Study Room Online Reservation in UUM library

A thesis submitted to the College of Arts and Sciences in Partial in
Fulfillment of the requirement for the degree Master of Science
(Information Technology)
Universiti Utara Malaysia
April 2009

by

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ABSTRACT

This study introduces the online room reservation system that is developed to facilitate the development of shared virtual environments. The main objective of this project is to assist the students in gaining an easier and faster way of reservation, providing them with more selections, and real time information. The library will be able to offer students the precise estimation of rooms schedule in the service management. This system is to be implemented by integrating online technology with web services.

ACKNOWLEDGMENTS

With a deep sense of gratitude, I wish to express my sincere thanks to both of my supervisors, Associate Professor Dr. Wan Rozaini Sheik Osman and Mr. Harryizman Harun for their continuous support, patience, motivation, enthusiasm, and immense knowledge. Their guidance had continuously helped while conducting and writing this study. I could not have imagined having a better advisors and mentors for my postgraduate study.

I would also like to give my sincere thanks to: Dr. Asmat (President of University), Dr. Sarkawt (Dean of Faculty), Mr. Majid (Head of the Department), and Mr. Nawzat from Duhok University for their constant encouragement and for offering me that opportunity to study at UUM.

My sincere gratitude to my colleagues in the College of Arts and Science to: Bayar, Zeravan, Shivan, Ayman, Shady, Aziz, and Alaa for their help.

My special thanks and gratitude to my parents in their support and guidance that pave a solid ground, by teaching me the value of hard work and the meaning of success. I would like to share this happy moment with my brother and sisters; they rendered me enormous support during the whole tenure of my research. Their encouragement and support had given me the motivation to do my best in my own work.

Last but not the least; I would like to thank all who concern and stand by my side to accomplish my study.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

Web is a specified set of communication protocols to standardize the way that wireless devices, such as cellular telephones and radio transceivers, can be used in accessing Internet portrayed through E-mail, World Wide Web, Newsgroups, and Instant Messaging. For decades, accessing Internet has been possible in the past. However, different manufacturers have used different technologies. It is highly expected that in the future that devices and service systems using Web will be able to interoperate. Before the introduction to Web, service providers had extremely limited opportunities to offer interactive data services. That is to say, these services that refer to a collection of facts usually are collected as the result of experiences, observations, experiments, processes within a computer system, or a set of premises. As a result, these useful data are considered as a responsiveness offer to the users, to the individuals or to the systems that interact with them.

Web application development is carried out by expert programmers, who are familiar with the coding needed for creating Web pages, using tools that include HTML, XML, Flash, PHP, JSP, ASP, and others. Each of these tools has a definite function and creates diverse results. Programmers must have the ability to make programs in one or more of these languages. Web application development can be viewed from different perspectives depending on the needs of the web pages.

The World Wide Web is not a firmly controlled environment. People side the web with just one or a few of a large handful of methods, mostly browsers. Each browser is different and displays Web pages in different ways. Some are friendlier to certain Web languages than others which can make web application development as greatly specialized task (White, 2009).

Web applications use HTTP as a communication medium. It uses techniques such as cookies or hidden fields in a web page to save the state of a session. The application pages are a combination of HTML tags and code controls.

1- Control codes: it is used to personalize web pages.

2- HTML tags are used to format the output of the page.

Using a Web application has numerous advantages over traditional systems: (Byrd, 2002).

- Can structure the program to match the problem.

- Gracefully handles unusual navigational patterns.

- Can use standard development tools, including debuggers.

- Can port legacy software to the Web more readily.

- Provides details that simplify the understanding of program structure and Web navigation.

- Can store state on the client's browser.

- Can take advantage of standard automatic program transformations.

There are a number of network services and applications that are the foundations of the concept of Web, and are already to some extent in education. These technologies are not really as such, but services using the "building blocks" of technologies and open standards as the basis for the Internet and the Web. This includes blogs, the wikis, sharing of multimedia services, content group, podcasting and content tagging services. Many of these Web applications are relatively mature technology, has in some years ahead to progress, even if the new features and functions will be added periodically. It is worth noting that many of these new technologies are concatenations by the already existing services the existing services (Anderson, 2007).

1.2: University Utara Malaysia

In UUM the Sultanah Bahiyah Library in offers a huge collection of physical and electronic materials that facilitate the search and retrieval of educational information. It is expected that students will learn and acquire information skills for smarter access to relevant information. The sources of skills will be from the library staff and as well as from the library website. The following are the collections that the UUM library provides:

I. Online Public Access Catalog (OPAC)

This facility is extensively used as a search tool in the library because of that the information about all items in library collection is available via OPAC. For that reason, students can make use of OPAC to verify available titles. Author search, title search, call and number search are the available search strategies whit in this facility. The students can access important points such as call numbers, item status and location.

II. Online Collections

The library provides online collections such as:

a) Subscribe Databases; which in turn offers

- Public Computers in the Library.

- Document Printing Service.

- Remote Access.

- NSTP ONLINE. which offers online newspapers is New Straits Times Press.

b) Library Homepage; this is the library homepage for UUM and it can be accessed via this link www.lib.uum.edu.my. The homepage gives the linkage to the library online resources including online databases, digital collections and online public access catalog.

c) Internet in the library the Internet is widely used by students and only for the search of academic materials is permitted at the Library.

III. Collections at Children's Corner

The library as well provides books and magazines appropriate for children. On the other hand, some of these collections are needed by the university students for their academic purposes, such as education and also for reference.

IV. Close Access Collection

This is also known as reserve collection and it contains materials that were suggested by faculty members. Burrowing period is only 2 hours since these materials are normally used as basic text and subject core references.

V. Entrepreneurship and Small Business Collection

This collection includes books, reports and materials that are related to entrepreneurship (free enterprise) and small business.

VI. Fiction

This collection is about novels, short stories and popular titles. The students may perhaps borrow fiction books for their free time reading.

VII. General collection

This collection all items **are available on loan and it consists of text books, conference proceedings, acts, reports and others** that support the curriculum of the University.

VIII. Law collection

This collection contains law associated resources such as law reports, journals, digests and legal forms.

IX. **Media collection**

This type of collection supports the access and provisions of audiovisual (av) materials. The av materials includes such as kits, CD - ROMs, videos, transparencies, diskettes and as well as books accompanied by av materials.

X. **Northern triangle collection**

This collection includes books, reports and special publications related to the issues to Northern Malaysia, Northern Sumatera and Southern Thailand.

XI. **Reference collection**

This collection covers up materials such as dictionaries, encyclopedias, annual reports, directories, handbooks, almanacs, atlases, past year exam papers and statistical reports.

XII. **Special collections**

This collection encompasses resources such theses, research reports, university archives, maps, newspapers, university calendars, company annual reports, acts, government circulars, and standards.

XIII. **Tuan Mahathir's collection**

Tuan Mahathir's Collection is another special collection specifically developed to provide information and publications about the Honorary Tun. This is both printed and audiovisual format of Tuan Mahathir's books, articles, photos, speeches and proceedings.

This study will introduce a reservation system as alternative method for the manual reservation system in the library system. In addition, the Web reservation system will

enable students and staffs to obtain information from Internet as a tool of assistance in making an informed choice about the available room and its vacancy and the exact time for being booked. In other words, this application will help students to perform their reservations easily, faster and more convenient way. The increase of students with a limited number of rooms will necessitate the need of an effective and efficient web-based to avoid the drawbacks of the system and as well it will provide good service for students all the time.

In addition to that the web-based system is available 24 hours a day, at any time, anywhere, for the students whenever they would like to make a reservation for the Carrel rooms in UUM library.

1.3: Problem Statement

Students face problem when they come to study at library. It has been found that although rooms in library have been booked, however, many students can not use the room because the room is unavailable.

One of the problems is that the students of UUM (international, local) face problem in booking the Carrel rooms in the library. The library uses traditional recording method (Manual System) through using the Log Book to record data about students, rooms, time, and keys .These problem is also experienced if students interact with staff. For example student may want to know information about Carrel rooms from the library clerks so they will probably interact with one of the clerks to provide them with the require information. What is the nature of these problems then? The real problem is that UUM

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library does not have computerized registration system that tracks down all the activities associated with the status of student as well as the Carrel rooms. For example, how many students booked for Carrel rooms? How many Carrel rooms are available? The real problems experienced using the manual booking system are the following:

1- Slow processing when entering data into log books or the manual system

2- Updating of the data is difficult

3- Information retrieval is too slow and time consuming

4- The manual system is inefficient

Thus this study will propose online system that provides many main services as:

1. Reservation service: the students can reserve Carrel rooms in a library and select type of time available which is shown by the system.

2. Delete service: the students can delete his/her reservation.

3. Update service: the students can update his/her reservation if the new room is available.

4. Change password service: the students can change his/her password.

1.4: Objective

1- To identify the requirements of online student room reservation application.

2- To design an online student room reservation application in library.

3- To develop and test prototype of the system.

1.5: Research Question

In this study, the raised research questions are:

- What are the currently process of getting information about Carrel Rooms?

- What will be the user requirements for the new proposed reservation system?

1.6: Purpose of the study

The purpose of this research project is make the library of UUM to offer service to facilitate searching and reservation of the study rooms for students in the library in UUM, which will be in addition to the service of the University Library.

Another reason is that the students will know everything about the rooms of study and the time available to reserve.

1.7: Research Scope

This research focus to identify requirements of Carrel study rooms of Sultanah Bahiyah Library in UUM. Design the reservation of Carrel rooms online by using (JSP). Also will apply and using this online reservation system in UUM library to add more service to library services to notify the university how many students using this service.

1.8: Research Significant

This research intends to propose a Web based system by which students will browse in order to book Carrel rooms in UUM library. This research will also engage assessments on the obtainable web technologies and tools that have already been developed or are being currently under development in both academic and industry sections. According to the reviews and research, a prototype will be developed for a Web based booking system which will help the facilities and Services department in the library. In addition this procedure wills facilities the student.

Finally, this research wills facilities the students and the librarians to in their other.

1.9: Project Organization

The report of this study consists of five chapters:

- **Chapter One:** presents a review on the introductions, problem statements, objectives, Research question, Purpose of the Study, Research Scope, and Research Significance of this Research.

- **Chapter Two:** presents a review on the literature of web based systems in general and its characteristics, using the internet in the reservation, example about some university using online reservation system for booking study rooms.

- **Chapter Three:** focuses on the methodology used in implementing this project in order to achieve the study objectives, while chapter four and five highlight the project findings.

- **Chapter Four:** discusses the findings of this study based on the results of implementing the proposed system using the methodology described in the previous chapter.

- **Chapter Five:** presents the evaluation and the result of this system by used the test case for testing.

- **Chapter Six:** emphasizes on the project limitations, future work and concludes the findings of this project.

1.10: Summary

This chapter presents the context of the importance of study rooms' reservation systems online library. It describes the problem of this study and the proposed solution to these problems. The objective of this study is to develop a booking system for a library to enable students to book rooms in the UUM library. This system will also provide additional extensive information to help students to use the system efficiently at the same time it will give students confidence in using new Internet technologies.

CHAPTER TWO

LITERATURE REVIEW

2.1: Introduction

This section reviews the literature relating with this study or research project. Many studies have been undertaken of the use of the web applications in schools, universities, hospitals, banking, government agencies, airport and many more areas. Literature in this area can be based on research, by observation, and survey.

Also, in this chapter will attempt to review the current literature and will identify research that has already being applied in this area. This will be done by reviewing the projects and their results from the research studies of Web-based applications, and reviews of specific information that can then help to develop application. There are general overviews of information on web technology which is similar to work that will be done to create an efficient online study room reservation system for libraries.

Normally students during the course of their studies will study in different ways, for example sometimes individual, sometimes as apart of a group. When students visit the library they will usually find different types of study areas such as large tables,

individual desks, individual study rooms, group study rooms, and IT workstations. It is possible that some the above mentioned rooms can be reserved beforehand. To make sure that the library is a quiet and pleasant to study, then it is required from the students to be quiet and at the same considerate to other library users at all times (Ko, 2006). According to Maxwell (2006) who commented a system called Room reserve that has made the handling of the room reservation system almost effortless. For example in her system the students can make their own reservation requests on web page day or night, which has freed up time that student and staff would have spent handling these reservations manually. Students and staff can see what rooms are available instantly when they pick dates for meetings and programs. By now that each department is responsible for handling their own reservations with room reservation system that have virtually eliminated booking problems and potential conflicts.

According to Czerny (2008)   a survey that the LibQUAL library conducted in the spring of 2007 indicated that two major concerns were expressed and they were as follows:

First, a number of students remarked that the library is required to offer extra group study space, especially for students who are working on projects or presentations.

 The second concern came from students who sought for extra areas chosen as quiet space for individual study. In this library it is necessary that the library needs to work with the available space, the optimal usage of the available space has been sought after in order to meet the demands of both types of students that come to the library building. Therefore the LibQUAL library has begun two pilot programs.

First, is about the open seating areas designated as Group Study Area. The second pilot program is an interest for this project since it is about reservation system for the Group

Study Rooms .Reservations must be made by registered Kutztown University (KU) students. The rooms can be reserved in half hour increases for up to two hours. After selecting a room, the user can then juts go to the Access Services Desk in which the staff and students will be pleased to help. If user needs one of the rooms, and for example it is not reserved, then he/she is free to use it.

2.2: Web Server

Web Server offer the pre-processing of all data from various sources and generate HTML page. The developers of the application for the development of the pages have two options.

1 - Code - based application: pages can be created with the help certain technique, such as CGI and Java Servlet, HTML pages generated by a fully executable program are doing.

2 - Can apply this template-based page. HTML tags and language that are embedded with the expanded control code, for example, PHP and Java Server Pages (JSP).

The Web applications in the following components in a rich environment which contains the following parts (Ziemer, 2002):

- Web browser

- Web Server

- Application Server

- Database

- Distributed Objects (Enterprise Java Beans)
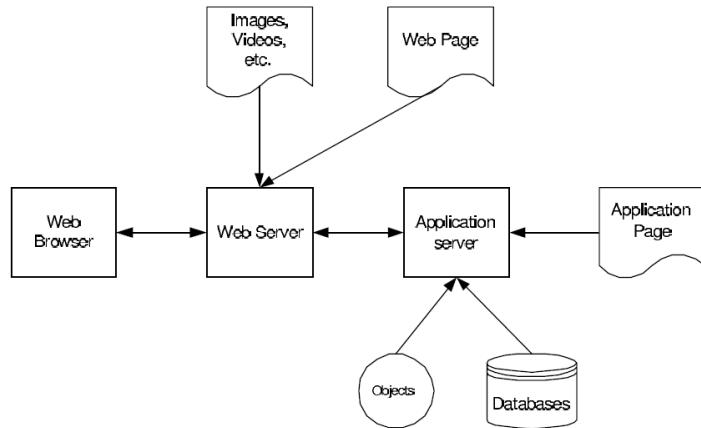
Figure 2.1: Physical View of a Web Application Source (Ziemer, 2002)

The Web Services can be defined as such applications enabling the possibility of creating functionalities through Internet like publishing, locating, as well as invoking (Kurt & Naiboglu, 2005). Moreover, typical examples can be shown in:

• Getting stock price information.

• Obtaining weather reports.

• Making flight reservations.

Using a Web-based reservation service were the possibilities to use it anytime and anywhere as well as to have an alternative to the more "traditional" ways of making room reservation. And it is part of the introduction of new technology possibilities in business and in various industries. Web-based services appear to be an obvious choice for booking study rooms as the students are on the move, which is the first criterion for Web application services to be relevant. The library in university, which is one of the

largest and most rapidly expanding places in the world and one of the uses of ICT in its operations, will no doubt be an important place for Web services.

On the other hand, show an interest in getting to use web services if and when they become available. The web service support is available, too, making the booking for study rooms in a library as easy as possible.

Web enabled reservations with library provide true students benefit, one of the requirements in the specification was that the person reserving a study room. The students making or canceling a reservation via a system feels certain that all the details are correct.

2.3: Room Reservation System

Room Reservation System is new electronic reservation to replace the existing paper-based approach. It aims to support the existing reservation policies, and to enforce and overcome the limitations and loopholes in the current paper-based interface (Liao, Shaikh, and Tang, n.d).

Additional benefits for using Room Reservation System:

1. Logical & graphical navigation to search for room and date information

2. Accessibility via the web, beyond the physical building boundary

3. Real-time display of room occupancy

4. Longer advance reservation schedule, beyond the existing 2 weeks period

2.4: Web based Reservation for study rooms Facilities

2.4.1: University of Waterloo

This university library has online booking system that offers online booking service for both group and single study rooms in the Dana Porter and Davis Centre Libraries. The booking can be done through the employment of user name and password (McCulloch, 2008).

Generally speaking every system has its own limits and every institutional organization, educational, business, government etc. Here the University of Waterloo has the following limits for its online study room reservation system:

- One booking per day for up to 3 hours to a maximum of 10 hours/week. Bookings can be made up to a week in advance for most rooms.
- If you haven't arrived to your booking after 15 minutes, the room will be available for others.
- Rooms must be left in good condition or booking privileges could be revoked.

2.4.2: Santa Fe College

The Santa Fe Community College offers the reservation for three types of study rooms, namely, small study rooms, group study rooms and large group study rooms. These services are exclusively for use by SFC students, faculty, and staff. The group study

rooms might only be reserved by Santa Fe College students, faculty, and staff. These rooms may be reserved by phone call or just stopping by the reference desk, or filling out the online form. However, university suggests the that the best way to reserve a room is through online by given the names of all members of the group of students when making the reservation(Santa Fe College,2009).

2.4.3: University of Carnegie Mellon

Just like other universities, this university as well provides online Student Room Reservation System. Students will be able to describe the type of the room they want to reserve and after choosing the type of a room that suite their needs, then they will make direct online reservation from this link: http://srrs.library.cmu.edu/ (Carnegie Mellon, 2008).

The guidelines for booking online study rooms at the University of Carnegie Mellon are as follows:

1. Reservations must be made online at http://srrs.library.cmu.edu/

2. Rooms may be reserved up to one week in advance.

3. No recurring reservations (same time, same day each week) may be scheduled.

4. Daily schedule - indicating both reserved and open times - will be printed once in the morning & posted outside the first study room. Online reservations take precedence over those written on the paper sheet.

5. In order to ensure that a room is still available, you must check online. If time slot is still open, you can reserve a room at that time.

6. Open time slots may be used by walk-in groups - i.e. those without a prior reservation - but walk-in groups must reserve the room online.

7. Reservations will be held for 15 minutes after the initial reserved time. After that time, reserved rooms become available for walk-in groups. After a walk-in group reserves the room, they have the right to stay in the room - even if the initially scheduled group shows up.

8. All group study rooms must be vacated 15 minutes before the Library's closing time.

9. Rooms must be left clean and in order = all trash placed in wastebaskets and furniture returned to original location, as illustrated in figure 2.2.

< **Friday, January 09, 2009** >
Today

	Red Room - #A13	Blue Room - #A11	Green Room - #A12
12:00am-12:30am			
12:30am-1:00am			
1:00am-1:30am			
1:30am-2:00am			
2:00am-2:30am			
2:30am-3:00am			
3:00am-3:30am			
3:30am-4:00am			
4:00am-4:30am			
4:30am-5:00am			
5:00am-5:30am			
5:30am-6:00am			
6:00am-6:30am			
6:30am-7:00am			
7:00am-7:30am			
7:30am-8:00am			
8:00am-8:30am			
8:30am-9:00am			
9:00am-9:30am			
9:30am-10:00am			
10:00am-10:30am			
10:30am-11:00am			
11:00am-11:30am			
11:30am-12:00pm			
12:00pm-12:30pm			
12:30pm-1:00pm			
1:00pm-1:30pm			

Figure 2.2: Student Room Reservation System

(University of Carnegie Mellon ,2008)

2.4.4: University of Washington

The University of Washington makes available Rooms and Equipment for Online Reservation for students to book and later use these facilities. The students can also reserve study rooms, and including inside the room there are other services such as the Digital Audio Workstation (DAW), Digital Presentation Studio (DPS), and Digital Collaboration Studio (DCS), through an online reservation system. To make online reservation it will need only to have UW NetID.

The guidelines for reservation in this university are as follows (University of Washington, 2008):

1. Check the Study Rooms web page at

   http://www.lib.washington.edu/services/facilities/studyRooms/

2. Click on the link for the type of room you would like to reserve (study room, DAW, DPS, or DCS); if that link leads to a further list of choices, click on the appropriate link to see the reservation record for a set of rooms.

3. Click on the blue MAKE A RESERVATION button in the middle of the page.

4. Log in with your UW NetID

5. From the pull-down menu, choose the date and time (indicate AM or PM) you want your reservation to BEGIN.

6. Then choose the date and time (indicate AM or PM) you want your reservation to END.

7. If you do not see a second pull-down menu with End times, click the SUBMIT button and then choose an End time.

8. If there is more than one available room, you   will also need to select a specific room to book. Note: the maximum reservation is 2 hours.

9. Your room is now reserved. You can double-check your reservation by logging in to your library record at http://catalog.lib.washington.edu/patroninfo

2.4.5: Umea University

Jonas, Daniel, Jan, and Per (2005) said that "The management and booking of rooms in large buildings is a tedious and complicated task." The mixture of deferent rooms with deferent sizes and equipment plus the possibility to choose between different dates and times is the main reason why a good booking system is required. To make this task as easy as possible, for example the requirement of a system that support reservation of rooms in conference buildings, or universities, or other large buildings is very important, since the systems is expected to solve the above mentioned problems .

Jonas et al. (2005), their article shows how a problematical human task like reservations can be solved by means of using a database management system as the key tool in the development. Their prototype shows an example how such a system could look like, as it is depicted in figure 2.3.
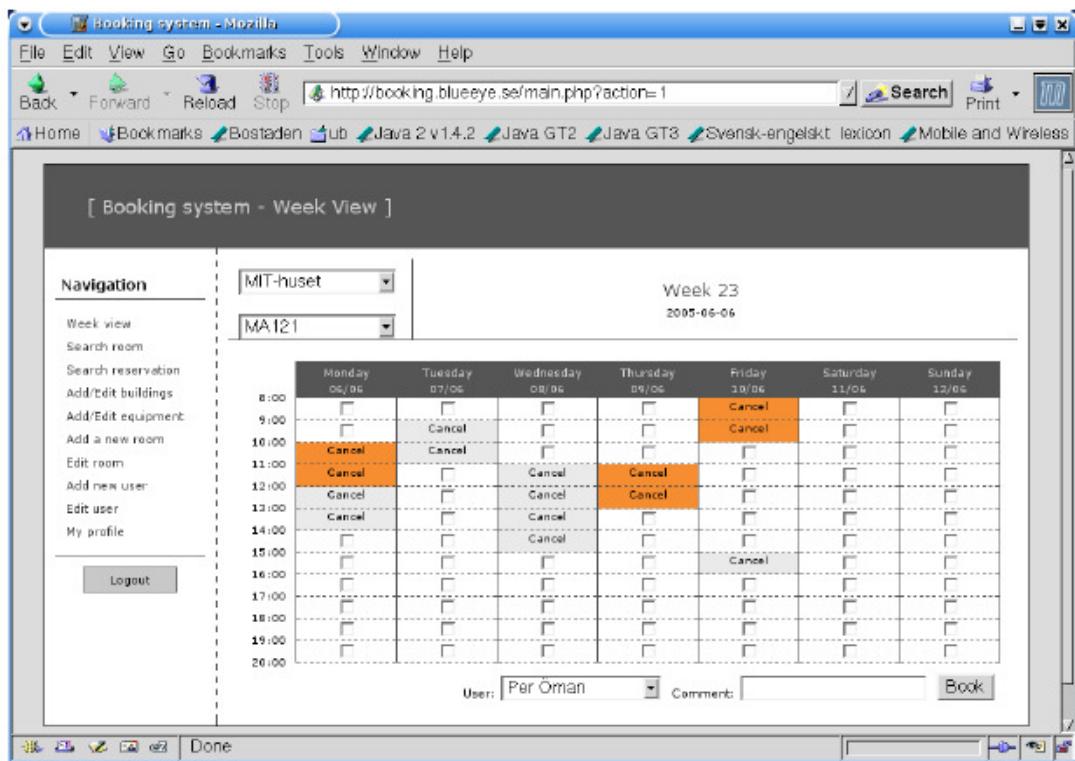
Figure 2.3: Room Booking System

(Sidborn, Wiberg, Öhman, and Öhman, 2005)

2.4.6: Utah State University

The Utah state University has online system for reservation. The students can make booking for study rooms (only group study room), and due to popularity of rooms. The university has instituted some rules to maximize availability (Utah State University, n.d.).

The rules are:

1. Reservations may be made for only two hours.

2. Reservation for longer than two hours will be DELETED.

3. Because of extremely high demand for group study rooms, each person may make only one reservation per day.

4. Group Study Rooms are intended for use by groups, i.e., two or more people. Space for individual study is available throughout the library.

Figure 2.4: booking group study room

(Utah State University,n.d)

2.4.7: Birmingham City University

The Birmingham City University library offers the service of booking a study room online. The students will make the study room reservation through the utilization of Library Catalogue. The students can make reservation in three ways (Birmingham City University, n.d.):

• Reservation from the PCs on each floor of the library;

- Reservation that is accessible from any Internet PC on- or off-campus via the Library Web Page (http://library.bcu.ac.uk/);

- Another reservation that is also accessible from any Internet PC from this link http://bitalis.bcu.ac.uk/TalisPrism/index.jsp which is direct link to the library catalogue.

   http://newton.bcu.ac.uk/TalisPrism/?newsession=true&rid=381494816

2.4.8: University of California at Berkeley

Haas is the school of business at the University of California, Berkeley. This school has an online reservation system for reserving equipment such as laptops, digital cameras, classrooms, or even keys.

The students, faculty and staff of Haas schools of business can access the online system. Based on the group membership the accessibility is different, for example faculty or staff member. The accessibility also depends on the type of user, for example free or paid account. As usual user needs to possess Calnet ID and passphrase to use the system. The users of this system have got two option ways of making an online reservation, namely Quick Reservations and Browsing. In here how to reserve a group study room through Quick Reservations is shown as follows (Haas School of business, 2004):

- Select Group Study Room from the pull down menu.

- Choose the Start Time and End Time.

- Choose the Date.

- Fill full E-mail address and Phone Extension are shown correctly. Errors can be corrected here.

- Click the make Quick Reservations button.
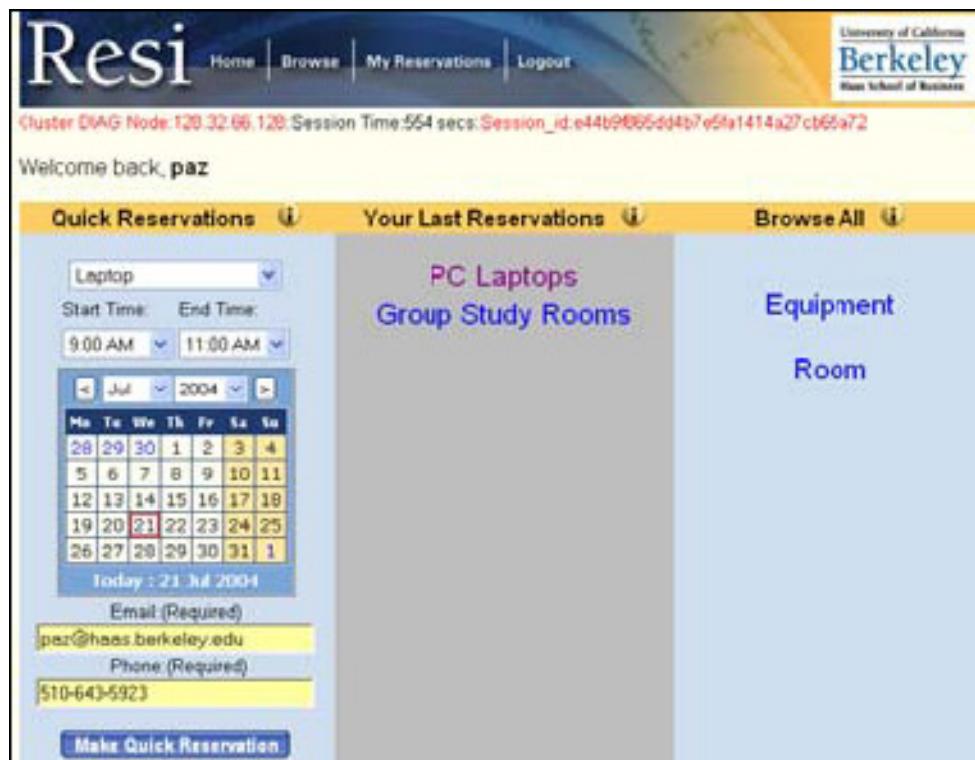
Figure 2.5: booking group study room Hass School

(Haas School of business, 2004)

2.4.9: University of Gloucestershire

The students may use OPAC different terminals of learning centers, on any network PC on campus or to their computer through the university website. OPAC e-learning is seen by clicking on the menu at the top of any of the university website (Gloucestershire LIS, 2009).

Using OPAC, the students can accomplish the following tasks:

1. Book equipment and study rooms

2. Search for resources in the Learning Centers

3. Access e-Books and e-journals

4. Book items

5. Check the list of items they have previously borrowed

2.4.10: University of Texas

The Fine Arts Library, at the University of Texas has three rooms and they are available for library sessions, classes, and meetings, and one room available for video/DVD viewing. These rooms are for the exclusive use of the University of Texas faculty, staff, and students with first choice given to those affiliated with the University of Texas Libraries and the College of Fine Arts (Arts Library, 2008).

When reserving rooms, the following steps should be taken:

1. Room reservation must be made by filling out the appropriate web form;

2. Or by emailing falreservations@lists.cc.utexas.edu.

3. A reservation is a request until it is confirmed by the room scheduler.

4. To check the availability of a room please go to
   http://www.lib.utexas.edu/fal/falreservations.html and click on the "Check For
   Room Availability" link.

The room reservation can be made in either for one-time event or for an entire semester

To guarantee optimal utilization of available spaces, the library has the right to reassign or even cancel reservations. However, notices will be given about the reassignment as much as possible.

2.4.11: Owen Graduate School of Management

Vanderbilt Owen School of management is internationally renowned for its challenging academics, spirit of teamwork and innovative research environment.

This school is located in Nashville, USA, has study room reservation system. Students can reserve a study room online and from anywhere (Vanderbilt Owen School, 2009). The steps taken

1. To begin, a user should go to https://community.owen.vanderbilt.edu/rooms/

2. Select a room to reserve.

3. Click the desired time slot.

4. On the Reservations Details page, users can update the start and end times to reflect the time they wish to reserve the room. Verification of that the correct room is a must.

5. Click "Save and Close" to finish your reservation.

Only 10 users can be logged in at one time and this is considered as a weakness for this system. If users are more than 10 then some of them will not be unable to access the room reservation system. In that case they should wait around 5-10 minutes before trying again.

2.4.12: University of Wisconsin-Madison

The University of Wisconsin System at Madison offers study rooms in five libraries with in the university. And in turn each library has a number of study rooms. These study rooms can be reserved online. Plus that the students can view from the map of the five libraries online. The following points summarize the policy of room reservation in this university (University of Wisconsin, 2006):

- Each person has four hours to reserve the room per week, and in the group wants to use the same room for a longer period of time, then individual from that group must make the reservation.

- If a group is late more than 15 minutes, they then forfeit the reservation.

- Patrons must not reserve a group study room for individual study. However, one person can make use of a group study room, but only on a temporary basis if there is no reservation for that particular room.

- Even though the group study room is a private space, sound can leak through the walls. Therefore, it is advised that noise should be kept down.

- The study rooms are obtainable only throughout the hours the library is open

Figure 2.6: Study Room Reservation system

(University of Wisconsin, 2006)

2.5: Summary

To sum up, this chapter highlighted the literature review that relates with this research project. Many studies have been undertaken that concentrated on systems that make use of the web applications. These systems can generally be found in schools, universities, hospitals, banking, government agencies, airport and many more areas. Indeed, there is a plethora of literature that available in this area.

Current issues concerning about the Web and its application has been considered and to make the issues relating with the study room reservation more clearer, then international Universities have been taken as an example. University libraries that make use of room reservations systems that employ web application tools have been covered. For example University of Wisconsin-Madison, Umea University, University of Carnegie Mellon, Owen Graduate School of Management, University of Texas, and University of Gloucestershire are good examples of educational institutions that have successfully established online study room reservation systems.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1: Introduction

This chapter concerns about the methodology that will be used for this project to meet project objectives. Research methodology is more than a collection of methods used to perform a research but there is a systematic investigation to solve the problem. The intended system to be developed or the software development methodology that will be employed to acquire the desired system is a series of step-by-step process that can lead to the development application.

Moreover, this chapter focuses on the method used for this task as well as it provides an overview of an Object-Oriented Analysis and Design (OOA). This method can be considered the main method for developing the prototype and indeed is the focal point of the prototype development.

3.2: Definition of the methodology

According to (Booch, 1994), the software development methodology can be defined as

"A methodology is a collection of methods applied across the software development life cycle and unified by some general, philosophical approach. Methods are important for several reasons. Foremost, they instill a discipline into the development of complex software systems. They define the products that serve as common vehicles for communication among the members of a development team. Additionally, methods define the milestones needed by management to measure progress and to manage risk."

The increasing demand of the web-based methods and models in the past few years caused many approaches to take the existing OO methodology. This is to extend and adapt the models and to develop methods for their use, or directly to extend the applicability of OO methods and techniques, such as design models for the design of systems. Other approaches offer the construction and extension of methodologies and modeling techniques for software and knowledge engineering, or to provide a formal composition and modeling languages that are suitable for the system's functional and structural verification.

However, these approaches are fit to provide the necessary standardized analysis and establishment in developing and implementing this technology. This methodology focuses on the construction of a series of models, which are fully developed to define the system's specification. The development and improvement of design processes leads directly to the executable specification which makes the methodology to take its starting point as an object-oriented Modeling adapting and extending their concept.

The methodology focuses on the development of the models described above. One of the features of this methodology is the emphasis on the use of abstract classes that means each group of tasks can be used during the analysis and specification of the model.

During the past two decades, software engineering has been improved to become more powerful and to support abstraction modeling as well as the development of complex systems. The procedural abstraction and abstract data types are used. As a matter of a fact most objects are examples of such abstractions. They can be used by software developers to give more understanding to the nature of the model and even the development of an important class of complex distributed systems (Wooldridge, Jennings, & Kinny, 1999).

3.3: Benefits of a reusability approach (OO) software development

The two reasons of optimism are:

1-First, the software cost can dramatically be reduced by an order of magnitude by removing most of the unintentional difficulties from industrial software engineering; which is not for only single system version, but unquestionably over a product's life cycle. In fact the methods and implementation languages are not sufficient to cover this scale, however, to accomplish this cost decrease, no matter how theoretically powerful and highly automated the system will be. It is also required to have an access to a large base of reusable components which encapsulate the fundamental ideas that are being reinvented over and over again in the current industrial software projects.

2 – The second benefit is reusable abstractions; which are not limited only to hiding accidental or unintentional difficulties, but can also be used to tackle the essence of software design. The complications that are observed when solving a problem depend not only on the nature of the problem, but also much on the primitive concepts available for reasoning about the problem. Therefore if it is possible to increase the expressive

power and understandability of these primitives in various problem areas, then the complexity of corresponding abstract designs can also be reduced.

Much of the failure has been recognized as an organizational shortcoming, for example the lack of clear responsibility roles (reuse managers), no consistent management policy, lack of automated tools support, and conflicts with short-term project budgets. Another initial difficulty arises from the nature commerce such as how to protect reusable designs enough to make the effort invested worthwhile for the inventors. As a matter of a fact these problems do not go away just or vanish since the switching of technology is a must and the solution of the problem is also a must. (Walden & Nerson, 1994).

The idea of creating a reservation system for the study rooms at the UUM library came from the realization of the benefits has for the library clerk. In addition to that, the students in UUM will exploit the advantages of such a system. This system will be implemented in information system for on-line applications for the purpose of anywhere any time service provision for all students of UUM. The objective of this part, not really to solve the problem, but to determine exactly what are the measurements to be taken to address the problem. The important things to mention here are the basic features which are necessary for the development of this system.

3.4: Object-Oriented Analysis and Design (OOAD)

Object-Oriented Analysis and Design methodology (OOAD) has developed over several years. There have been many methods that have been proposed. OOAD as it looks today is actually a combination of these methods. This provides a good background in

understanding how and why OOAD is what it is today. The experts who were involved in OOAD are Grad Booch, Evora Jackson and Jeames Rumbauch. Their methods are still being studied separately in order to gain insight into their work. But more often a combination of these methods are now being studied and applied, as it combines the best forwards of all (Kahate, 2004).

It needs for testing these software applications and therefore it is very clear because testing helps to ensure that developed applications meet with the original intent of the user. System Development (OOAD), using a common language is considered as an insufficient detail to enable a project manager to plan and manage a system development project.

The development of software application is based on adapted (OOAD) process known as the software development (OOAD) methodology. OODA is software engineering process that provides information about steps that need to be taken to advance software project from concept to deployment. Each phase also specifies what must happen during that portion of the software process.

OODA helps describing an approach which, when followed properly, ensure that application meets both the functional and visual requirements stipulated in their creation document, as illustrated in figure 3:1.
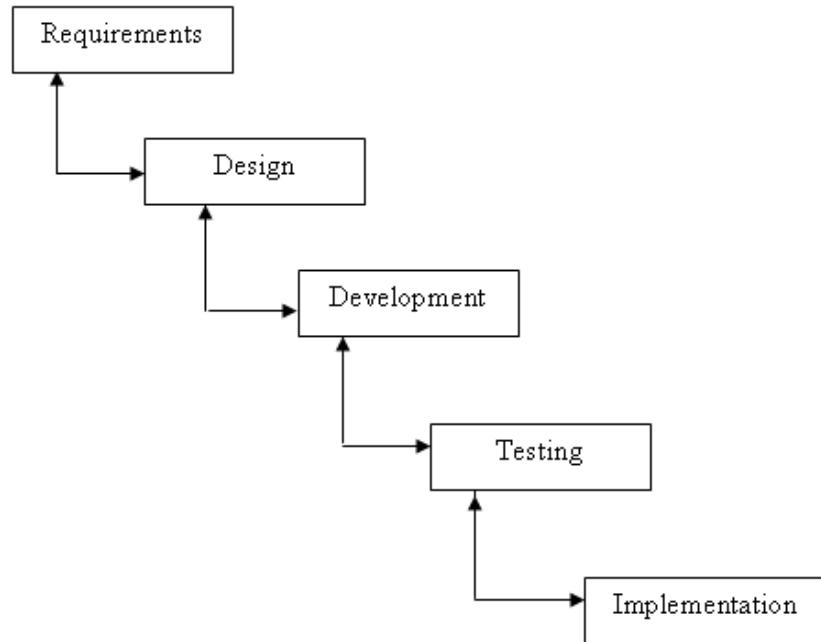
Figure 3.1: Object-Oriented Analysis and Design (OOAD) methodology (Kahate, 2004)

Object-Oriented Analysis and Design (OOAD) methodologies make the combination of text and graphical notation for the purpose of creating an illustration that will give the description of the natural system , which are often complex. This illustration must bring the visual realization of such natural system as closely as possible to the problem area.

This made it possible to describe the system as a whole in a broken down scenario to describe how each object in the system will detect and interact with the environment and at the same time other subjects. Literature in this area has shown large number of proposals regarding the OOAD methods, and some of these are have good recommendation since their usage is widespread. One well-known problem for these methods, is that OOAD is general-purpose, which is seeking to meet the needs of a wide range of applications, regardless of the paradigm, and the actual computation that should be used for the system implementation. As consequence for a specific type of

application or computation paradigm, it can be   expected that only part of the illustrated notation in the method will finish up being used (Bayram, n.d.).

By definition (OOAD) Methodology has appeared as well- accepted and an admired paradigm for both the analysis and design software, in both theory and practice. Currently several variations of (OO) methods are made use of, but they are all similar in their approach when it comes to modeling the application domain.

In addition to that the (OO) methods have being widely used and applied in many traditional technology sectors for example banking, accounting, and personnel issues. In such data applications, the objects represent the related company, the institutions and operations (Lamia, 1995).

Table (3.1) below show the Gantt chart that describes the time allocated for all the phases of the system development.

Table 3.1: Gantt Chart the system development

Week	1	2	3	4	5	6	7	8	9	10	11	12	13
Requirements and Analysis	■	■	■	■									
Design			■	■	■	■	■	■					
Development					■	■	■	■	■	■			
Testing							■	■	■	■	■	■	
Implementation	■	■	■	■	■	■	■	■	■	■	■	■	■

3.4.1: Requirements and Analysis

The Requirements and Analysis stage is a process of gathering of details about what is needed to be done, and how the application should perform those tasks. That is to say, this module plays a role in capturing all the needs and details about what the intended purpose the users want to be performed.

By obtaining a detailed and comprehensive understanding of business requirements are strategic move to develop the functional specification that will lead to the desired system design. The following two aims should be carefully considered:

- Study the current reservation system.

- Determine feasibility, scope, objective, and overview of the project.

In this phase, there will be a comprehensive understanding about what the user needs the system to assist. Therefore, designing that model of the application and validate that model will actually meet the user's needs. Accordingly, there is a need to come out with the appropriate identification for the current requirement.

The purpose of this phase is to identify the users to use web-based online booking UUM study rooms. It is important to know what criterion and functions are used for the requirement capture from the target users in advance to the development of the system. In this phase, the researcher must know how the current system; which is in fact a manual system, determines and analyzes the facts and documents, and how the system can work better.

Interview is most commonly used techniques for gathering information. So there are many steps when starting the interview:

1. Selection of respondents

2. Design issues

3. preparation for interview

4. conducting the interview

The primary approach used to in this research in order to identify the requirements intended is conducting interviews with ten students.

The interview was conducted with the Clerk of the study rooms in the library (Mr. Mohd Nor, Manager of Carrel Rooms and Discussion Rooms: 2009). The interview focused on the manual system and how students can make their bookings. The administration and head office indicated that the system is used is a manual system. The clerk must make sure that the students provide the necessary information to carryout manual booking and at the same time the clerk should be able to know which study room has been reserved and which one is not reversed.

3.4.2: Design a Prototype

This step includes the way of solving the problem of accessing to the research approach and the relationship with software development, the objective of designing a system that is designed to:

• A given functional specification (perhaps informal satisfied).

• On the boundary with the target device compliance.

• Resources for efficiency and meeting demand for clear or unclear.

• Artifact lies in the form of a clear design or meets the criteria.

- The design process, its length or cost, or equipment designed to satisfy the restriction as if available.

This builds upon the work performed during System Requirements Analysis, and results in a translation of the functional requirements into a complete technical solution. This solution dictates the technical architecture, standards, specifications and strategies to be followed throughout the building, testing, and implementation of the system.

3.4.3: Development

This design involves writing the code for the application using the chosen programming language. This study uses JSP and MySQL 2005, for the development of on-line prototype. This can be used as database container to store the data of the system and the retrieval required information. A software application is going to be created in programming for instance might be coded by using the Abstract. The choice of the used tool is made during the design phase, and the implementation would simply create the application conforming to this decision. The choice of interface technology determines the actual type of software code that the developer will write. During this process, unit testing is performed at the code level to ensure the correctness of the software functions that are created by the programmer. Also Unit testing ensures the several functions which can work together in fulfilled tasks.

Noticeably, the developer implements the prototype by using all the components of the design phase in order to be implemented. If any error occurs while testing the system,

developer will go back to the previous step and fix the problem until the system can work properly.

3.4.4: Testing

The testing phase covers the process of planning the tests that will be run on the application to examine its functionality. Interestingly, this phase describes how different tests would be executed? Consequently, the decisions are going to be made by using manual or automated approaches as well as test cases are created based on the chosen test strategy. Objectively, the entire test application is going to be confirmed when all the separate components that can draw functionality of the application in relation with the assembled and required document.

3.4.5: Implementation

Include applications to write code by using the selected programming language. These applications are created in programming. The Selection tool is made in the design stage, and implementation that will be easy to create applications in accordance with these solutions. The choice of interface technology determines the type of code that a developer uses in writing. During this stage, Unit test is carried out at the level of code to ensure that the software functions are created by the programmer. This includes all activities related to the deployment application. These activities include training, installation in the production adjustment and transition of ownership to apply the project.

Finally the project will be documented in which includes detailed information about the system. Documentation can appear in a variety of forms, the most common of them are the manuals.

3.5: Summary

This chapter discusses the methods used in this project that are based on the Group's five stages of the project:

1. **Requirements and analysis:** The goal of this stage is to identify the needs of users, and the system requirements.

2. **Prototype design:** In this stage, the solutions are given to the users as well as the library clerks.

3. **Development:** This stage is about the development of the prototypes into a complete system with the help of the ideas, concepts, criticism, or simply the feed-back both negative and positive from the users.

4. **Test:** This is stage for the system testing; which means finding out if there are any bugs and anomalies in the system. Just like when designing the prototypes, the user will give their feed-back such ideas and criticism.

5. **Implementation:** At this stage, starts from the first phase up to the last phase (the documentation).

CHAPTER FOUR

FINDINGS AND ANALYSIS

4.1 Introduction

In this chapter, the study room reservation system requirements and design model prototype model is implemented to cover. Many tools can help create a prototype. As a Rational Rose 2000, UML Studio, Macromedia Dreamweaver 8, JSP, MySQL 2005, etc. The chapter will start with the system requirements and design collected throughout the methodology which is designed according to the research objectives. In this chapter, the proposed model, application architecture design, integration, the process flow of design, the graphical user interface of the proposed prototype system.

4.2 Requirements Analysis

This section will elaborate on the requirements analysis. The analysis process should take exactly. Most analysts agree that many errors occur in an information system that was a consequence of the lack of analysis and effort in planning. For this reason, all the requirements for Web based applications have also been established to ensure that your

system meets the needs of end users. The requirements that emerged from the discussions with administration and the manager of Carrel rooms in UUM to the main factors responsible for the administration of Carrel Room. The interview questions for designing the analysis and design of the system. The characteristics of the system were based on the results of the interviews. After all necessary information to better deal with the properties of the system, then the system was analyzed and designed.

The complete list of the system requirements is available in this system, describe as the follow (see Table 4.1).

Table 4.1: List of Requirements

No	REQ_ID	REQUIREMENT_DESCRIPTION	PRIORITY
1.	**REQ_01**	**Clerk Login**	M
		Clerk can login to the system to perform his/her tasks	
2.	**REQ_02**	**Students Login**	M
		Student can login to the system to perform his/her tasks	
3.	**REQ_03**	**Make reservation**	M
		Students can make reservation to study room.	
4.	**REQ_04**	**View booking**	M
		students can see his/her available time for study rooms	

5.	**REQ_05**	**Make delete**	M
		student can make delete to his/her booking	
6.	**REQ_06**	**Make update**	M
		student can make update to his/her booking	
7.	**REQ_07**	**Make change**	M
		student can make change to his/her password	
8.	**REQ_08**	**View students reservation**	M
		Clerk can view all of the reservation for students	
9.	**REQ_09**	**Delete reservation**	M
		Clerk can delete any booking for the students.	
10.	**REQ_09**	**Make change**	M
		Clerk can make change to his/her password	

A use case and measurable value of actor to provide something that describes a series of actions can be made as a horizontal ellipse (Ambler, 2004). Using use cases to determine the best way to run a project. Common to two or more use cases should be applied only once and then can be reused.

Use case is a functional requirement that is described in terms of users of a use case defines a functional requirements system. That described as a series of steps, including actions by a system and interactions between the system and actors. Use cases address the question of how to interact with the actors of a system, and describe the actions that the system works (Alhir, 2003).
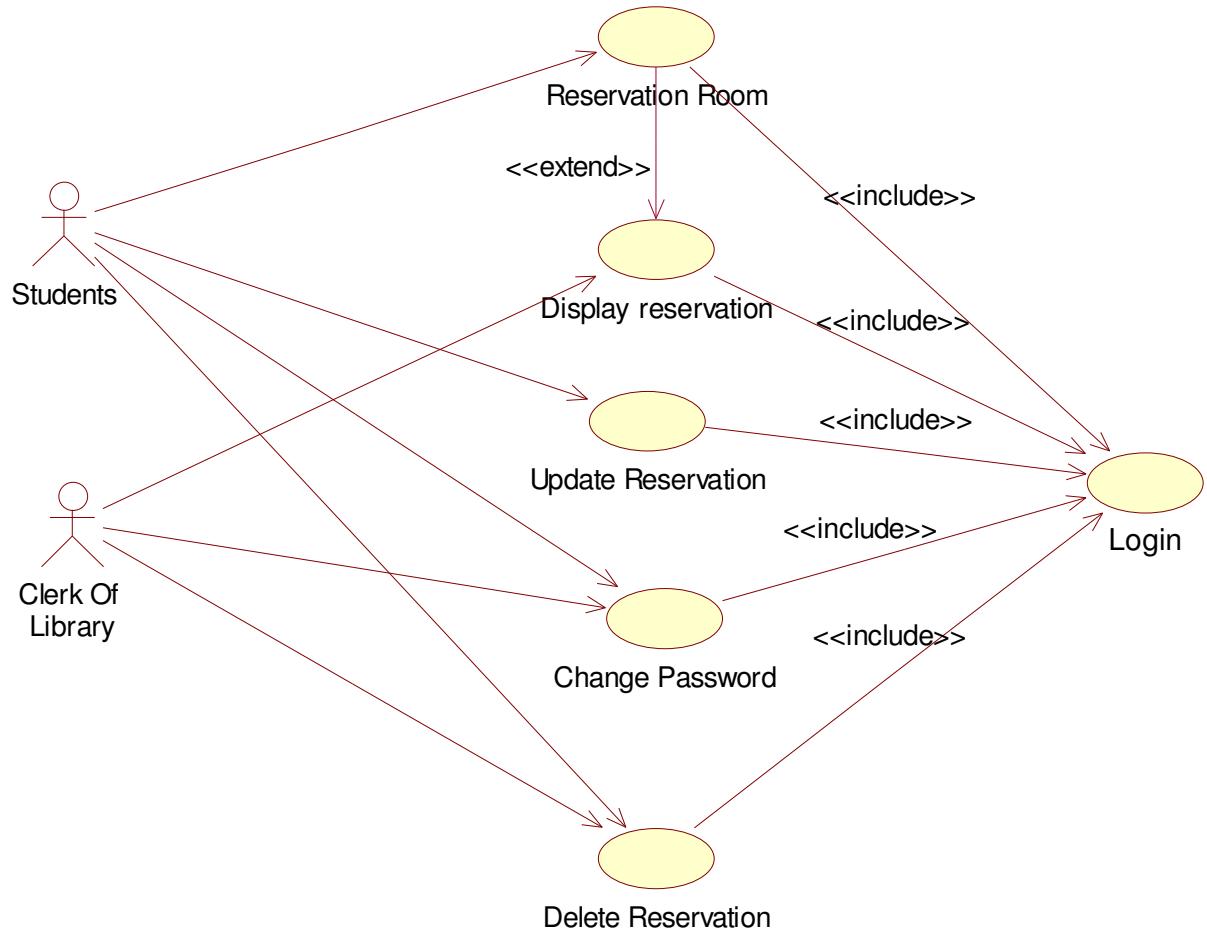
Figure 4.1: Use Case Diagram

The use case specifications and all of the system structure (see Appendices C).

4.3: System Design

In this section, the system design is illustrates. System design and includes a sketch of
the system architecture and UML diagrams. Rational Rose is a full cycle of Unified

Modeling Language development environment specifically designed to meet these real-time embedded targets. It extends the power of UML standard profile is optimized for the unique real-time concurrency, and distribution problems (Garone, 2000).

Rational Rose is a simple object-oriented Modeling Language (UML) software design tool for visual modeling and component construction of enterprise-level software applications. There are two popular features of Rational Rose is its capacity to deliver an iterative development and re-engineering back. Rational Rose allows designers to take advantage of iterative development. As new applications, it can create the output stage is a repetition of a second port. And when the developers begin to understand how the components interact and change the relationship, known as Rational Rose can do "round trip engineering" that goes back to the rest of the model and updated to ensure that the code is consistent (Midmarket CIO, 2005).

For small projects, this tool can be a bit too powerful which means that training May take longer, which is relatively less favorable for the project (Uimonen, 2000).

The Unified Modeling Language (UML) is a graphical language for specifying display, building and documenting artifacts of software intensive systems. UML represents the unification of efforts to build a series of shortcuts for the expression of patterns of object-oriented analysis and design (OOAD) under the auspices of the Object Management Group of matter (OMG). Currently, UML is considering standard for Object Oriented modeling (Ojo & Estevez, 2005).

According to (Martin, 2002), the UML is a graphical notation for drawing diagrams of software concepts. One is the domain of the problem, designing the software that is provided can be used to draw a diagram of the software is implemented or already

completed. There are three types of diagrams in UML: Static diagrams, Dynamic diagrams, and Physical diagrams.

4.4: Sequence Diagram

A sequence diagram consists of objects and messages. Objects are represented exactly how they are represented in all UML diagrams as rectangles to emphasize the class name in the rectangle. This is the most popular UML diagram for modeling dynamic artifact and used for the purposes of analysis and design, which focuses on identifying the behavior within the system (Chitins, Tiwari & Ananthamurthy, 2002).see Appendices (A,B).

4.5: Class Diagram

Class diagrams are the basis for object-oriented analysis and design. The purpose of a class diagrams to represent the classes within a model. In an object-oriented application, classes have attributes (member variables), operations (member functions) and relationships with other classes. This diagram can represent all these things quite easily. Class diagrams show the classes of the system, their relationships (including inheritance, aggregation and association), and the operations and attributes of classes. Class diagrams are used for a wide range of uses, including conceptual / domain modeling and detailed design modeling (Martin, 1997).
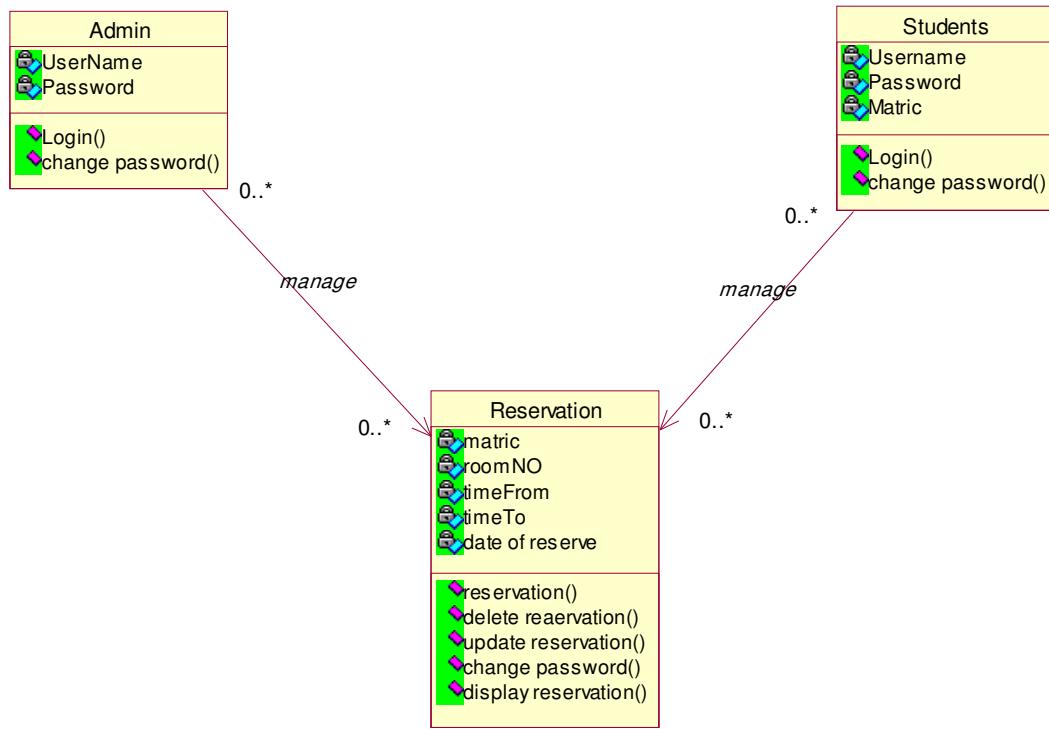
Figure 4.2: Class Diagram

4.6: Flow Control of the Website

Flow control display the map of the website of Carrel Room in UUM library so it describe all the pages of this system, it can be easy to understand the structure of this Carrel Room. (See figure 4.3).

49
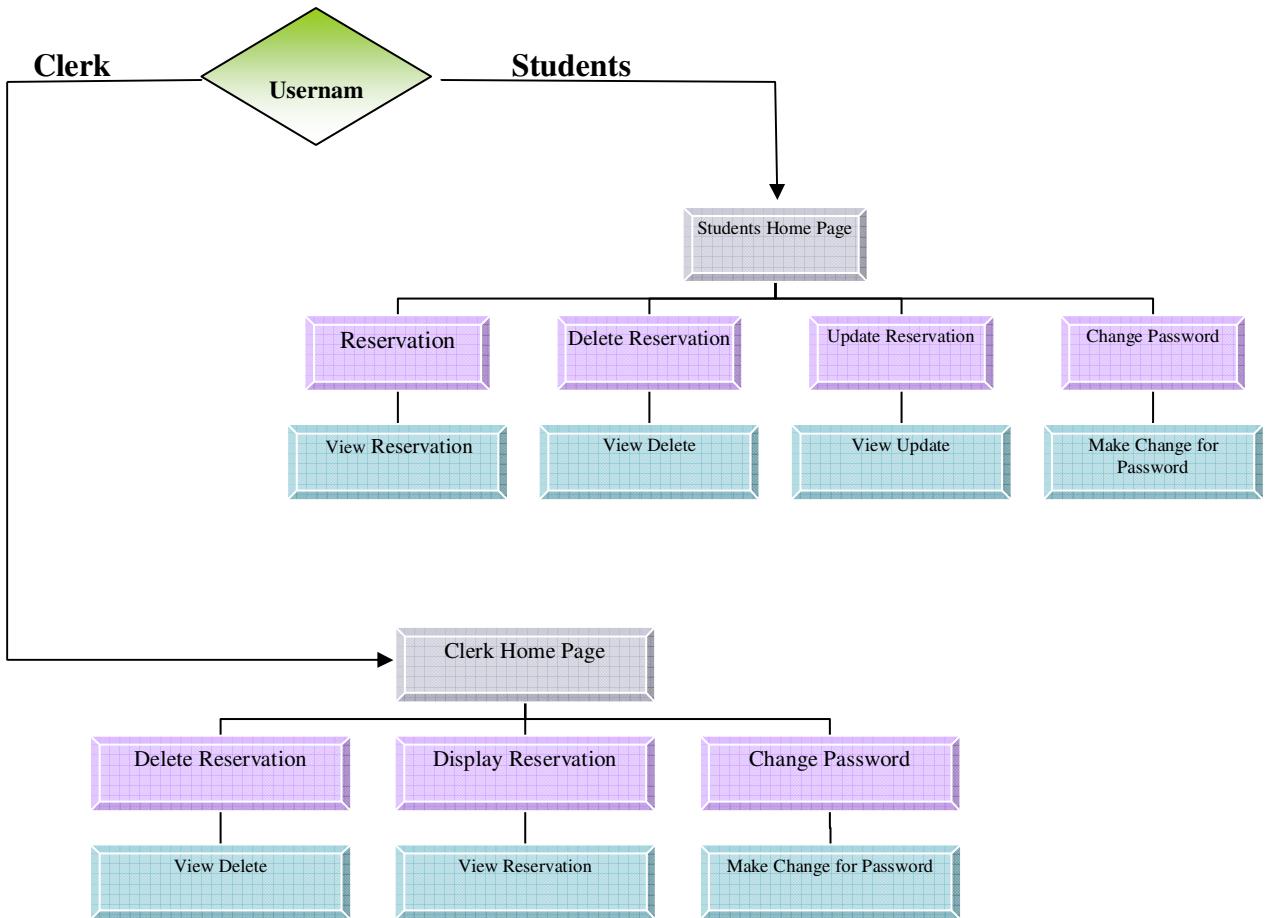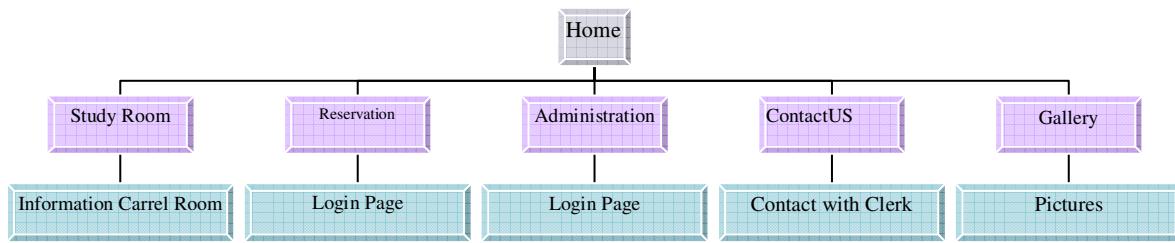
Figure 4.3: Flow Chart of website

4.7: Design Prototype

A prototype is a preliminary version of part (or a frame of the whole) of a website that can be controlled by its public, or the marketing team. Prototyping is an iterative process where web site users to propose further changes before prototypes are made and the final version of the site are developed (Chaffey, 2008).

This prototype contains Web-Based applications to allow the students to interaction with these services from their computer.

In the following, there are some pages from the design prototype.

4.7.1: Web-Based Interface

This prototype designed to be compatible with computer through the Internet site by using tools FrontPage and JSP programming language. JSP page as normal HTML pages include a special tag for the Java code. The page dynamically compiles into a servlet behind the scenes and executes as such. This language can write HTML without regard to the Java code in the page and there are many other ways to use both servlets and JSP pages (Patzer, 2002).

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4.7.1.1: Home Page

This library web-based system displays the home page of the application in the first page. It contain the pages of application, as (home, Student Room, Reservation, Administration, Contact Us, Gallery), the home page is the index of the application, the about page is the information of the UUM library, the login page allows the students and clerk to login in the system. (See figure 4.4).

Figure 4.4: Home Page

4.7.1.2: Study Room page

The Study Room page is the information of the Carrel Rooms in library. The students can know the location of these rooms. (See figure 4.4).

Figure 4.5: Study Room page

Students' pages:

4.7.1.3: Login Page

To access the system, user must have to login. Only valid ID and password can access the system. Otherwise, in case that the user inserts a wrong username and password, the system will display a message that there is wrong authorization to login. (See figure 4.6).

Figure 4.6: Login Page for students

4.7.1.4: Options Page

Students' home page displays the main menu to make reservation, delete reservation, update reservation, change password and logout from his/her page. (See figure 4.7).

Figure 4.7: Options Page for Students

4.7.1.5: Reservation Page

Students' reservation page displays the *TERMS AND CONDITION* to make reservation. They can make reservation by choose the Time of reserve (day and month), Date of Reserve, and Room number. Also they can check which rooms and times are reservations. (See figure 4.8).

Figure 4.8: Reservation Page for Students

4.7.1.6: Check Time Available Page

Students Check Time available page displays the available time for booking. This page shows the rooms are booking (Room Number, Time From, Time To), Date of Reserve, and Room number. (See figure 4.9).

Figure 4.9: Check Time available Page

4.7.1.7: Delete Reservation Page

Students delete page displays the table of reservation for his/her student. To make delete for his/her reservation, they can choose the Time of reserve (day and month) and Room Number. (See figure 4.10).

Figure 4.10: Delete Reservation Page for Students

4.7.1.8: Change password Page

Students can change his/her password. They need only to put old password and new and confirm password. Successfully change password will display confirmation message. (See figure 4.11).

Figure 4.11: Change password Page for Students

4.7.1.9: Update reservation Page

Students can update his/her booking. They can see his/her booking and change the booking for day or time. Successfully change booking will display confirmation message. (See figure 4.12).

Figure 4.12: Update reservation Page for Students

Administration's Pages:

4.7.1.10: Login Page

To access the system, clerk must have to login. Only valid ID and password can access the system. Otherwise, in case that the clerk inserts a wrong username and password, the system will display a message that there is wrong authorization to login. (See figure 4.13).
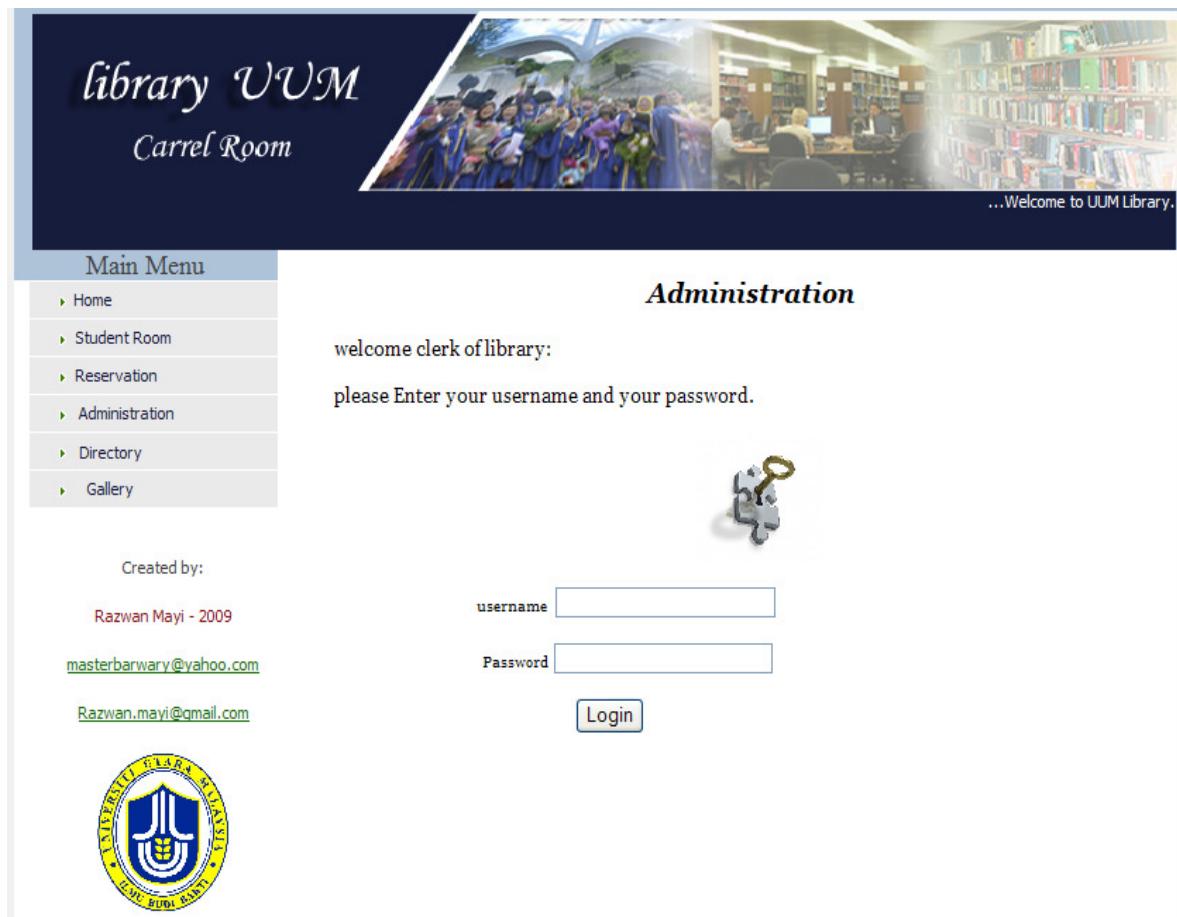
Figure 4.13: Login Page for Administration

4.7.1.11: Option Page

Administration home page displays the main menu to make (delete reservation, display reservation, change password and logout) from administration page. (See figure 4.14).

Figure 4.14: Option Page for Administration

4.7.1.12: Delete Page

Administration delete page displays the table of reservation for all students. To make delete for reservation, the administration can choose the Time of reserve (day and month) and Room Number. (See figure 4.15).

Figure 4.15: Delete Page for Administration

4.7.1.13: Display Page

Administration display page displays the table of reservation for all students (matric number for students, Time of reserve (day and month), Room Number and date of reservation. (See figure 4.16).

matrix	roomNO	time From	time To	Date
800157	3	29/4	30/4	31/3/2009
800157	5	28/3	29/4	26/5/2009
800157	4	4/4	5/4	26/6/2009

Figure 4.16: Display Page for Administration

4.7.1.14: Change password Page

The administration also can change his/her password. They need only to put old password and new and confirm password. Successfully change password will display confirmation message. (See figure 4.17).

Figure 4.17: Change password Page for administration

4.7.1.15: Contact Us Page

The students can contact with the manager of Carrel Rooms by phone and Email.

Figure 4.18: Contact us page

4.8: Summary

In this chapter an overview of the analysis study room reservation system with the requirements for implementation of systems for online and using the procedure with the use case diagrams specification. It describes a prototype of this research, as the system for dealing with the room reservation, and how to organize the flow of students in the library by giving each student the date of his appointment to study in the room library. However, the system has needed to be uploaded on the Internet as a real test environment.

Finally, this system can meet the requirements needed for UUM Library (Carrel rooms). Improvements to the system should be more flexible and users can be easily implemented by the library services are available through a computer device.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1: Introduction

The main objective in this chapter is to discuss and evaluate the system for the study room in the library of the UUM. Usability testing is one of the main methods in the evaluation of systems, because the users are asking to test the product and compare this system with the current system .Also, this chapter focuses on the descriptive analysis of the questions.

According to (Williams, n.d) the usability testing in a system of software system development projects can be considered as the most important part. Usability effectiveness, efficiency and specific users can achieve specified goals in a certain environment to create satisfaction.

Usability testing of Web sites has become interest for Web developers. Many of Web sites use usability engineers to ensure that their web sites have an easy-to-use, friendly site that provides a the users knowledge for web site(techtarget,2009).

Using data collected during usability targets usually developed on the basis of analysis is required. These goals can be measured in terms of the usability test results and the system goals can be used to determine the expression came to be. Usability testing includes developing of a test plan:

1- Specifying the usability objectives.

2- Test procedures and reporting requirements.

The development of test scenarios conducting the

1- Testing according to the plan,

2- Reporting test results.

In another definition the Knowledge Management Consulting (KM Consulting, 2005) they defined the Usability testing, it is evaluating the product with web users, in a controlled, structured environment. It is scientific approach provides unbiased and objective feedback.

Usability questionnaires are effective, when used in combination with other methods, but should not be used as the sole component of a test of usability. Questionnaires should be both qualitative (open) and quantitative (structured) styles.

5.2: Evaluation Techniques

The evaluation was performed after the system has been developed to determine the level of usefulness and operability of the system; it is tested through a questionnaire and interview. The questionnaire has been distributed to students and manager of clerk of library an interview with the manager was also conducted. Testing more than 8 people

on the web site may be finding problems and obstacles in all parts of the test. Therefore, the test only 5 people is not enough to detect problems in the usability testing (Perfetti and Landesman, 2001).

The Advantages of using Questionnaires it is subjective preferences of the user satisfaction, and possibly concern can be easily identified and can be used to compile statistics (Holzinger, 2005).

The questionnaire was distributed to students. The sample size was (81) students (local and international) and (postgraduate and undergraduate); each student was given a brief description of the functionality of the prototype Carrel Rooms. Then they were allowed to use and learn about the prototype. Finally, they had prepared a series of questionnaires to obtain their perceptions. Its purpose was to see the satisfaction and perception of the prototype developed in ease of use and operation of the prototype system.

5.3: Evaluation Questionnaire

The questionnaire questions were prepared and adopted from different standard questionnaire (Lund, 2001; Lewis, 1995).

It consisted of five main sections, firstly the general information (Demographic Background) which intended to gather demographic data about the sample and its distribution.

From second section to fifth section included questions about the web-based Satisfaction, web-based Ease of use and learning, web-based Usefulness, and the last

section of the questionnaire included questions about using the system for reservation online. The questions were close ended and scaled in five levels. The users have to answer a series of Statements Likerts scale. Typically, Likerts scale consists of five points are as follows: 1= Strongly Disagree, 2= Disagree, 3= Neither, 4= Agree, 5= Strongly Agree). This data Likert' obtained by the scale factors can be easily analyzed, and have found that the preferred scaling percentage to testing (Mathieson and Doane, 2003; Likert, 1932). See appendix (D).

 Finally, there was an interview face to face with the manger of the Carrel Rooms, where several questions related to usability and benefits of the web-based application in study room reservation in library.

5.4: Data Analysis

During the questionnaire, the data collected was analyzed use of the program (SPSS) version (13). Different statistics were used for data analysis. The following section describes the result obtained through analysis of data.

5.4.1: Demographic Distribution of the Sample

The following information was gathering from the first section of the questionnaire. All of the 81 participants were students and staff. The analysis shows that:

1. **Occupation:** The number of students = 80 and one staff only. (See Figure 5.1)

2. **Gender:** The number of male =56 (69.14% of students) and the number of female =25 (30.86% of students). (See Figure 5.2)

3. **Age:** The age of the sample range from 18-34 years old. (See Figure 5.3)

4. **Using web:** The users have using internet. (See Figure 5.4)

   ➤ Less than one year =8.64%.

   ➤ 1-2year= 24.69%.

   ➤ 2-3 year=24.69%.

   ➤ More than 3 year=37.04%.

5. **Program taken in UUM** Nationality: distribution of the study sample, are: 44.44% are Malay, 55.6% are nationalities. (See Figure 5.5)

6. **Program taken:** According to the level of education, 50.62% were undergraduate, 49.38 % were postgraduate (master and PhD). (See Figure 5.6)

7. **Year of study:** Statistical analysis of the data also indicates that: (See Figure 5.7)

   ➤ First year: 24.69%.

   ➤ Second year: 37.03

   ➤ Third year: 24.69%.

   ➤ Final year: 13.58%
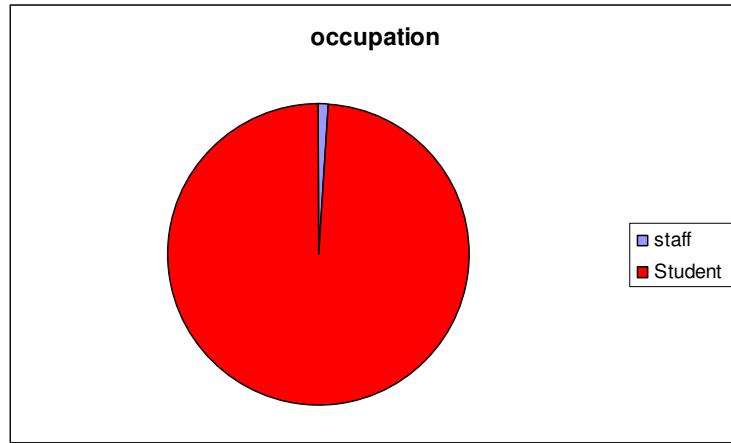
Figure 5.1: Occupation
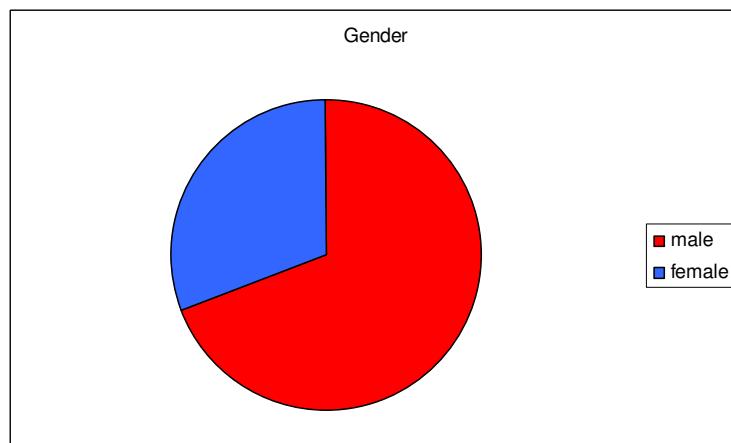
Figure 5.2: Gender
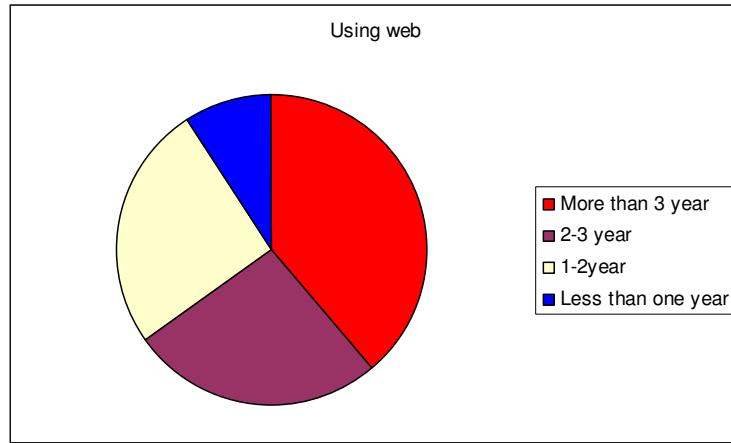
Figure 5.3: Using Web
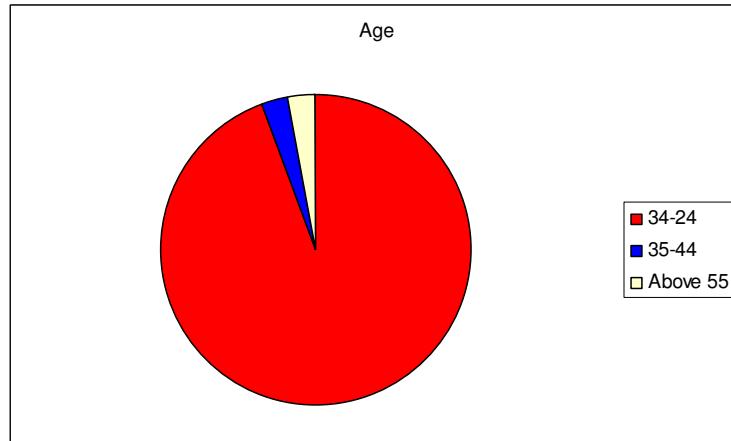
Figure 5.4: Age
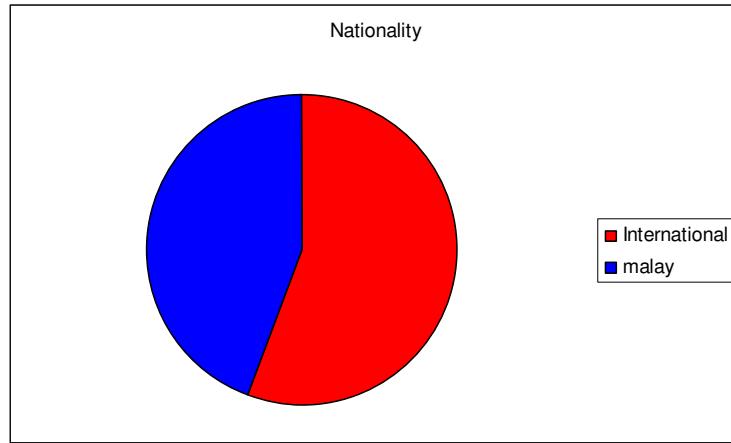
Figure 5.5: Nationality
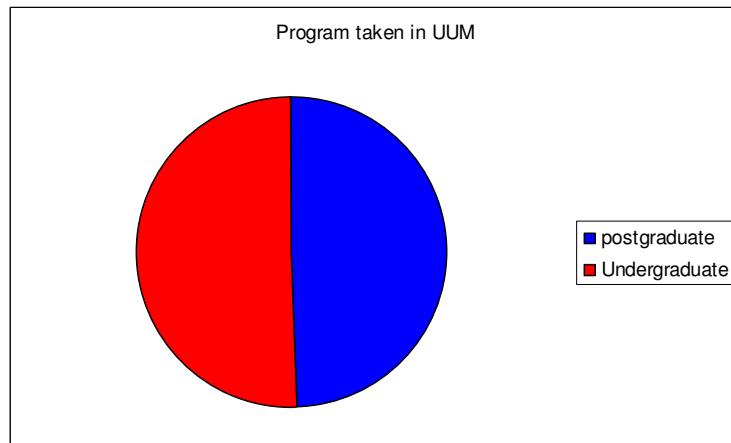
Figure 5.6: Program taken in UUM
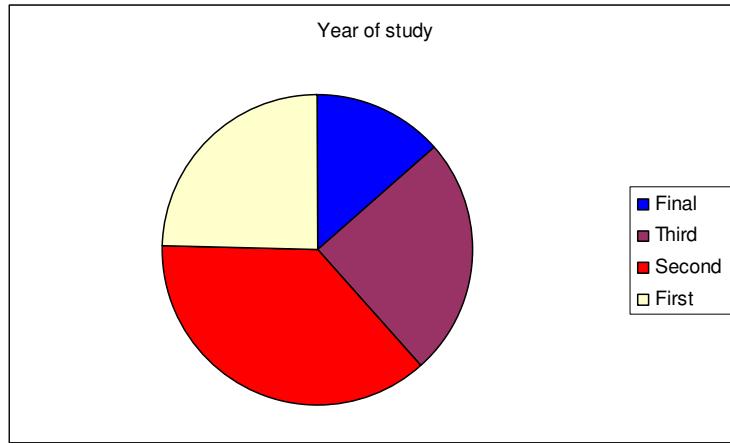
Figure 5.7: Year of study

5.4.2: Usability Testing Results

The following tables show the average standard deviation of each section of the questionnaire; it appears to cover all dimensions, including a separate answer questions on the web based (Satisfaction, Ease of use and learning, Usefulness, and Using the System for Reservation Online). The analysis show good usability performance by the system.

5.4.2.1: Web-Based Satisfaction

The Figure 5.8 shows the mean level of evaluation of user to the web-based Satisfaction. X: number of questionnaire respondents, std. deviation: standard deviation. The average of mean for Web-Based Satisfaction is equal almost (77.8 %) which indicate that the measure of User Experience is agree altitude toward.
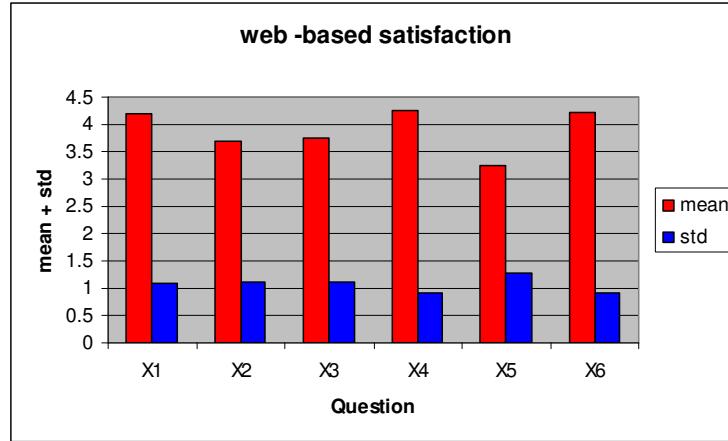
Figure 5.8: Web-based Satisfaction

5.4.2.2: Web-Based Ease of Use and Learning

The Figure 5.9 shows the mean level of evaluation of user to the web-based Ease of use and learning. X: number of questionnaire respondents, std. deviation: standard deviation. So, the result found that the mean of the all mean values is equal almost (83.42857) which indicate that the measure of Usability of moving around the form is agree altitude toward which indicate that the system Usability for Web-Based Ease of use and learning.
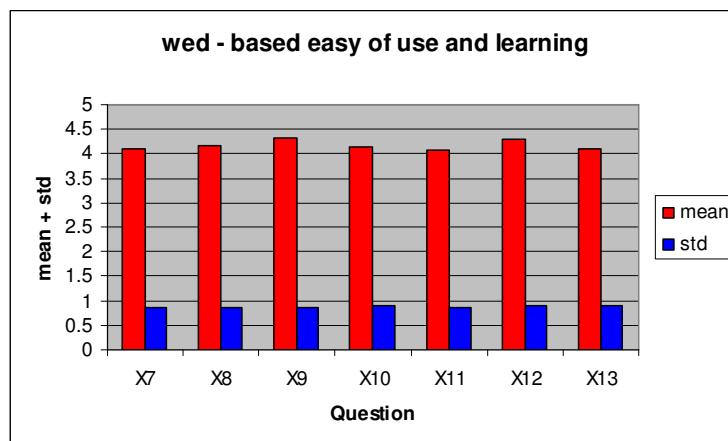
Figure 5.9: Web-Based Ease of use and learning.

5.4.2.3 Web-Based Usefulness

The Figure 5.10 shows the mean level of evaluation of user to the web-based Usefulness. X: number of questionnaire respondents, std. deviation: standard deviation. The average of mean for Web-Based Usefulness is equal almost (84.12%) which indicate that the measure of User Experience is agree altitude toward.
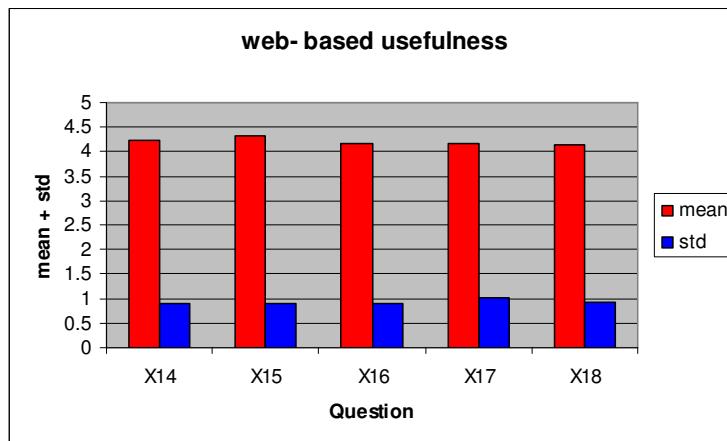
Figure 5.10: Web-Based Usefulness

5.4.2.4: Using the System for Reservation Online

The Figure 5.11 shows the mean level of evaluation of user to the web-based Using the System for Reservation Online. X: number of questionnaire respondents, std. deviation: standard deviation. So, the result found that the mean of the all mean values is equal almost (80.5%) which indicate that the measure of Usability of moving around the form is agree altitude toward which indicate that the system Usability for Web-Based Using the System for Reservation Online.
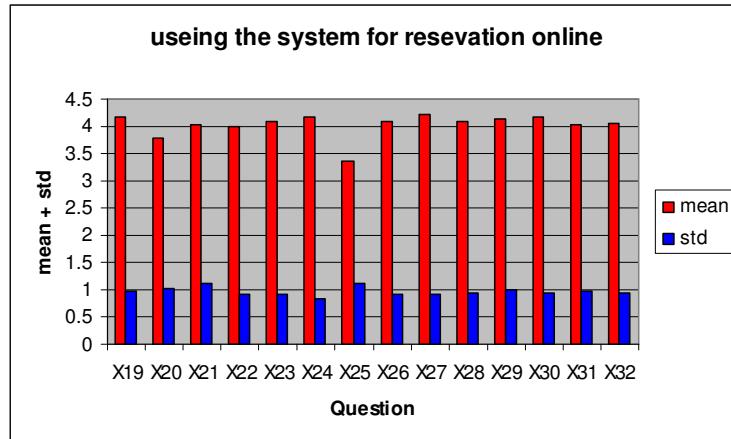
Figure 5.11: Web-Based Using the System for Reservation Online

For more details about the descriptive Statistics for All Sections of questionnaire see appendix E.

5.4.3: Reliability Analysis

Cronbach's Alpha based on standardized items use to measure the reliability scale of the system usability. According to Yu (2000) in general the higher the Alpha is, the more reliable the test is. There is not a commonly arranged cut-off, but the Cronbach's Alpha is equal 0.7 and higher the reliability is acceptable. In this research the analysis of the questionnaire is shown is equal almost (.949). The following table 5.12 illustrates Cronbach's Alpha for all questions.

Table 5.1: Cronbach's Alpha for all questions

Cronbach's Alpha	N of Items
.949	32

79

5.5: Interview with the Manager

Face-to-face interview was with the director of Carrel Rooms in UUM library. The interview has been focused on possibility using the reservation system online of rooms and compared it with the currently used (manual system) to reserve rooms. The manager has responded to the following questions:

Q1): Do you think that the web applications facilitate work of the clerk in the library and the same time offered the student an easier way of reserving the room?

He said" *Yes, I think the web applications will facilitate work of the clerk in the library and at the same time offered the student an easier way of reserving the room."*

Q2): Do you think that the students will get benefit from web applications especially in the library?

He said" *Yes, I think that the students will get benefit from web applications especially in the library."*

Q3): Does the web provide useful information for the manager?

He said" *Basically the web provides useful information for the manager but it needs some additional application such as to provide the monthly and daily statistic. "*

Q4): Do you think that the web provides user interface guidelines which are easier to use than the manual system?

He said*" Yes, I think that the web provides the user interface guidelines which are easier to use than the manual system."*

Q5): Can the web application system be considered as a computerized system to facilitate work of the clerk?

He said*" Yes, this system can be considered as a computerized and can be implemented to facilitate work of the clerk."*

5.6: Summary

This chapter concentrates on the evaluation of the study room prototype by a sample of target students, so there was explanation of the content of the questionnaire and then statistical analysis of the user responses to the different sections of the questionnaire. The users found this prototype Satisfaction, Ease of use and learning, Usefulness, and using the system for reservation online. Even more, users were satisfied to use this clear simple system to do their online reservation for Carrel Rooms. Also in this chapter discussed the evaluation of the manager of Carrel Rooms and how this system will help the clerk and students to manage his/her booking. In the result, found this system is really helpful and can provide vital information about the users of the carrel rooms in UUM library that can help the management.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1: Introduction

This chapter reviews this project finding to explain the outcome of the project and its contributions, the limitation of this study, and the recommendations for future work on this project.

This project proposed a web-based system to be applied in the study room in UUM library. This system is including online reservation system for study rooms (carrel room) available in the UUM library. And focuses how this system will help the large number of students to make his/her reservation easily and also help the clerk of library to control the booking.

6.2: Conclusion of the Study

The purpose of this study has developed and implemented an efficient appointment system using Web-based technology to reducing the time for booking Room in UUM library by development of Carrel room system for reservation to be online.

The users of the study room in UUM library will be offered an opportunity by using online reservation for their room, as this considered an easy, fast way to get information about the available room and make the online reservation for these rooms. Even more, the clerk of library in the UUM library will have an easy and effective way to provide the students of the study room with up to date information on the rooms including the availability of the rooms and delete any room and so on. Beside all that, the System would be one of the available facilities in the Library Services that the university provides to students facilitating and enhancing the interactions between students and clerk. And also gives feedback and information to accessing the information and services from study room reservation online system. This technique has a many benefits such as:

- Reduce time waiting.

- increase of transparency,

- create convenience,

- improving the operation of study rooms reservation

- Reduce cost.

Moreover, Internet applications can be used more widely among the general public and particularly among students, so a large number of students can reach to the study rooms'

reservation system through the Internet at any time and any place. Therefore, the system increases the acceptance, adoption and the usage of online study rooms' reservation services by student, UUM staffs.

This study has achieved its objectives by develop the system of booking rooms for Carrel rooms in the UUM library that will   assist the students in the process of booking and save time and effort for students.

6.3: Problems and Limitations

This web-based prototype covers online reservation for study rooms only in the UUM library and does not include the reservation for discussion rooms. The web-based prototype was tested using localhost server, namely (HTTP://localhost :.....) and it needs to be integrated with the current system. However this prototype is not published on the internet and it needs the service of internet in order to be uploaded for the users. Also, this prototype needs authorizations from the administrator of library and university Utara Malaysia in order to be applied in real environment.

6.4: Recommendations for Future Work

Many students hope to apply this system in the library in real environments, and develop the other requirements in the library to improve the performance of the interactions between the students and library.

This is the few of recommendations for future improvement:

i.   The study rooms in UUM should provide a complete room reservation system and make it available online for all the students.

ii.   A mobile web-based application to enable the students of the study room's activities in UUM to reserve rooms anywhere and anytime using their mobile devices.

iii. Add also functionality for the manager that allows him/her to do statistic report monthly.

6.5: Summary

This research has presented the results of the evaluation of Web applications, which consider is one of the most used applications at present time. The study room reservation system is allows for quick making and managing students' reservation, and save time and effort for students by allowing the students to make their booking through the internet. Web-based applications system designed to provide the needs for a more convenient way for students to make booking during 24 hours per day from their computer. In this study, Web application was developed to obtain the desired results and achieve the research objectives.

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Appendices A

Sequence Diagram
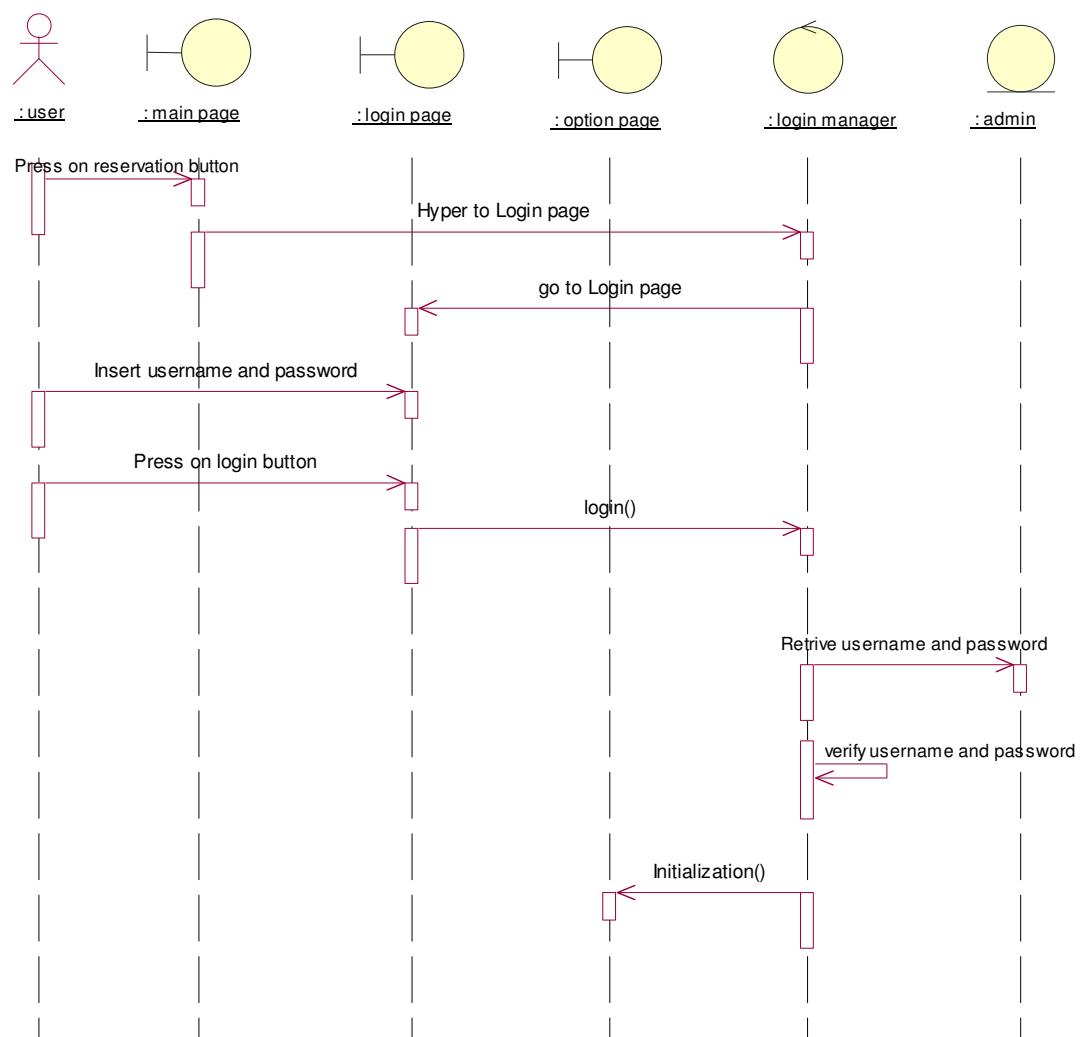
Figure A.1: Sequence diagram for Student Login. (SD- 01)
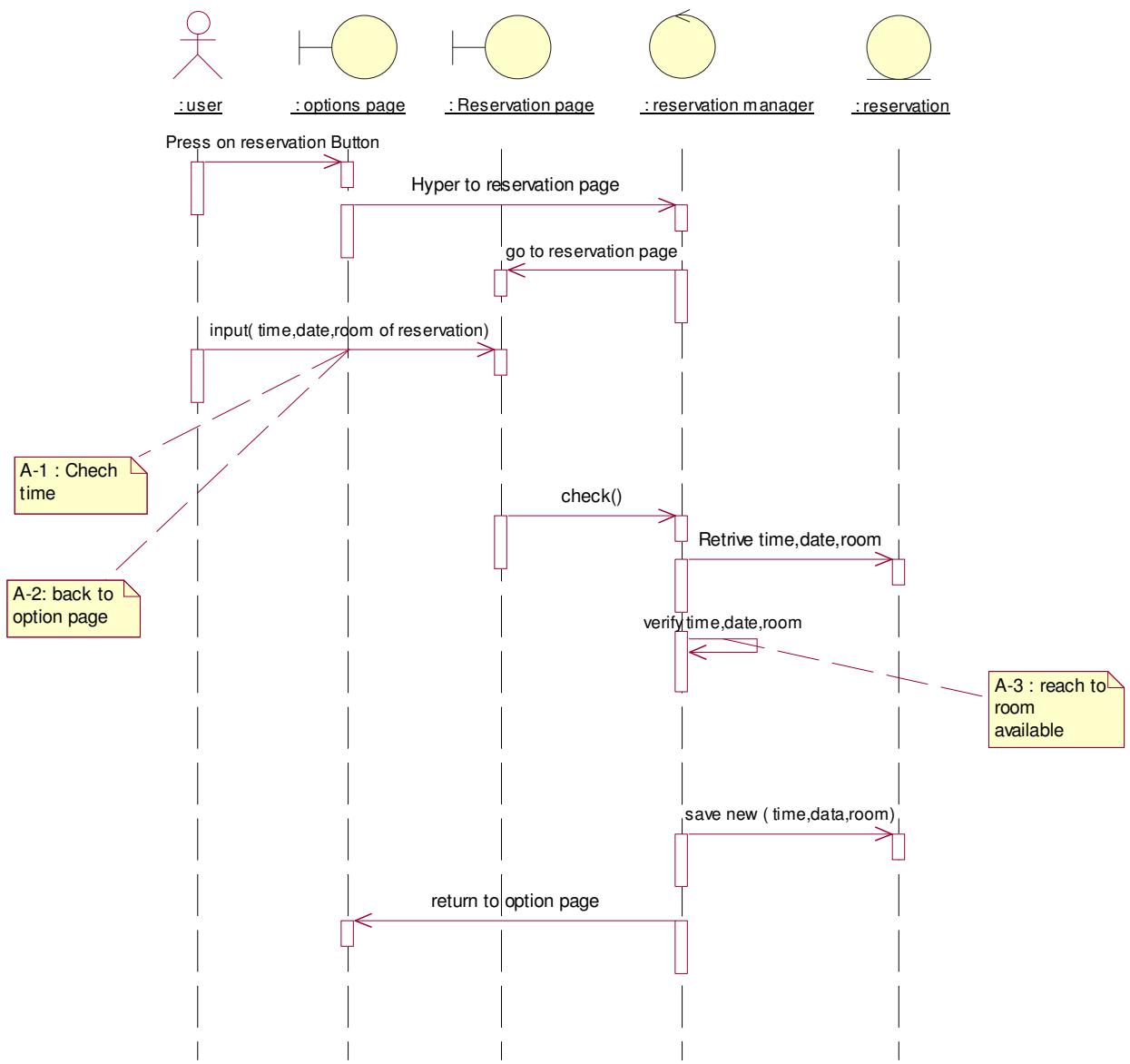
Figure A.2: Sequence diagram for Reservation Study Rooms. (SD- 02)
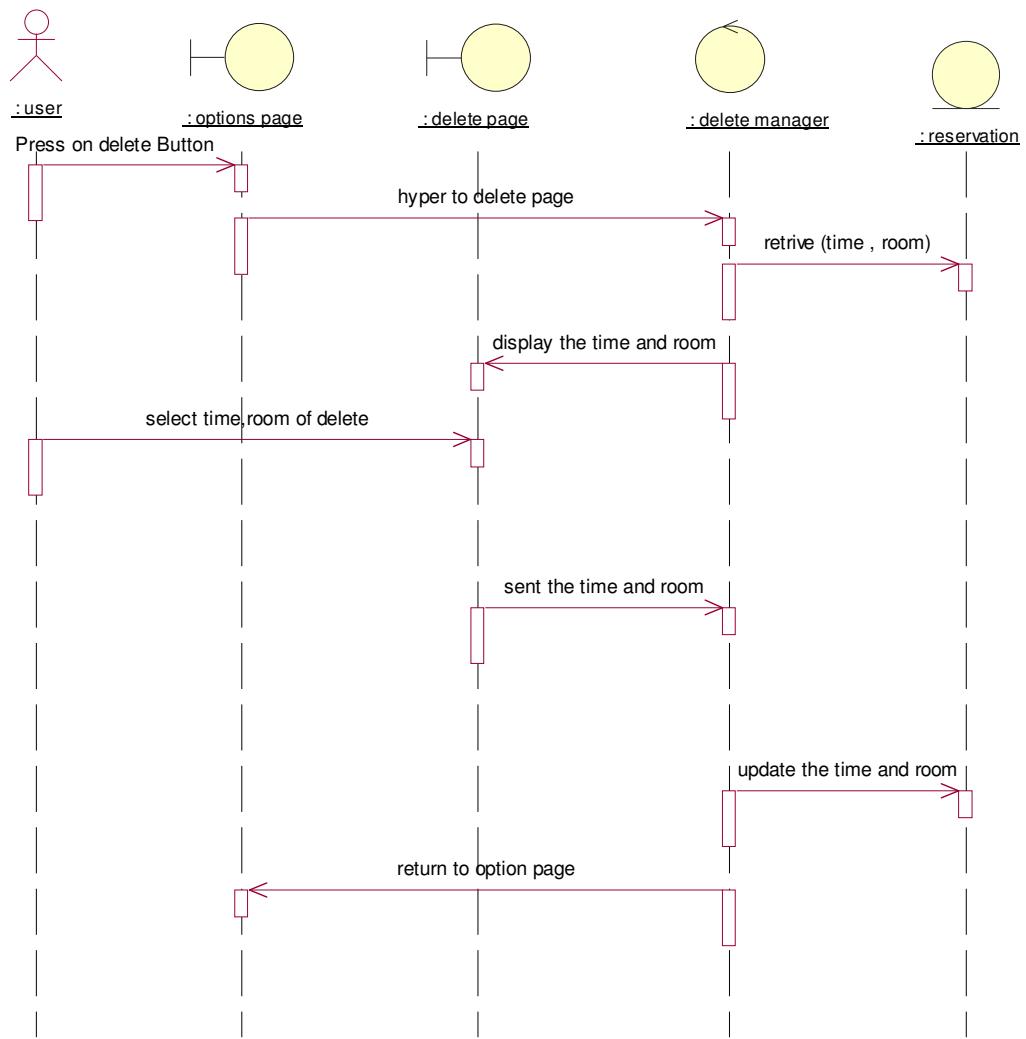
Figure A.3: Sequence diagram for Delete Study Rooms. (SD- 03)
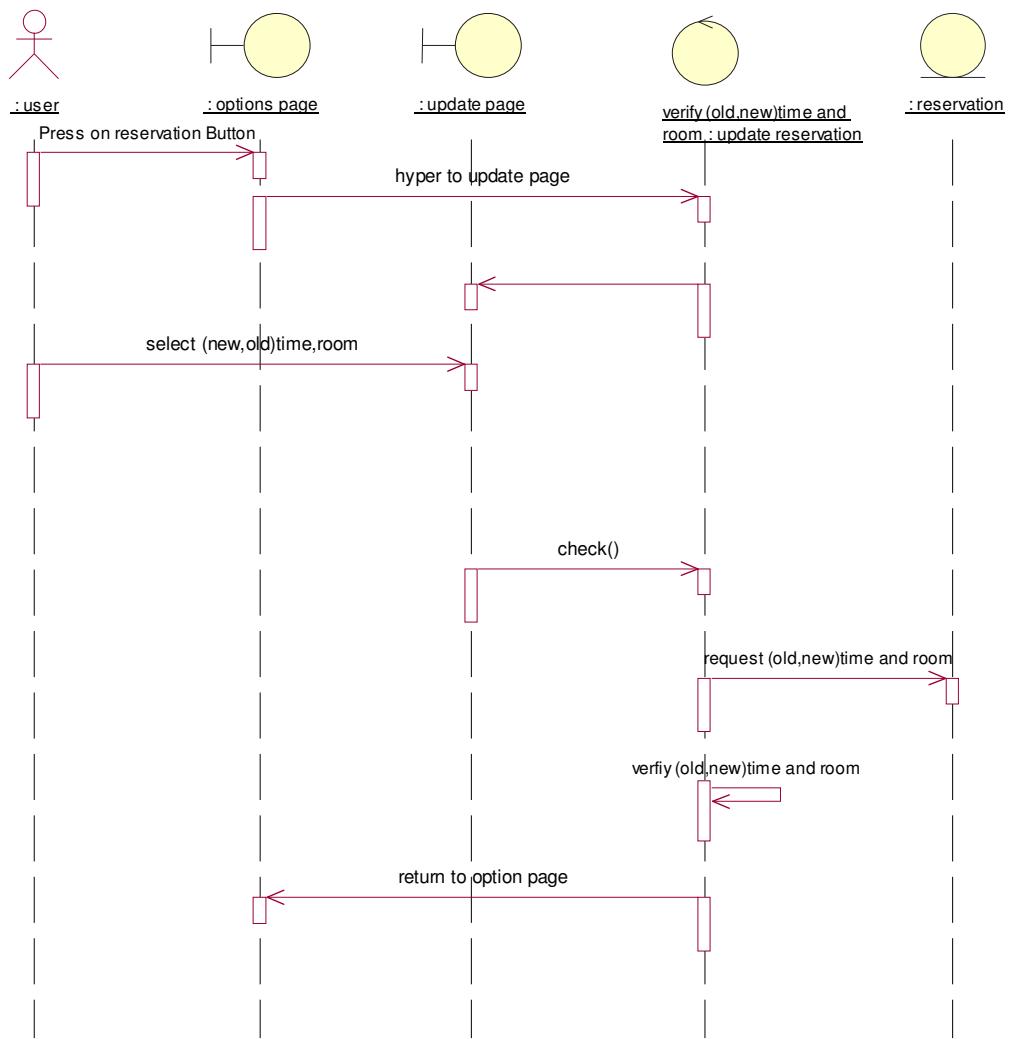
Figure A.4: Sequence diagram for update reservation for Study Rooms. (SD- 04)
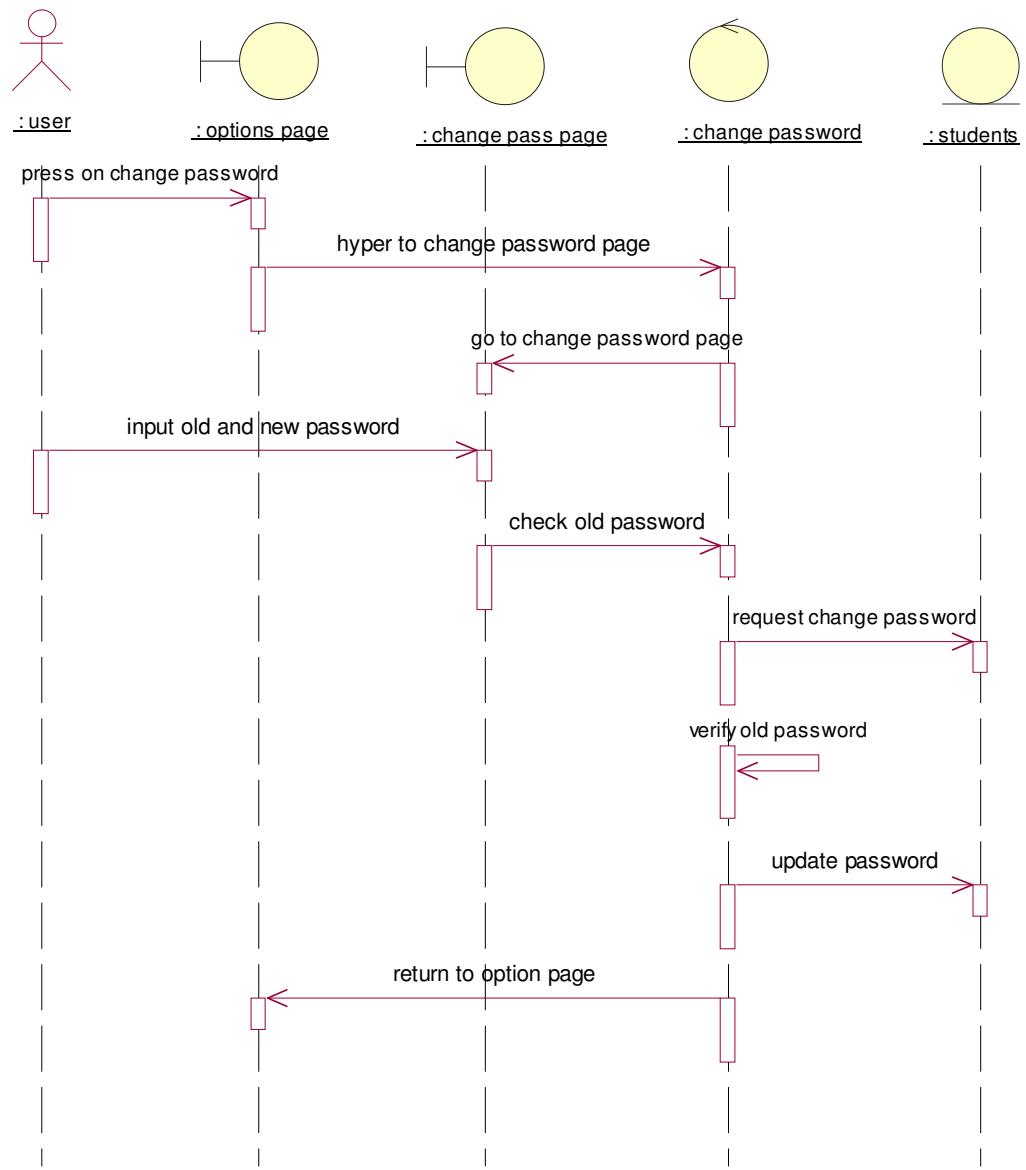
Figure A.5: Sequence diagram for change password students. (SD- 05)
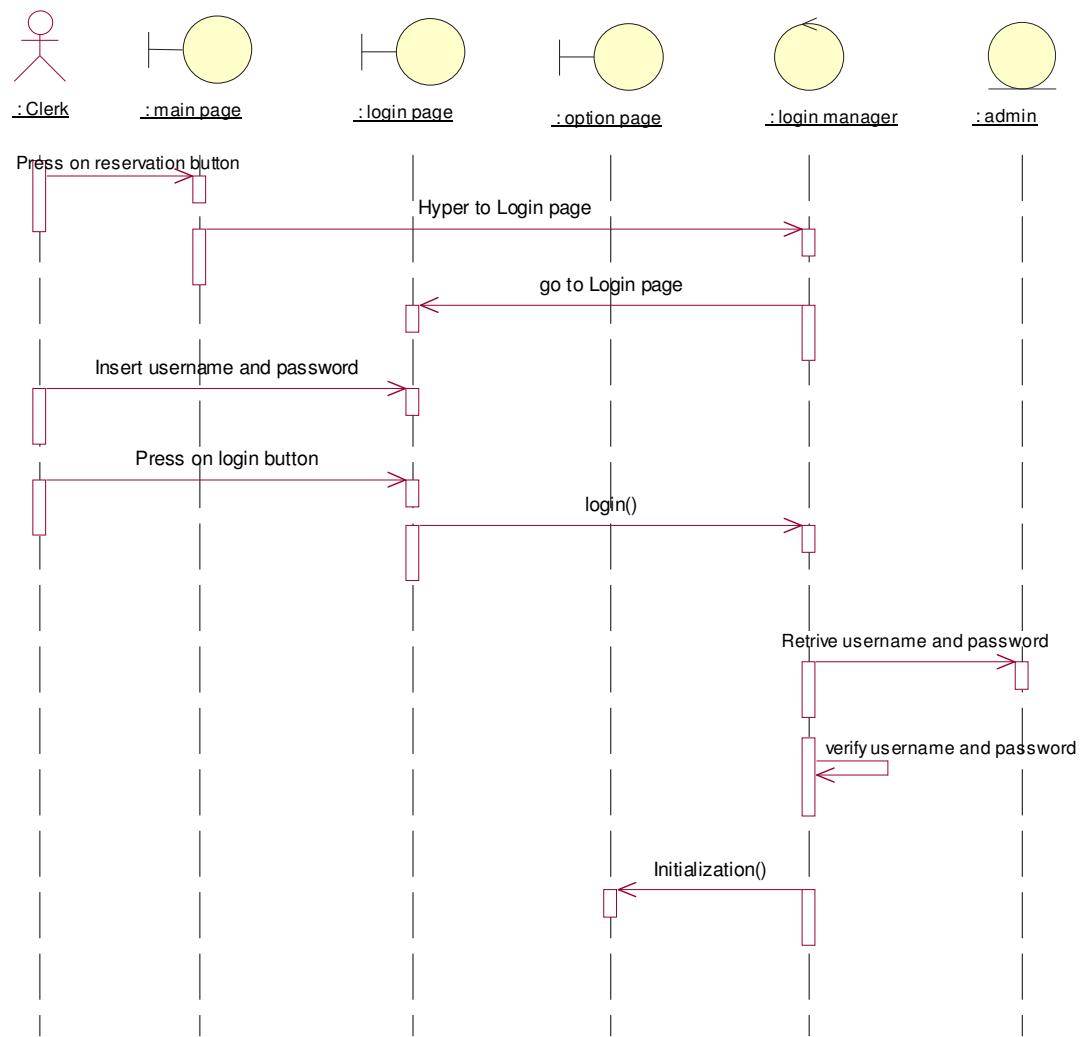
Figure A.6: Sequence diagram for Clerk Login. (SD- 06)
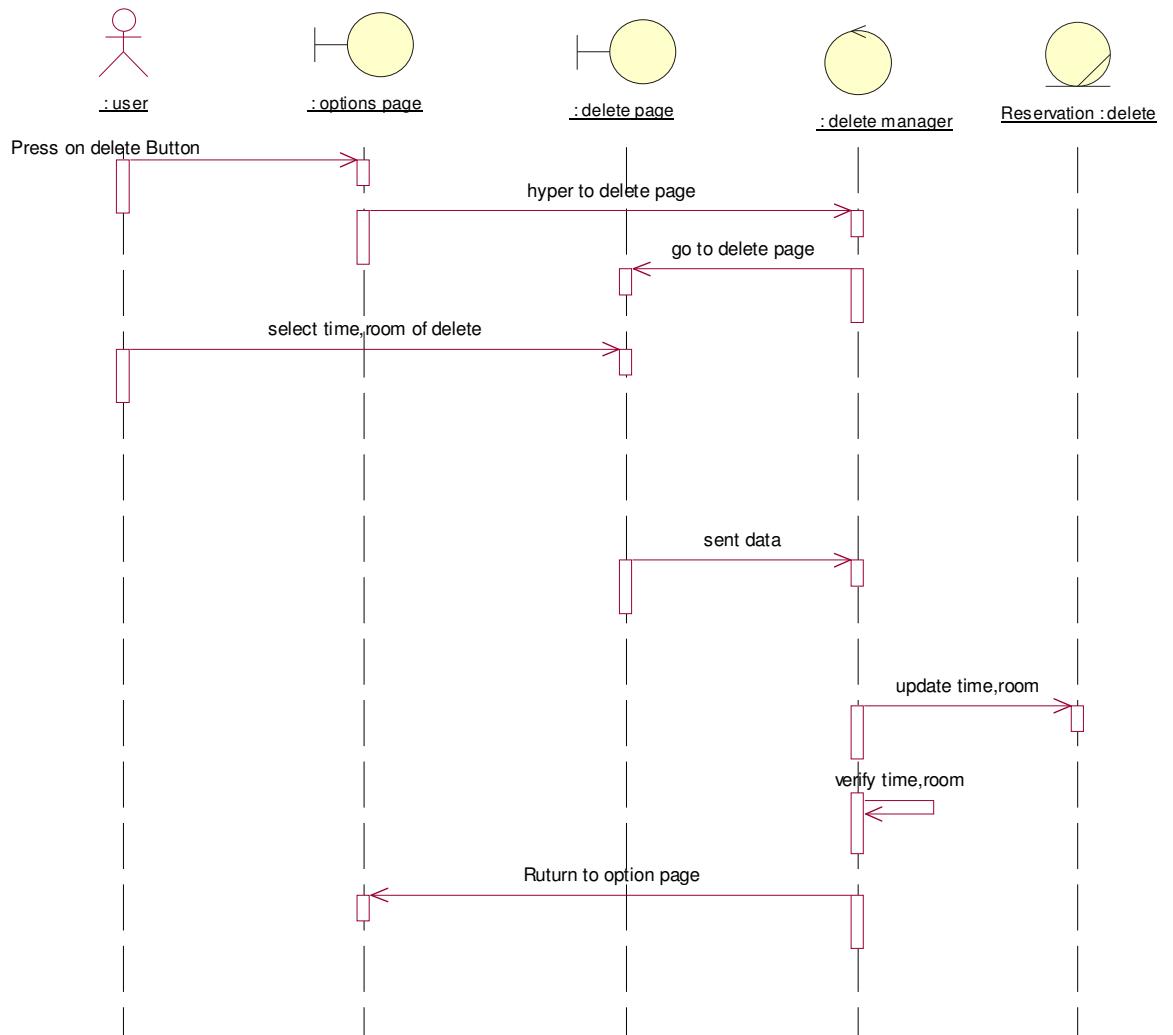
Figure A.7: Sequence diagram for delete reservation (Clerk). (SD- 07)
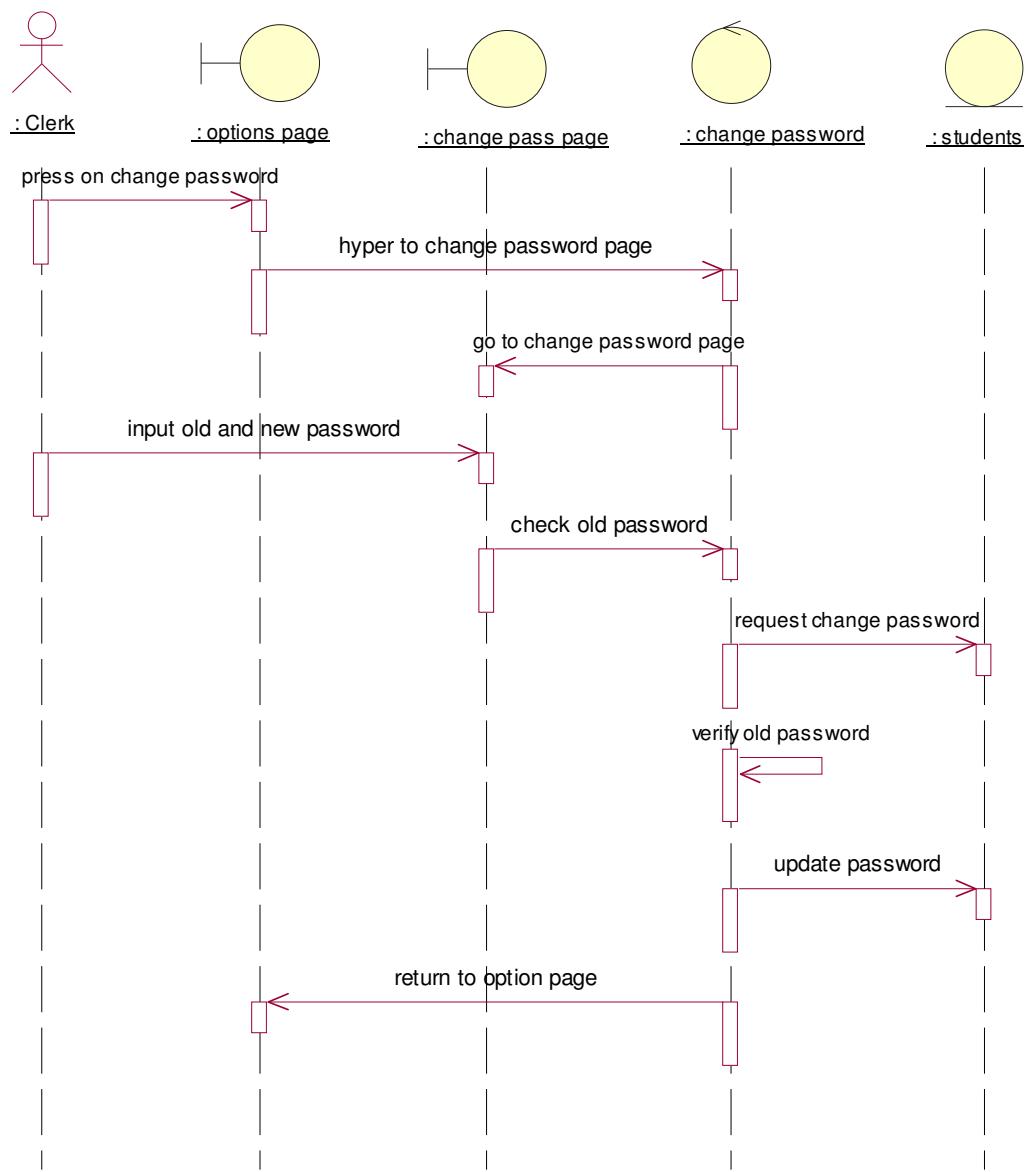
Figure A.8: Sequence diagram for change password clerk. (SD- 08)
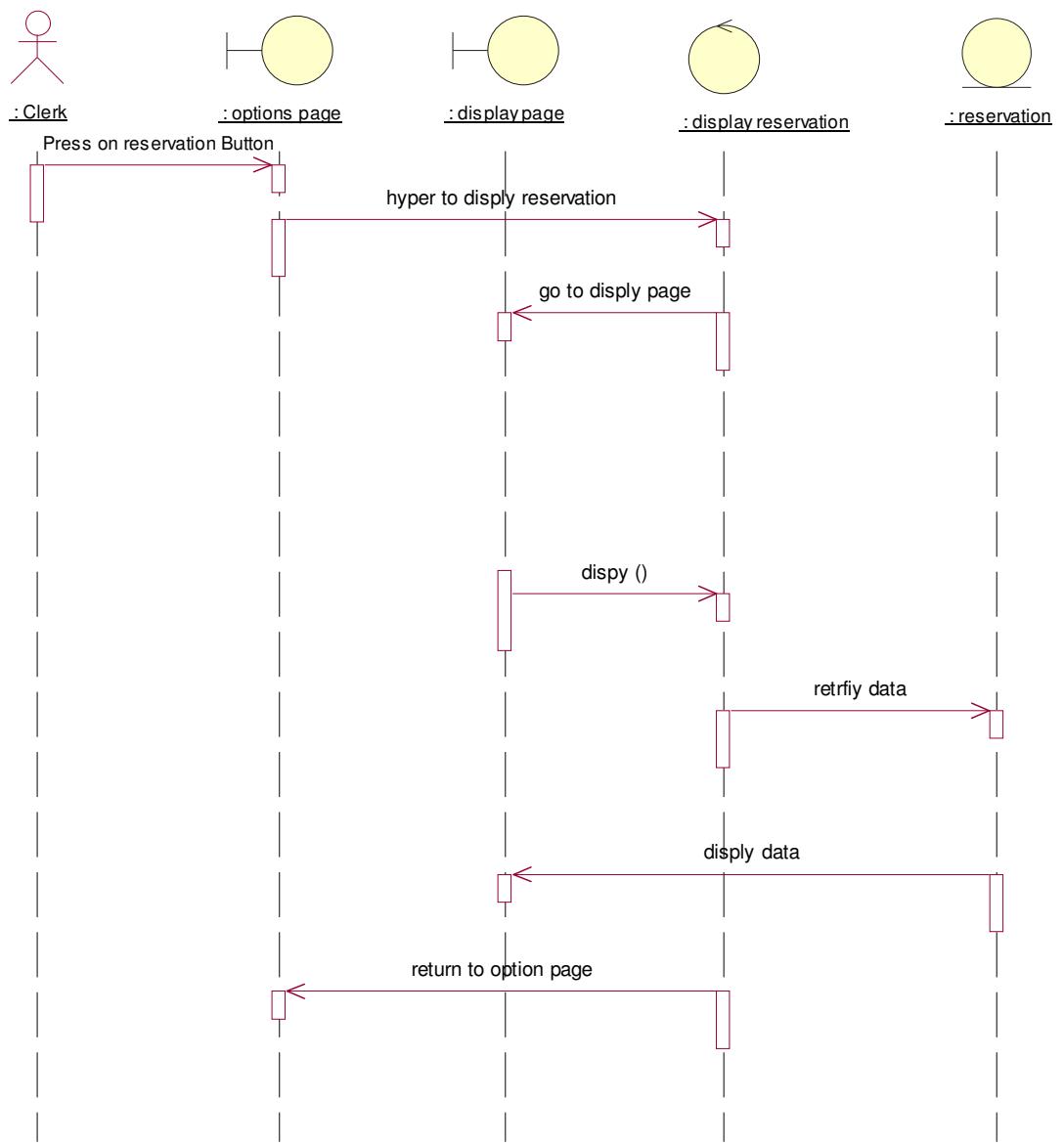
Figure A.9: Sequence diagram for display reservation (clerk). (SD- 09)

Appendices B

Collaboration Diagram

4: Insert username and password
5: Press on login button

: login page

: user

1: Press on reservation button

3: go to Login page

6: login()

: option page

: main page

8: verify username and password

9: Initialization()

2: Hyper to Login page

7: Retrive username and password

: login manager

: admin
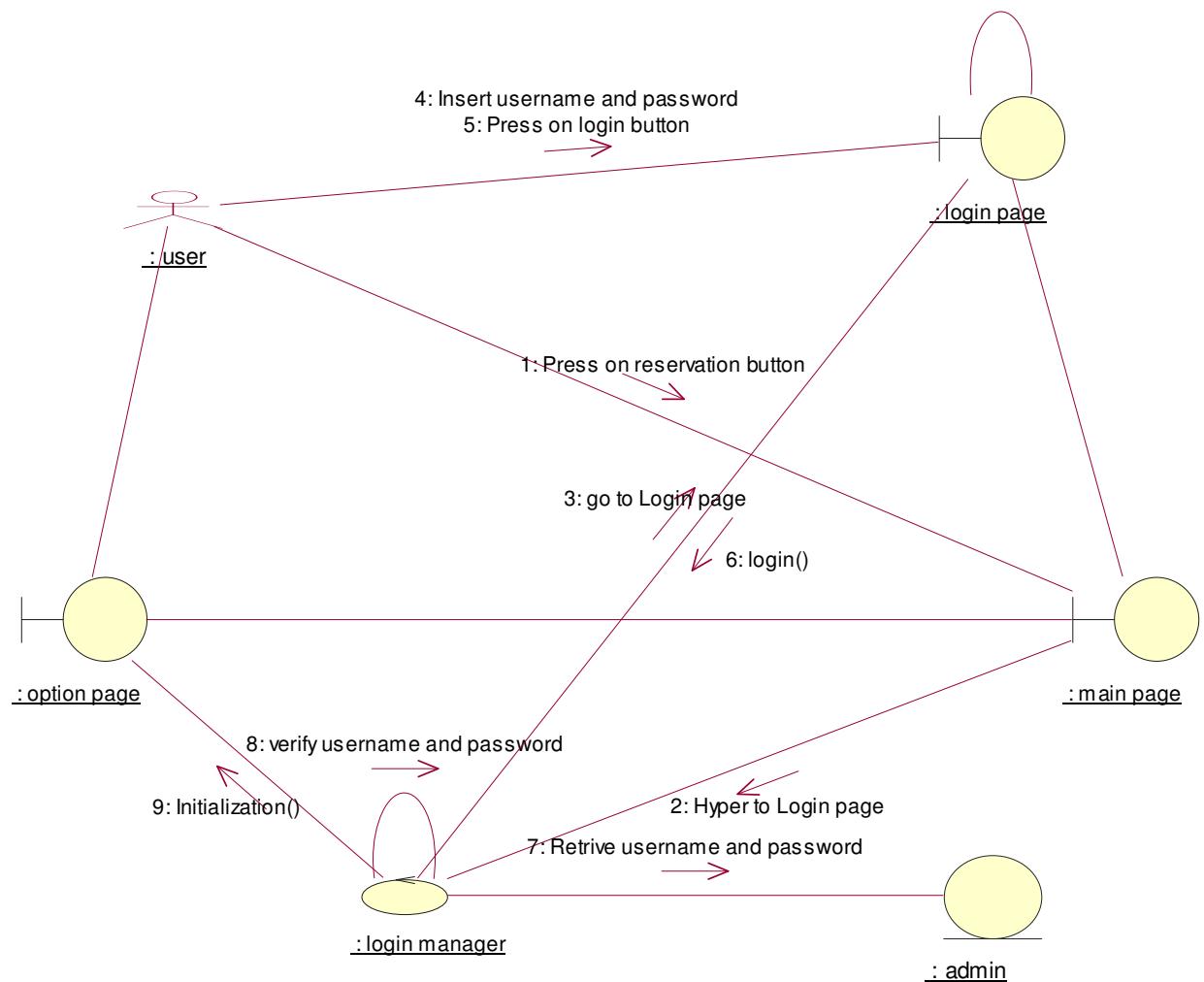
Figure B.1: Collaboration diagram for Students Login. (CD- 01)
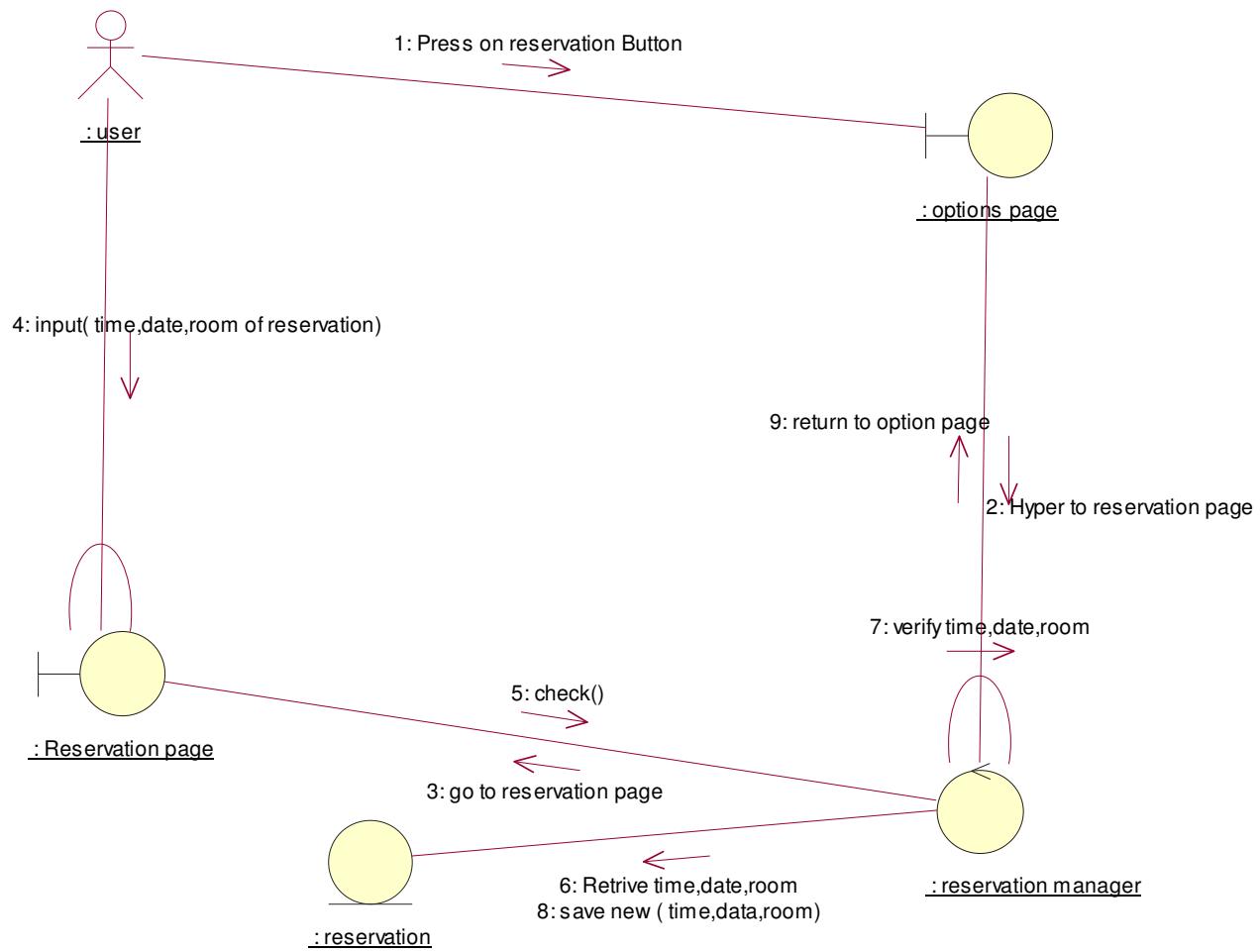
Figure B.2: Collaboration diagram for Reservation Study Rooms. (CD- 02)
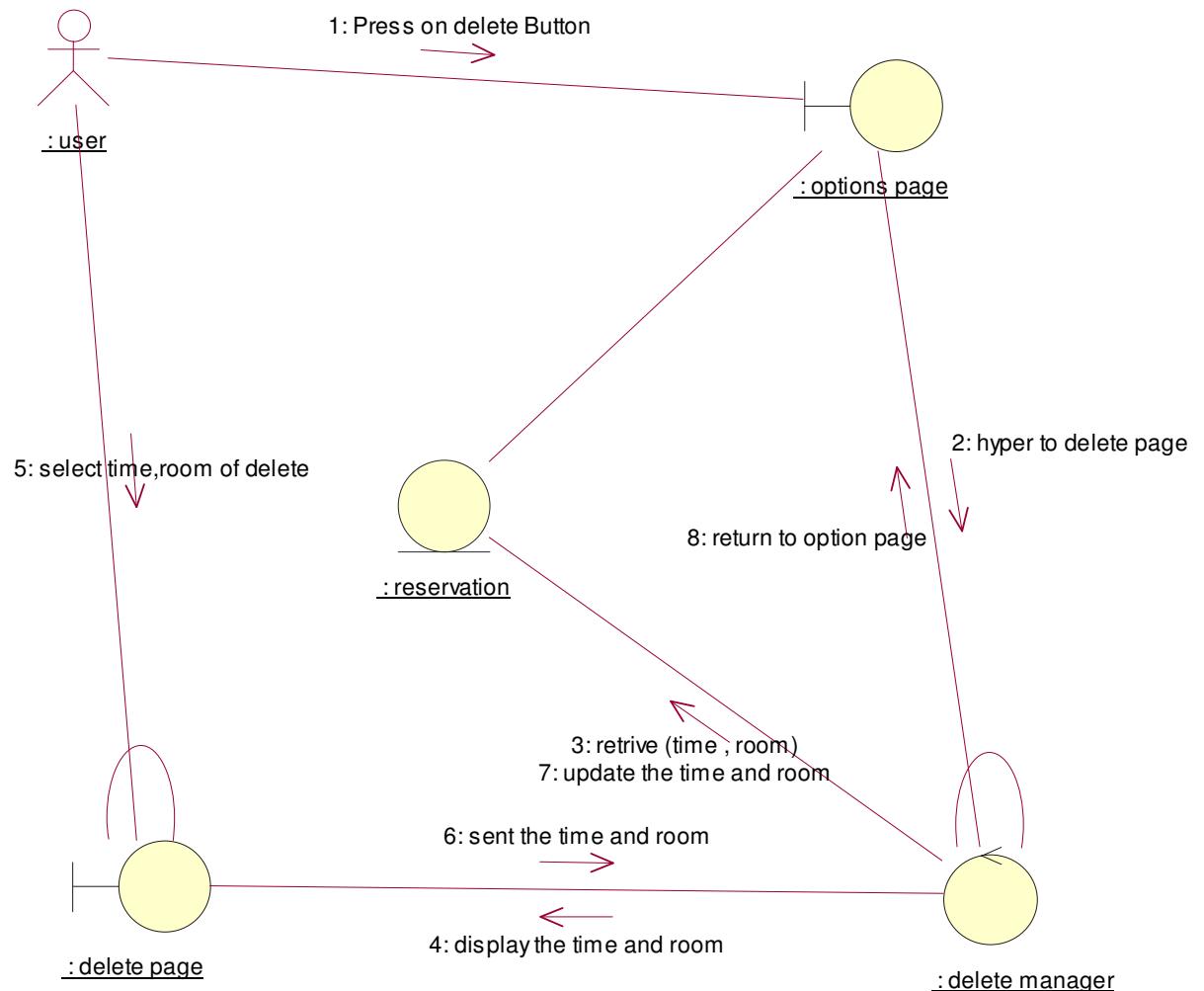
Figure B**.3: Collaboration diagram for Delete Reservation Study Rooms. (CD- 03)**
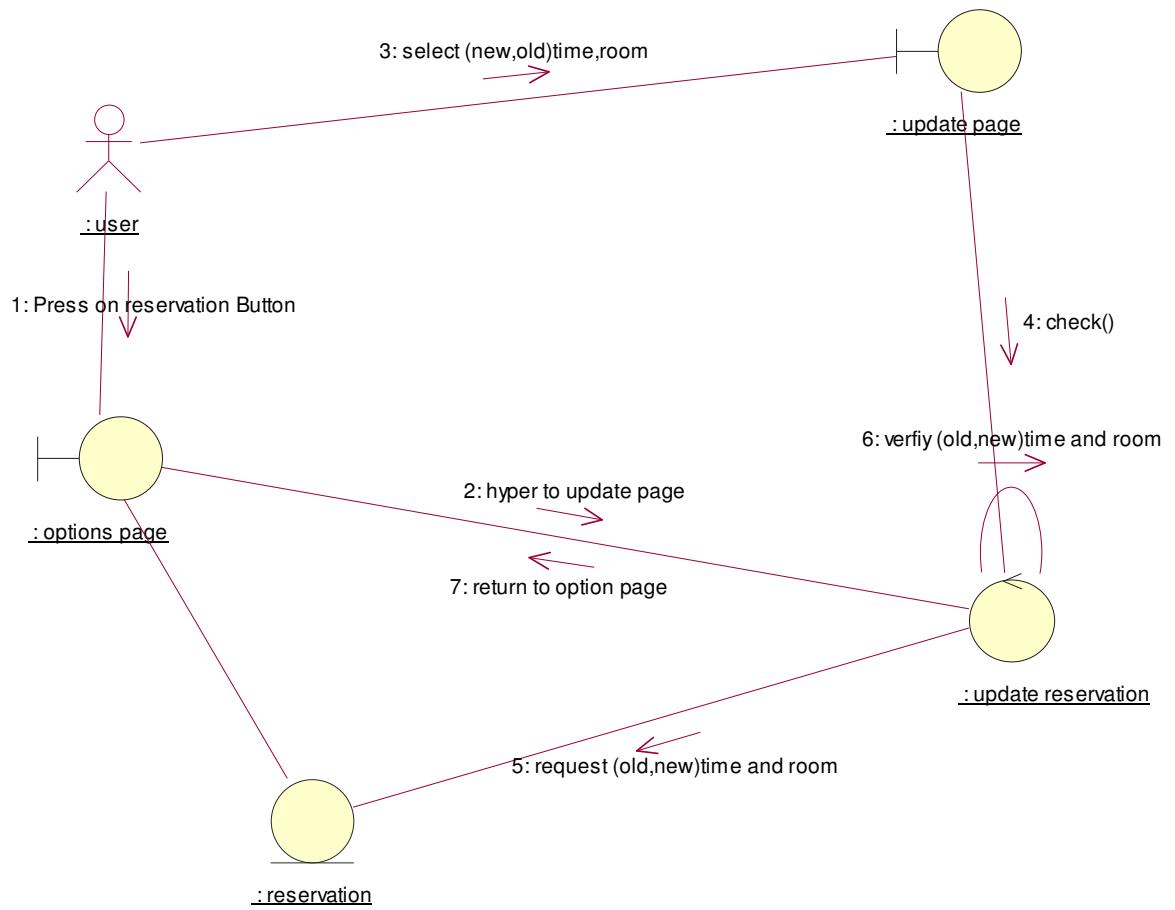
Figure B**.4: Collaboration diagram for Update Reservation Study Rooms. (CD- 04)**
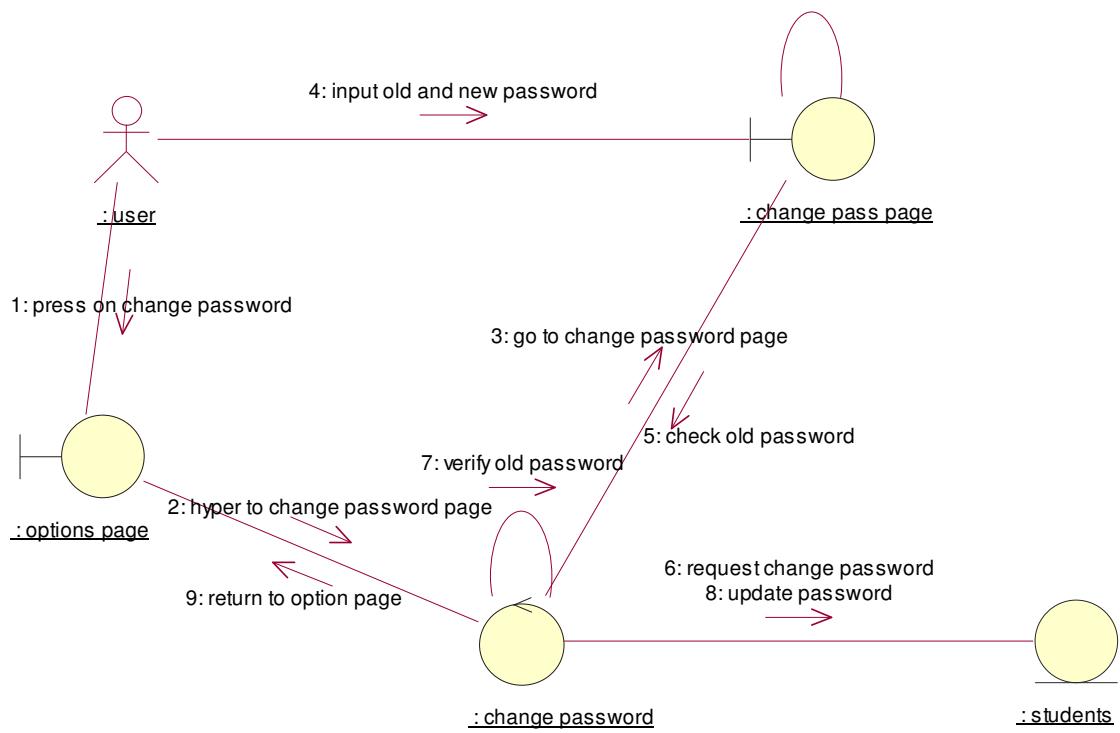
Figure B**.5: Collaboration diagram for Change password students. (CD- 05)**
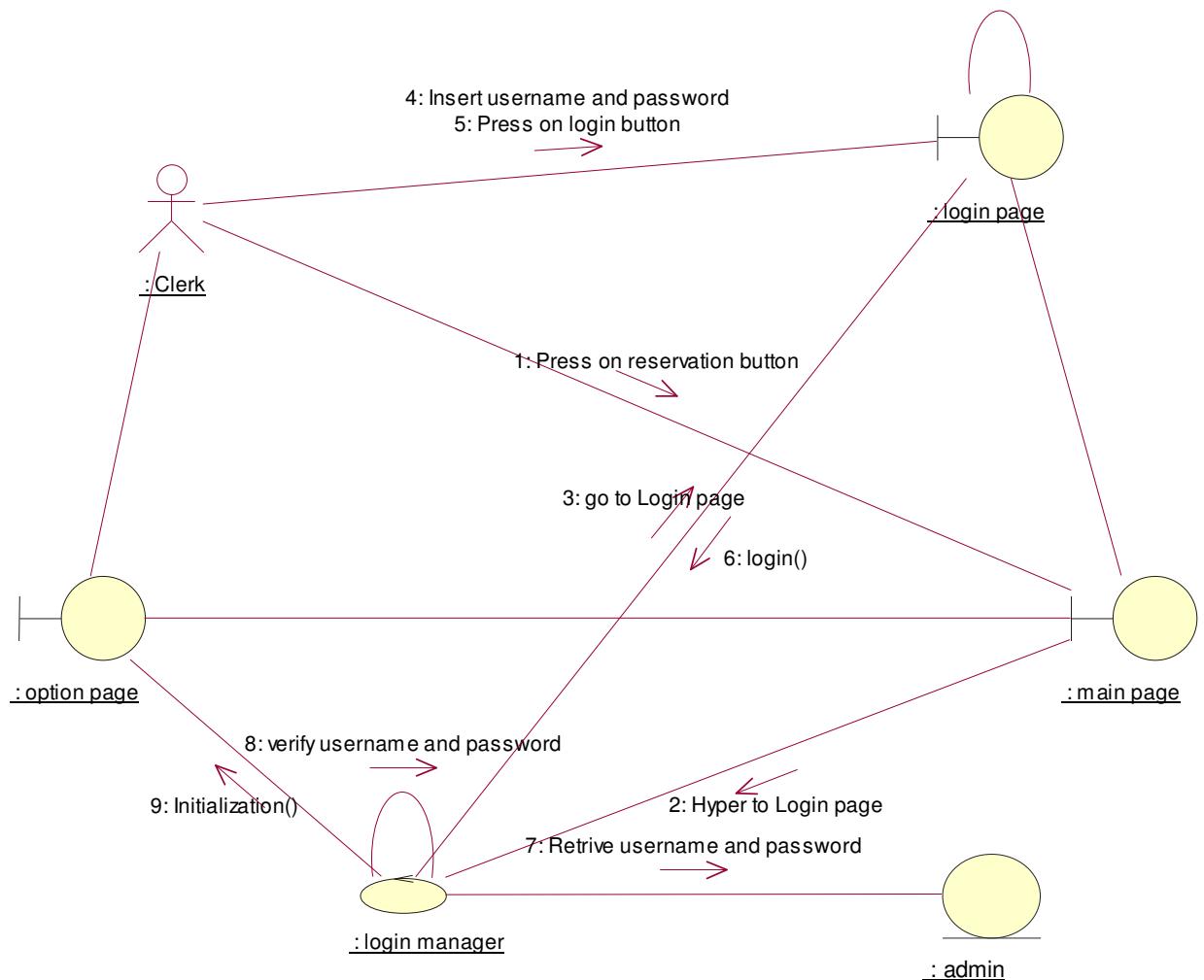
Figure B.6: **Collaboration diagram for Clerk Login. (CD- 06)**
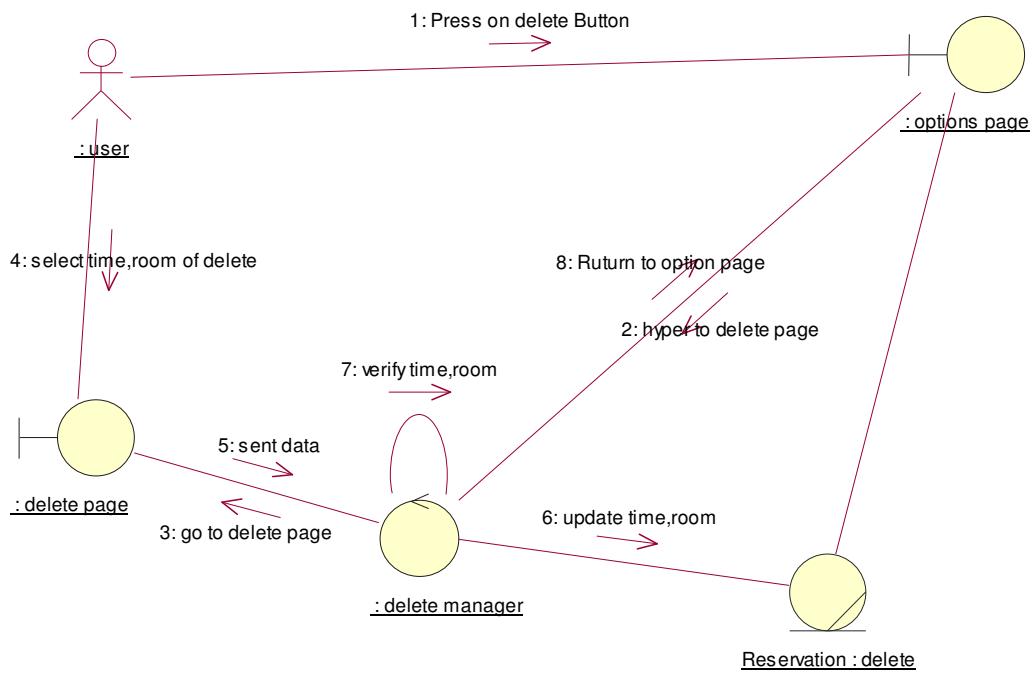
Figure B.**7: Collaboration diagram for Delete Reservation (Clerk). (CD- 07)**
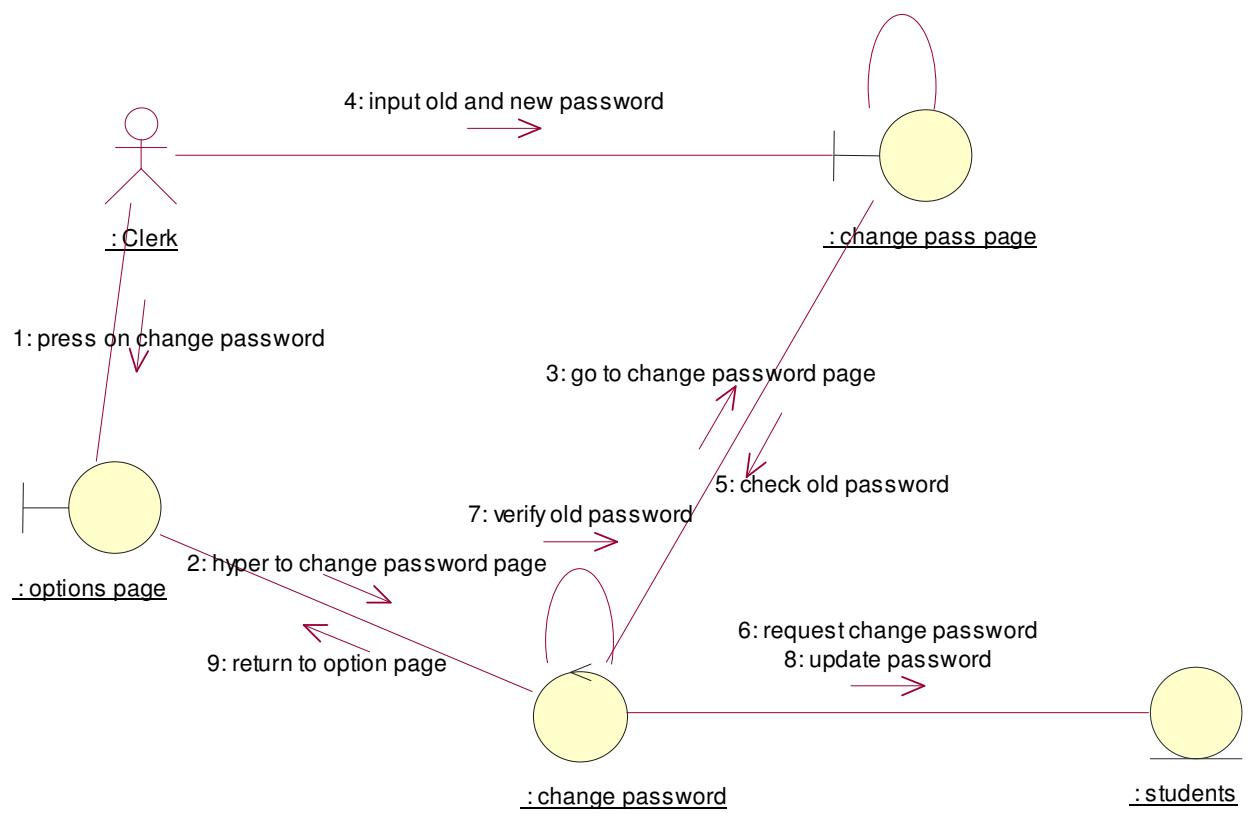
Figure B.**8: Collaboration diagram for Change Password (Clerk). (CD- 08)**
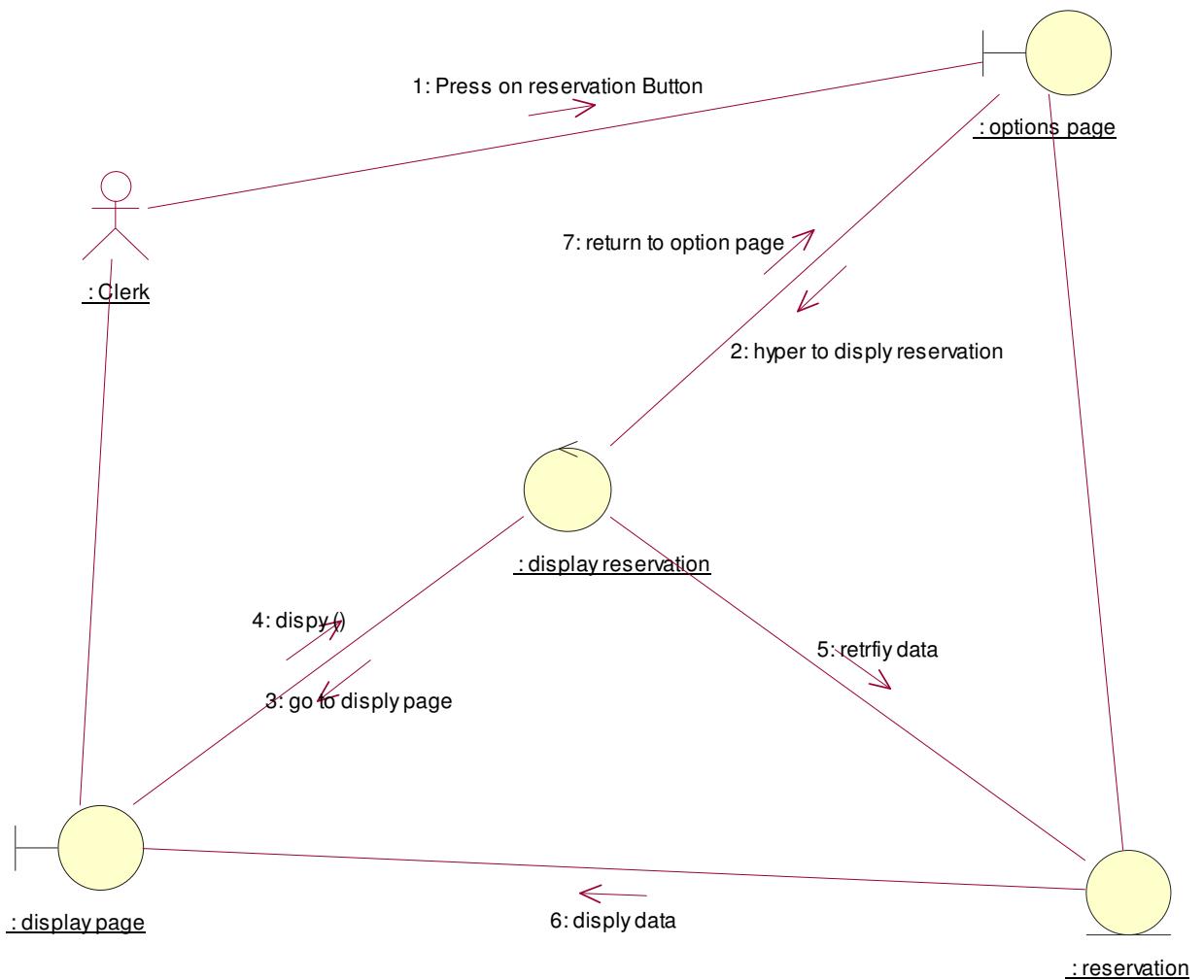
Figure B**.9: Collaboration diagram for Display reservation (Clerk). (CD- 09)**

1: Press on reservation Button

: options page

7: return to option page

: Clerk

2: hyper to disply reservation

: display reservation

4: dispy ()

5: retrfiy data

3: go to disply page

: display page

6: disply data

: reservation

Appendices C

Use Case Specification

1 Use Case Diagram: Clerk Login (CS- 01)

1.1 Brief Description

This case is used to allow the clerk to login to the system to perform his/her tasks

1.2 Pre-Conditions

The clerk must have authorization to login into the system.

1.3 Characteristic of Activation

The execution of this case depends on the clerk demand.

1.4 Flow of Events

1.4.1 Basic Flow (CS- 01-01)

- This case begins when the clerk press on Login button at the main menu page.

- Then, clerk inters his/her username and password.[E-1: wrong username and password].

- Finally clerk press on login message to inter the system, if username and password is wrong, then wrong message will display otherwise, display the clerk home page.

1.4.2 Alternative Flow

No Alternative

1.4.3 Exceptional Flow

- **.[E-1: wrong username and password]**

The system will appear message to the clerk that "check username and Password is wrong".

1.5 Post-Conditions

The clerk login into the system to perform his/her tasks.

2 Use Case Diagrams: Students Login (CS- 02)

2.1 Brief Description

This case is used to allow the Students to login to the system to perform his/her tasks

2.2 Pre-Conditions

The Students must have authorization to login into the system.

2.3 Characteristic of Activation

The execution of this case depends on the Students demand.

2.4 Flow of Events

2.4.1 Basic Flow

- This case begins when the clerk press on Login button at the main menu page.

- Then, Students inters his/her username and password.[E-2: wrong username and password].

- Finally Students press on login message to inter the system, if username and password is wrong, then wrong message will display otherwise, display the Students home page.

2.4.2 Alternative Flow

No Alternative

2.4.3 Exceptional Flow

- [E-2: wrong username and password]

  The system will appear message to the clerk that "check username and Password

  is wrong".

2.5 Post-Conditions

The Students login into the system to perform his/her tasks.

3 Use Case Diagrams: Student Reservation (CS- 03)

3.1 Brief Description

This case is used to allow the Student to make reservation to his/her the study

room in library.

3.2 Pre-Conditions

The Students must have authorization to login into the system.

3.3 Characteristic of Activation

The execution of this case depends on the Students demand.

3.4 Flow of Events

3.4.1 Basic Flow

- This case begins when the student press on Reservation button at the options

  page.

- Then, Students has to select the (room number, time reservation, and date of

  reservation). [E-2: wrong room number and time reservation].

- The Students can check the time of reservation also.

- Finally Students press on reserve and get message to successful.

3.4.2 Alternative Flow

No Alternative

3.4.3 Exceptional Flow

- [E-2: wrong room number and time reservation]

  The system will appear message to the Students that "wrong room number and time reservation ".

3.5 Post-Conditions

The Students already reserved room.

4 Use Case Diagrams: Students Delete Reservation (CS- 04)

4.1 Brief Description

This case is used to allow the Students to make delete to his/her delete Reservation in the study room in library.

4.2 Pre-Conditions

The Students must have authorization to login into the system.

4.3 Characteristic of Activation

The execution of this case depends on the Students demand.

4.4 Flow of Events

4.4.1 Basic Flow

- This case begins when the clerk press on delete Reservation button at the main menu page.

- Then, Students has to select the (room number and time reservation). [E-2: wrong room number and time reservation].

- Finally Students press on delete and get message to successful.

4.4.2 Alternative Flow

No Alternative

4.4.3 Exceptional Flow

- [E-2: wrong room number and time reservation]

The system will appear message to the Students that "wrong room number and

time reservation ".

4.5 Post-Conditions

The Students already deleted room.

5 Use Case Diagrams: Students Update Reservation (CS- 05)

5.1 Brief Description

This case is used to allow the Students to make update to his/her update

Reservation in the study room in library.

5.2 Pre-Conditions

The Students must have authorization to login into the system.

5.3 Characteristic of Activation

The execution of this case depends on the Students demand.

5.4 Flow of Events

5.4.1 Basic Flow

- This case begins when the students press on update button at the main menu

page.

- Then, Students has to select the (room number (old and new) and time reservation (old and new)). [E-2: wrong room number and time reservation].

- Finally Students press on update and get message to successful.

5.4.2 Alternative Flow

No Alternative

5.4.3 Exceptional Flow

- [E-2: wrong room number and time reservation]

The system will appear message to the Students that "wrong room number and time reservation ".

5.5 Post-Conditions

The Students already updated room.

6 Use Case Diagrams: Students Change Password (CS- 06)

6.1 Brief Description

This case is used to allow the Students to make Change Password to his/her password.

6.2 Pre-Conditions

The Students must have authorization to login into the system.

6.3 Characteristic of Activation

The execution of this case depends on the Students demand.

6.4 Flow of Events

6.4.1 Basic Flow

- This case begins when the students press on Change Password button at the main menu page.

- Then, Students has to write the (old password and new password). [E-2: check the password].

- Finally Students press on change password and get message to successful.

6.4.2 Alternative Flow

No Alternative

6.4.3 Exceptional Flow

- [E-2: check the password].

- The system will appear message to the Students that "check the password".

6.5 Post-Conditions

The Students already changed his/her password.

7 Use Case Diagrams: Clerk Change Password (CS- 07)

7.1 Brief Description

This case is used to allow the clerk to make Change Password to his/her password.

7.2 Pre-Conditions

The clerk must have authorization to login into the system.

7.3 Characteristic of Activation

The execution of this case depends on the clerk demand.

7.4 Flow of Events

7.4.1 Basic Flow

- This case begins when the clerk press on Change Password button at the main menu page.

- Then, clerk has to write the (old password and new password). [E-2: check the password].

- Finally clerk press on change password and get message to successful.

7.4.2 Alternative Flow

No Alternative

7.4.3 Exceptional Flow

- [E-2: check the password].

- The system will appear message to the clerk that "check the password".

7.5 Post-Conditions

The clerk already changed his/her password.

8 Use Case Diagrams: Clerk display reservation (CS- 08)

8.1 Brief Description

This case is used to allow the clerk to display reservation.

8.2 Pre-Conditions

The clerk must have authorization to login into the system.

8.3 Characteristic of Activation

The execution of this case depends on the clerk demand.

8.4 Flow of Events

8.4.1 Basic Flow

- This case begins when the clerk press on display button at the main menu page.

8.4.2 Alternative Flow

No Alternative

8.4.3 Exceptional Flow

- No Exceptional Flow.

8.5 Post-Conditions

The clerk already displayed reservation.

9 Use Case Diagrams: Clerk Delete Reservation (CS- 09)

9.1 Brief Description

This case is used to allow the Clerk to make delete to delete Reservation in the study room in library.

9.2 Pre-Conditions

The Clerk must have authorization to login into the system.

9.3 Characteristic of Activation

The execution of this case depends on the Clerk demand.

9.4 Flow of Events

9.4.1 Basic Flow

- This case begins when the clerk press on delete Reservation button at the main menu page.

- Then, clerk has to select the (room number and time reservation). [E-2: wrong room number and time reservation].

- Finally clerk press on delete and get message to successful.

9.4.2 Alternative Flow

No Alternative

9.4.3 Exceptional Flow

- [E-2: wrong room number and time reservation]

  The system will appear message to the clerk that "wrong room number and time

  reservation ".

9.5 Post-Conditions

The clerk already deleted room and time reservation.

Appendices D

QUESTIONNAIRE

A. Demographic Background

Please kindly tick (√) your answers to the given statements.

1. Occupation

   [ ] Student   [ ] Staff

2. What is your GENDER?

   [ ] Male   [ ] Female

3. What is your AGE group?

   [ ] 18-25 Years old   [ ] 26-34 Years old

   [ ] 35-44 Years old   [ ] 45-54 Years old

   [ ] Above 55 Years old

4. How long you have been using web based:

   [ ] Less than 1 year   [ ] 1 – 2 years

   [ ] 2 – 3 years   [ ] More than 3 years

Note: Question (5,6and7) for students only.

5. What is your Nationality?

   [ ] Malay   [ ] International

6. Program taken in UUM

   [ ] Undergraduate   [ ] Postgraduate

7. Year of study

   [ ] First Year   [ ] Second Year

   [ ] Third Year   [ ] Final Year

Please check the appropriate column. The numbers 1 to 5 represent the following:

1= Strongly Disagree;   2= Disagree;   3= Neither   4= Agree;   5= Strongly Agre

Web-Based Satisfaction	1	2	3	4	5
1	I am satisfied with this system.					
2	I would recommend it to the students.					
3	The system is fun and pleasant to use.					
4	The system works the way I want it to work.					
5	The system is wonderful.					
6	I feel I need to have this system.					

Web-Based Ease of use and learning	1	2	3	4	5
1	The system requires the fewest steps possible to accomplish what I want to do with it.					
2	The system is flexible and friendly.					
3	The system can use it without written instructions.					
4	I don't notice any inconsistencies as I use this system.					
5	I can use it successfully every time.					
6	I easily remember how to use the system.					
7	I quickly became skillful with the system.					

Web-Based USEFULNESS	1	2	3	4	5
1 The system will be useful.					
2 The system will gives me more control over the activities in my study.					
3 The system will makes the things I want to accomplish easier to get done.					
4 The system will saves me time and my needs when I use it.					
5 The system does everything I would expect it to do.					

Using the System for Reservation Online.	1	2	3	4	5
1 Overall, I am satisfied with how easy it is to use this system					
2 I can effectively complete my work using this system					
3 I am able to complete my work quickly using this system					
4 I am able to efficiently complete my work when I using this system					
5 I feel comfortable using this system					
6 It was easy to learn to use this system					
7 I believe I became productive quickly by using this system					
8 The system gives error messages that clearly tell me how to fix problems					
9 Whenever I make a mistake using the system, I recover easily and quickly					
10 The information (such as booking, deleting, updating, on-screen messages, and other documentation) provided with this system is clear					
11 It is easy to find the information I needed					
12 The information provided for the system is easy to understand					
13 The information is effective in helping me complete the tasks and scenarios					
14 The organization of information on the system screens is clear					

Appendices E

Table E.1: Descriptive Statistics for all sections of questionnaire

STANDARD DEVATION	MEAN	Strongly Disagree (1) %	F	Disagree (2) %	F	Neither (3) %	F	Agree (4) %	F	Strongly agree (5) %	F		
1.08	4.19	4.9	4	3.7	3	9.9	8	29.6	24	51.9	42	X1	WEB-BASED Satisfaction
1.10	3.70	6.2	5	3.7	3	30.9	25	32.1	26	27.2	22	X2	
1.11	3.75	2.5	2	13.6	11	21	17	32.1	26	30.9	25	X3	
0.91	4.24	2.5	2	1.2	1	13.6	11	34.6	28	48.1	39	X4	
1.28	3.24	6.2	5	30.9	25	18.5	15	21	17	23.5	19	X5	
0.93	4.22	2.5	2	2.5	2	12.3	10	35.8	29	46.9	38	X6	
0.87	4.09	2.5	2	1.2	1	14.8	12	46.9	38	34.6	28	X7	WEB-Based Ease of use and learning
0.85	4.18	2.5	2	-	-	13.6	11	44.4	36	39.5	32	X8	
0.87	4.32	2.5	2	-	-	12.3	10	33.3	27	51.9	42	X9	
0.89	4.13	2.5	2	-	-	18.5	15	39.5	32	39.5	32	X10	
0.86	4.07	2.5	2	1.2	1	14.8	12	49.4	40	32.1	26	X11	
0.90	4.30	2.5	2	1.2	1	11.1	9	33.3	27	51.9	42	X12	
0.88	4.11	2.5	2	1.2	1	14.8	12	45.7	37	35.8	29	X13	
0.89	4.23	2.5	2	2.5	2	8.6	7	42	34	44.4	36	X14	Web-Based Usefulness
0.90	4.33	2.5	2	1.2	1	11.1	9	30.9	25	54.3	44	X15	
0.89	4.17	2.5	2	3.7	3	6.2	5	49.4	40	38.3	31	X16	
1.03	4.16	3.7	3	2.5	2	16	13	29.6	24	48.1	39	X17	
0.93	4.14	2.5	2	2.5	2	14.8	12	38.3	31	42	34	X18	
0.97	4.17	2.5	2	4.9	4	9.9	8	38.3	31	44.4	36	X19	Using the System for Reservation Online
1.02	3.79	3.7	3	6.2	5	23.5	19	40.7	33	25.9	21	X20	
1.11	4.02	4.9	4	6.2	5	12.3	10	34.6	28	42	34	X21	
0.92	4.01	2.5	2	1.2	1	23.5	19	38.3	31	34.6	28	X22	
0.91	4.07	3.7	3	-	-	16	13	45.7	37	34.6	28	X23	
0.82	4.16	1.2	1	1.2	1	16	13	43.2	35	38.3	31	X24	
1.11	3.35	4.9	4	18.5	15	28.4	23	32.1	26	16	13	X25	
0.92	4.08	3.7	3	2.5	2	8.6	7	51.9	42	33.3	27	X26	
0.91	4.23	2.5	2	3.7	3	6.2	5	43.2	35	44.4	36	X27	
0.94	4.07	3.7	3	2.5	2	11.1	9	48.1	39	34.6	28	X28	
1.01	4.14	2.5	2	4.9	4	14.8	12	30.9	25	46.9	38	X29	
0.95	4.17	3.7	3	1.2	1	12.3	10	39.5	32	43.2	35	X30	
0.98	4.04	2.5	2	4.9	4	9.9	8	38.3	31	44.4	36	X31	
0.95	4.05	3.7	3	1.2	1	12.3	10	39.5	32	43.2	35	X32	