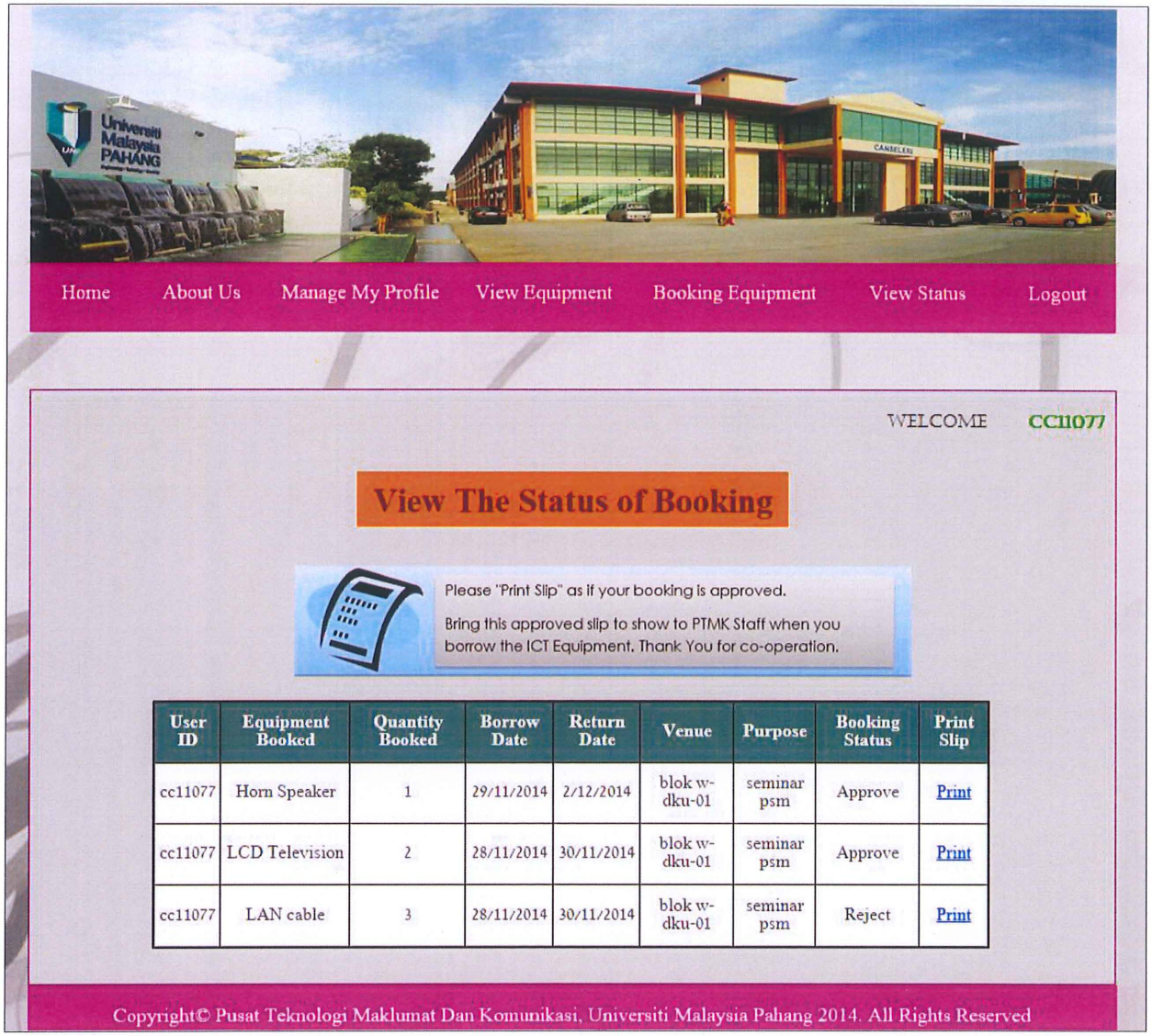


Figure 2.27 View Status Interface

There will be display a member ID of the user in every page beside the Welcome. User can the status on the 8th column of the table. If the status shows "Approve" then user need to click on "Print" link to print the approved equipment slip and bring as prove to PTMK when borrowing the equipment.

2.2.3.5 Manage User Profile Information

This page is a View Status whereby admin can view details of the user in this system and as well as their information.

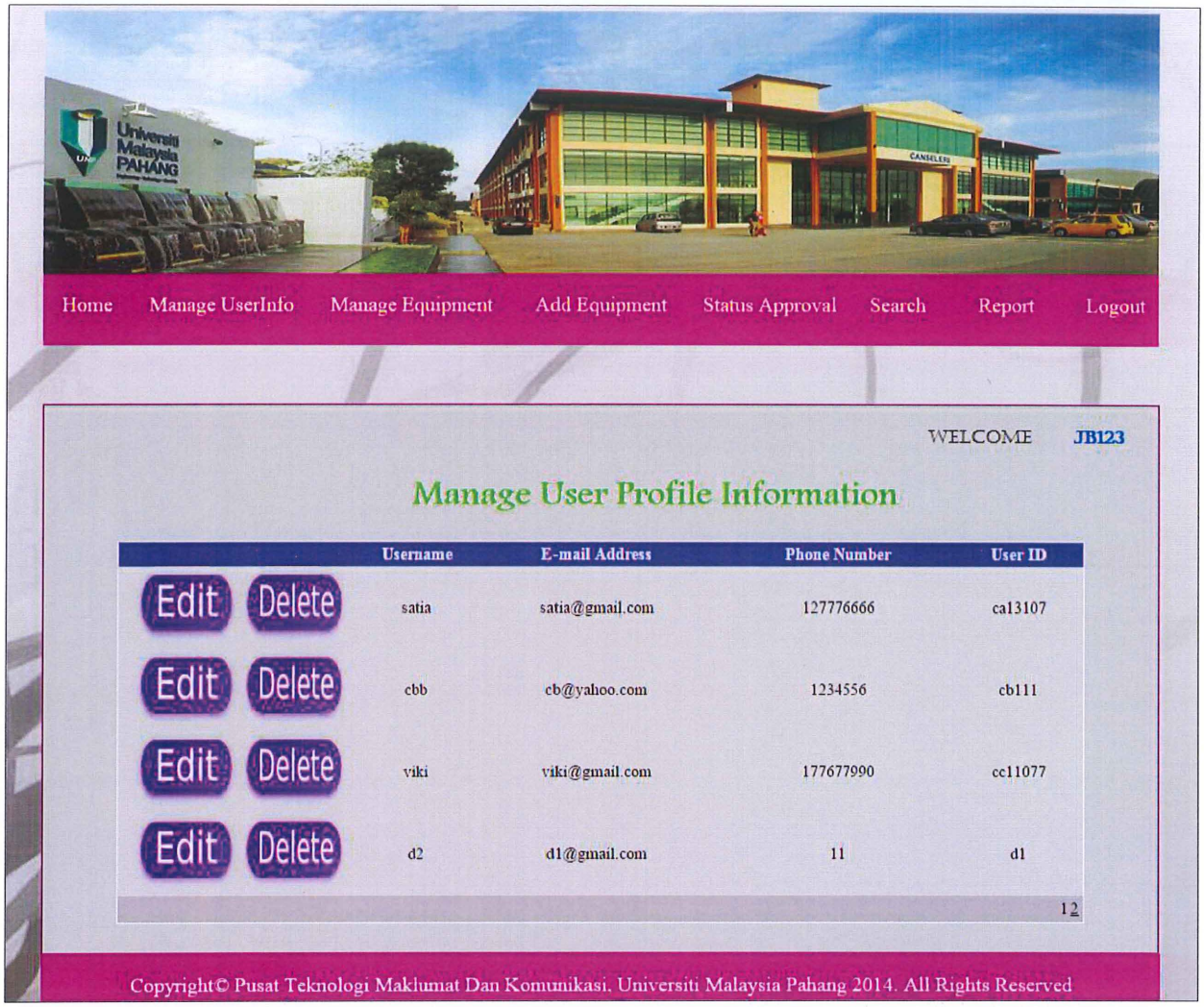


Figure 2.28 Manage User Profile Information Interface

There will be display admin ID of the user in every page beside the Welcome. If the user information member ID (matrice ID/ staff ID) not same with the details of name and etc, then admin can update that user information. Then when user login, they can see in their Manage Profile that the details are different. On the bottom of the table, is a page number. Admin can see the all member details by click for page number.

2.2.3.6 Status Approval

This page is a Status Approval whereby admin can view details of equipment that booked by user and check all the details and if the equipment is available, then admin can approve the status of booking with some term and conditions or reject the booking.

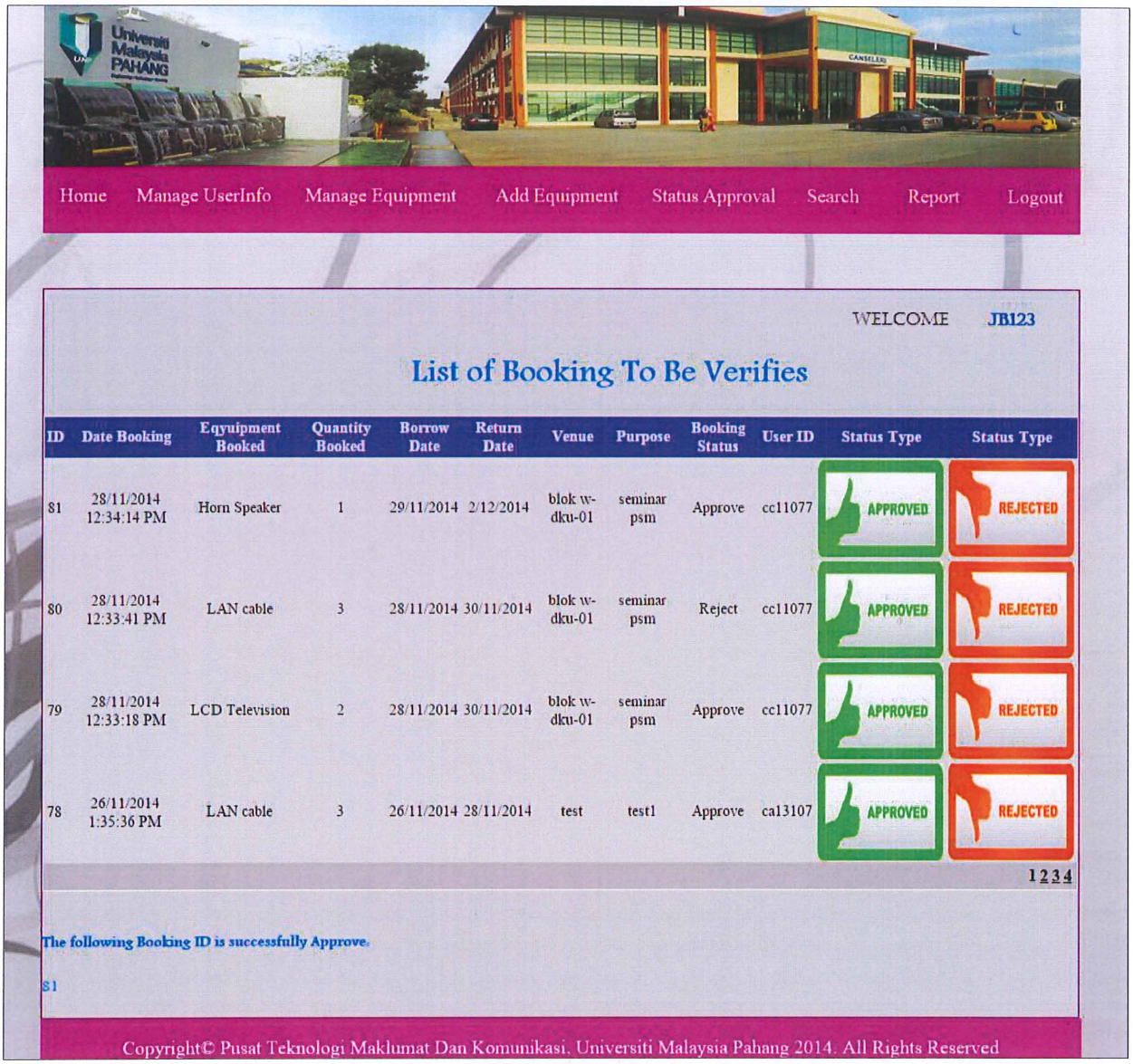


Figure 2.29 Status Approval Interface

There will be display admin ID of the user in every page beside the Welcome. When admin click on Approve button, then column 8th will show "Approve" for selected ID with display in details below the table for which ID was successfully Approved and vice versa for reject booking status.

2.2.3.7 Search User

This page is a Search User whereby admin search for user booking details.

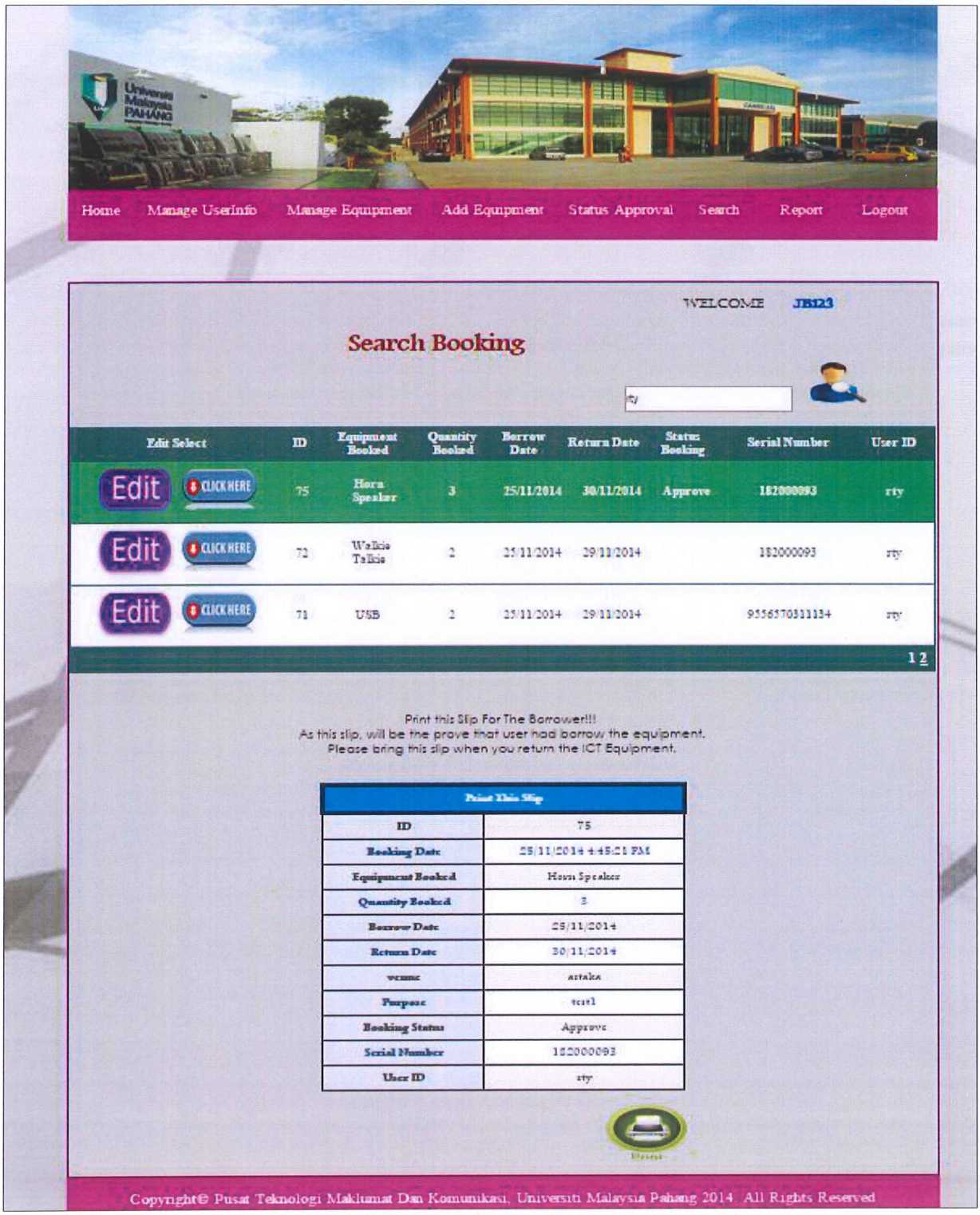


Figure 2.30 Search User Interface

There will be display admin ID of the user in every page beside the Welcome. When the user come to take the approved equipment to borrow, then admin will search by Member ID. If the Member ID is valid, then will display the user details in the table. Then admin will click on ''Edit" button to scan the serial number of the equipment. After scan the barcode, then it will be update in the database. Then admin need to select the row for that selected equipment by click on "Click Here" and the details for the selected equipment will be show in details. At last, admin need to print the details slip by click "Print" button and stamp the PTMK official cop before give the printed slip to user. This slip will be prove for the user as the had borrowed the equipment with valid serial number and must bring the slip when time returning the equipment.

2.2.3.8 Report Option

This page is a View Status whereby admin can select the image to proceed for each report.

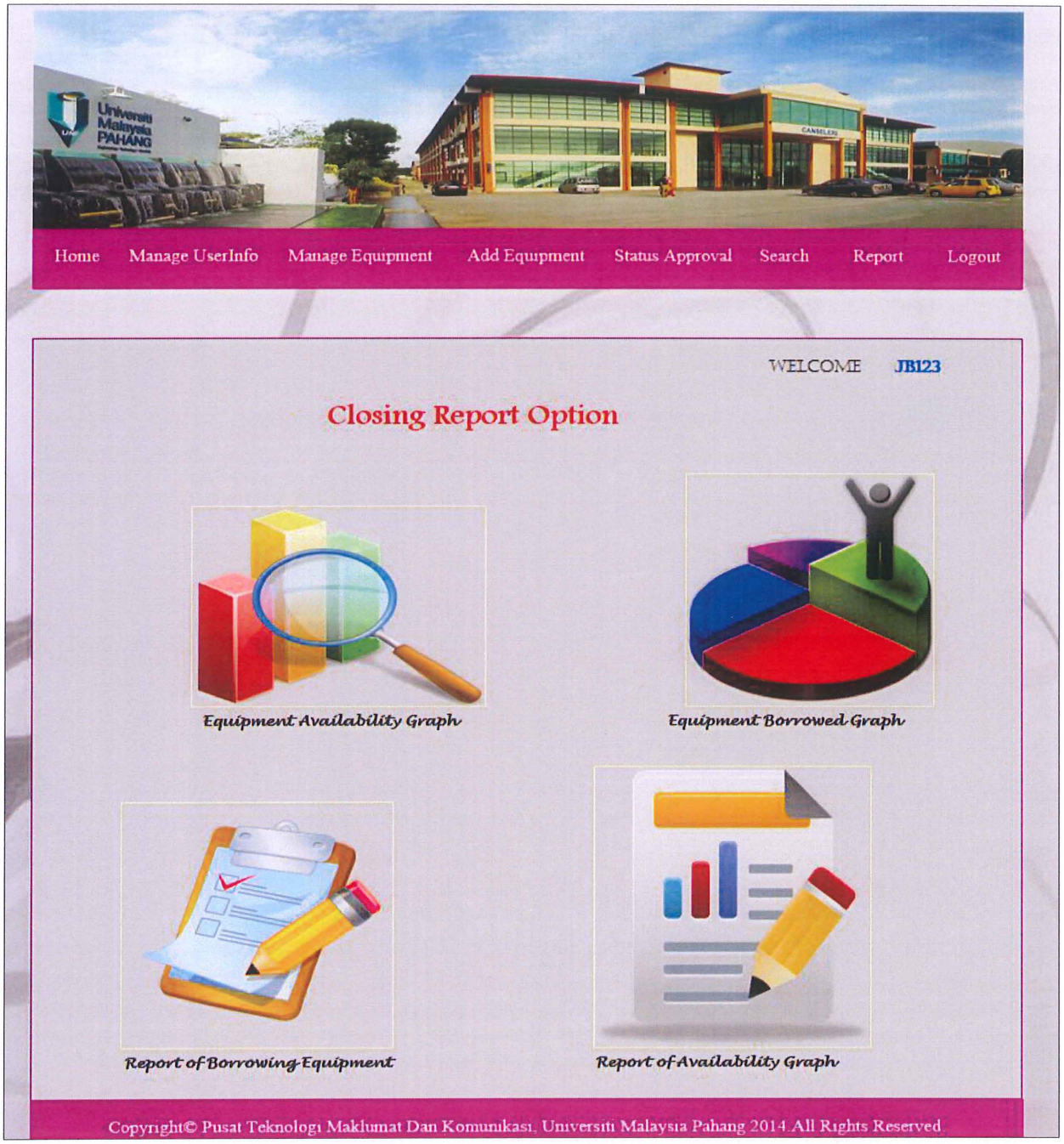
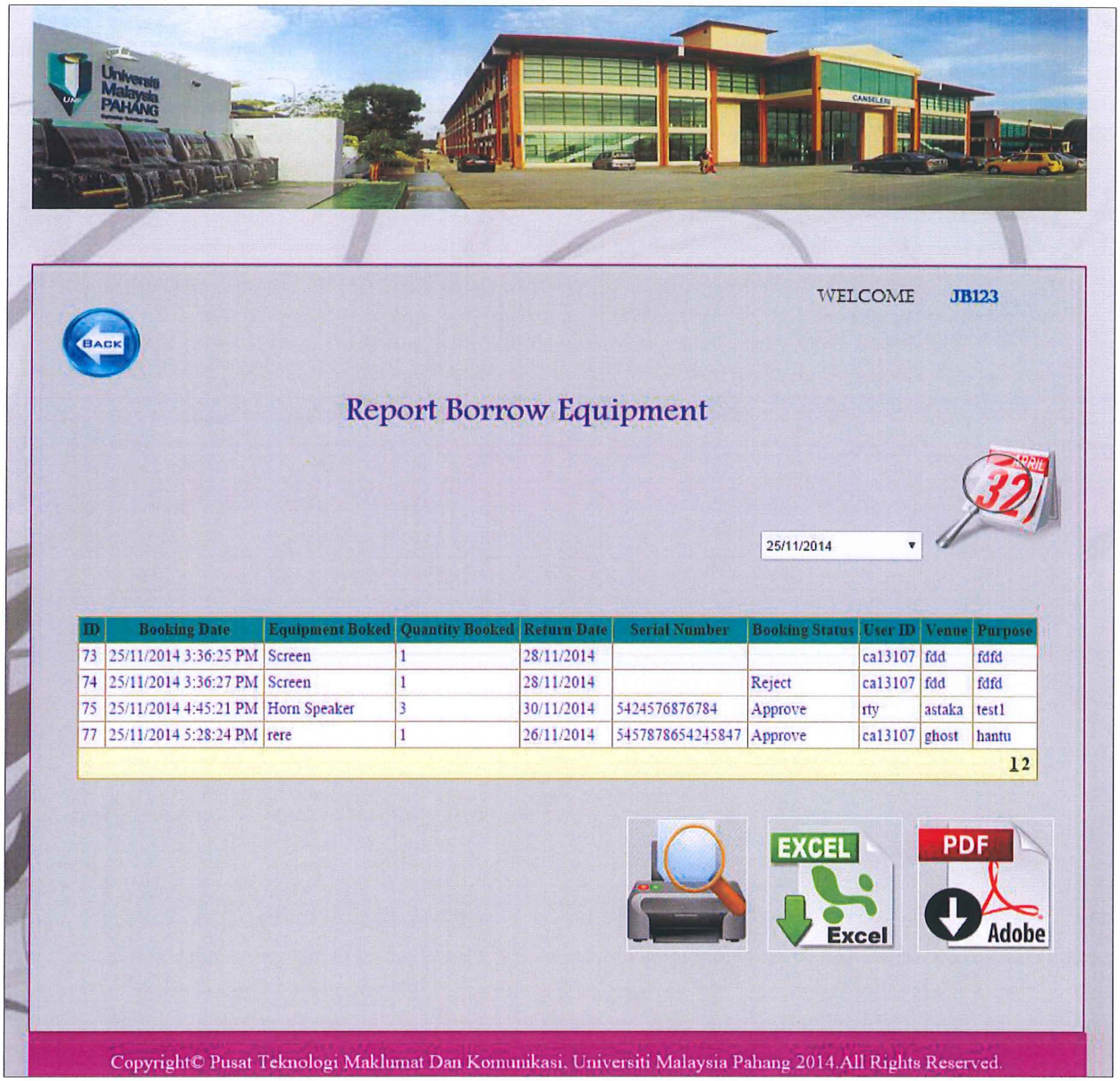


Figure 2.31 Report Option Interface

This is main page option for admin to select before the print the daily progress report and the chart. There will be display a admin ID of the user in every page beside the Welcome.

2.2.3.9 Report For Borrowing Equipment

This page is Report Borrow whereby admin can print report for day equipment been borrowed.



ID	Booking Date	Equipment Boked	Quantity Booked	Return Date	Serial Number	Booking Status	User ID	Venue	Purpose
73	25/11/2014 3:36:25 PM	Screen	1	28/11/2014			ca13107	fdd	fdfd
74	25/11/2014 3:36:27 PM	Screen	1	28/11/2014		Reject	ca13107	fdd	fdfd
75	25/11/2014 4:45:21 PM	Horn Speaker	3	30/11/2014	5424576876784	Approve	rty	astaka	test1
77	25/11/2014 5:28:24 PM	rere	1	26/11/2014	5457878654245847	Approve	ca13107	ghost	hantu

12

Figure 2.32 Report for Borrowing Equipment Interface

There will be display a admin ID of the user in every page beside the Welcome. When admin select the date, then table will be display with the details of equipment be borrowed with details of the user. Admin can print this report by click on "Print" button. Admin can download this report as to save as back up by click on "Excel" for Excel file of "PDF" button PDF file.

2.2.3.10 Graph For Equipment Availability

This page is a Graph Equipment Available whereby admin can print the graph for the day on equipment availability.

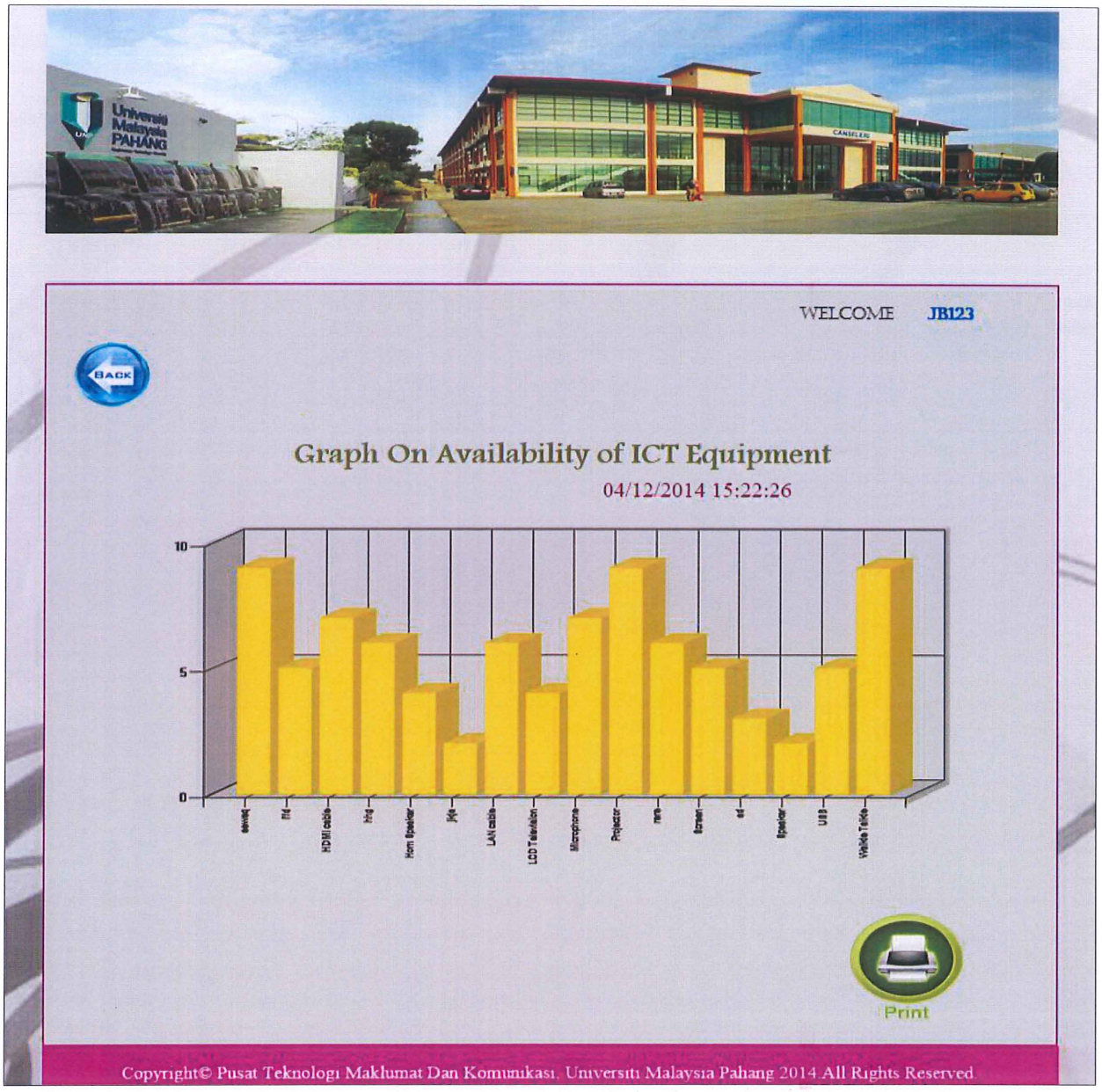


Figure 2.33 Graph for Equipment Availability Interface

There will be display a admin ID of the user in every page beside the Welcome. When admin click on "Print" button, then the graph can be printed for the day. This page is automatically update from time by time in database.

2.2.4 Data Dictionary

This subsection will describe the attribute of each entity diagram as Figure 2.34. The attribute that will be describe in this subsection are data field, definition, data type and details.

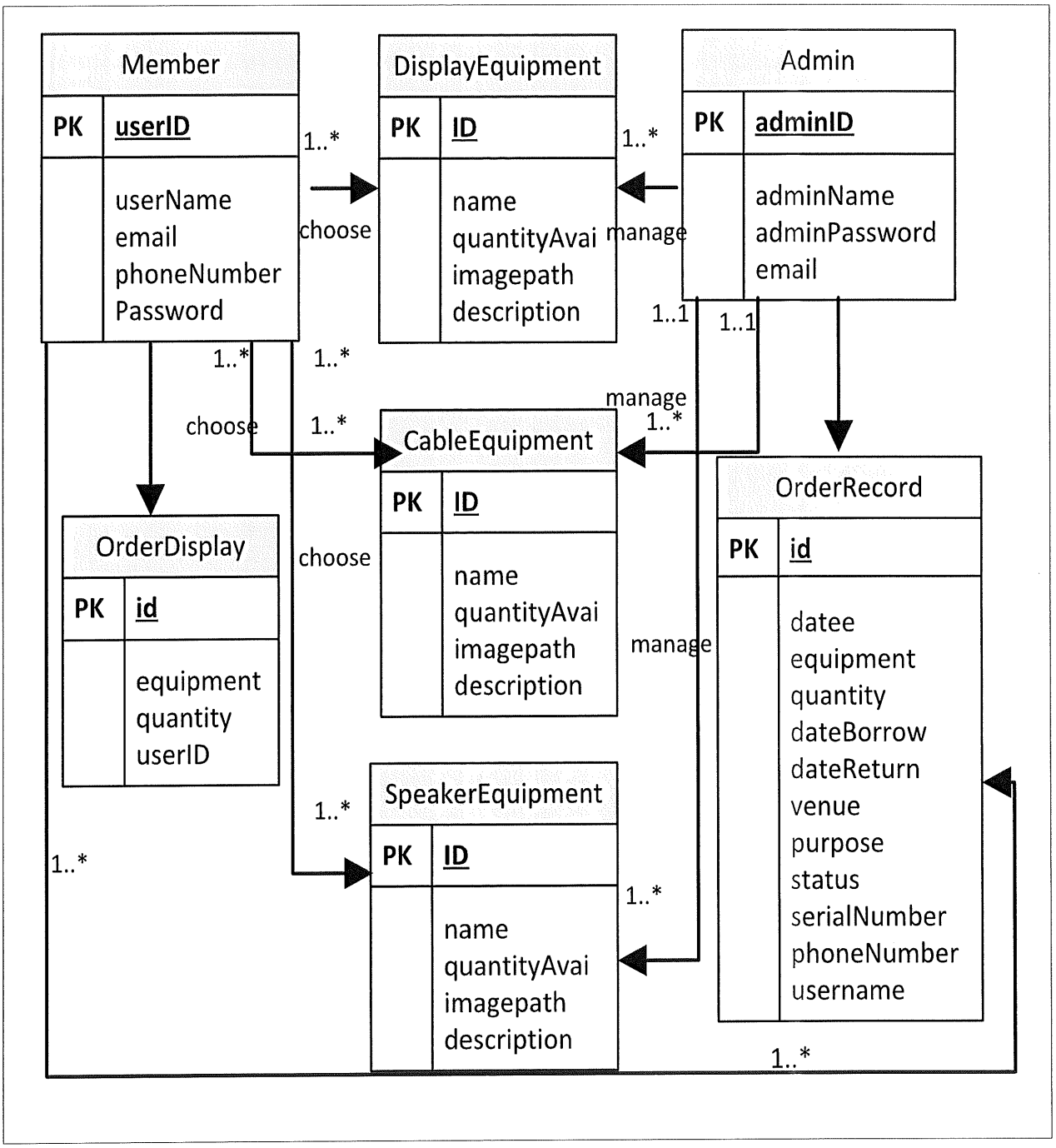


Figure 2.34 Entity Relationship Diagram (ERD) of Booking System

2.2.4.1 Member Database

This subsection will describe all the attributes that possess by Member Entity.

Table 2.8 Member Data Entities

No.	Attributes	Definition	Data Type	Details
1	userID -PK	userID used as auto incremental.	NCHAR(10)	Used as unique identifier for each user (staff and student.)
2	userName	userName used as name of the user.	NVARCHAR(50)	The name of the user (staff and student.)
3	email	email used as email of the user.	NVARCHAR(50)	The email of the user (staff and student.)
4	phoneNumber	phoneNumber used as handphone number of user.	INT	The contact number of the user (staff and student.).
5	Password	userPassword used as password of the user.	NVARCHAR(50)	The password of the user (staff and student.)

2.2.4.2 Admin Database

This subsection will describe all the attributes that possess by Admin Entity.

Table 2.9 Admin Data Entities

No.	Attributes	Definition	Data Type	Details
1	adminID - PK	adminID used as auto incremental.	NVARCHAR(50)	Used as unique identifier for admin.
2	adminName	adminName used as name of the admin.	NVARCHAR(MAX)	The name of the admin.
3	adminPassword	adminPassword used as password of the admin.	NVARCHAR(50)	The password of the admin.
4	email	email used as email of the admin.	NVARCHAR(MAX)	The email of the admin.

2.2.4.3 Display Equipment Database

This subsection will describe all the attributes that possess by Display Equipment Entity.

Table 2.10 Display Equipment Data Entities

No.	Attributes	Definition	Data Type	Details
1	ID -PK	ID used as auto incremental.	INT(10)	Used as unique identifier for each display equipment.
2	name	name used as name of the display equipment.	NVARCHAR(50)	The name of the display equipment.
3	quantityAvai	quantityAvai used as quantity of display equipment for user booking.	INT	The quantity of equipment for user booking.
4	imagepath	imagepath used as the path of the display equipment image.	NVARCHAR(50)	The imagepath of the display equipment.
5	description	description used as to describe the display equipment.	NVARCHAR(MAX)	The description of the display equipment.

2.2.4.4 Cable Equipment Database

This subsection will describe all the attributes that possess by Cable Equipment Entity.

Table 2.11 Cable Equipment Data Entities

No.	Attributes	Definition	Data Type	Details
1	ID -PK	ID used as auto incremental.	INT(10)	Used as unique identifier for each cable equipment.
2	name	name used as name of the cable equipment.	NVARCHAR(50)	The name of the cable equipment.
3	quantityAvai	quantityAvai used as quantity of cable	INT	The quantity of equipment for user

		equipment for user booking.		booking.
4	imagepath	imagepath used as the path of the cable equipment image.	NVARCHAR(50)	The imagepath of the cable equipment.
5	description	description used as to describe the cable equipment.	NVARCHAR(MAX)	The description of the cable equipment.

2.2.4.5 Speaker Equipment Database

This subsection will describe all the attributes that possess by Speaker Equipment Entity.

Table 2.12 Speaker Equipment Data Entities

No.	Attributes	Definition	Data Type	Details
1	ID -PK	ID used as auto incremental.	INT(10)	Used as unique identifier for each speaker equipment.
2	name	name used as name of the speaker equipment.	NVARCHAR(50)	The name of the speaker equipment.
3	quantityAvai	quantityAvai used as quantity of display speaker equipment for user booking.	INT	The quantity of equipment for user booking.
4	imagepath	imagepath used as the path of the speaker equipment image.	NVARCHAR(50)	The imagepath of the display speaker equipment.
5	description	description used as describe the speaker equipment.	NVARCHAR(MAX)	The description of the speaker equipment.

2.2.4.6 OrderDisplay Database

This subsection will describe all the attributes that possess by orderDisplay Entity.

Table 2.13 OrderDisplay Data Entities

No.	Attributes	Definition	Data Type	Details
1	id -PK	id used as auto incremental.	INT	Used as unique identifier for each booking.
2	equipment	equipment used as name of booking equipment.	NVARCHAR(50)	The name of booking equipment.
3	quantity	quantity used as number of booking equipment.	INT	The quantity of booking equipment.
4	userID - FK	userID used as auto incremental.	NCHAR	Used as unique identifier for each user (staff and student.)

2.2.4.7 OrderRecord Database

This subsection will describe all the attributes that possess by orderRecord Entity.

Table 2.14 OrderRecord Data Entities

No.	Attributes	Definition	Data Type	Details
1	id -PK	id used as auto incremental.	INT	Used as unique identifier for each booking.
2	datee	datee used as date of booking equipment.	NVARCHAR()	The date of booking equipment.
3	equipment	equipment used as name of booking	NVARCHAR(50)	The name of booking

		equipment.		equipment.
4	Quantity	quantity used as number of booking equipment.	INT	The quantity of booking equipment.
5	dateBorrow	dateBorrow used as date for borrowing equipment.	NVARCHAR(MAX)	The date for borrowing equipment.
6	dateReturn	dateReturn used as date for returning equipment.	NVARCHAR(MAX)	The date for returning equipment.
7	Venue	venue used as describe the place.	NVARCHAR(50)	Describe the venue of booking.
8	Purpose	purpose used as describe the purpose of the booking equipment.	NVARCHAR(MAX)	Describe the purpose of the booking equipment.
6	Status	status used as describe the status of booking approval.	VARCHAR(50)	Describe the status of booking approval.
7	serialNumber	serialNumber used as describe the barcode number of equipment.	VARCHAR(50)	Describe the serial number of equipment.
8	PhoneNumber - FK	phoneNumber used as handphone number of user.	INT	The contact number of the user (staff and student.).
9	username – FK	userName used as name of the user.	NVARCHAR(50)	The name of the user (staff and student.)
10	userID –PK	userID used as auto incremental.	NCHAR(10)	Used as unique identifier for

				each user (staff and student.)

2.2.5 Interface chart

This subsection will describe the interface that available for user to interact and the access control of each interface with respect to type of people used (either admin or user).

Table 2.15 Table of Interface Chart for Booking System

Feature		**User**	**Admin**
Home Page			
1	Display link to login either as user or admin.	✓	✓
Login Page			
1	Enter the username, password, and choose category	✓	✓
2	Click button Login to enter the system	✓	✓
User Registration			
1	Enter all the necessary information as username, password, telephone number and etc.	✓	
2	Click button Register, in order to login into the system.	✓	
Main Menu Page			
1	Display all the page to be easier for user and admin to navigate between pages.	✓	✓
Manage Profile			
1	User can update the user information and click on Update button.	✓	
2	User can add the new user information and click on Add button.	✓	
3	User can delete the user information and click on Delete button.	✓	
View Equipment list			
1	Display list of the ICT Equipment that available in PTMK.	✓	
Booking Equipment			

1	User will fill up the Online Booking Form which have event, date, time and etc.	✓	
2	User can click on Booking button, once they fill up the form ready and confirm to booked to equipment.	✓	
3	User can click on Cancel Booking button, once they fill up the form ready or not and wished to reject the booking.	✓	
View Booking Status			
1	Display the status of booking.	✓	
Approval of Booking Equipment			
1	View the approval of user.		✓
2	Check the availability of equipment.		✓
3	If availability, the admin click on Approve button.		✓
4	If unavailable, the admin click on Reject button.		✓
Manage Equipment List			
1	Display list of equipment		✓
2	Choose equipment for the list.		✓
3	Update the detail of the equipment.		✓
4	Add new equipment to the database.		✓
5	Delete the equipment from the database.		✓
Key-In Equipment Serial Number			
1	Fill up the user information and dates.		✓
2	Scan the equipment to be borrowed by user.		✓
Search User			
1	Enter the userID and click the button Search.		✓
2	Display the history of the searched user.		✓
Generate Report			

1	Select the option: Report of quantity availability of Equipment or unavailable of equipment.		✓
2	The display of report		✓

2.3 Software Development Plan

A good software development methodology can ensure the software that going to be developed be able to deliver within budget and time constraint. There is a lot of software development methodology and each of its have its own advantages and limitations. In this sub-section, comparison of three methodologies will be explained.

I. Waterfall Model

The first development methodology will be classic model that is Waterfall model. This model consists of six phases: planning and requirement specification, design phase, construction, integration and testing, deployment, maintenance.

a) Planning and requirement – where all the resources are systematically assigned to each task, the risk identification and also timeline of the project is introduced. Elicit the requirement from the client and this requirement may be modally by context diagram, use case diagram and so on.
b) Design – Involve the designed activities of architecture design of the system from high level view to low level view.
c) Construction – This phase involves the coding process for the system developed.
d) Integration and Testing – Involved integration of all unit that is coded and form a new subsystem. Before integrated, unit testing for each module will be done. And if flaw detected, it is immediately be fixed to avoid the flaw remain there and cause other testing cannot be carried out.
e) Deployment – this phase also known as installation phase whereby the system is installed in customer environment and they start using after this phase.
f) Maintenance – This is last phase which covers corrective maintenance and adaptive maintenance, where the new requirement is introduced and need to be fulfilled.

II. Prototyping Model

The second development process will be prototyping model where an approximation (prototype) is developed extensively. These prototype is built, tested and then finally reworked as the process goes and will be getting nearer to the customer expectation. The prototype stops as once the customer needs was fulfilled.

III. Rapid Application Development

The last methodology will be Rapid Application Development which an application can be developed in an extremely fast rate. This can be achieved by minimizing the time in planning and transfer this valuable resource in the construction phase. This methodology will drive the user to get better understanding of the system background which brings the system closer to the user requirement [14].

Comparisons between three of the methodologies in Software Development Process

Table 2.16 compares the three methodologies which will be Waterfall Model, Prototyping Model, and Rapid Application Development (RAD).

Table 2.16 Comparisons between three Software Development Methodologies

Subject to Compare	**Waterfall Model**	**Prototyping Model**	**Rapid Application Development**
Degree of Review	There is no much of review need	Extensive review involved client	Extensive review involved client
User Involvement	Less involvement of user	Most of time many user involvement	Most of time many user involvement
Strength	Easy to implement	Deviation from the requirement is minimized	Application can be developed rapidly
Direction	Linear and unidirectional	Non-linear and some phases involved loops.	Non-linear and some phases involved loops.
Compatibility	Small Project	Large Project	Large Project
Degree of requirement ambiguities	When the requirement from client is clear and consistent, it is suitable to be used.	When the requirement from client is ambiguities and inconsistent, it is suitable to be used.	When the requirement from client is ambiguities and inconsistent, it is suitable to be used.
Weakness	Difficulty to implement when requirement is not	Lack of planning may cause the insufficient of resources	Lack of planning may cause the insufficient of

	clear		resources [15].

Based on the comparisons from Table 2.16, Rapid Application Development (RAD) will be used in this project and the reason will be summarized below:

1. Willingness of participation of customer

    - ✓ Client willingness to take part in the development of project and hence this favors the use of RAD methodology since RAD requires extensive involvement of user.
    - ✓ Involvement of user in the design and construction phase.
    - ✓ Can help the developed system to be delivered faster with less cost.

2. Requirement is fairly ambiguous

    - ✓ The requirements that elicited from client are fairly ambiguous and therefore RAD will be used to avoid the extreme loss of resources if requirements are to be changed.
    - ✓ This methodology also offers user early visibility because of prototype to ensure the system meets user needs.
    - ✓ Avoids specification become ambiguity before cutover phase.

3. Development time

    - ✓ The dateline that given by the client fairly insufficient. As a result, RAD will be used since the application can be provided rapidly.

2.3.1 Mapping of Rapid Application Methodology with the project

This subsection will describe the mapping of the methodology chosen and the project that is to be developed.

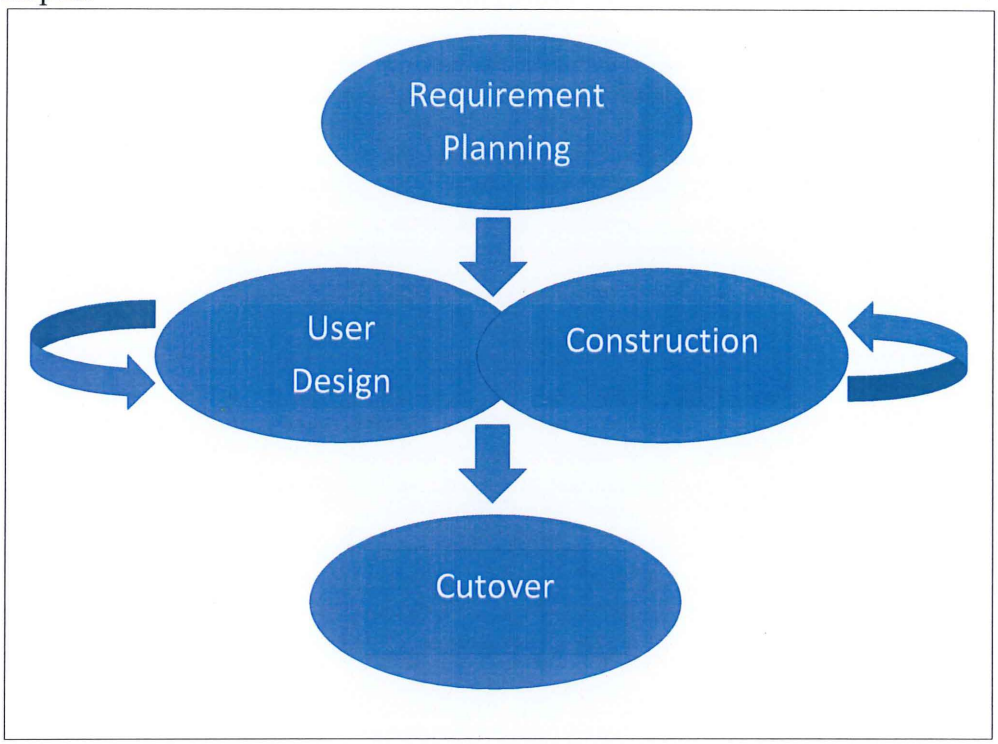


Figure 2.33 Rapid Application Development Phases

Requirement Planning Phase

The planning and requirements are combine together to minimize the time to be allocated in the phase. Review of proposed system. The review produce the definition in term of function the system will support. It describes the business functions and determines the system's scope and data subject areas that the system will support [16]. The outcome or deliverables from this phase is an outline system outline area model consists of system scope, and the existing system studies. From this phase, I had gathered the requirement from the client on the proposed system. I had interview session with the staff of PTMK to discuss on the requirement that they need in order to meet the user expectation on the system. This had been done in the Introduction part of the technical report.

User Design Phase

The user design phase involved the design of the system. This stage uses workshops to model the system's data and processes and to build a working prototype of critical system components. Design diagram such as entity relationship diagram, system interface diagram, dialogue diagram and wireframe can be found in part (2.2.2). After get the requirement and satisfies by the client, I had design few Unified Model Language (UML). This is for the client more understand on the flow of the system when I explained to them. By modeling these kind of diagrams, the client can be get into more deeper on the understanding of system and can reduce the probability of make the changes on the requirements phase. Besides that, I also did some prototype to show to the clients on the how the look of interface of the system. This can be viewed in Report Body part in the technical report.

Construction Phase

This phase involved the coding process. The coding process will begin immediately after design phase and most of the resources will be allocated to this phase to ensure the application can be developed rapidly. This stage completes the construction of the physical application system, builds the conversion system, and develops user aids and implementation work plans. In this phase, I had do some function or module and show to the clients to conforms that the requirements that been proposed is fulfill. I had use database, HTML, Javascript, ASP.NET and so on to do coding. And this phase, takes time to be implemented.

Cutover Phase

Resembles the final tasks in the SDLC implementation phase, including data conversion, testing, changeover to the new system and user training. User acceptance test is the end activities in this phase. As a result, the new system is built, delivered, and placed in operation much sooner. This stage includes final user testing and training, data conversion, and the implementation of the application system. In this last phase, after settle with the coding, I had tested the module by module and finally integrate all the module and tested. This is because to detect error in coding in early stage by determine which module contains these bugs before integration testing and acceptance testing is done. After tested and find its free of error, then the system can deployed in the client site to be used by the client [8].

2.4 Implementation

In this phase, I started to developed the code for the each module as mentioned by the user. Besides that, I had do some function or module and show to the clients to conforms that the requirements that been proposed is fulfill. I had use database, HTML, Javascript, ASP.NET and so on to do coding. And this phase, takes time to be implemented.

2.4.1 SQL Statement

Booking System of ICT Equipment requires a centralized database which will be the processing center for any incoming data. Besides that, a uniform and consistent stream of data can be maintained throughout the system more accurate in giving output. Therefore, Structured Query Language (SQL) is chosen to be the key ingredient to query the data from this database. Function that provided by these SQL statement includes Insert new data to the database such as inserting new equipment where the information such as equipment name, quantity, imagepath and description can be added to the database. Besides that, these equipment also can be update from time to time. This can be done by using SQL statement like Update the equipment name, quantity, imagepath, description. On the other hand, function such as Delete data also provided by SQL which data that is to be deleted can be record of user such as username, phone number and etc. Here is the some example of SQL statement been used in this system.

2.4.1.1 View Status SQL Statement

The SQL Statement for View Status Page.

```
<asp:SqlDataSource ID="SqlDataSource1" runat="server"
  ConnectionString="<%$ ConnectionStrings:ConnectionString %>"

SelectCommand="SELECT [id], [datee], [equipment], [quantity], [dateBorrow],
[dateReturn],    [venue], [purpose], [status], [userID] FROM [orderRecord]
ORDER BY [datee] DESC, [dateBorrow]">

 </asp:SqlDataSource>
```

Figure 2.36 View Status SQL Statement

2.4.1.2 Search SQL Statement

The SQL Statement for Search Page.

```
<asp:SqlDataSource ID="SqlDataSource2" runat="server"
  ConnectionString="<%$ ConnectionStrings:ConnectionString %>"

SelectCommand="SELECT id, equipment, quantity, dateBorrow, dateReturn, status,
serialNumber, userID FROM orderRecord WHERE ([userID] = @userID) ORDER
BY [id] DESC, [dateBorrow] DESC"

UpdateCommand="UPDATE orderRecord SET serialNumber = @serialNumber
WHERE (id = @id)">

<SelectParameters>
<asp:ControlParameter ControlID="TextBox1" Name="userID"
PropertyName="Text" />
        </SelectParameters>
        <UpdateParameters>
        <asp:Parameter Name="serialNumber" />
        <asp:Parameter Name="id" />
        </UpdateParameters>
</asp:SqlDataSource>
<asp:SqlDataSource ID="SqlDataSource3" runat="server"
ConnectionString="<%$ ConnectionStrings:ConnectionString %>"

DeleteCommand="DELETE FROM [orderRecord] WHERE [id] = @id"

InsertCommand="INSERT INTO [orderRecord] ([datee], [equipment], [quantity],
[dateBorrow], [dateReturn], [venue], [purpose], [status], [serialNumber], [userID])
VALUES (@datee, @equipment, @quantity, @dateBorrow, @dateReturn, @venue,
@purpose, @status, @serialNumber, @userID)"

SelectCommand="SELECT [id], [datee], [equipment], [quantity], [dateBorrow],
[dateReturn], [venue], [purpose], [status], [serialNumber], [userID] FROM
[orderRecord] WHERE ([id] = @id)"

 UpdateCommand="UPDATE [orderRecord] SET [datee] = @datee, [equipment] =
@equipment, [quantity] = @quantity, [dateBorrow] = @dateBorrow, [dateReturn] =
@dateReturn, [venue] = @venue, [purpose] = @purpose, [status] = @status,
```

```
[serialNumber] = @serialNumber, [userID] = @userID WHERE [id] = @id">

        <DeleteParameters>
            <asp:Parameter Name="id" Type="Int32" />
        </DeleteParameters>
        <InsertParameters>
            <asp:Parameter Name="datee" Type="DateTime" />
            <asp:Parameter Name="equipment" Type="String" />
            <asp:Parameter Name="quantity" Type="Int32" />
            <asp:Parameter DbType="Date" Name="dateBorrow" />
            <asp:Parameter DbType="Date" Name="dateReturn" />
            <asp:Parameter Name="venue" Type="String" />
            <asp:Parameter Name="purpose" Type="String" />
            <asp:Parameter Name="status" Type="String" />
            <asp:Parameter Name="serialNumber" Type="String" />
            <asp:Parameter Name="userID" Type="String" />
        </InsertParameters>
        <SelectParameters>
            <asp:ControlParameter ControlID="GridView1" Name="id"
                PropertyName="SelectedValue" Type="Int32" />
        </SelectParameters>
        <UpdateParameters>
            <asp:Parameter Name="datee" Type="DateTime" />
            <asp:Parameter Name="equipment" Type="String" />
            <asp:Parameter Name="quantity" Type="Int32" />
            <asp:Parameter DbType="Date" Name="dateBorrow" />
            <asp:Parameter DbType="Date" Name="dateReturn" />
            <asp:Parameter Name="venue" Type="String" />
            <asp:Parameter Name="purpose" Type="String" />
            <asp:Parameter Name="status" Type="String" />
            <asp:Parameter Name="serialNumber" Type="String" />
            <asp:Parameter Name="userID" Type="String" />
            <asp:Parameter Name="id" Type="Int32" />
        </UpdateParameters>

    </asp:SqlDataSource>
```

Figure 2.37 Search SQL Statement

2.4.1.3 Manage Equipment SQL Statement

The SQL Statement for Manage Equipment Page.

```
<asp:SqlDataSource ID="SqlDataSource1" runat="server"
ConnectionString="<%$ ConnectionStrings:ConnectionString %>"

SelectCommand="SELECT * FROM [display]"

DeleteCommand="DELETE FROM [display] WHERE [ID] = @ID"

InsertCommand="INSERT INTO [display] ([name], [quantityAvai], [imagepath],
[description]) VALUES (@name, @quantityAvai, @imagepath, @description)"

UpdateCommand="UPDATE [display] SET [name] = @name, [quantityAvai] =
@quantityAvai, [imagepath] = @imagepath, [description] = @description WHERE
[ID] = @ID">

        <DeleteParameters>
            <asp:Parameter Name="ID" Type="Int32" />
        </DeleteParameters>
        <InsertParameters>
            <asp:Parameter Name="name" Type="String" />
            <asp:Parameter Name="quantityAvai" Type="Int32" />
            <asp:Parameter Name="imagepath" Type="String" />
            <asp:Parameter Name="description" Type="String" />
        </InsertParameters>
        <UpdateParameters>
            <asp:Parameter Name="name" Type="String" />
            <asp:Parameter Name="quantityAvai" Type="Int32" />
            <asp:Parameter Name="imagepath" Type="String" />
            <asp:Parameter Name="description" Type="String" />
            <asp:Parameter Name="ID" Type="Int32" />
        </UpdateParameters>

    </asp:SqlDataSource>
```

Figure 2.38 Manage Equipment SQL Statement

2.4.2 JavaScript

JavaScript had been implemented in this project for mostly in Print function modules. This is because, by using this Javascript language developer can call the selected GridView Row and print the output or slip for that row only. This is a unique characteristics of this language. Here are some example for that language:

2.4.2.1 View Status Javascript

The JavaScript for View Status Page.

```
<script type="text/javascript"
src="http://ajax.googleapis.com/ajax/libs/jquery/1/jquery.min.js"></script>
  <script type="text/javascript">

function Print(a) {

var row = $(a).closest("tr").clone(true);
var printWin = window.open('', '', 'left=0',
'',top=0,width=1000,height=600,status=0');
var table = $("[id*=GridView]").clone(true);
$("tr", table).not($("tr:first-child", table)).remove();
table.append(row);
$("tr td:last,tr th:last", table).remove();
var dv = $("<div />");
var divToPrint = document.getElementById('printarea');
dv.append(table);
printWin.document.write(dv.html());
printWin.document.close();
printWin.focus();
printWin.print();
printWin.close();}
</script>
<asp:TemplateField HeaderText="Print Slip">
  <ItemTemplate>
    <a href="javascript:;" onclick="Print(this)">Print</a>
  </ItemTemplate>
</asp:TemplateField>
```

Figure 2.39 View Status JavaScript

2.4.2.2 Report Borrow Javascript

The JavaScript for Report Borrow Page.

```
<script type="text/javascript">

function PrintGrid() {
var prtGrid = document.getElementById('<%=GridView1.ClientID %>');
var prtwin = window.open('',
'PrintGridView','left=200,top=100,width=1500,height=1500,tollbar=0,scrollbars=1,s
tatus=0,resizable=1');
prtwin.document.write(prtGrid.outerHTML);
prtwin.document.close();
prtwin.focus();
prtwin.print();
prtwin.close();}

</script>

<asp:ImageButton ID="ImageButton3" runat="server" BorderColor="White"
BorderStyle="Solid" BorderWidth="1px" Height="135px"
OnClientClick="javascript:PrintGrid();"
ImageUrl="~/image/Print2.png" Width="121px" />
```

Figure 2.40 Report Borrow Javascript

2.4.3 ASP.Net Source Code

Booking System of ICT Equipment using Barcode Scanner was developed using this programming language. This is the requirement my client which they prefer this language have the control and toolbox available for developer to use rather than developed using PHP and other languages. The example of coding using this language is as follow.

2.4.3.1 Report Equipment Source Code

The ASP.Net Source Code for Report Equipment Page.

```
Imports System.IO
Imports iTextSharp.text
Imports iTextSharp.text.html.simpleparser
Imports iTextSharp.text.pdf
Imports System.Web.UI
Imports System.Data

Partial Class ReportEquipment
   Inherits System.Web.UI.Page

Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Me.Load
      Label5.Text = DateAndTime.Now.ToString
If Session("userID") Is Nothing Then
         Response.Redirect("Home.aspx")
      Else
         Label1.Text = Session("userID")
      End If
   End Sub

Protected Sub ImageButton2_Click(ByVal sender As Object, ByVal e As
System.Web.UI.ImageClickEventArgs) Handles ImageButton2.Click

      Response.Clear()
      Response.Buffer = True
      Response.AddHeader("content-disposition", "attachment;filename=Report
Equipment Availability.xls")
      Response.Charset = ""
```

```
        Response.ContentType = "application/vnd.ms-excel"
        Me.EnableViewState = False
        GridView1.AllowPaging = False
        GridView1.DataBind()
        Dim oStringWriter As New System.IO.StringWriter
        Dim oHtmlTextWriter As New
System.Web.UI.HtmlTextWriter(oStringWriter)
        GridView1.RenderControl(oHtmlTextWriter)
        Response.Write(oStringWriter.ToString())
        Response.[End]()
    End Sub

Protected Sub ImageButton3_Click(ByVal sender As Object, ByVal e As
System.Web.UI.ImageClickEventArgs) Handles ImageButton3.Click

        Response.ContentType = "application/pdf"
        Response.AddHeader("content-disposition",
        "attachment;filename=Report Equipment Availability.pdf")
        Response.Cache.SetCacheability(HttpCacheability.NoCache)
        Dim sw As New StringWriter()
        Dim hw As New HtmlTextWriter(sw)
        GridView1.AllowPaging = False
        GridView1.DataBind()
        GridView1.RenderControl(hw)
        Dim sr As New StringReader(sw.ToString())
        Dim pdfDoc As New Document(PageSize.A4, 10.0F, 10.0F, 10.0F, 0.0F)
        Dim htmlparser As New HTMLWorker(pdfDoc)
        PdfWriter.GetInstance(pdfDoc, Response.OutputStream)
        pdfDoc.Open()
        htmlparser.Parse(sr)
        pdfDoc.Close()
        Response.Write(pdfDoc)
        Response.End()
    End Sub

Public Overloads Overrides Sub VerifyRenderingInServerForm(ByVal control As
Control)
```

Figure 2.41 Report Equipment Source Code

2.4.3.2 Login Source Code

The ASP.Net Source Code for Login Page.

```
Imports System.Data

Partial Class Login
   Inherits System.Web.UI.Page

Protected Sub Button1_Click(ByVal sender As Object, ByVal e As
System.EventArgs) Handles Button1.Click
      Dim dv As DataView

      If String.Equals(DropDownList1.SelectedValue, "Admin") Then
       dv = CType(SqlDataSource3.Select(DataSourceSelectArguments.Empty),
DataView)
      Else
      dv = CType(SqlDataSource2.Select(DataSourceSelectArguments.Empty),
DataView)
      End If

      If dv.Count = 1 Then
         Session.Add("userID", TextBox1.Text)

         If String.Equals(DropDownList1.SelectedValue, "Member") Then
            Response.Redirect("About.aspx")
         Else
            Response.Redirect("UpdateUser.aspx")
         End If

      Else
         Label2.Text = "Invalid Username or Password, Please key in again!"
      End If
   End Sub
End Class
```

Figure 2.42 Login Source Code

2.4.3.3 Booking Source Code

The ASP.Net Source Code for Booking Page.

```
Imports System.Data
Partial Class Bookingaspx
 Inherits System.Web.UI.Page

Protected Sub RadioButton1_CheckedChanged(sender As Object, e As
System.EventArgs) Handles RadioButton1.CheckedChanged
      Dim dv As DataView
      If RadioButton1.Checked Then
      DropDownList1.DataSourceID = "SqlDataSource1"
       DropDownList1.DataBind()
       dv = CType(SqlDataSource1.Select(DataSourceSelectArguments.Empty),
DataView)
        Label4.Text = dv.Table.Rows(0)(1)
        Image2.ImageUrl = "~/display/" & dv.Table.Rows(0)(3)

      End If
   End Sub

Protected Sub RadioButton2_CheckedChanged(sender As Object, e As
System.EventArgs) Handles RadioButton2.CheckedChanged
      Dim dv As DataView
      If RadioButton2.Checked Then
       DropDownList1.DataSourceID = "SqlDataSource2"
       DropDownList1.DataBind()
       dv = CType(SqlDataSource2.Select(DataSourceSelectArguments.Empty),
DataView)
        Label4.Text = dv.Table.Rows(0)(1)
        Image2.ImageUrl = "~/display/" & dv.Table.Rows(0)(3)

      End If
   End Sub
```

```
Protected Sub RadioButton3_CheckedChanged(sender As Object, e As
System.EventArgs) Handles RadioButton3.CheckedChanged
        Dim dv As DataView
        If RadioButton3.Checked Then
        DropDownList1.DataSourceID = "SqlDataSource3"
        DropDownList1.DataBind()
        dv = CType(SqlDataSource3.Select(DataSourceSelectArguments.Empty),
DataView)
        Label4.Text = dv.Table.Rows(0)(1)
        Image2.ImageUrl = "~/display/" & dv.Table.Rows(0)(3)

        End If
    End Sub

Protected Sub DropDownList1_SelectedIndexChanged(sender As Object, e As
System.EventArgs) Handles DropDownList1.SelectedIndexChanged
        Dim dv As DataView
        Dim a, b As Integer
        a = DropDownList1.Items.Count

        If RadioButton1.Checked Then
        dv = CType(SqlDataSource1.Select(DataSourceSelectArguments.Empty),
DataView)

          For b = 0 To a – 1

            If DropDownList1.Items(b).Selected Then
            Image2.ImageUrl = "~/display/" & dv.Table.Rows(b)(3)
            Label4.Text = dv.Table.Rows(b)(1)
            Label5.Text = dv.Table.Rows(b)(4)
            End If
          Next
        End If

If RadioButton2.Checked Then
          dv = CType(SqlDataSource2.Select(DataSourceSelectArguments.Empty),
DataView)

          For b = 0 To a – 1
```

```
            If DropDownList1.Items(b).Selected Then
            Image2.ImageUrl = "~/cable/" & dv.Table.Rows(b)(3)
             Label4.Text = dv.Table.Rows(b)(1)
             Label5.Text = dv.Table.Rows(b)(4)
           End If
        Next
    End If

    If RadioButton3.Checked Then
       dv = CType(SqlDataSource3.Select(DataSourceSelectArguments.Empty),
DataView)

        For b = 0 To a – 1

           If DropDownList1.Items(b).Selected Then
           Image2.ImageUrl = "~/speaker/" & dv.Table.Rows(b)(3)
           Label4.Text = dv.Table.Rows(b)(1)
            Label5.Text = dv.Table.Rows(b)(4)
           End If
        Next
    End If
  End Sub

Protected Sub Button1_Click(sender As Object, e As System.EventArgs) Handles
Button1.Click

    SqlDataSource4.InsertCommand = "insert into orderDisplay
(userID,equipment,quantity) values ('" & Session("userID") & "','" & Label4.Text
& "'," & DropDownList2.Text & ")"

    SqlDataSource4.Insert()

    MsgBox("Your selected equipment in table. Please 'Sent Booking' button for
admin approve!", MsgBoxStyle.SystemModal, "Ordered")
    '#AA1E1B

  End Sub
```

```
Protected Sub Button2_Click(sender As Object, e As System.EventArgs) Handles
Button2.Click

    Dim venue As String
    Dim purpose As String
    venue = TextBox1.Text
    purpose = TextBox2.Text

    SqlDataSource5.InsertCommand = "insert into orderRecord
(datee,equipment,quantity,dateBorrow,dateReturn,venue,purpose,userID) values ('" &
DateTime.Now & "','" & Label4.Text & "'," & DropDownList2.Text & ",'" &
Calendar1.SelectedDate & "','" & Calendar2.SelectedDate & "','" & TextBox1.Text &
"','" & TextBox2.Text & "','" & Session("userID") & "')"

    SqlDataSource5.Insert()
    Session.Add("date", DateTime.Now)

    MsgBox("Your booking sent to admin for verifies Booking Status.Please wait for
the reply.Thank You.", MsgBoxStyle.SystemModal, "Ordered")

  End Sub

Protected Sub Calendar1_SelectionChanged(sender As Object, e As
System.EventArgs) Handles Calendar1.SelectionChanged

    Label8.Text = Calendar1.SelectedDate

  End Sub

  Protected Sub Calendar2_SelectionChanged(sender As Object, e As
System.EventArgs) Handles Calendar2.SelectionChanged

    Label9.Text = Calendar2.SelectedDate

  End Sub
End Class
```

Figure 2.43 Booking Source Code

2.4.3.4 Status Approval Source Code

The ASP.Net Source Code for Status Approval Page.

```
Imports System.Data
Partial Class StatusApproval
    Inherits System.Web.UI.Page

Protected Sub Page_Load(ByVal sender As Object, ByVal e As System.EventArgs)
Handles Me.Load

        If Session("userID") Is Nothing Then
            Response.Redirect("Home.aspx")
        Else
            Label1.Text = Session("userID")
        End If
    End Sub

 Protected Sub GridView1_RowCommand(ByVal sender As Object, ByVal e As
System.Web.UI.WebControls.GridViewCommandEventArgs) Handles
GridView1.RowCommand

 If e.CommandName = "Approve" Then
        Dim index As Integer = Convert.ToInt32(e.CommandArgument)
        Dim str As String = GridView1.Rows(index).Cells(0).Text
        Label4.Text = "<h4>The following Booking ID is successfully
Approve:</h4>" & str & ""
        SqlDataSource1.UpdateCommand = "Update orderRecord set status =
'Approve' where id = '" & str & "'"
        SqlDataSource1.Update()
      End If

      If e.CommandName = "Reject" Then
        Dim index As Integer = Convert.ToInt32(e.CommandArgument)
        Dim str As String = GridView1.Rows(index).Cells(0).Text
        Label4.Text = "<h4>The following Booking ID is Rejected:</h4>" & str & ""
        SqlDataSource1.UpdateCommand = "Update orderRecord set status = 'Reject'
where id = '" & str & "'"
        SqlDataSource1.Update()
```

Figure 2.44 Status Approval Source Code

2.5 Test Plan

This section will describe the testing methodology that will be used to test Booking System of ICT Equipment to ensure the system to be free from any error, minimizing bugs, and also meet the user requirement. Efficient test cases will be developed to be used to stress the system to its potential limit which in return will display the hidden bugs and correction can be done massively before the system is handed to user. Besides that, the several techniques will be used to design a set of test cases that the best match this system such as the use of Equivalence Partition (EP), Boundary Value Analysis (BVA) to test every possible value of input by user, t-way testing to all the possible combinations that user might input, and lastly is the use case testing to ensure the system meets all the requirements that specified in section 2.1.

Test plan is an ongoing process throughout the project lifecycle with test plans being developed for each phase of software development. Firstly I decide to do unit testing to find defects and verifies functionality of software components which can been seen in part 2.5.1. Due to time constraints, so I planned to not implement testing on integrate all the modules and testing on system parts as well. But the important part which is acceptance testing was done with the real user and produce report of testing. This testing is for validation testing against user needs in part 2.5.2. This will be my step by step to do testing for Booking System of ICT Equipment.

Type of testing that will be used can differentiate into two categories as below:

1. Unit Testing
    a) The first stage of the testing procedures. All available modules within the Booking System of ICT Equipment will be tested by a set of testy cases that is designed by the techniques such as Boundary Analysis Value (BVA), Equivalence Partitioning (EP), and decision table. The unit testing form will be also developed to examining the likely output that the system gives.
2. User acceptance Testing
    a) This is the final stage of test procedure. The system will be tested with the tested by client to ensure that they are satisfied with the system.

The testing that is to be conducted will start with the unit testing which every module is tested for their functionalities which expected to produce the one that required by client,

followed user acceptance test will be the last stage of the testing to ensure the system meets the specified requirements and exceeds client satisfaction.

2.5.1 Unit Testing Script

Table 2.17 Unit Testing for Booking System of ICT Equipment

No	Module	Unit	Testing Script
1	**Authentication**	**Login Page**	1. If the member ID and password is valid, and the roles are detected to be member, user will be redirected to View Equipment page. 2. If the member ID and password is valid, and the roles are detected to be admin, user will be redirected to Update User Profile page. 3. If member ID is invalid, "Invalid member ID or password" will be displayed. 4. If password is invalid, "Invalid member ID or password" will be displayed. 5. If member ID and password is invalid, "Invalid member ID and password" will be displayed. 6. If member ID is null, "Invalid member ID and password" will be displayed. 7. If password is null, "Invalid member ID and password" will be displayed. 8. If member ID and password is null, "Invalid member ID and password" will be displayed.
2	**Member Page**	**Booking Page**	1. If category is selected, the equipment that corresponds to the category will be displayed. 2. If the equipment is chosen, the chosen

			item with its description will be displayed. 3. If the "Delete" button is selected, the focus equipment will be deleted from the list. 4. If the "Add Booking" button is selected, the focus equipment will be added to the list with quantity booked. 5. If the "Send Booking" button is selected, the focus equipment in the list with quantity booked will be send to the PTMK staff.
		View Equipment	1. User click the menu on View Equipment, then it will display the list of equipment available to be borrowed.
		View Status	1. User click the menu on View Status, then it will display the list of status of approved equipment for the booking equipment.
3	**Admin Page**	**Update Profile**	1. If the entire required field has been filled and "Update" button is chosen, then the user information will be updated in the database. 2. If the input field has been filled, and the "Cancel" button is chosen, then all the input will be reset to its original without any changes to the information.
		Manage Equipment	1. If the entire required field has been filled and "Update" button is chosen, then the equipment will be updated in the database. 2. If the input field has been filled, and the "Cancel" button is chosen, then all the

			input will be reset to its original without any changes to the equipment details. 3. If the "Delete" button is chosen, then chosen equipment will deleted and leave from the list of equipment as well as the database.
		Add Equipment	1. If the entire required field has been filled and "Add" button is chosen, then the new equipment will be added in the database. 2. If the input field has been filled, and the "Cancel" button is chosen, then all the input will be reset to its original without any changes to the equipment details.
		Search User	1. If the input field is filled with Member ID, then the history list of equipment that been borrowed can be viewed. 2. The admin need to select the equipment been approved to be borrowed from the list, then scan the serial number of the equipment being borrowed. 3. After that, admin need to issue a borrowed slip which can be print when click on "Print" image button.
		Report	1. The report will be displayed based on the equipment availability and borrowed equipment versus the day. 2. There will four option of report to be choosen: Report Of Equipment availability and equipment borrowed. Graph of Equipment availability and

			equipment borrowed.
		Daily Equipment Availability Report	1. Date selection should be correctly entered and the equipment availability for the selected date will be generated. 2. Admin can print these reports on click "Report" image button. 3. Or admin also can download these reports either to Excel or PDF file by click the "Excel" image button or "PDF" image button.
		Daily Equipment Borrowed Report	1. Date selection should be correctly entered and the equipment borrowed for the selected day will be generated. 2. Admin can print these reports on click "Report" image button. 3. Or admin also can download these reports either to Excel or PDF file by click the "Excel" image button or "PDF" image button.
		Daily Equipment Availability Graph	1. Date selection should be correctly entered and the equipment availability for the selected date will be generated. 2. Admin can print these reports on click "Report" image button.
		Daily Equipment Borrowed Graph	1. Date selection should be correctly entered and the equipment borrowed for the selected day will be generated. 2. Admin can print these reports on click "Report" image button.
		Logout	1. If the "Logout Button" is clicked, then the user will be redirected to Homepage.

2.5.1.1 Complimentary Testing

To lower the probability of incorrect transaction, the use of BVA and EP is recommended and test cases for such are designed and shown in the table 2.18.

Table 2.18 Boundary Value Analysis and Equivalence Partitioning for BSIE

Test ID	Test Case	Input	Expected Result	Actual result
1	Valid Member ID and Password with category chosen	"CB11078", "1234", "Admin"	Valid	Valid
2	Invalid Member ID and Valid Password with category chosen	"CB11090", "1234", "Admin"	Invalid	Invalid
3	Valid Member ID with category chosen and Invalid Password	"CB11078", "1453", "Admin"	Invalid	Invalid
4	Invalid Member ID, Password and chosen category	"CB11090", "1453", "Member"	Invalid	Invalid
5	Invalid Member ID, and chosen category with valid Password	"CB11090", "1234", "Member"	Invalid	Invalid
6	Valid Member ID, invalid Password and chosen category	"CB11078", "1453", "Member"	Invalid	Invalid

2.5.1.2 Decision Table

The decision table will be used to test the authentication module to test every possible combination user might use and it shown below. This module is selected as avoid unauthorized access which can bring to critical problem that can lead the third party to get into the system.

Table 2.19 Decision Table for ICT Equipment Booking System

Input Condition				
Member ID	F	T	T	T
Password	-	F	T	T
Category ("Admin")	-	-	F	T
Output Condition				
Login Accepted	F	F	T	T
Member Module	-	-	T	F
Admin Module	-	-	F	T

This decision table has been simplified just enough to cover every possible outcome that comes from the system which initially derived from a few long column and rows of table and the result as shown a positive sign towards these table.

During the testing, there are a lot of error happens as not all the member action is considered during the development, and hence an error presentation code has been developed to address this problem and therefore has addressed all the possible error that might occur based on member interaction with the system. After the correction had been done, the testing result shows that the system is free from error and can be preceded to integration testing.

2.5.2 User Acceptance Testing

The ICT Equipment Booking System was tested by the real user to ensure that their requirement has been satisfied and meet the user expectation. The staff of PTMK had tested the system and this system was passed the user acceptance testing and has fulfill the entire requirement been specified by the user and the result of user acceptance testing is provided on Appendix C.

Result Analysis

The table shown below is the summarizes the test cases that being used in unit testing and the result for each case.

Table 2.20 User Testing Result

Date Tested	06/ 12 /2014
Tester	Developer
Result	100% Pass
Severity of Defect	No
Summary of Defect	No
Comments	The testing shows that the system run effectively with every module in free of error and did not have unexpected crash.

The table shown below is the summarizes the test cases that being used in unit testing and the result for each case.

Table 2.21 User Acceptance Testing Result

Date Tested	06/ 12 /2014
Tester	User (Admin)
Result	100% Pass
Severity of Defect	No
Summary of Defect	No
Comments	The testing shows that the user acceptance test with the system has fulfill the user expectation and been accepted.

3.0 Conclusion

Booking System of ICT Equipment plays an important role for the student and staff of UMP to borrowed equipment for the events. Since the existing system is integrated with UMP E-Community, so there is performance issue which affected the booking module if the UMP E-Community have the performance issue as well. So with that the proposed system will be developed as standalone system which can make the users easier to use and save time. The advantages will be in the proposed system will be make the admin work easier to track the available of equipment by viewing the report rather than checking manually by calculating. Besides that, this system also can avoid frustrated on user for waiting long time to borrow the equipment. Last but not least. It can also avoid the admin work from complex when there's wrong input of serial number.

As a conclusion, I had come out with an implementation of Barcode scanner to overcome the problem statement. This Booking System of ICT Equipment that I have engineered has succeeded in solving PTMK booking system problem and hence has succeeded in achieving its objective.

3.1 Limitation and Constraints

Due to the lack of time, resources, budget, manpower and etc., the Booking System of ICT Equipment will act differently upon different web browser. This is because different web browser have differently HTML and JavaScript performance. However, it doesn't affect the requirement of user since the user wants to open the system using Google Chrome as a platform for their current Booking System of ICT Equipment. Besides that, the limitation of languages. Since some of user may have lack of knowledge and they need to use Malay language selection.

3.2 Advantages

There are many advantages of this system. The advantages of this Booking System for ICT Equipment as below:

iv. Can make the admin work easier to track the available of equipment by viewing the report rather than checking manually by calculating.
v. Can avoid frustrated on user for waiting long time to borrow the equipment.
vi. Can avoid the admin work from complex when there's wrong input of serial number.

3.3 Suggestion for Future Work

When user booking the equipment, they need to wait for the approval from the PTMK. When PTMK approved the booking, then it will be displayed in user page. This can be improved, by sending message to mobile phone on the approval of the bookings. This can improve the flexibility of the system and as the new technology to be operated.

Besides that, language selection module can be integrated into the system to increase the scope of targeted user as certain user cannot read English language.

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APPENDIX A

Data Flow Diagram Level-1

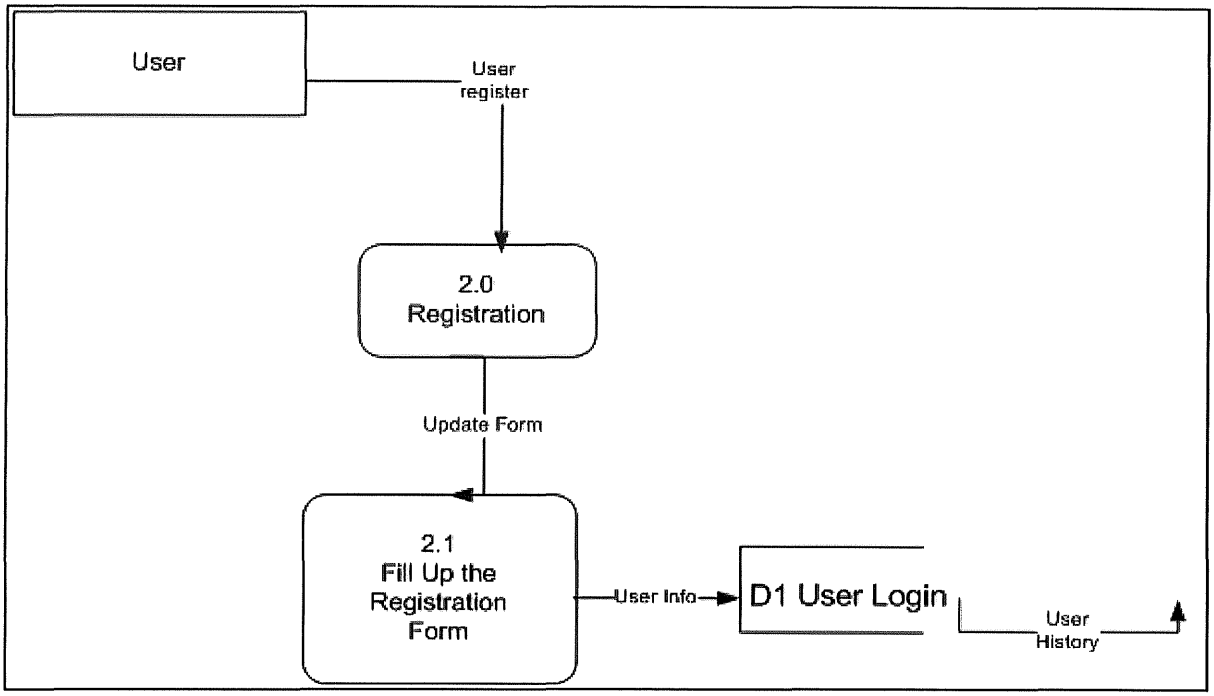

Figure 2.45 Data Flow Diagram For Registration

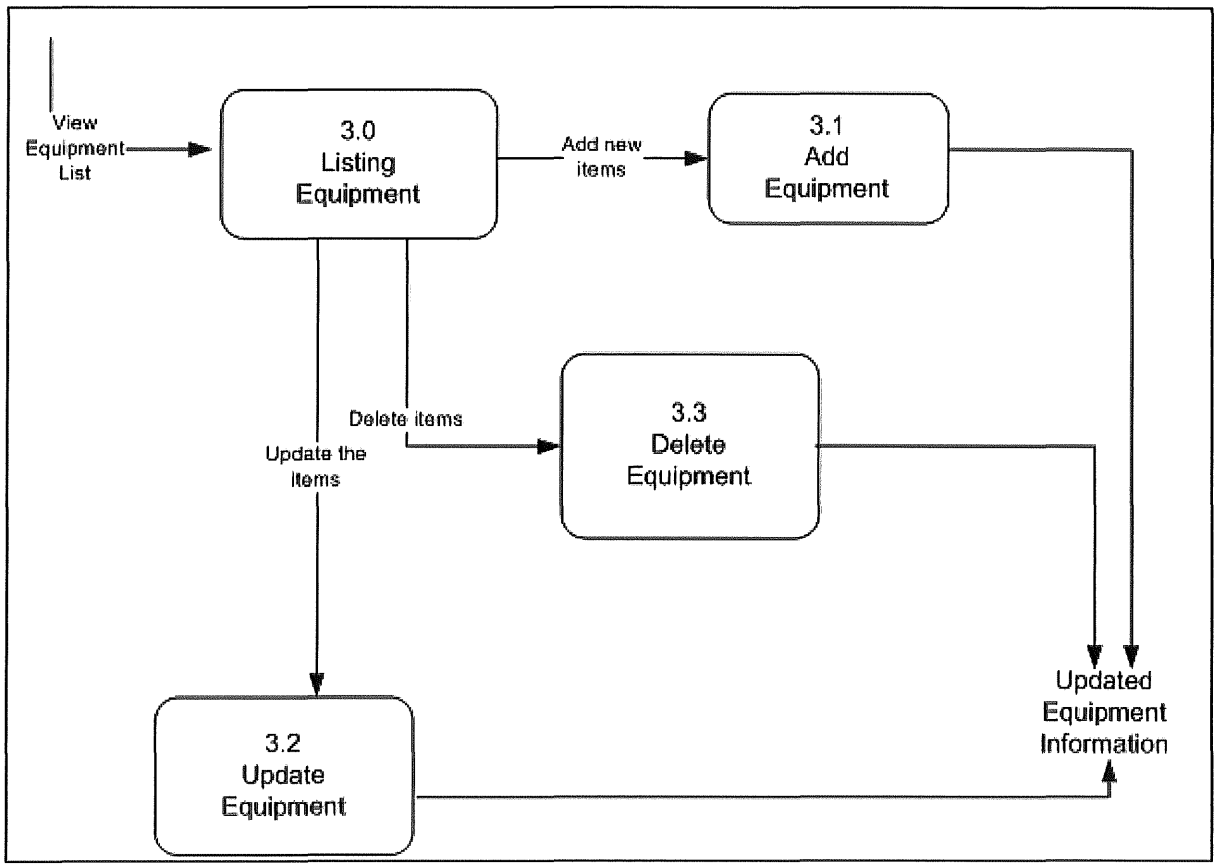

Figure 2.46 Data Flow Diagram For Manage Equipment

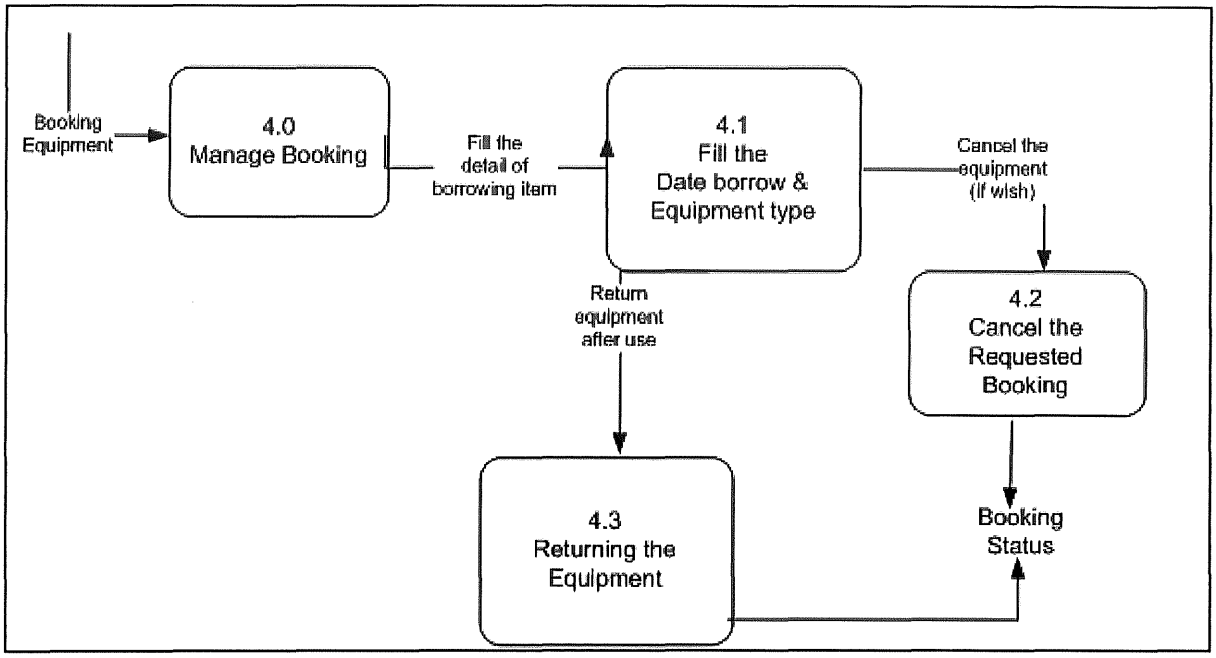

Figure 2.47 Data Flow Diagram For Manage Booking

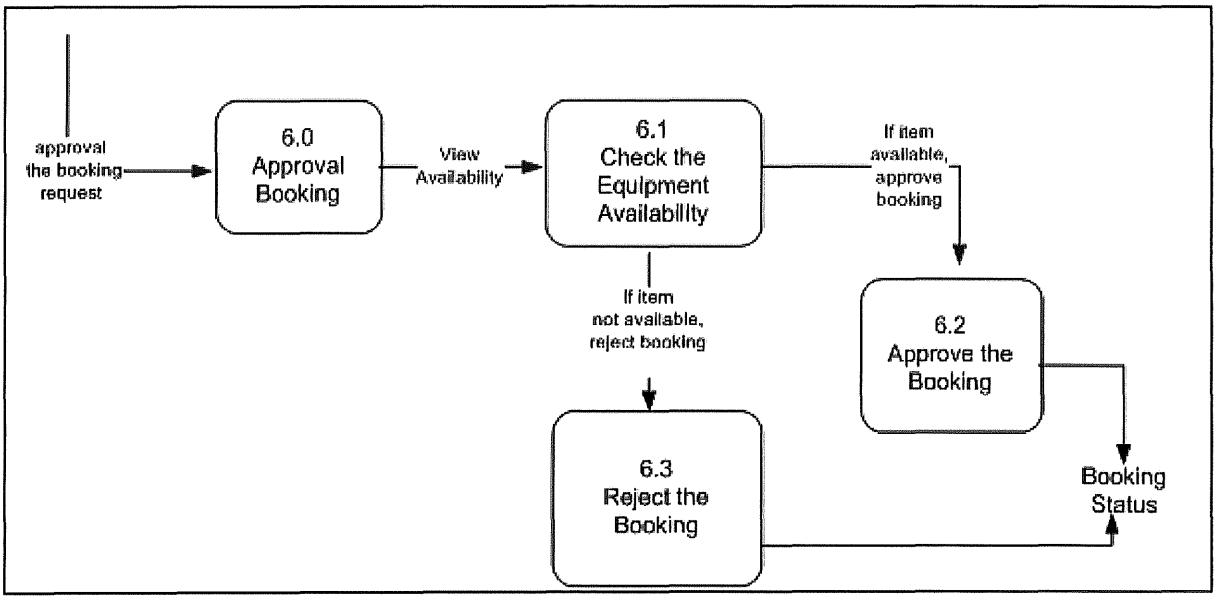

Figure 2.48 Data Flow Diagram For Approval Booking

APPENDIX B

User Testing Form

User Testing Form

Table 2.22 Unit Testing Form for Booking System of ICT Equipment

No	Test Case	Yes	No	Remark
1.	**Login**			
	Login with valid member ID and password	✓		
	Direct user to their respective page according to their roles.	✓		
2.	**View Equipment**			
	User click the menu on View Equipment, then it will display the list of equipment available to be borrowed.	✓		
3.	**Booking**			
	Able to select the item to be borrowed.	✓		
	Able to select the quantity of item to be borrowed.	✓		
	Add the booking item to the table.	✓		
	Delete the unwanted item from the table.	✓		
	Submit the booking to admin by click on "Send Booking".	✓		
4.	**View Status**			
	User click the menu on View Status, then it will display the list of status of approved equipment of equipment been booked.	✓		
5.	**Manage Equipment**			
	Display all item according to the category.	✓		
	Update items in the database.	✓		
	Delete new item from the database.	✓		
	Add new item to the database.	✓		
6.	**Approve Booking**			
	Send user the booking status.	✓		
7.	**Search User**			

	Search the user by using member ID.	✓		
	Scan the equipment serial number for the equipment been booked (if approved).	✓		
	Print the slip and give to user as prove for that equipment been borrowed by them.	✓		
	Update the serial number in database.	✓		
9.	**Generate Report**			
	Search report by Report Of Equipment availability and equipment borrowed or Graph of Equipment availability and equipment borrowed.	✓		
	Select the date. If the date selection correct, then output of report or graph can be seen.	✓		
	Print the report.	✓		
	Download to Excel file or PDF file.	✓		

Comments: Good.
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APPENDIX C

User Acceptance Testing Form

User Acceptance Testing Form Admin

Table 2.23 below shows the testing form that is used by admin to ensure that the system meet in specification in term of redirect function.

Table 2.23User Acceptance Testing for Management Module BSIE

Features		Yes	No	Remark
Management Module				
1.	Redirect to Home Page	✓		
2.	Redirect to Manage Equipment page	✓		
3.	Redirect to Approval Booking page	✓		
4.	Redirect to Search User page	✓		
5.	Redirect to Report page	✓		

Table 2.24 below shows the testing form that is used by admin to ensure that the system meet in specification in term of login function.

Table 2.24 User Acceptance Testing for Login Module BSIE

Features		Yes	No	Remark
Login Module				
1.	Login with valid admin ID and password	✓		
2.	Redirect to Admin Management Page	✓		
3.	Logout	✓		

Table 2.25 below shows the testing form that is used by admin to ensure that the system meet in specification in term of manage equipment function.

Table 2.25 User Acceptance Testing for Manage Equipment Module BSIE

Features		Yes	No	Remark
Manage Equipment Module				
1.	Display item according to the category	✓		

2.	Add item to the Database	✓		
3.	Edit item to the Database	✓		
4.	Delete item from the Database	✓		

Table 2.26 below shows the testing form that is used by admin to ensure that the system meet in specification in term of manage approval booking function.

Table 2.26 User Acceptance Testing for Manage Approval Booking Module BSIE

Features		**Yes**	**No**	**Remark**
Manage Approval Booking Module				
1.	Accept the Booking	✓		
2.	Reject the Booking	✓		

Table 2.27 below shows the testing form that is used by admin to ensure that the system meet in specification in term of manage approval booking function.

Table 2.27 User Acceptance Testing for Search Module BSIE

Features		**Yes**	**No**	**Remark**
Search User Module				
1.	Search user by member ID	✓		
2.	Scan the serial number for the equipment been booked (if approved) for that particular user.	✓		

Table 2.28 below shows the testing form that is used by admin to ensure that the system meet in specification in term of generate report function.

Table 2.28 User Acceptance Testing for Generate Report Module BSIE

Features		**Yes**	**No**	**Remark**
Generate Report Module				
1.	Search by four option:			

	Report of Equipment Availability Report of Equipment Borrowed Graph of Equipment Availability Graph of Equipment Borrowed	/ / / /		
2.	Print Report	/		
3.	Download report to Excel file or PDF file.	/		

Comments: Good

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User Acceptance Testing Form User

Table 2.29 below shows the testing form that is used by user to ensure that the system meet in specification in term system function.

Table 2.29 User Acceptance Testing for User Module BSIE

Features		**Yes**	**No**	**Remark**
1.	View the Equipment available	✓		
2.	Select the item and quantity and add booking	✓		
3.	Delete the booking from the list	✓		
4.	Send the booking to admin for approve	✓		
5.	View the status of Booking	✓		

Table 2.30 below shows the testing form that is used by user to ensure that the system meet in specification in term of login function.

Table 2.30 User Acceptance Testing for User Login Module BSIE

Features		**Yes**	**No**	**Remark**
Login Module				
1.	Login with valid member ID and password	✓		
2.	Redirect to User Page	✓		
3.	Logout	✓		

Comments: Good .....

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APPENDIX D

Gantt Chart

	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Requirement Planning**	**25 days**	**Thu 20/02/14**	**Wed 26/03/14**	
2		Meeting with Supervisor	1 day	Thu 20/02/14	Thu 20/02/14	
3		Meeting with Customer	1 day	Fri 21/02/14	Fri 21/02/14	2
4		Discussion and choose title with Supervisor	2 days	Mon 24/02/14	Tue 25/02/14	3
5		Make Draft	5 days	Wed 26/02/14	Tue 04/03/14	4
6		Meeting with Supervisor	1 day	Wed 05/03/14	Wed 05/03/14	5
7		Meeting with Customer	1 day	Thu 06/03/14	Thu 06/03/14	6
8		Identifying the requirement	3 days	Fri 07/03/14	Tue 11/03/14	7
9		Define Problem Statement, Objective	2 days	Wed 12/03/14	Thu 13/03/14	8
10		Review Existing System	4 days	Fri 14/03/14	Wed 19/03/14	9
11		submission of Part1	0 days	Wed 19/03/14	Wed 19/03/14	10
12		Correction Part1	5 days	Thu 20/03/14	Wed 26/03/14	11
13		Re-submission of Part1	0 days	Wed 26/03/14	Wed 26/03/14	12
14		**User Design**	**40 days**	**Thu 27/03/14**	**Wed 21/05/14**	**13;1**
15		Meting with Customer	2 days	Thu 27/03/14	Fri 28/03/14	
16		Ploting UML diagram	19 days	Mon 31/03/14	Thu 24/04/14	15
17		Designing the interface and database	8 days	Fri 25/04/14	Tue 06/05/14	16
18		Compile SRS	4 days	Wed 07/05/14	Mon 12/05/14	17
19		Submission of Part2 (SRS)	0 days	Mon 12/05/14	Mon 12/05/14	
20		Correction Part2	7 days	Tue 13/05/14	Wed 21/05/14	18
21		Complete Report Submission	0 days	Tue 20/05/14	Tue 20/05/14	
22		Presentation PSM1	0 days	Wed 21/05/14	Wed 21/05/14	20
23		**Construction**	**90 days**	**Thu 17/04/14**	**Wed 20/08/14**	
24		Create Database in SQL	3 days	Thu 17/04/14	Mon 21/04/14	
25		Develop the system and write the code	47 days	Tue 22/04/14	Wed 25/06/14	24
26		Configure with the hardware	10 days	Thu 26/06/14	Wed 09/07/14	25
27		Testing Process (Unit, Integration, System)	10 days	Thu 10/07/14	Wed 23/07/14	26
28		Determine Error and Fix	20 days	Thu 24/07/14	Wed 20/08/14	27
29		**Cutover**	**36 days**	**Thu 21/08/14**	**Fri 10/10/14**	23
30		Evaluation	15 days	Thu 21/08/14	Wed 10/09/14	
31		Documentation (Testing, User Manual)	20 days	Thu 11/09/14	Wed 08/10/14	30
32		Report Submission	0 days	Thu 09/10/14	Thu 09/10/14	31
33		PSM2 Presentation	0 days	Fri 10/10/14	Fri 10/10/14	32

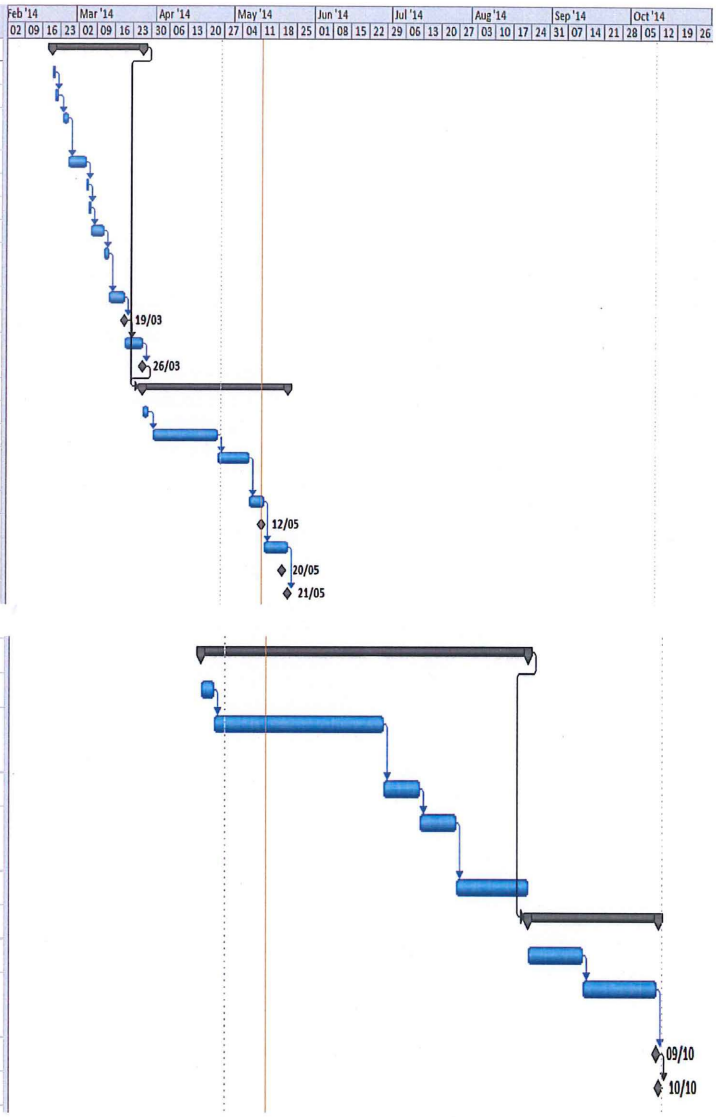

Figure 2.49 Gantt Chart of Rapid Application Development Methodology

APPENDIX E

Turnitin Report

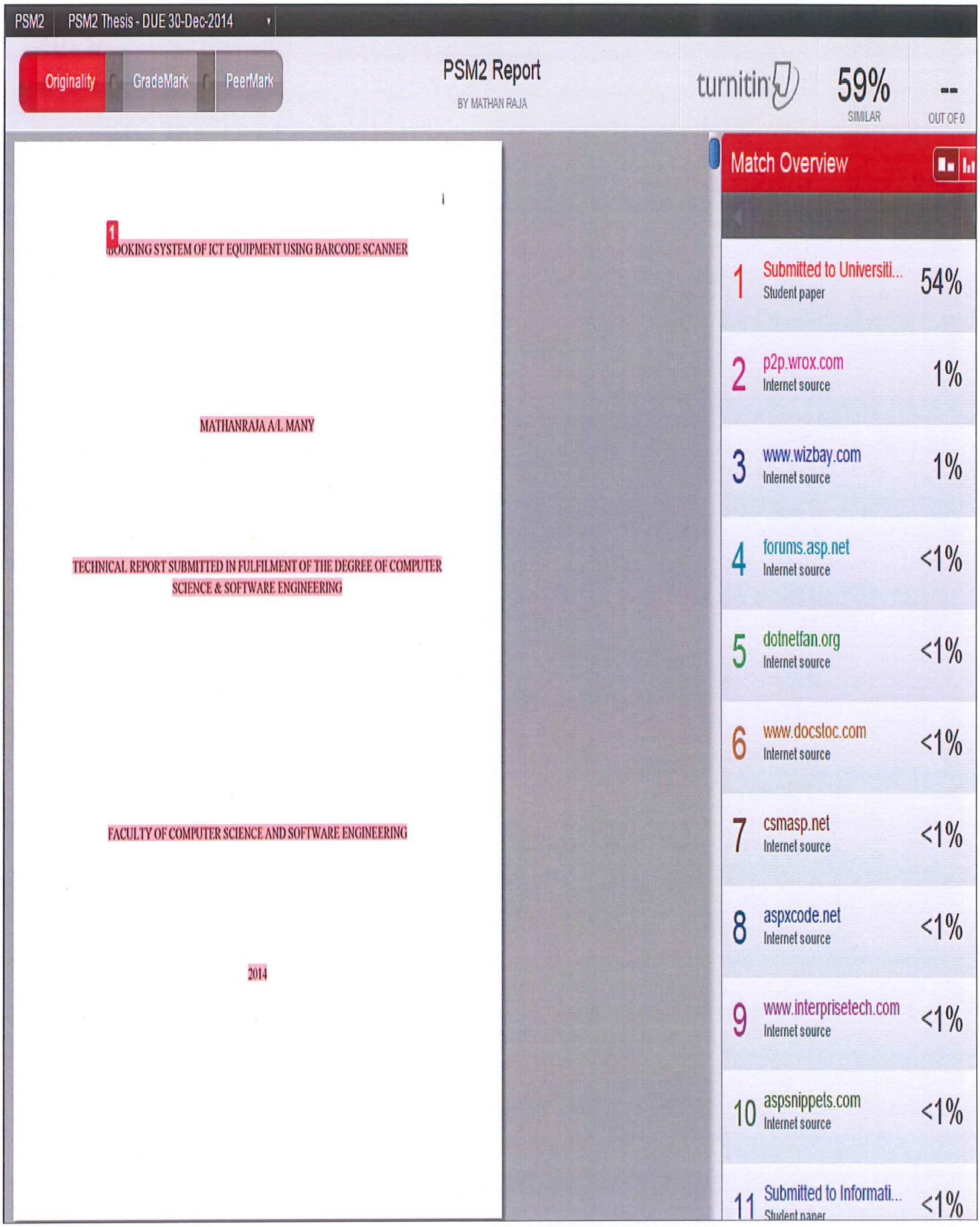

Figure 2.50 Turnitin Report