

**LIBRARY SEAT AND BOOK AVAILABILITY CHECKING USING
MOBILE APPLICATION**

By

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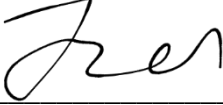
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ABSTRACT

Nowadays, the libraries are usually located in higher education institutions such as colleges and universities. Mostly, the students come to the libraries to do their assignments and research papers. When the UTAR students comes to the library, they will be facing some problems, such as difficult to find an available or preferred seat, hard to find exact location of the books or overwhelmed with vast amount of the books. For this purpose, a user-friendly library seat and book availability checking mobile application has been developed in this project, with the aim to help UTAR students reserving a library seat, and to locate exact location of the books. Agile development methodology is implemented to provide a development plan for this project and Android Studio is used to develop the mobile application. Furthermore, this project will replicate the real UTAR library's seat layout. In the mobile application, there will be four floors of library shown and a seat viewing feature is implemented where the students can visualize the available seats in each floor before coming to the library. The students can zoom in or zoom out the visualized seat layout to have a better view. Students can check the real-time availability of their preferred seat and make seat reservation with the desired date and time. When the student has successfully booked the seat, the student must scan the QR code that had provided on the seat to check in the booked seat when come to the library. The purpose is to make sure that the students do not take the wrong seat. In alternatively way, the student is allowed to scan the QR code to get and check in the seat directly, provided that the selected seat is available for reservation. A search engine is provided in the proposed application so that students can use the search engine to check the availability of the book. Then, the detail information of the book such as book name and call number will be displayed. In addition, this mobile application is able to point the exact location of the books in the layout, so that students can easily pick up the book in library and it can save the user's time from browsing the books one by one on the shelves.

TABLE OF CONTENTS

| | |
|--|------------|
| TITLE PAGE | i |
| REPORT STATUS DECLARATION FORM | ii |
| FYP THESIS SUBMISSION FORM | iii |
| DECLARATION OF ORIGINALITY | iv |
| ACKNOWLEDGEMENTS | v |
| ABSTRACT | vi |
| LIST OF TABLES | x |
| LIST OF FIGURES | xi |
| CHAPTER 1 PROJECT BACKGROUND | 1 |
| 1.1 Introduction..... | 1 |
| 1.1 Problem Statement and Motivation | 3 |
| 1.1.1 Difficult to find an available or preferred seat..... | 3 |
| 1.1.2 Difficult to find the exact location for the books | 3 |
| 1.1.3 The traditional seat reservation process is time-consuming | 4 |
| 1.2 Project Objectives | 4 |
| 1.3 Project Scope and Direction..... | 4 |
| 1.4 Contributions..... | 5 |
| 1.5 Report Organization..... | 5 |
| CHAPTER 2 LITERATURE REVIEW | 7 |
| 2.1 Introduction..... | 7 |
| 2.2 Website and Mobile Application | 7 |
| 2.2.1 University Libraries Seat Reservation System | 7 |
| 2.2.2 Columbia University Libraries Website | 9 |
| 2.2.3 Rice University Fondren Library Seat Reservation | 11 |
| 2.2.4 SeatEd @ UoE | 13 |
| 2.2.5 Kyungpook National University Library Mobile Application..... | 14 |
| 2.2.6 Comparison | 16 |
| 2.3 Existing Seat Viewing Method | 17 |
| 2.4 Summary | 18 |
| CHAPTER 3 SYSTEM METHODOLOGY/APPROACH | 19 |
| 3.1 System Design | 19 |
| 3.1.1 Flowchart | 19 |
| 3.1.2 Use Case Diagram..... | 21 |

| | |
|---|----|
| 3.1.3 Activity Diagram – Login and Register Module | 22 |
| 3.1.4 Activity Diagram- Seat Reservation Module..... | 23 |
| 3.1.5 Activity Diagram – Book Availability Checking Module..... | 24 |
| 3.1.6 Activity Diagram- QR Code Scan module | 25 |
| CHAPTER 4 SYSTEM IMPLEMENTATION..... | 26 |
| 4.1 Agile Methodology | 26 |
| 4.2 Tools to use | 27 |
| 4.3 System Requirement | 28 |
| 4.4 Login Activity | 30 |
| 4.5 Register Activity | 31 |
| 4.6 Seat Requirement Form Activity | 32 |
| 4.7 Seat Layout Activity | 33 |
| 4.8 Seat Reservation..... | 35 |
| 4.9 Book Search Activity | 36 |
| 4.10 Visualize the Book’s Exact Location..... | 38 |
| 4.11 Scan QR code Activity..... | 39 |
| 4.12 View Reservation Activity..... | 42 |
| 4.13 Logout Activity | 43 |
| CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION | 44 |
| 5.1 Verification Plan | 44 |
| 5.2 Testing..... | 46 |
| 5.2.1 Test case 1 | 46 |
| 5.2.2 Test case 2..... | 47 |
| 5.2.3 Test case 3..... | 48 |
| 5.2.4 Test case 4..... | 49 |
| 5.2.5 Test case 5..... | 50 |
| 5.3 Project Challenges | 51 |
| 5.4 Objectives Evaluation | 51 |
| 5.5 Timeline | 52 |
| 5.5.1 FYP 1 Timeline..... | 52 |
| 5.5.2 FYP 2 Timeline..... | 53 |
| 5.6 Concluding remark..... | 54 |
| CHAPTER 6 CONCLUSION AND RECOMMENDATION | 55 |
| 6.1 Conclusion | 55 |
| 6.2 Recommendation | 55 |

| | |
|-------------------------------------|-----|
| REFERENCE..... | 57 |
| APPENDIX A FYP2 WEEKLY REPORT | A-1 |
| POSTER..... | A-8 |
| PLAGIARISM CHECK RESULT | |
| FYP 2 CHECKLIST | |

LIST OF TABLES

| Table Number | Title | Page |
|---------------------|--|-------------|
| Table 2.1 | Table comparison of feature in the literature review | 16 |
| Table 4.1 | System requirement | 28 |
| Table 5.1 | Verification plan | 43 |
| Table 5.2.1 | Test case 1 | 44 |
| Table 5.2.2 | Test case 2 | 45 |
| Table 5.2.3 | Test case 3 | 46 |
| Table 5.2.4 | Test case 4 | 47 |
| Table 5.2.5 | Test case 5 | 48 |
| Table 5.5.1 | FYP 1 Timeline | 50 |
| Table 5.5.2 | FYP 2 Timeline | 51 |

LIST OF FIGURES

| Figure Number | Title | Page |
|----------------------|--|-------------|
| Figure 2.1 | Main menu of University Libraries Seat Reservation System | 7 |
| Figure 2.2 | Seat reservation in Columbia University Libraries Website | 9 |
| Figure 2.3 | Search engine in Columbia University Libraries Website | 10 |
| Figure 2.4 | Real-time crowd level in Rice University Fondren Library | 11 |
| Figure 2.5 | Check in and Check out procedure for SeatEd@UOE | 13 |
| Figure 2.6 | Seat Reservation in Kyungpook National University Library | 14 |
| Figure 2.7 | Seat layout for SeatLayout Demo mobile application | 18 |
| Figure 3.1 | Flowchart of Library Seat and Book Availability Checking using Mobile Application | 19 |
| Figure 3.2 | Use case diagram of Library Seat and Book Availability Checking using Mobile Application | 21 |
| Figure 3.3 | Login and register module activity diagram | 22 |
| Figure 3.4 | Seat reservation module activity diagram | 23 |
| Figure 3.5 | Book availability checking module activity diagram | 24 |
| Figure 3.6 | QR scan module activity diagram | 25 |
| Figure 4.1 | Agile Development Methodology model | 26 |
| Figure 4.2 | Login Activity | 30 |
| Figure 4.3 | Register Activity | 31 |
| Figure 4.4 | Seat Requirement Form Activity | 32 |
| Figure 4.5 | Floor plan and Seat Layout Activity | 33 |
| Figure 4.6 | Non-highlighted and highlight seat layout | 34 |
| Figure 4.7 | Normal seat layout, and zoom in seat layout | 34 |
| Figure 4.8 | Seat Reservation | 35 |
| Figure 4.9 | Book Search Activity | 36 |
| Figure 4.10 | Document of stated range of book in each rack and floor number | 37 |
| Figure 4.11 | Book Exact location Layout | 38 |
| Figure 4.12 | Scan QR Activity | 39 |
| Figure 4.13 | After scan QR code layout | 40 |
| Figure 4.14 | Check in successful layout | 41 |
| Figure 4.15 | View reservation activity | 42 |

| Figure Number | Title | Page |
|----------------------|-----------------------------|-------------|
| Figure 4.16 | Sign out activity | 43 |
| Figure 5.1 | Test Case 1 – Actual Result | 45 |
| Figure 5.2 | Test Case 2 – Actual Result | 46 |
| Figure 5.3 | Test Case 3 – Actual Result | 47 |
| Figure 5.4 | Test Case 4 – Actual Result | 48 |
| Figure 5.5 | Test Case 5 – Actual Result | 49 |

CHAPTER 1 PROJECT BACKGROUND

CHAPTER 1 PROJECT BACKGROUND

1.1 Introduction

Traditionally, libraries are the buildings or rooms where kept the collection of books and used for reading and research [2]. Then, the main purpose of the libraries is to provide numerous supports giving factual information to help users find information. The users can find the information that comes from many different resources such as biographies, histories, journals and so on. However, libraries have come to the new norm with the rapid development of technology in the middle of the 20th century. The development of technology such as computer, mobile and telecommunication help libraries store the reading materials in online and the user able to access on any devices. However, libraries have not fully implemented the technology yet as the people still need libraries because it provides a better environment for them to study and reading.

Nowadays, the libraries are usually located in higher education institutions such as colleges and universities. It can be called as academic libraries. The main function of the libraries is to provide a comprehensive and tremendous collection of documents that help the students for their study and research [5]. Usually, the students come to the libraries to do their assignments and research papers. This is because the libraries provide a large collection of fundamental researches such as biographies and journals. These fundamental researches can give them ideas to write assignments and research papers while gaining extra knowledge that is usually not written in the textbook. Besides that, the libraries also provide newspapers and magazines to the students for the entertainment and healthy leisure purpose [5]. This is because some of the students use the library as a place to relax and the libraries give student a chance to use their leisure time to read newspapers or magazines instead of just playing with their mobile phone in their free time. Therefore, the students will read the newspapers or magazines and the inside contents of the newspapers such as comics, sudoku and cinema information can give students a fun and enjoyment of leisure time.

Besides, the libraries are the place where can provide a quiet environment for reading and studying [6]. In every education institute, there will have a final exam for the students and they are given an exam preparation week for them to prepare for their

CHAPTER 1 PROJECT BACKGROUND

exam. Therefore, students will choose to stay in the library to prepare for their exam as the library is a quiet environment for them to more focus on studying and learning. Other than that, the libraries have provided a study room to students who wish to do group discussions in the library. Therefore, students can have a group discussion in the library without making noise disrupt other students and the students also can find some reading materials in the library when facing problems during group discussion.

We can know that libraries play a very important role to students such as provide a quiet environment, provide various documentation for study and research and giving entertainment leisure time. As mentioned above, the libraries have not fully implemented the technology which is most of the libraries only use computers and the internet to store the resources. Therefore, the students still have problems when coming to the library. The challenge for the student faced when coming to the library is the student hard to find an available seat for them to sit. When the student comes to the library, the student has to find an available place floor by floor and it is time-consuming for them. Other than that, most of the libraries used call number to assign all of the books on the shelves. The call number acts like an address in library and the student can use call number to browse the shelves and get the book. However, the student will be overwhelmed with call number if vast amounts numbers of books on the shelves. It is because the student does not know the exact location of the books and the student must find the book one by one on the shelves and it is a time-consuming process.

To solve the problems issued faced by the students when coming to the library, this project will build a user-friendly mobile application to overcome the problems. It is because everyone owns a mobile phone nowadays and people carry their mobile phone around with them. Compared to the computer or laptop, the computer or laptop is too heavy and could not carry outside as people want to. Therefore, the mobile application is a better choice build to solve the problems as long as the people carry their mobile phone around with them.

CHAPTER 1 PROJECT BACKGROUND

In the nutshell, a platform will be created to let the student reserve a seat using a mobile application developed in this project. The student can view all the available seats and then reserve a seat before coming to the library. Besides, the student can use the mobile application search books and then find the exact location of the books.

1.1 Problem Statement and Motivation

Here are the problems issued by the UTAR library. The problems include:

1.1.1 Difficult to find an available or preferred seat

The students only can find their available seats after entering the library and it could cause time-consuming for them. The students have to find available seats one by one if their favorite seat or the seat normally sit is not available for now. In other words, the students may not find a seat they preferred to sit such as a seat that have power supply or a seat that have no people surround. Also, it could be possible to happen which is there are no more available seats for them. It happens during the peak time especially the final exam preparation week. During the final exam preparation week, most of the students will choose to study in the library because the library provides a quiet environment for them so that they can pay more attention to their exam preparation. As a result, the students who come late to the library would not find any seat for them to study in the library. Therefore, I suggest adding the diagram to show the available seats and unavailable seats in the library. The students can choose an available seat or a preferred seat to reserve a seat based on the diagram.

1.1.2 Difficult to find the exact location for the books

Most of the mobile applications or websites of libraries use search engine to check availability of the books. Also, the UTAR library portal had provided a search engine for the same purpose. Unfortunately, the result of the search engine only shows the description of the book and call number of the book if the book is availability in UTAR library. The students could not know the exact location for the books even if the students have the call number. Therefore, the student may feel anxiety to find books in the UTAR library. So, I suggest adding a search engine for students to search the books and the search engine will directly inform the exact location for the books to the students.

CHAPTER 1 PROJECT BACKGROUND

1.1.3 The traditional seat reservation process is time-consuming

Most of the mobile application required the student to reserve the seat before coming to the library. If the student does not reserve the seat, the student is not allowed to come to the library. Therefore, I suggest adding a QR code for each seat so that the student can scan the QR code to get the seat when the seat is not reserved by anyone. It is suitable for the student who is familiar with the library and suddenly wants to sit in the library. If the student reserves the seat before coming to the library, the student is required to scan the QR code for check-in purposes. Also, the student can choose to release the seat and quit to the library within the time given, so that the other student can take the seat.

1.2 Project Objectives

1. To build a mobile application which student can reserve a seat

Seats in the library will be visualized in this project. The students can view the status of the seat which is available, unavailable or the seat with power availability. Then, the student can select an available seat they like and further reserve this seat in this project.

2. To locate the exact location of the books

The student can use the search engine to search the availability of the book. The result of the search will come out the detailed information about the books. Also, the exact location will show to the students in a diagram and the student can directly go to the shelf and get the book.

3. To keep track of the student who is already checked in the correct seat

In the library, each of the seats has a unique QR code. When the seat is not reserved by anyone, the student can scan the QR code directly and take the seat. Other than that, if the student has already reserved the seat before coming to the library, the student is required to scan the QR code for check-in purposes. The purpose is to avoid the student taking a wrong seat. The mobile application will check whether the seat is booked by the student, or the student is taking another student's seat.

1.3 Project Scope and Direction

The project will build a mobile application platform to let the students find available seats with the mobile phone. The students must use login before using the mobile

CHAPTER 1 PROJECT BACKGROUND

application. The seat's availability status will be shown in the diagram and different colors are used to describe the status of the seat availability. Also, the student must scan the QR code when the student is taking the reserved seat. So that the other students would not take the wrong seat. When the seat is not taken by anymore, the student can scan the QR code directly and take the seat. Therefore, the students will know the exact location of the seats and then they can reserve the available seat by clicking the icon. Then, the students are allowed to check the availability of the books in this project. The students can check the availability by using the search engine. Furthermore, the search result will view the detailed information of the books such as the book name and call number. Also, the result will show the exact location of the book to the students. The students can directly go to the shelf to get the book based on the search result.

1.4 Contributions

This project can help the student to reserve a seat before coming to the library. The project will display a library seat layout to show the status of the seat availability to the student. Therefore, the student can select reserve a seat with the desired date and time. For example, the student wants to reserve a seat where the place is quite with fewer people. Then, the student can use the library seat layout to view which floor has fewer people occupying the seat. The student can decide and reserve the seat based on it. After the student done reserving the seat, the student must scan the QR Code that had provided on the seat at the day the student come to the library. The purpose is to check the student is not taking the wrong seat. Other than that, this project can help the student to locate the exact location of the books. This is because this project will provide a search engine to the student and the student can use the search engine to get the desired book. Then, the result of the search engine will show the exact location with the detailed information of the book and the student can directly go to the shelf to get the book.

1.5 Report Organization

The details of this project are shown in the following chapters. In Chapter 2, some related existing websites and mobile applications are reviewed and then made a comparison table for better understanding. Then, system design used for this project is presented in Chapter 3. And then, Chapter 4 shows and describes preliminary work that

CHAPTER 1 PROJECT BACKGROUND

had done in FYP. Next, Chapter 5 is to show the methodology and verification plan used in this project. Furthermore, Chapter 6 reports the conclusion of the project.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

In this chapter, it will review some existing practice or research that have done toward this project's problems. These existing practices or researches are including 3 website systems and 2 mobile applications. The website systems are University Libraries Seat Reservation System, Columbia University Libraries Website, and Rice University Fondren Library Seat Reservation. While the mobile applications are SeatEd@UoE and Kyunghee University Library Mobile App. Also, this chapter will review a seat viewing method and a method for book recommendation system.

2.2 Website and Mobile Application

2.2.1 University Libraries Seat Reservation System

Brief

University Libraries is a website that implemented a seat reservation system for students to reserve their seats online for Newman Library, the Art and Architecture Library, Veterinary Medicine Library, Virginia Tech Carilion School of Medicine Library, and the Northern Virginia Centre Library [12]. The students can select the requirements for seats such as power availability at the seat to reserve seat. The system will filter out the requirements and show out the available seats to the students with the date and time. The figure 2.1 show the service provided in University Libraries Seat Reservation System. The student can choose the seat they want and reserve their seats online. Also, the student can type the provided code to check-in and check-out in this system.

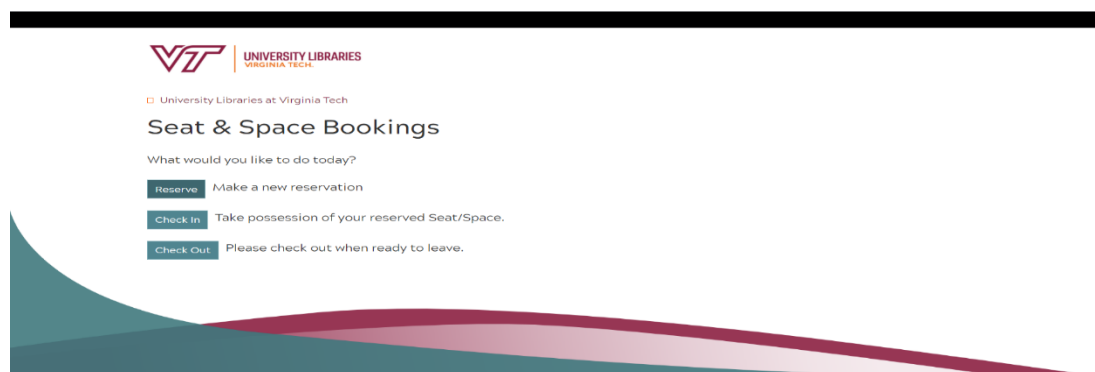


Figure 2.1. Main menu of University Libraries Seat Reservation System [12].

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

Strength

The strength of the University Libraries Seat Reservation System is the system will be giving a check-in code and check-out code to the students via email if the students had succussed reserve their seats. The students just have to type the check-in code to let the system verify the eligibility of the students sit the seat so that it would not happen in the situation where the students take the wrong seat. Other than that, the students just have to type check-out code when ready to leave, even if the time limit has not been reached. Therefore, the other students may have the opportunity to reserve the seat at that time when the students had just check-out. It can help to solve the problem where the student late reserve seats and could not find any available seat.

Weakness

The weakness of the University Libraries Seat Reservation System is the seat reservation process. When reserving the seat, the users only have to enter the first name, last name and email to submit their reservation to the system. Besides, the email can write in a fake email. Because of that, it may occur an annoying situation where people reserve seats through fake email while others cannot get the seat they want.

Recommendation

The recommendation is the users have to log into the system before reserve seats. The users only can log in by using their student id and the name of the university. This can prevent the intention of people who just want to play around with this seat reservation system and the system will directly trackback the person's name and detail information if happens this kind of situation.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

2.2.2 Columbia University Libraries Website

Brief

The Columbia University Libraries Website is a platform that provides various services that benefit the staffs and students of Columbia University. The services such as searching resources and reserving seats online. Students and staff are required to enter their student ID or staff ID before booking a seat in Butler Library, Avery Library, Lehman Library, Starr East Asian Library, Business Library, and Science & Engineering Library. [1]. Figure 2.2 shows the seat reservation in this website while Figure 2.3 shows the search engine for Columbia University Libraries Website.

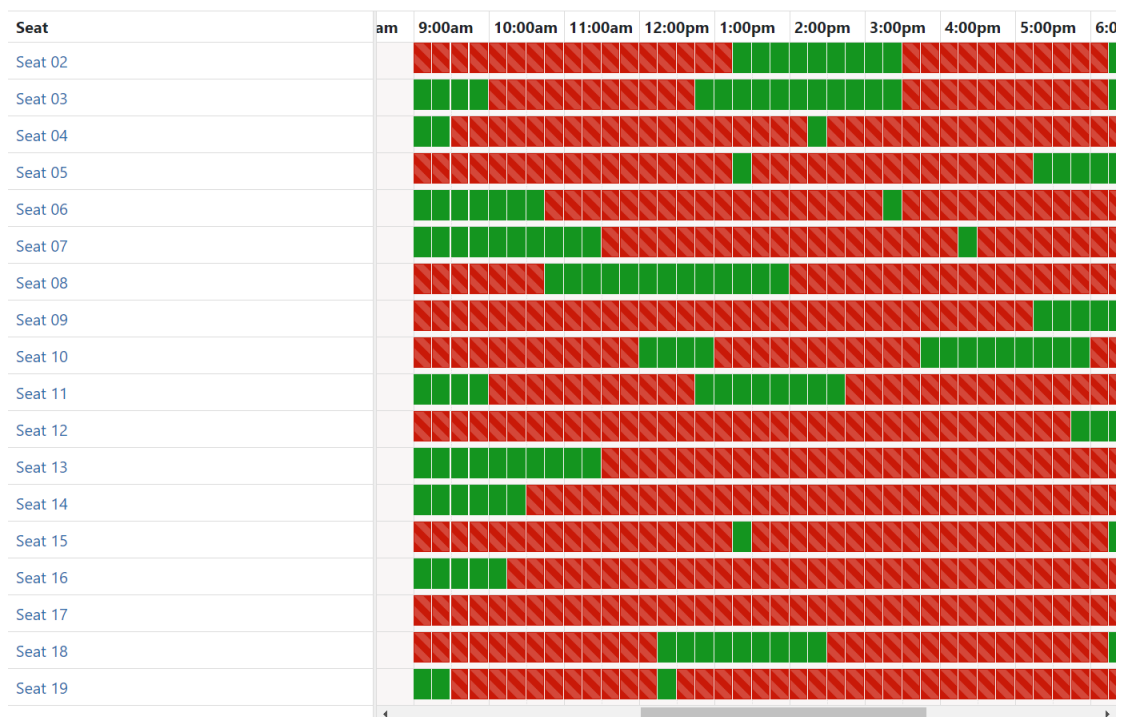


Figure 2.2. Seat reservation in Columbia University Libraries Website [1].

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

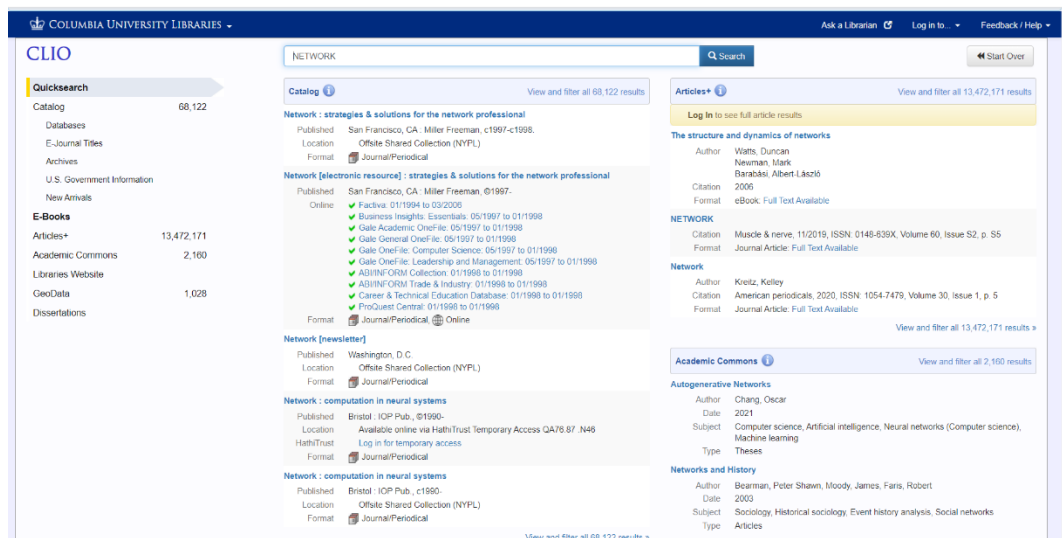


Figure 2.3. Search engine in Columbia University Libraries Website [1].

Strength

The strength of the Columbia University Libraries Website is the website has provided users with a search engine for the purpose of searching the available resources in the library. The search engine is user-friendly and easy to use as the user not only can search the resources by typing the name of the resources, but the users also can type the name of the author or the subject of the resources to search the resources. Besides, this website will show the search results which are more relevant to the user, but the users can have options to sort the results, which can be sorted by title or published date.

Weakness

Although the website already provides a search engine for students to search for resources, the system does not display the location of the resources in the library. Even if they know that there are resources available in the library, it may cause students to waste time looking for bookshelves and resources.

Recommendation

There are some suggestions to improve the search engine in the system. The administrator of the system has to add the location of the books, such as the floor and the shelf, so that

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

the users would not waste times to find and get the books in the library. Then, the next suggestion is to implement a deep learning algorithm to the system so that daily recommendation books will show to the users based on their favourite. Therefore, the users can know which books are most popular and most suitable for them based on the book recommendation.

2.2.3 Rice University Fondren Library Seat Reservation

Brief

Rice University Fondren Library Seat Reservation is a platform that allows the students of Rice University to reserve study rooms in the Fondren Library [10]. Other than that, the platform allows the students to search and view the resources online. Besides that, it had provided a real-time crowd level to the users. The figure 2.4 show the real-time crowd time in Rice University Fondren Library Website.

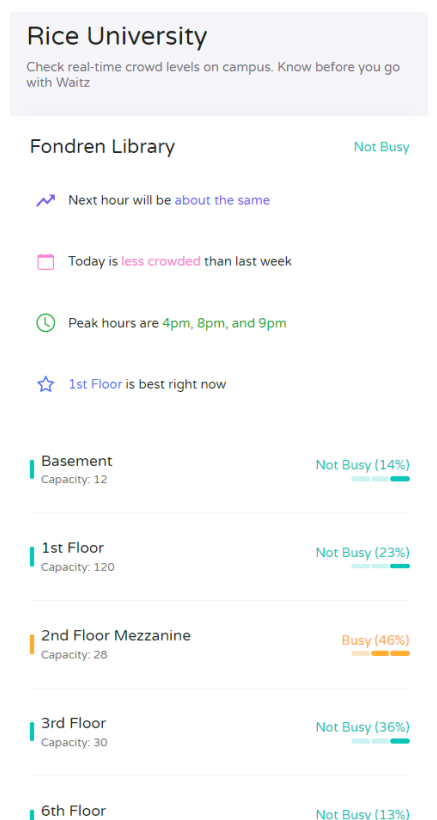


Figure 2.4. Real-time crowd level in Rice University Fondren Library [10].

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

Strength

The strength of the Rice University Fondren Library Seat Reservation is the platform will provide real-time crowd levels to the users. The real-time crowd levels will show the time of the peak hours and capacity of each floor. Also, this real-time crowd will recommend which floor is better to reserve right now based on the number capacity of the floor and total number are using the seat. So, the users who wish to sit at a quiet place can view these real-time crowd levels and then reserve a seat on a certain floor. Therefore, the users do not have to view available seat floor by floor.

Weakness

The weakness is the seat reservation system of Rice University Fondren Library Seat Reservation. When the students want to reserve a seat, the system shows the time slot only. It may cause the students to be confused especially the new students which is the students do not know the location of the study room.

Recommendation

The system can use a diagram to show the location and structure of the library. Besides, the system has to show the status of the seat such as available and reserved. Also, the system must able to display which seat have power availability. Furthermore, the students must able to zoom in or zoom out so that the users have a better view of the seat.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

2.2.4 SeatEd @ UoE

Brief

This SeatEd@UoE app is for University of Edinburgh students to reserve and manage their study space bookings [13]. The students must log in using normal University of Edinburgh credentials before using the application. Each of the study spaces in the University of Edinburgh has a desk and the students can search for the available seat with a desk or computer to reserve their study space. The search result will return and give up to five suggested booking options to the students. Each of the available study spaces will be giving information such as the location information and the facilities so the students can reserve their study space as their wants. The figure 2.5 show check in and check out procedure in this mobile application.

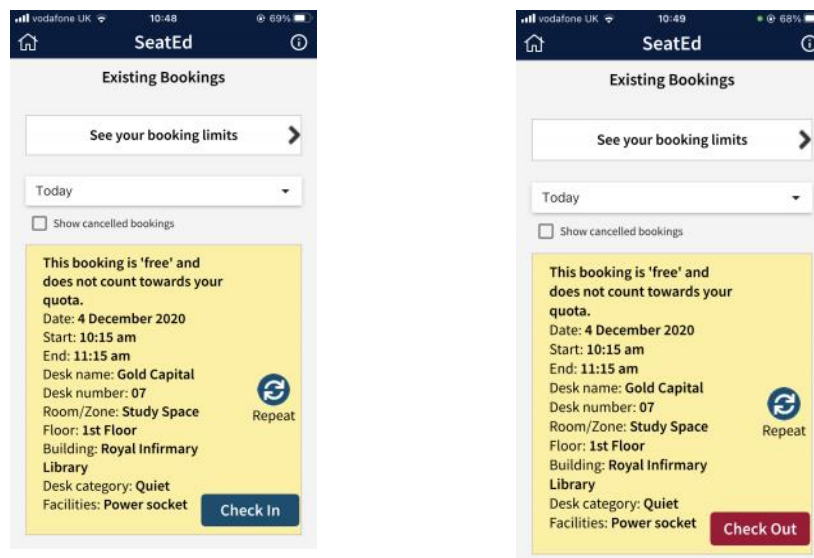


Figure 2.5. Check in and Check Out procedure for SeatEd@UOE [13].

Strength

The strength of this SeatEd@UoE is the students able to view their existing booking form. The students can click the repeat button to repeat the existing bookings with the same study place and time slot. Therefore, the students do not have to use a search engine to find the same study place and make a booking again. Besides, the students can use QR code to check in or check out the seat when ready besides type the name of the desk. These features in this mobile application will make it more user-friendly and ease-of-use as the students only use few simple steps to do their desk booking.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

Weakness

This mobile application is considered newly built as it releases in the Play Store in 2020. Therefore, it contains some bugs that cause the students to feel uncomfortable and feel hard to use it. Bugs such as the system will force students to log out of the system and the student has to log in to the system every day. Also, the students may encounter a situation which is the booking system not responding when choosing the study place.

Recommendation

For the situation where the booking system not responding because the application takes a long time to do the UI thread and the application cannot respond to it. Therefore, long operations such as reserve study place operations should be done in a worker thread to avoid this system not responding.

2.2.5 Kyungpook National University Library Mobile Application

Brief

This Kyungpook National University Library mobile application had provided some services such as book borrowing, check the seating layout and map of the reading room and reserve the seat [8]. Besides, the users can use search engines to check the availability of books. The users have to enter their student id login into the system before using the mobile application. The figure 2.6 show seat reservation process in this mobile application.



Figure 2.6. Seat Reservation in Kyungpook National University Library Mobile Application [8].

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

Strength

The strength of this Kyungpook National University Library Mobile Application is the mobile application uses the diagram to show the status of the seat. The mobile application uses three colours to show status which is blue colour for available, green colour for in use and white for unavailable. Therefore, the students able to have a better view of the seat compared to the use time slot to show available seat. Also, the students able to check the ticketing history and the students can return the seat and cancel the reservations if the students suddenly cannot attend the seat.

Weakness

The weakness of this mobile application is the mobile application only provides one language which is the Korean language. This mobile application can only be accessed by Koreans. Therefore, exchange students from different countries cannot use this application because they are not familiar with the Korean language. Besides, the search result does not provide an advanced search engine to the users. The search result may come with a large result that is not relevant to it and the users have to waste time find the books they want.

Recommendation

The recommendation is the system should provide some language version or international languages such as English to the users so that this mobile application can open to all students especially international students or exchange students. Therefore, all the students no matter which country they come from can use this mobile application as long as they are university students. Besides, the advanced searching engine can be implemented to filter out the result and come out the result more specificity.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

2.2.6 Comparison

| Website/Mobile App | Service Provide | | | | |
|--|-----------------------|--|---------------|------------------------|-----------------------|
| | Login into the system | Provide diagram to view status of the seat | Search engine | Check-in and check-out | Real-time Crowd-level |
| University Libraries Seat Reservation System | | | √ | √ | |
| Columbia University Libraries Website | √ | | √ | | |
| Rice University Fondren Library Seat Reservation | √ | | √ | | √ |
| SeatEd @ UoE | √ | | √ | √ | |
| Kyungpook National University Library Mobile Application | √ | √ | √ | | |

Table 2.1. Table comparison of feature in the literature review.

Based on table 2.1, only the University Libraries Seat Reservation System does not require user login to the system. It may cause less security and the system unable to trackback the users if the users use fake email to request the reservation. Next, most of the website or mobile application had used timeslot and list to show the available and unavailable seats. Only the Kyungpook National University Library Mobile Application uses the diagram to show the status seats. This diagram gives the users a better view of the exact location of the seat. Then, all of the websites or mobile applications had provided search engines. In addition, all of the websites or mobile applications only provided search engine to check to availability of the seat and books

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

except SeatEd@UOE which is only search engine for seat availability checking. All of the websites or mobile applications does not provide exact location of the books. Besides, only the University Libraries Seat Reservation System and SeatEd@UoE had provided the check-in and check-out service to the students once they had succussed reserve their seats. For the University Libraries Seat Reservation System, the student has to type check-in code to use the seat and they have to type the check-out code when they are ready to quit the seat. While the users for SeatEd@UoE can scan the QR code to check-in and they can click the button to check out the seat. Other than that, only the Rice University Fondren Library Seat Reservation provides real-time crowd-level to the students. The students can view the capacity for each floor and then can reserve the seat based on it.

2.3 Existing Seat Viewing Method

There is a sample mobile application called SeatLayoutDemo created by Suchandrim Sarkar. The figure 2.7 show the seat layout design in SeatLayoutDemo. This SeatLayoutDemo is an interactive seat layout that has few interesting features which is able to zoom in and zoom out the seat, have multiple seat type or seat status and able select and deselect multiple seats [11]. Then, it has two major modules which is example modules and seatlayout module. The example is the example show how to use this seatlayout. While, the seatlayout module is the module used for other people to edit and design. It uses `Array<Array<SeatData>>` to draw and design the seats in the xy plain. Besides, the seat layout has used data models and JSON to edit the status of the seat which is available, in-seat or unavailable. Also, these data models can edit the shape of the seats and table whether is a single table or a big table. Then, it offers three callbacks which is `maxSeatReached()`, `seatTapped()` and `updateSelectedSeatDisplay(selectedSeats: Int, maxSelectedSeats: Int)`. It can help to calculate the total seats the users had reserved and update the status of the seat after the users reserve the seat. This method specially the features such as able to zoom in and zoom out and the ways show seat status will be taken and implement in this project.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

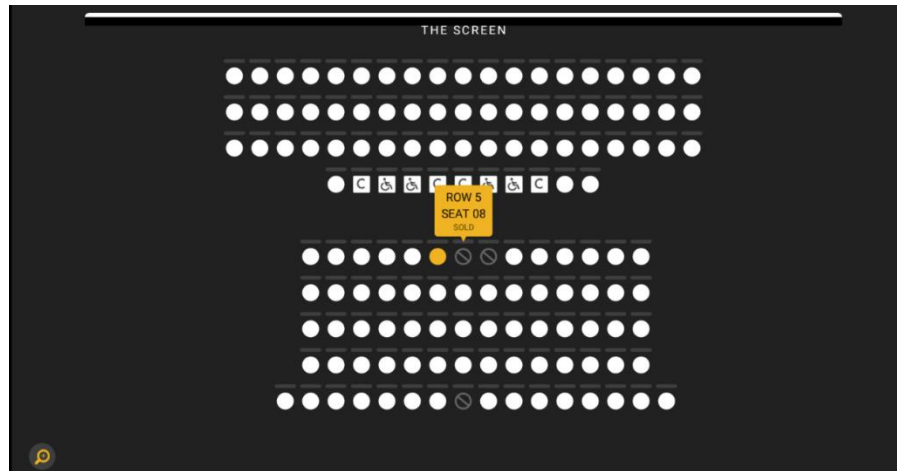


Figure 2.7. Seat layout for SeatLayout Demo mobile application [11].

2.4 Summary

This chapter has explored the existing website or mobile application related to library. Also, previous works such as seat viewing had been reviewed in order to understand and implement in this project. Also, the weakness and recommendation mentioned from the existing website or mobile application will be taken into consideration and improvement will be done in this project to ease the user in terms of convenience.

3.1 System Design

3.1.1 Flowchart

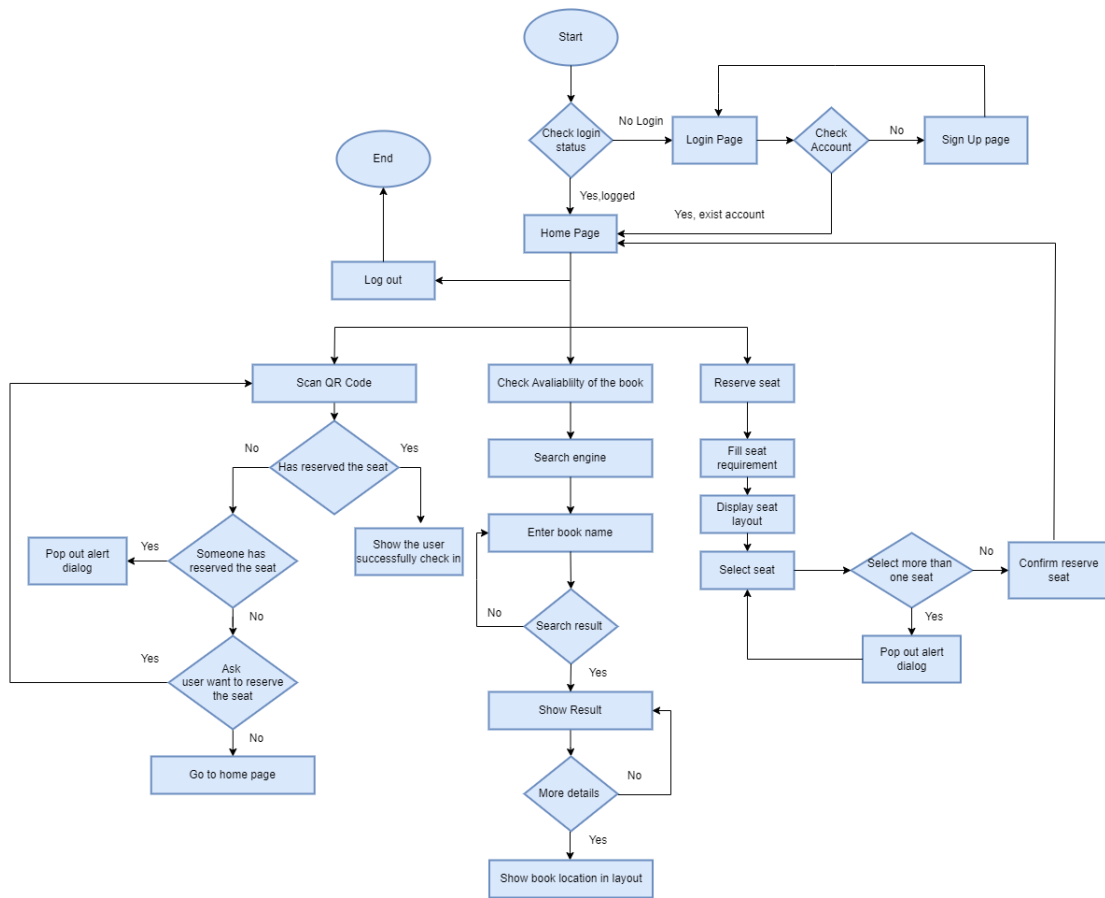


Figure 3.1. Flowchart of Library Seat and Book Availability Checking using Mobile Application

At the beginning, the mobile application will check the login status of the user whether the user has logged in the mobile application before. If the user logged in application before, the mobile application directly shows the home page. Else, if the user has not logged in application before, it will show the login page. In the login page, the user requires to fill the email account and password to login. Other than that, in case of the user does not an account, the user has to register a new account by going to the sign-up page. In the sign-up page, the user has to fill in all the information such as name, faculty, email, password and etc to register an account. After done registering an account, the user can login account by filling the email and password and the user is able to view the home page.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

In the home page, there are three main functions that allow the user to perform which is reserve seat, check book availability and scan QR code. For the seat reservation function, the user must first fill in all the seat reserving requirements in form. After that, the user can view the seat layout and the user can select an available seat for reservation. If the user selects more than one seat, the application will pop out an alert dialog to warn user that each user is allowed to choose one seat only. Then, the user can click a button to confirm seat reservation and it will be directed to the home page.

Next, the user can use this mobile application to check book availability. The user needs to enter name of the book in the search engine to check availability. After that, it will show the result by displaying the book name and call number. If there is no matching result, it will not display anything. After that, the user can choose to click more details to see the book location in the floor layout. If the user does not want to see the details, the user is allowed to back to the home page.

Besides, the user can use this mobile application to scan QR code of each seat in the library. The user must scan the QR code on the seat when they come to the library and take the seat. The application will check whether the user has reserved the seat. If the user has reserved the seat, the application will show that the user has successfully checked in the seat and the user is allowed to take the seat. However, if the mobile application has noticed the user has not yet reserved the seat, the application will tell the user and ask the user wants to reserve the user or not in the seat is available for reservation. If the seat has reserved by someone, the application will pop out an alert dialog to warn the user that the seat is unavailable.

3.1.2 Use Case Diagram

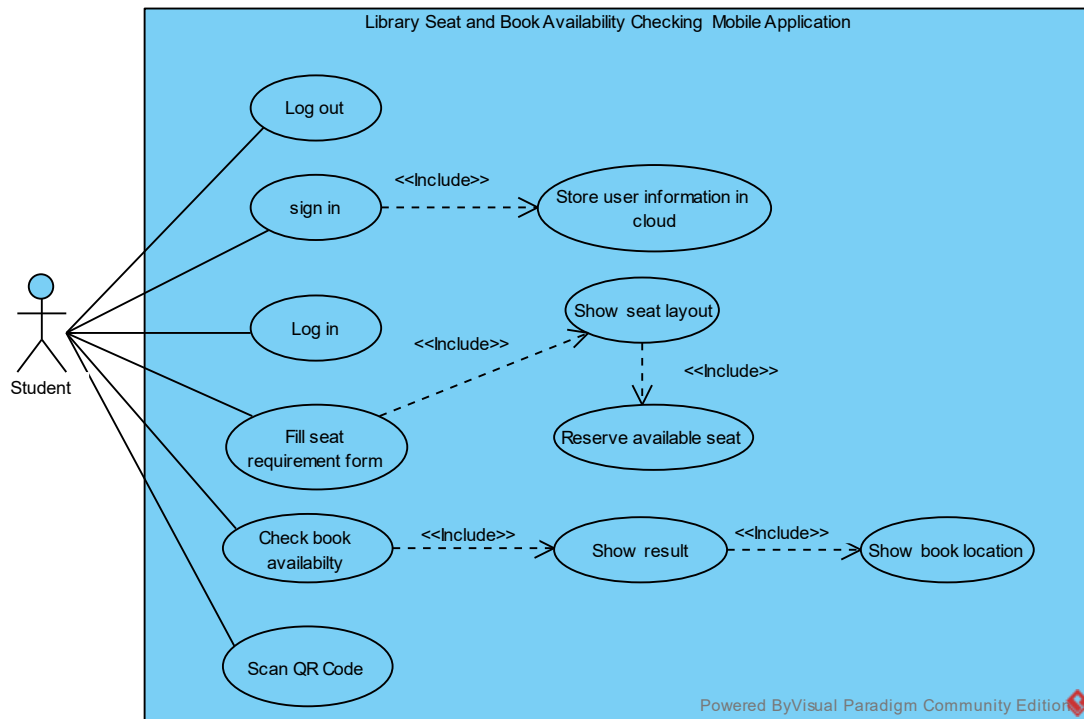


Figure 3.2. Use case diagram of Library Seat and Book Availability Checking using Mobile Application

There is only one actor in this mobile application which is student. As mentioned in the flow chart diagram, the system requests student to have an account before using or performing and use any features and functions in this system. Therefore, student can register an account and then login into the application. After that, the student can perform three actions in the system, such as reserve seat, check book availability and scan QR code. For the seat reservation, the student must fill in all the requirements in seat reservation form before viewing the seat layout and reserving an available seat. After completing the form, the student is able to view the seat layout and the seat status such as unavailable or available will be shown as well. The user only can reserve a seat at the same time and date.

For the book availability checking, the student must enter the book name to check its availability. If the book is available, the student can see a result list with the book name follow by the book's call number. After that, the student can see the book location in layout by clicking one of the books in the result list. Moreover, the QR code scanning in the system is to let the student scan the QR code when the student comes to the library and takes the reserved seat, and it is compulsory.

3.1.3 Activity Diagram – Login and Register Module

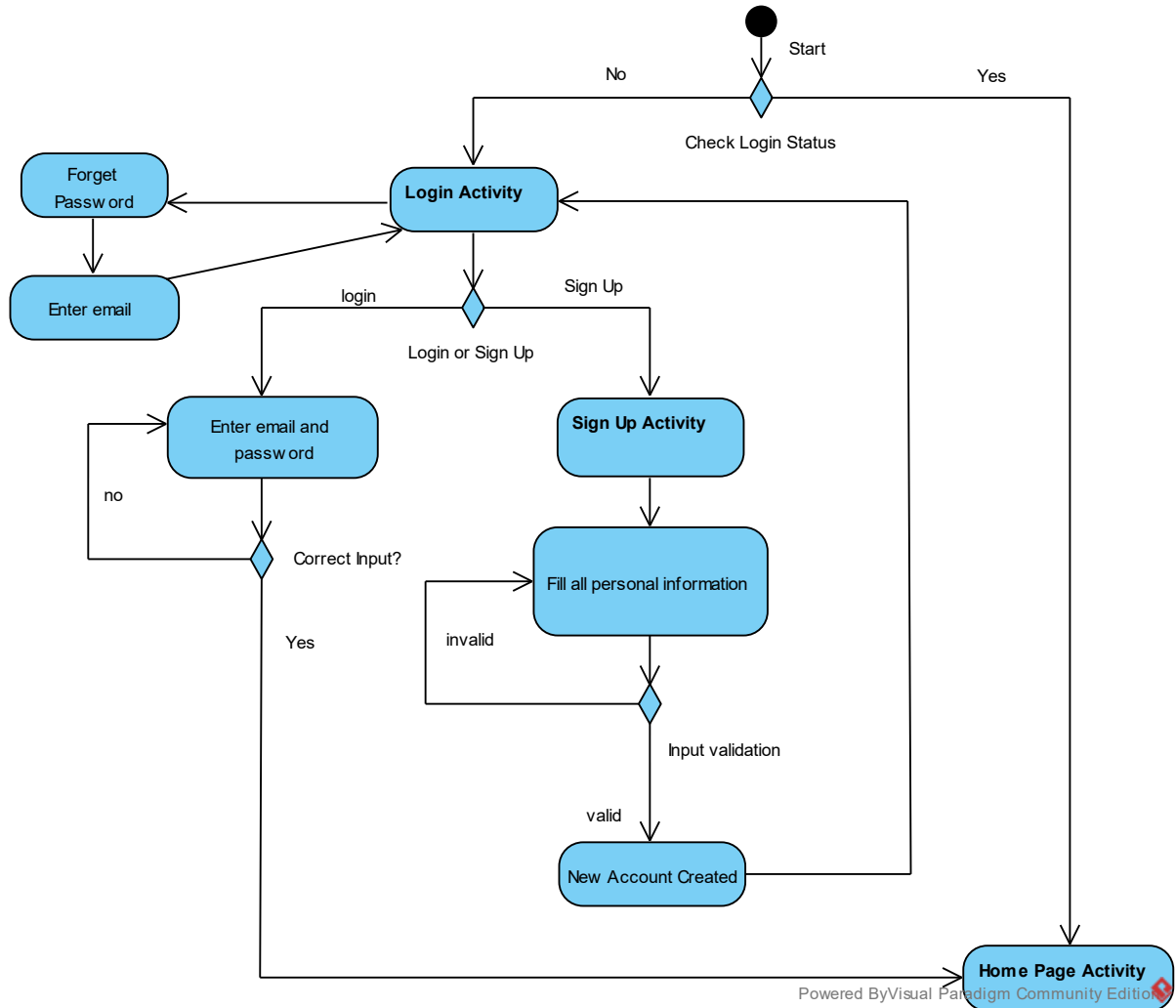


Figure 3.3. Login and register module activity diagram

The figure 3.3 shows the activity diagram for login and register. Firstly, the mobile application will check the login status of the application. If the user has logged in the mobile application before, it will directly go to the home page activity whenever the user opens the application. Otherwise, the system will display login activity instead of home page activity. In the login activity, the user needs to enter email and password in order to login the mobile application. After that, it will check the user input. If the user input is valid, it will be directed go to the Home Page Activity. Else, the mobile application will ask the user to re-enter the email and password. Other than that, the user has an option to click forgot password in case the user had created an account before but fail to remember the password. The user needs to enter the created email details and the mobile application will email a link to the user for changing password.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

If the user is new to this application, the user can create a new account by going to the sign-up activity. In the sign-up activity, the user must fill in all the personal information in the form. Otherwise, the system will not allow the user to create a new account. After finish creating a new account, it will be redirected to the login activity. The user has to enter the email and password to validate account and the mobile application will be redirected to the home page activity if the account is existed.

3.1.4 Activity Diagram- Seat Reservation Module

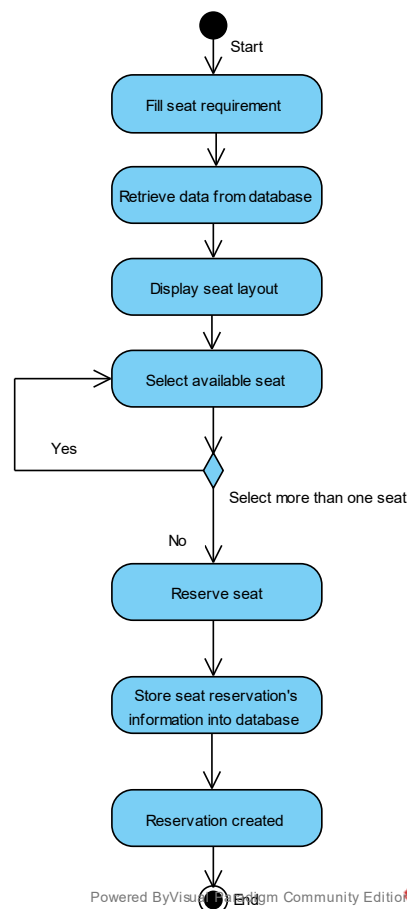


Figure 3.4. Seat reservation module activity diagram

In seat reservation module, the user must fill in all the requirements in seat reserving form which is date, time and floor. Then, the mobile application will receive the input and retrieve data from database. In the database, it will search the seat for the selected date and time. After that, the mobile application will display the seat layout and some seats will change into red colour when the date in mobile application stated that the seats have been reserved and not available at the moment. Afterwards, the user is able to select an available seat for reservation. If the user selects more than one seat, the system will alert the user and the user cannot proceed to the next step. In the next step,

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

the user can click on a button to confirm seat reservation and the system will store the information of seat reservation into the database and the system will tell the user that the reservation has been created.

3.1.5 Activity Diagram – Book Availability Checking Module

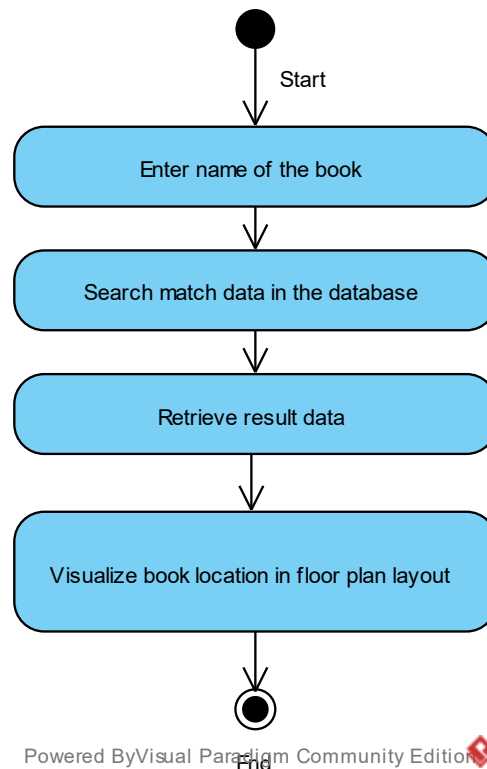


Figure 3.5. Book availability checking module activity diagram

The figure 3.5 shows the activity diagram for book availability checking module. In this mobile application, user is allowed to check the book availability in UTAR library. First, the user needs to enter the name of the book to check availability. After that, the mobile application will search for the matching data in the database and then retrieve the data. Then, the mobile application will visualize the book location in floor plan layout, so that the user can easily pick up the book in the library.

3.1.6 Activity Diagram- QR Code Scan module

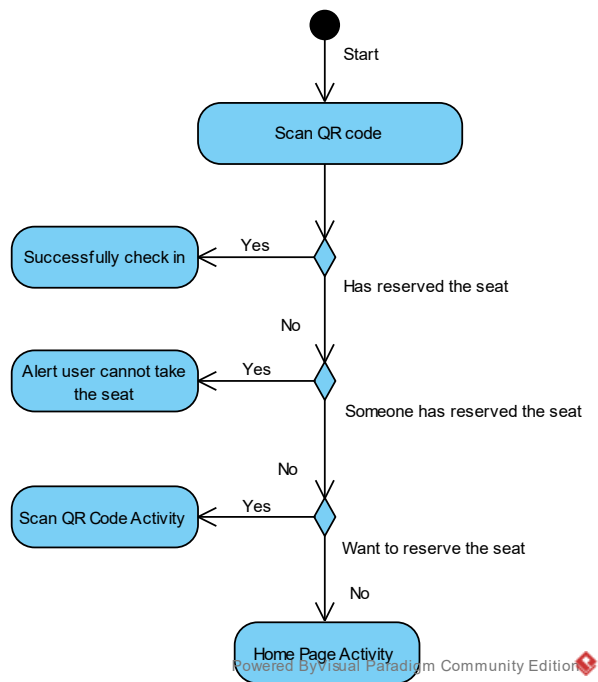


Figure 3.6. QR scan module activity diagram

Figure 3.6 shows the activity diagram for QR code scan module. In QR code scan module, the user needs to click into the scan QR code button to perform the action. After that, the system will check whether the user has reserved the seat. In case of the user has reserved the seat, the system will record and inform the user that they have successfully checked in the seat and are allowed to take the seat. However, if the user has not reserved the seat yet, the system will continue to check anyone has reserved the seat. If the seat is being reserved by someone, the system will alert the user that the seat is being reserved by someone and the user is not allowed to take the seat. If the seat is not reserved by someone yet, the system would ask the user to reserve and take the seat. If the user wants to reserve the seat, the system will record down, and the user is allowed to take the seat. Also, if the user does not want to reserve the seat, the system will direct back to the Home Page Activity.

CHAPTER 4 SYSTEM IMPLEMENTATION

CHAPTER 4 SYSTEM IMPLEMENTATION

4.1 Agile Methodology

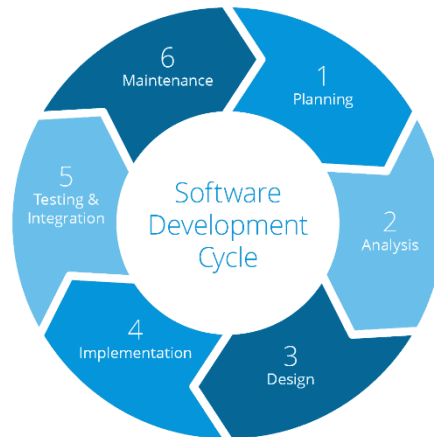


Figure 4.1. Agile Development Methodology model

The methodology that is implemented in this project is Agile Development methodology. It is very suitable for small team. In addition, this methodology allows to change in the development process and very flexible as compared to the traditional methods. By using this methodology, this project will have continuous iteration of development and testing to ensure that this project is working well and able to change to fix bugs and release new user requirement [9]. Besides, this project will be developed in 6 phases of Agile Development methodology which is planning, analysis, design, implementation, testing, and maintenance [7].

In the planning phase, the title of the project will be formed. Afterward, the objective and problem statements of the project will be discussed and identified in this analysis phase. After that, several existing systems related to this project will be reviewed. The strengths and weaknesses of each existing system will be identified. The purpose of this phase is to recognize the features or functions that will be implemented in this project. Next is the design phase which aims to transform all the requirements into different kinds of models and architectures. The flow of events in this project will be presented in flowchart and activity diagram while the features or functions of this project will be shown in use case diagram. Then, it will move to the implementation phases which aims to build and create source code to fulfill requirement. After that, it will move to testing phase to ensure that the mobile application does not consist of any bugs or error. If bugs or errors occur during testing phases, it will step into maintenance phase to solve

CHAPTER 4 SYSTEM IMPLEMENTATION

the problems. Due to Agile is an iterative development approach, new features or functions can be included in every iteration.

4.2 Tools to use

Hardware

Android Mobile Device

The android mobile device will be used for the test in this project since this project is a mobile application.

Personal Computer or Laptop

A personal Computer or Laptop will be used to develop this project for the coding. The minimum requirement for a personal computer or laptop must 2GB RAM and 1TB disk space since it needs to install the Android Studio.

Software

Android Studio

Android studio is a free and open software for android application development. Also, Android studio is the official Integrated Development Environment (IDE) based on IntelliJ IDEA [3]. It provides a drag-and-drop visual editor that makes it easier to create a new layout. The Android Studio is available to download for Windows, Mac, Linux and Chrome OS. The system requirement is 4GB ram and 2GB disk space for the minimum.

Android Software Development Kits (SDK)

The Android Software Development Kits (SDK) is the most important part for an android developer. This provides all the tools that help the developers build android applications. It includes debuggers, libraries and emulators and it is available in Android Studio.

Firebase

Firebase is a Backend server developed by Google for creating web and mobile application [4]. Other than that, it provides some functionality such as Google authentication and Cloud Firestore to sync and store data on cloud. Therefore, the user's

CHAPTER 4 SYSTEM IMPLEMENTATION

account will authentication by email account and the user information will be stored in Cloud Firestore. Besides, the seat information also stored in Cloud Firestore.

Visual Paradigm and Draw.io

Visual Paradigm and Draw.io is a drawing diagram tool that can be used to draw diagrams like use case diagram, activity diagram and flow chart. All the diagrams draw is used for documentation.

Adobe illustrator and Adobe XD

Adobe illustrator and Adobe XD both is a vector graphics design tool. Adobe illustrator is used to design the floor plan, while the Adobe XD is used to design all the layout in the application.

4.3 System Requirement

| | |
|-------------------|---|
| 1. Create Account | 1.1 User can enter username 1.2 User can enter password 1.3 User can enter email 1.4 User can enter student id 1.5 User can choose the faculty 1.6 User can view the invalid input message 1.7 User can register an account |
| 2. Login | 2.1 User can enter username 2.2 User can enter password 2.3 User can click forgot password to reset password 2.4 User can view the invalid input message 2.5 User can login an account |
| 3. Logout | 3.1 User can logout the system |
| 4. Seat reserve | 4.1 User can select the date 4.2 User can select the time 4.3 User can select the floor level 4.4 User can select the preferred seat type 4.5 User can view the invalid input message |

CHAPTER 4 SYSTEM IMPLEMENTATION

| | |
|---------------------|---|
| | 4.6 User can view the seat layout 4.7 User can view the highlighted seat type 4.8 User can view reserved seat 4.8 User can select the seat 4.9 User can view cannot select more than one seat warning message 4.9 User can reserve available set |
| 5. Book Search | 5.1 User can enter book name 5.2 User can search the book 5.3 User can view the search result 5.4 User can click the result list 5.5 User can view the exact location of the book |
| 6. Scan QR code | 6.1 User can scan the QR code 6.2 User can view check in successfully message |
| 7. Release seat | 7.1 User can click check out button |
| 8. View Reservation | 8.1 User can view the reservation 8.2 User can click the reservation that is still active 8.3 User can cancel the reservation that is still active |

Table 4.1. System requirement

CHAPTER 4 SYSTEM IMPLEMENTATION

4.4 Login Activity

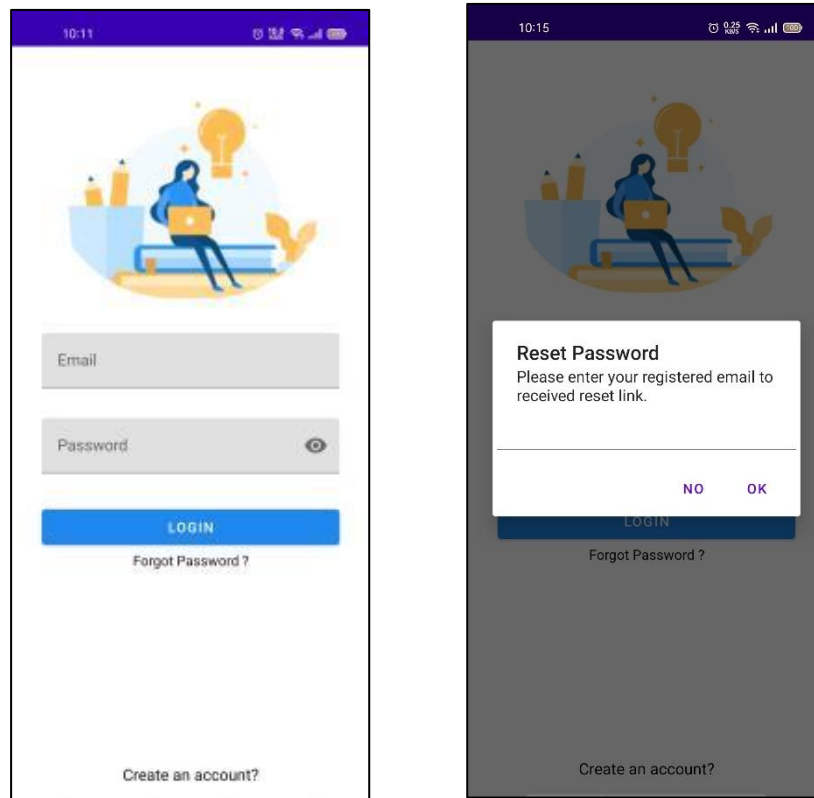


Figure 4.2. Login Activity

Figure 4.2 show the login activity. Before the user is allowed to use any features or functions of the application, the user has to login the application by entering the email and password. If the user fails to remember the password, the user can click the “Forgot Password?” text and the user needs to enter the registered email, Then, the application will send a reset password link to the user through email and the user can use the link to reset the password. If the user is new to this application and does not register an account before, the user can click the “Create an account?” to enter register page.

CHAPTER 4 SYSTEM IMPLEMENTATION

4.5 Register Activity

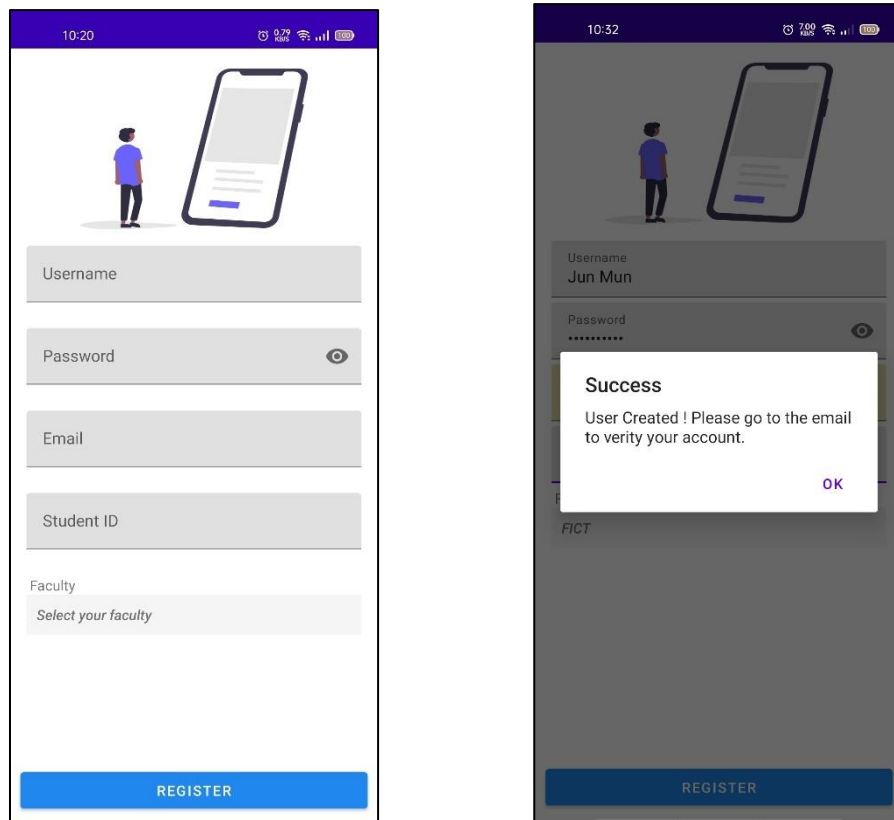


Figure 4.3. Register Activity

In the register activity, the user has to fill in all personal information such as name, email, password and student id. If the user does not fill all the information, the application would not let the user to create and register an account. After the user filling in all the information, the user can click the register button to register an account and the application will send a link to the user's email to verify the account.

CHAPTER 4 SYSTEM IMPLEMENTATION

4.6 Seat Requirement Form Activity

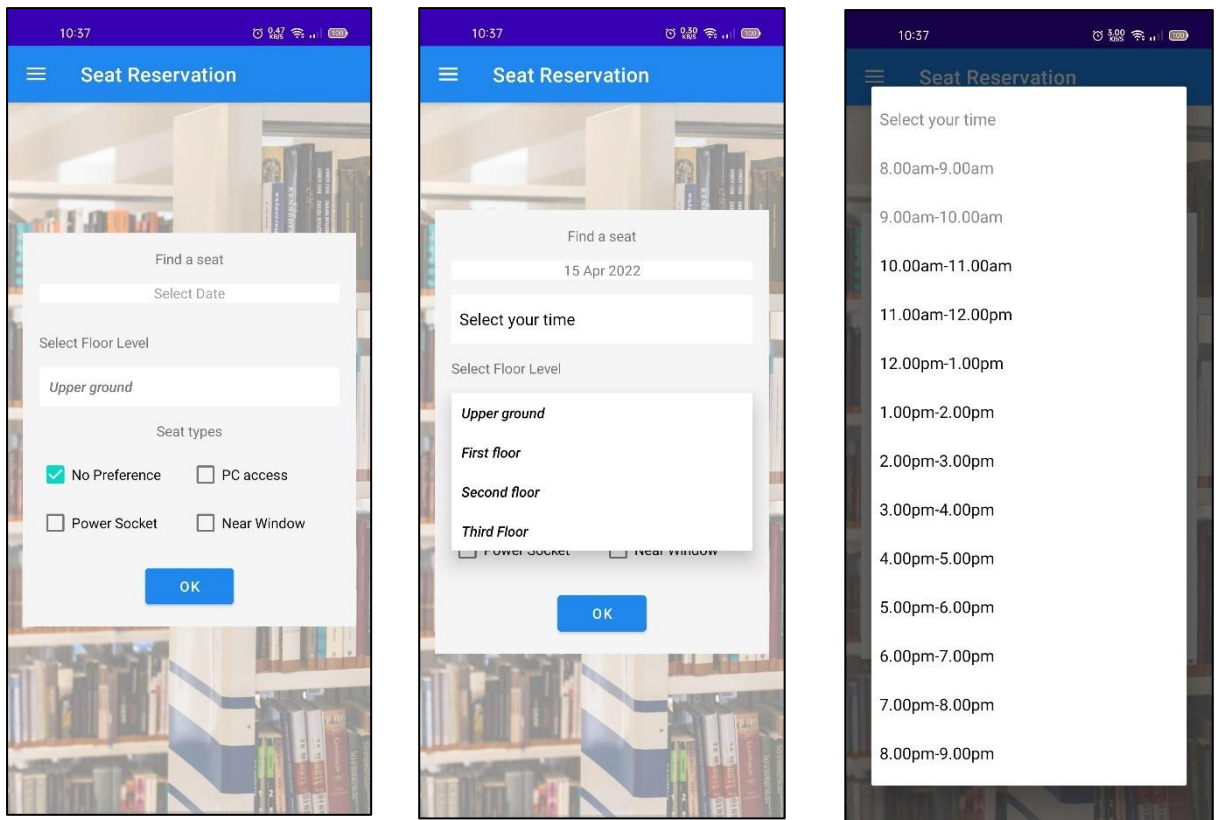


Figure 4.3. Seat Requirement Form Activity

Before the user reserving a seat, the user needs to fill in a form in seat requirement form activity. The user needs to choose the date, time and the floor, else the application would not allow user to proceed to the next step. It is optional for the use to select seat type because it will highlight the desire seat for user's attention.

CHAPTER 4 SYSTEM IMPLEMENTATION

4.7 Seat Layout Activity

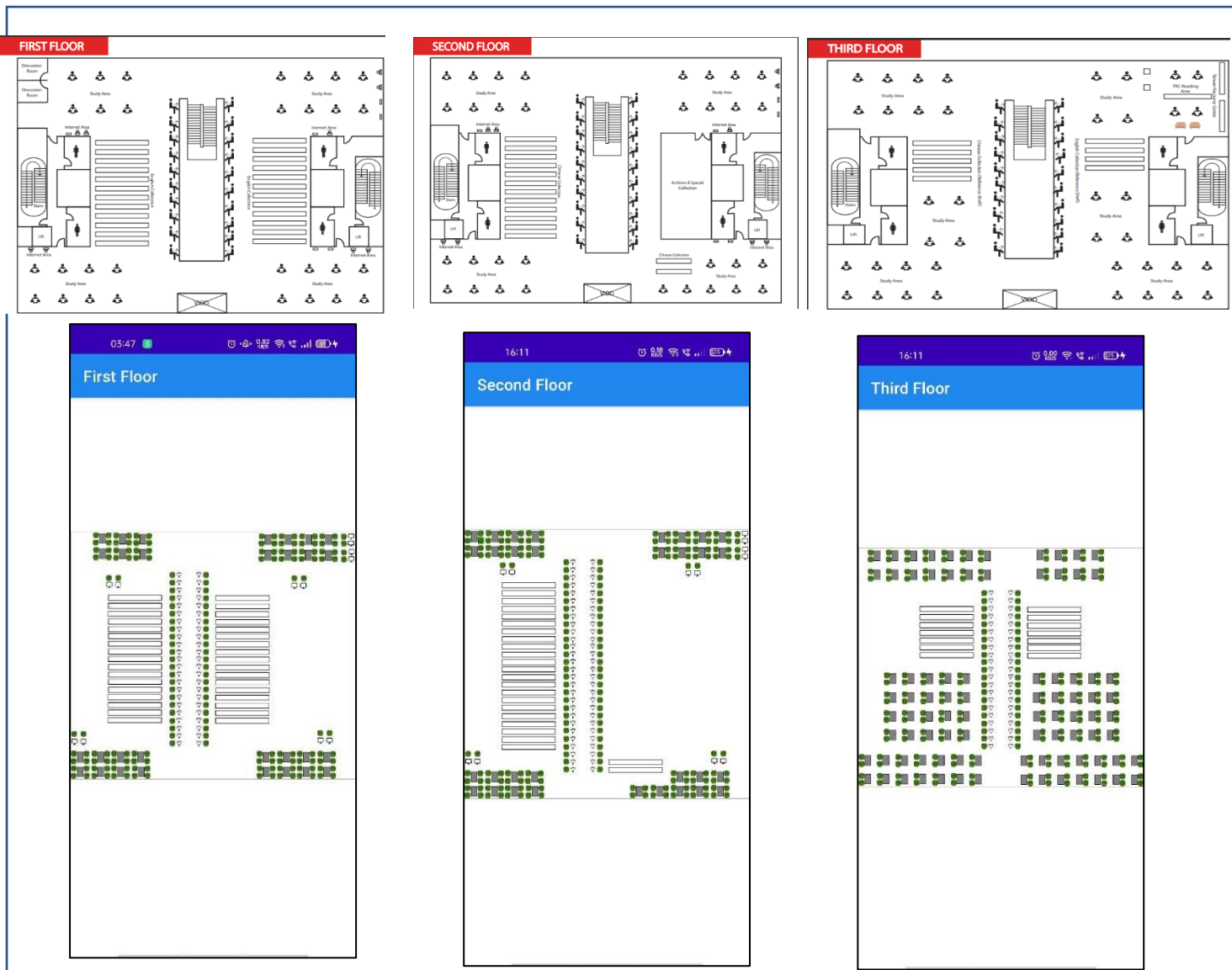


Figure 4.5. Floor plan and Seat Layout Activity

After the user done filling in the seat requirement form, they will be directed to the seat layout activity. As shown in the Figure 4.5, the top figure is the floor plan provided by the librarian and the bottom figure is the first-floor, second floor and third floor seat layout in the mobile application. The user can see the total view of the seat layout.

CHAPTER 4 SYSTEM IMPLEMENTATION

Besides, if the user had selected a seat type in seat requirement form, some of the seats will be highlighted as shown in Figure 4.6.

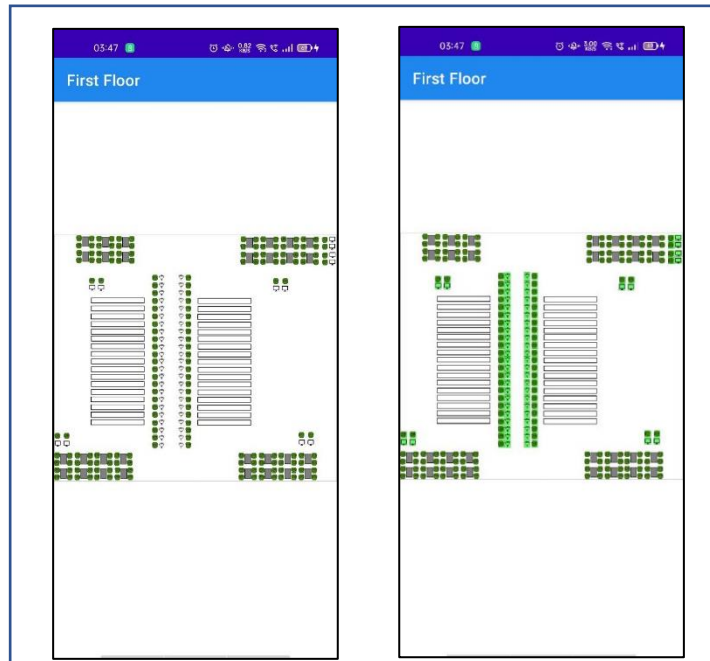


Figure 4.6. Non-highlighted and highlight seat layout

Other than that, the user can use two fingers to zoom in or zoom out to have a better view of seat layout. Figure 4.7 shown an example of zoom in of the seat layout.

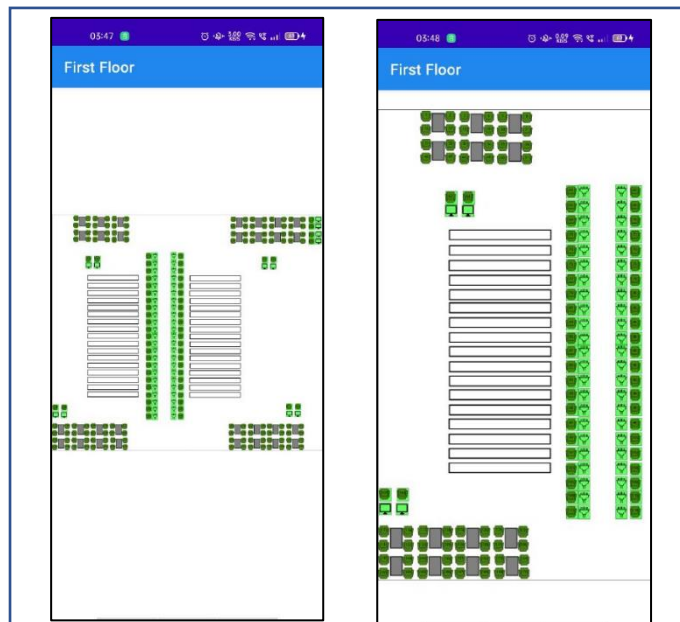


Figure 4.7. Normal seat layout, and zoom in seat layout

CHAPTER 4 SYSTEM IMPLEMENTATION

4.8 Seat Reservation

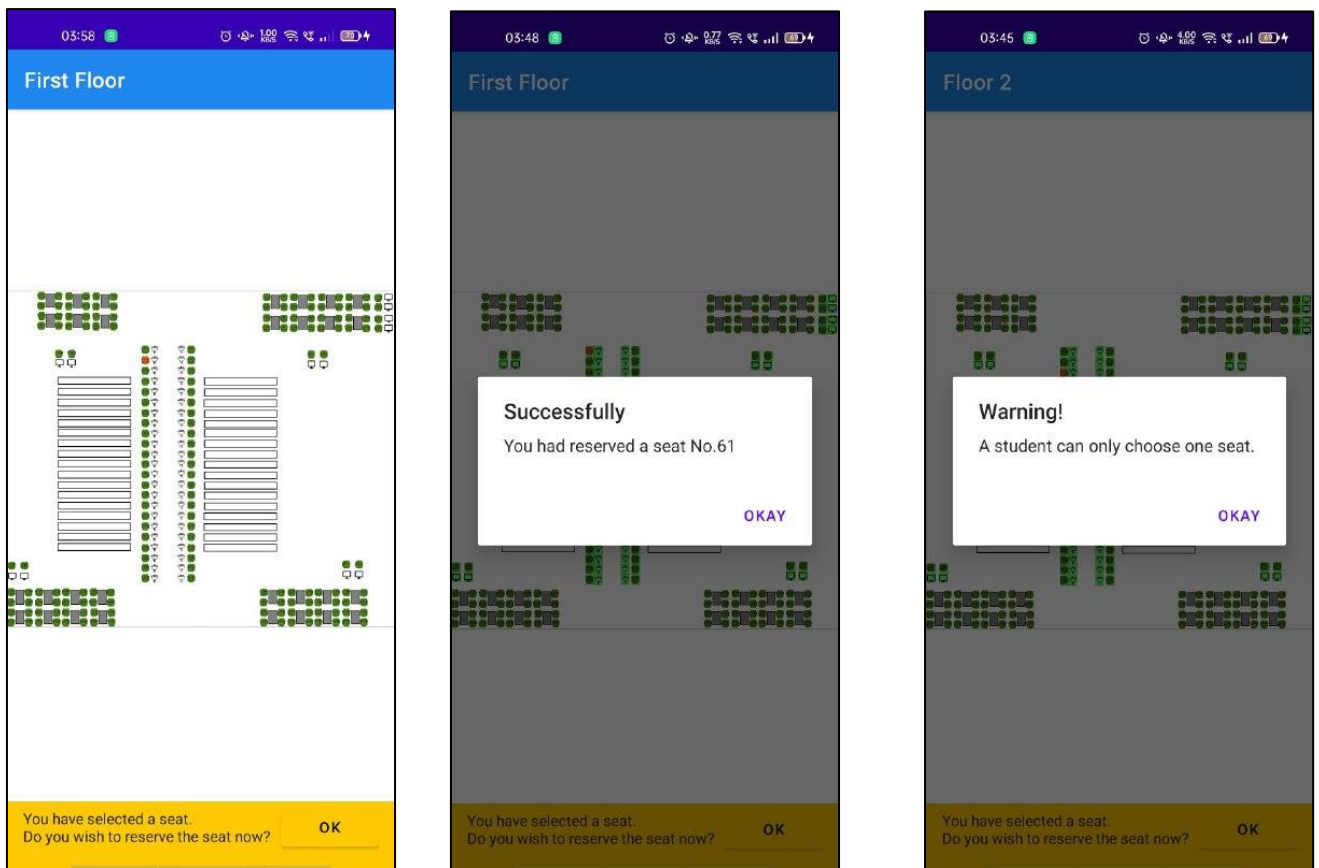


Figure 4.8. Seat Reservation

In the seat layout activity, the user can select the seat and there will be a message displayed at the bottom of the screen. If the user confirms to reserve the seat, the user can click the “OK” button at the bottom right corner of the screen. Then, the application will store the reservation information into database and subsequently notify that the user had reserved a seat. However, if the user selects more than one seat, the application will pop out a dialog message to warn the user that every student should not choose more than one seat.

CHAPTER 4 SYSTEM IMPLEMENTATION

4.9 Book Search Activity

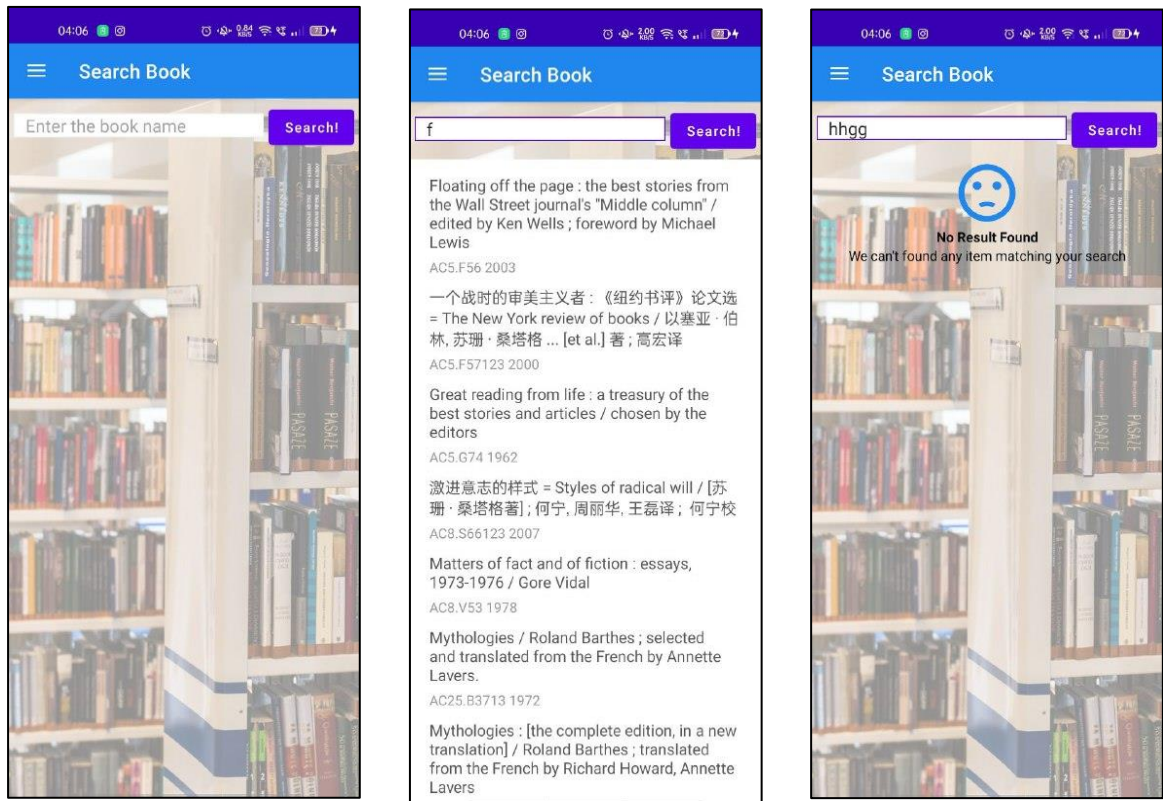


Figure 4.9. Book Search Activity

In the search activity, the user needs to type the book name and click search button to perform book searching. After that, the application will fetch all the data and find any data matching with the book name given by the user. The data fetched from the application is provided by the UTAR librarian and it includes all the book name and call number that are existing in the UTAR Library.

CHAPTER 4 SYSTEM IMPLEMENTATION

| | A | B | C |
|----|---------------|--------------------------|-----------------------|
| 1 | Shelf | Call Number Range | |
| 2 | Number | Start | End |
| 3 | Eng 1 | AC5.F56 2003 | BF176.A63 2013 |
| 4 | Eng 1 | BF176.B35 2014 | BF637.S4C68 2004p |
| 5 | Eng 2 | BF637.S4C68 2005 | BL1853.G37 2014 |
| 6 | Eng 2 | BL1900.A1T49 1891 | DC33.L5413 1992 |
| 7 | Eng 3 | DC33.7.W65 2010 | DS609.S564 1993 |
| 8 | Eng 3 | DS609.S65 1984 | GE230.T39 2014 |
| 9 | Eng 4 | GE300.S77 2012 | H62.S549 2017 |
| 10 | Eng 4 | H62.S55 2010 | HB141.H46 2007 |
| 11 | Eng 5 | HB141.H463 2000 | HB172.5.B37 2008 |
| 12 | Eng 5 | HB172.5.B467 1999 | HC412.5.I58 2009 |
| 13 | Eng 6 | HC415.C6N35 2011 | HD30.28.T363 2010 |
| 14 | Eng 6 | HD30.28.T563 2010 | HD38.5.C64 2005 |
| 15 | Eng 7 | HD38.5.C66 2008 | HD58.7.N43 2017 |
| 16 | Eng 7 | HD58.7.N45 2003 | HD62.7.M44 2013 |
| 17 | Eng 8 | HD62.7.R93 2006 | HD2745.5.K36 2005 |
| 18 | Eng 8 | HD2745.5.Z828 2011 | HE8689.8.F73 1990 |
| 19 | Eng 9 | HE8689.8.D66 2004 | HF5386.G36 2018 |
| 20 | Eng 9 | HF5386.G58 2006 | GF5415.123.S5525 2003 |
| 21 | Eng 10 | HF5415.123.S553 2007 | HF5415.2.H34 2009 |
| 22 | Eng 10 | HF5415.2.H35 2006 | HF5438.4.J64 2006 |

< > **1st Floor** 2nd Floor 3rd Floor +

Figure 4.10. Document of stated range of book in book rack and floor number

Besides, the librarian also provides a document which states the range of the book in each book rack and floor number. The figure 4.10 show the part of document. If there is any matching result, the application will show it in a list way. Otherwise, the application will not display any result and tell the user that no item is matching with the user's search.

CHAPTER 4 SYSTEM IMPLEMENTATION

4.10 Visualize the Book's Exact Location

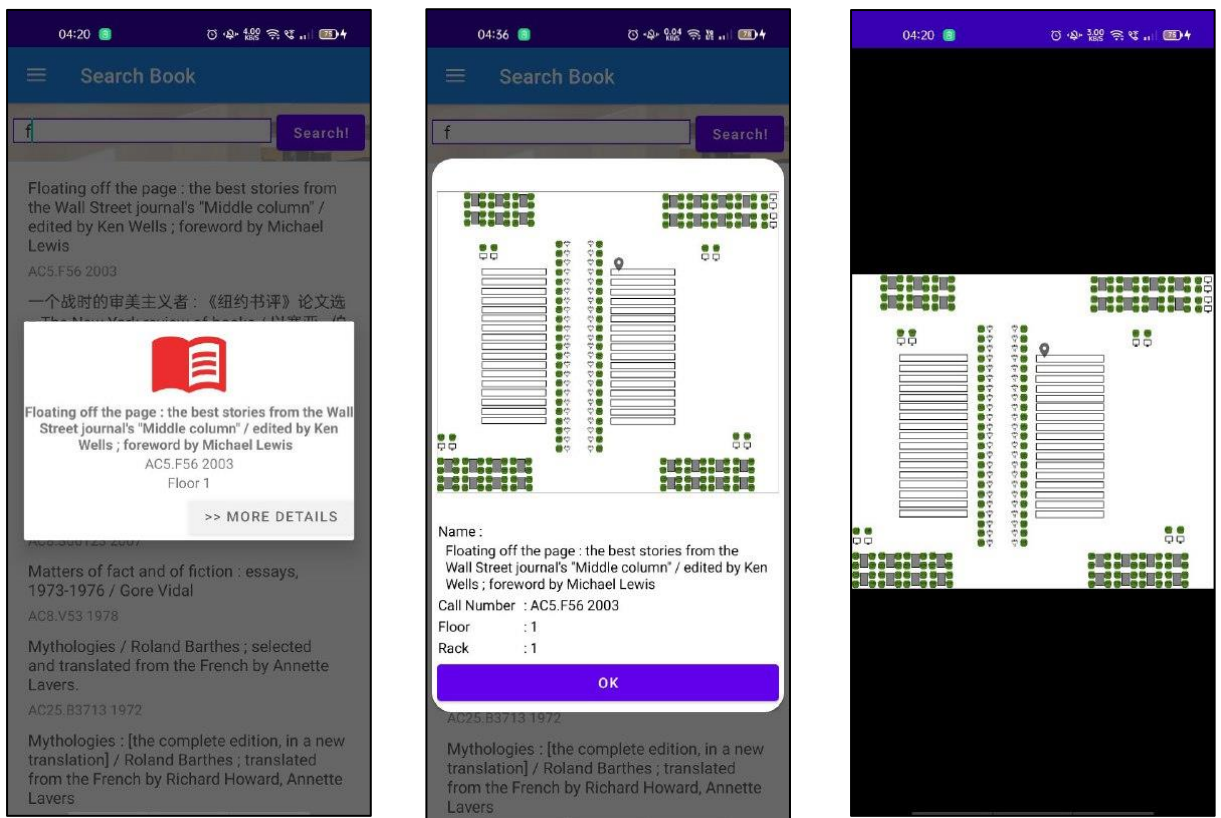


Figure 4.11. Book Exact location Layout

When the application is showing the search result, the user can click any one of the results and the application will show a dialog to display the book name, call number of the book and the floor where the book located. Then, the user can click the more details button to view the layout where the book is located. Now, the user is able to know the book is located at which floor and rack. Other than that, the user can click the image and the application will make the image full screen and the user can use two fingers zoom in and zoom out for a better view.

CHAPTER 4 SYSTEM IMPLEMENTATION

4.11 Scan QR code Activity

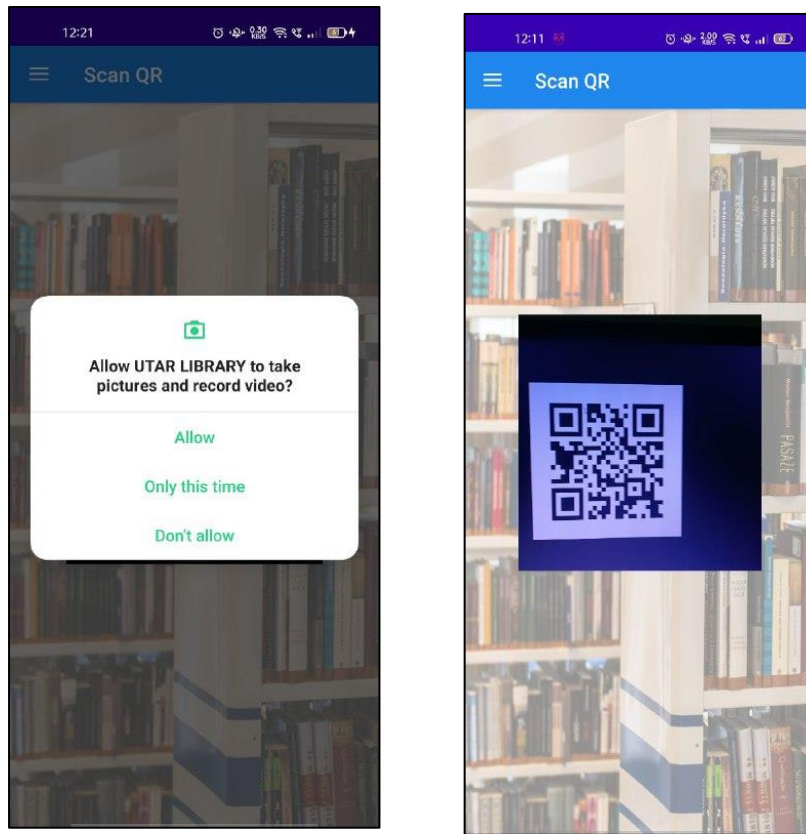


Figure 4.12. Scan QR Activity

Figure 4.11 show the Scan QR activity. Before the user scans the QR code, the user is required to give application permission to use the camera to capture QR code. Afterwards, the user can scan the QR code for check in or reservation purpose.

CHAPTER 4 SYSTEM IMPLEMENTATION

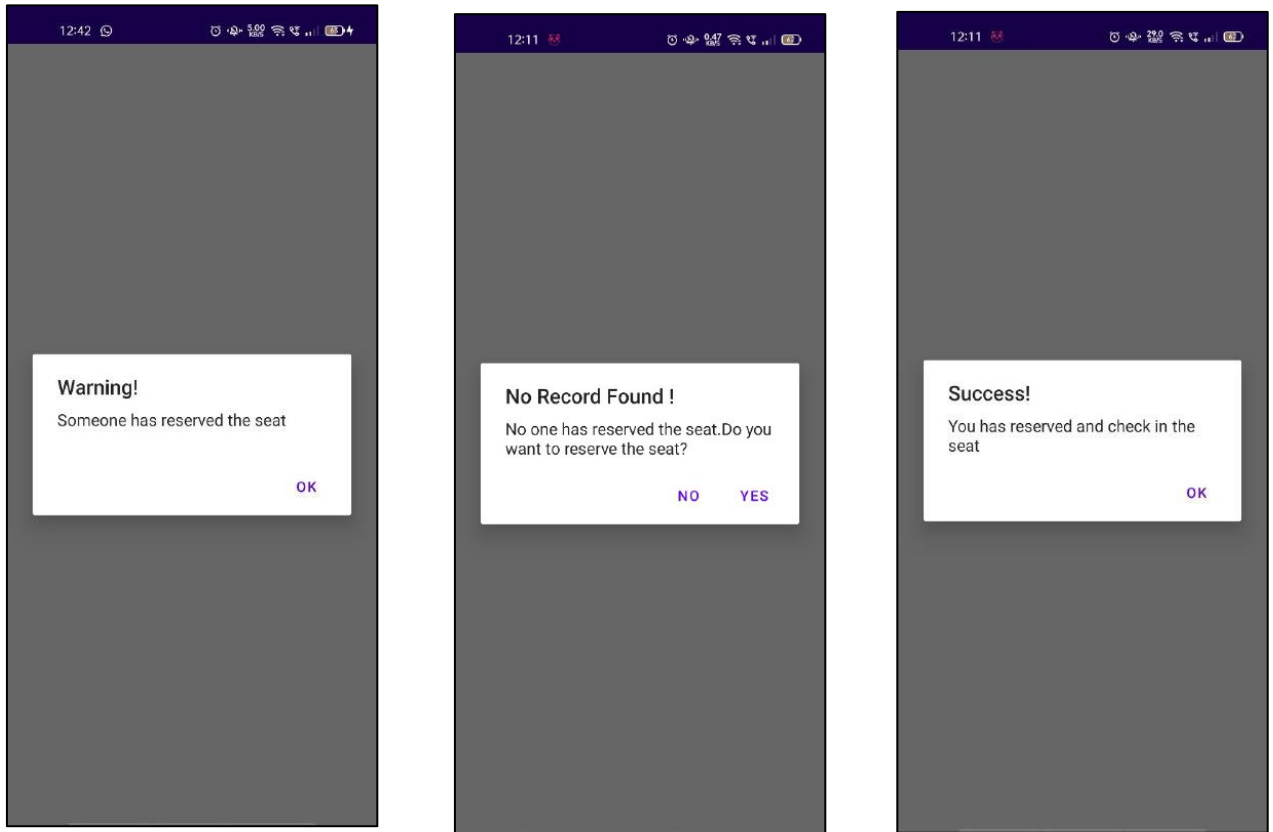


Figure 4.13. After scan QR code layout

After done scanning the QR code, the application will check the seat whether the seat is being reserved by someone. If the seat is being reserved by someone, the application will warn the user that the seat is unavailable. Other than that, if the seat is not being reserved and the user has not booked the seat yet, the application will ask the user whether they want to reserve the seat or not. If the user wishes to take the seat, the application will store the reservation information into database and then notify that the user had reserved and checked in the seat.

CHAPTER 4 SYSTEM IMPLEMENTATION

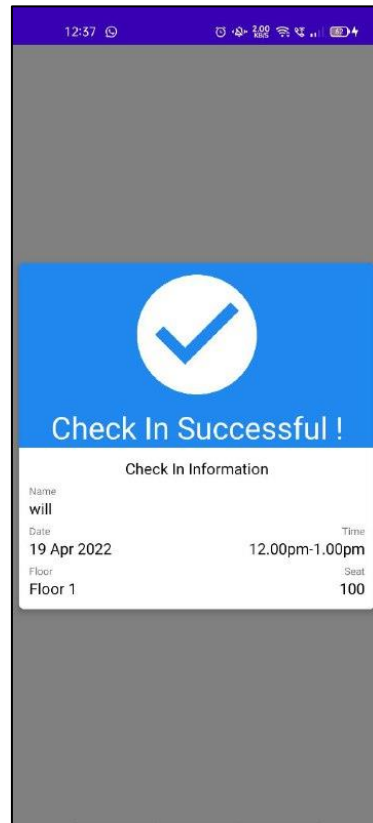


Figure 4.14. Check in successful layout

If the user has reserved the seat before coming to the library, the application will update the reservation information of the database as the user has checked in the seat and notify the user that they have checked in the seat successfully.

CHAPTER 4 SYSTEM IMPLEMENTATION

4.12 View Reservation Activity

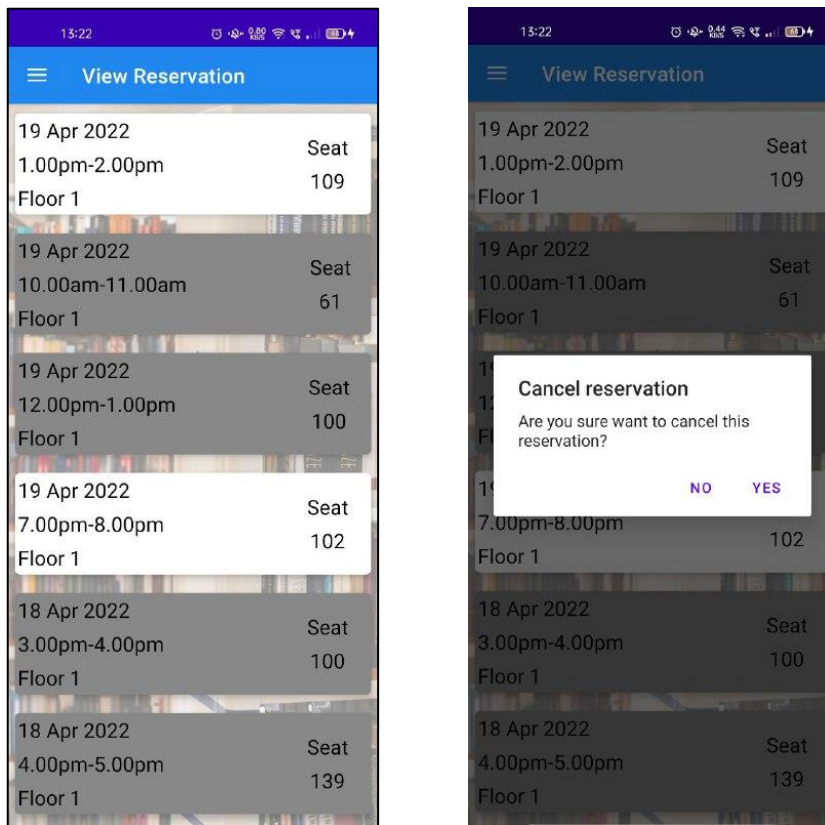


Figure 4.15. View reservation activity

In the view reservation activity, the user can view all the reservation that has been made. For the reservation that is expired, the application will display the reservation in grey colour, and the reservation that is still active will be displayed in white colour. Also, the user can cancel the reservation by clicking the reservation that is still active. After that, the application will delete the reservation and other user is allowed to reserve the seat.

CHAPTER 4 SYSTEM IMPLEMENTATION

4.13 Logout Activity

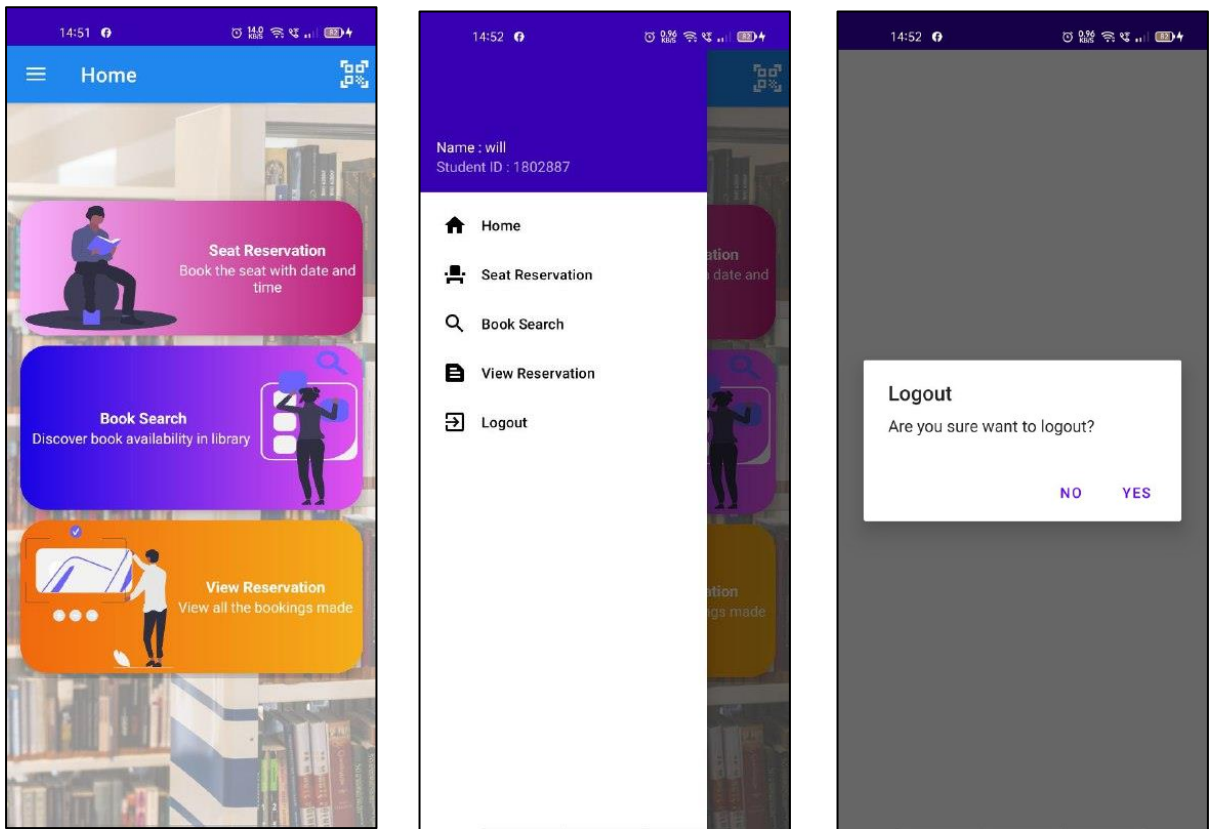


Figure 4.16. Sign out activity

In the home page activity, the user can swipe from the left or click the icon in the upper left corner to open the drawer. After that, the user can click the text saying logout to log out user account. Then, the application will pop up a dialog to confirm with the user whether they want to logout the account or not. If the user confirms it, the application will log out user's account.

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.1 Verification Plan

| | | |
|---|---|--|
| 1 | Verify user authentication is work | <ul style="list-style-type: none">• User needs to make sure the email and password format is correct• User needs to make sure the account wish to login is created and verify by the user• User can login into the application |
| 2 | Verify user create account successfully | <ul style="list-style-type: none">• User needs to make sure all the input fill into the form is correct• User needs to make sure all the field in the form is not blank• User needs to make sure an email will be sent to verify after creating an account |
| 3 | Verify user can view the seat layout and reserve a seat | <ul style="list-style-type: none">• User needs to make sure all the input fill into the form is correct• User needs to confirm that there is an internet connection• User needs to confirm the layout is shown in screen• User needs to confirm user has not reserved any seat at chosen date and time.• User can click the seat• User can zoom in and zoom out the seat layout• User can reserve a seat |
| 4 | Verify user can search book | <ul style="list-style-type: none">• User needs to enter keyword into search bar• Application shown the search result found |

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

| | | |
|---|---|---|
| | | <ul style="list-style-type: none">• User needs to make sure the search result is match with user wants |
| 5 | Verify user can view all reservation and cancel reservation | <ul style="list-style-type: none">• User needs to confirm all the seat reservations information is correct• User can click the one of the active reservations and cancel the reservation |
| 6 | Verify user can scan QR code to check in | <ul style="list-style-type: none">• User needs to confirm permission use camera is allowed• User needs to make sure the application can notify user is check in successfully |
| 7 | Verify user logout successfully | <ul style="list-style-type: none">• User can logout• User needs login again after logout |

Table 5.1. Verification plan.

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.2 Testing

5.2.1 Test case 1

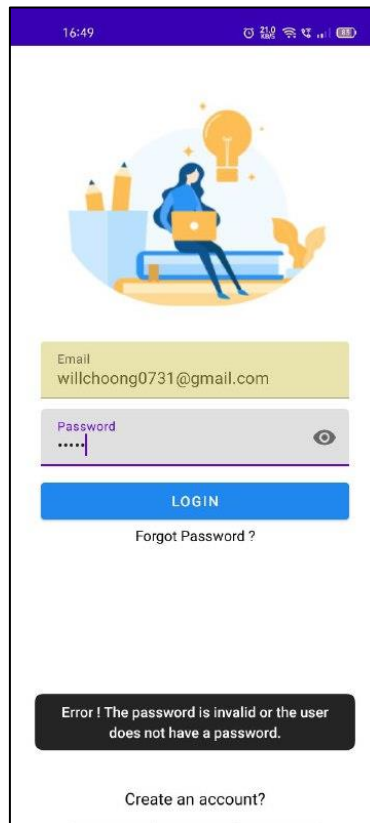


Figure 5.1. Test Case 1 – Actual Result

| | | | |
|--|---|---------------------------------------|------------------------------|
| Test Case ID | Test Case 001 | | |
| Related Feature ID | None | | |
| Objective | To confirm an error message will display after entering a wrong email or password | | |
| Input | Excepted Result | Special Procedural Requirement | Inter-case Dependency |
| Email= “willchoong0731@gmail.com” Password = “abcde” | User cannot login with account and error message come out. | none | none |

Table 5.2.1. Test case 1.

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.2.2 Test case 2

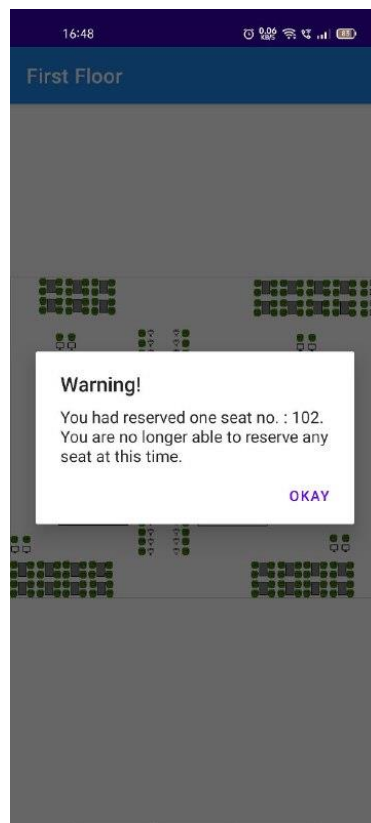


Figure 5.2. Test Case 2 – Actual Result

| | | | |
|---------------------------|--|---|------------------------------|
| Test Case ID | Test Case 002 | | |
| Related Feature ID | None | | |
| Objective | To confirm a dialog pops out | | |
| Input | Expected Result | Special Procedural Requirement | Inter-case Dependency |
| None | A dialog pops out and the user cannot reserve seat | Select the date and time where the user had reserved a seat | none |

Table 5.2.2. Test case 2.

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.2.3 Test case 3

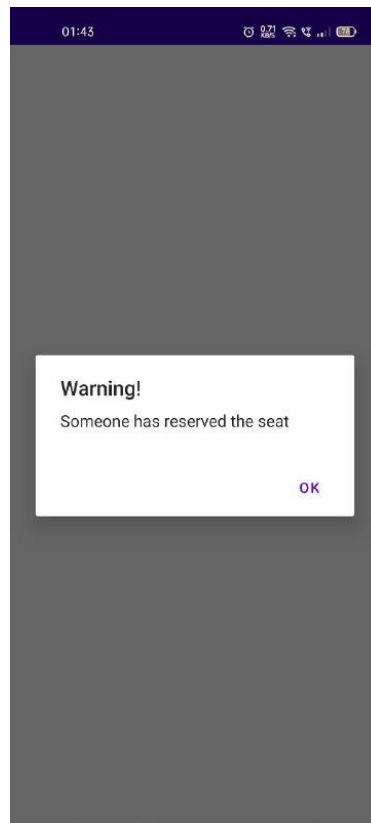


Figure 5.3. Test Case 3 – Actual Result

| | | | |
|---------------------------|--|---------------------------------------|------------------------------|
| Test Case ID | Test Case 003 | | |
| Related Feature ID | None | | |
| Objective | To confirm a warning dialog pops out after user scan reserved seat's QR code | | |
| Input | Excepted Result | Special Procedural Requirement | Inter-case Dependency |
| None | A dialog pops out and the user cannot reserve the seat | Another user has reserved the seat | none |

Table 5.2.3. Test case 3.

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.2.4 Test case 4

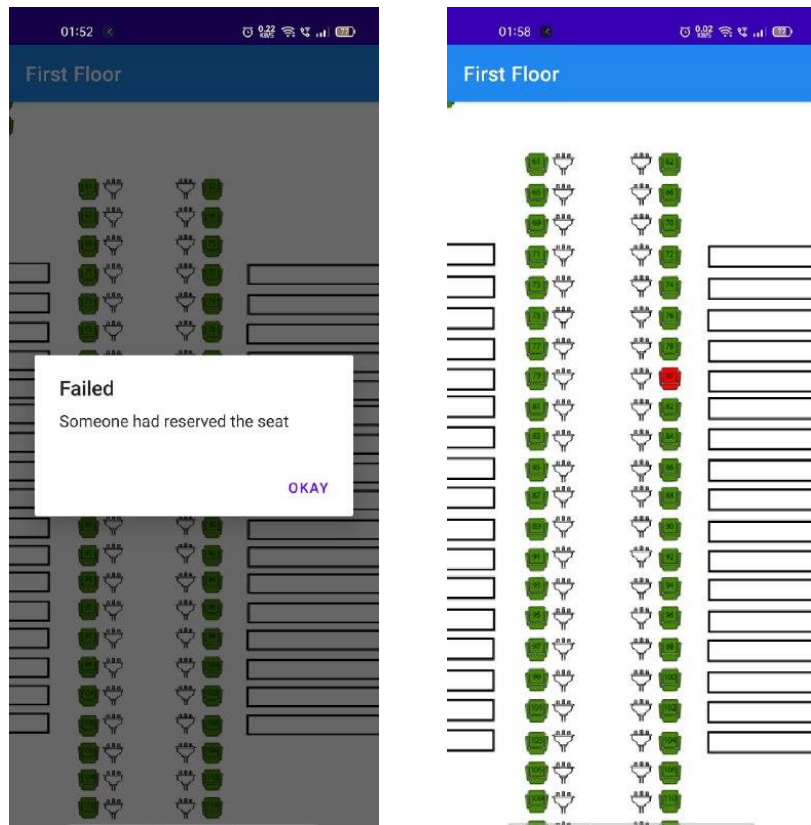


Figure 5.4. Test Case 4 – Actual Result

| | | | |
|---------------------------|--|---------------------------------------|------------------------------|
| Test Case ID | Test Case 004 | | |
| Related Feature ID | None | | |
| Objective | To confirm a dialog pops out to notify the user has failed reserved the seat because another user has already reserved the seat, the selected seat will turn red to indicate that the seat is reserved | | |
| Input | Expected Result | Special Procedural Requirement | Inter-case Dependency |
| None | A dialog pops out and the user cannot reserve selected seat | Another user has reserved the seat | none |

Table 5.2.4. Test case 4.

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.2.5 Test case 5

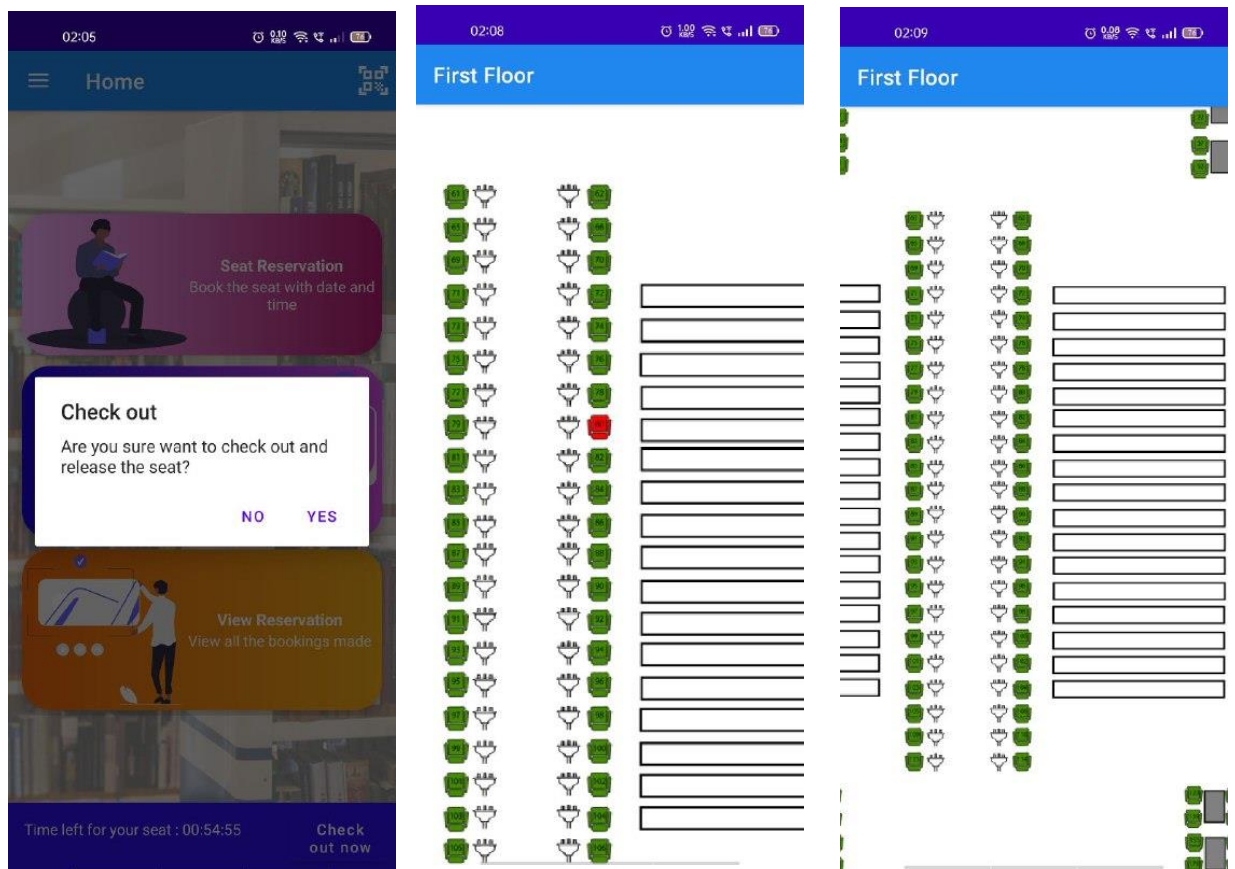


Figure 5.5. Test Case 5 – Actual Result

| | | | |
|---------------------------|---|--|------------------------------|
| Test Case ID | Test Case 005 | | |
| Related Feature ID | None | | |
| Objective | To confirm seat that is release can click and reserve by another user | | |
| Input | Excepted Result | Special Procedural Requirement | Inter-case Dependency |
| None | The seat change to green colour as available seat and other user can reserve the seat | The user must check out and release the seat | none |

Table 5.2.5. Test case 5.

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.3 Project Challenges

There are some challenges and issues in the development phase of the project. First and foremost, the challenge and issues I faced during development phase is displaying seat layout to the user. Due to the COVID-19, it is risky as often come to UTAR Library. Therefore, it may cause a challenge knowing the actual seat layout in UTAR library. To solve these issues, I have to contact the librarian and ask for floor plan as a reference. As a result, the librarian only can provide a simple floor plan without indicating the number of seats in each floor. Therefore, the seat layout shown in the proposed application may not be correct. Also, the librarian provides limited of database of book, which consists of the book name and call number only. In addition, a database is provided showing the range of books in the UTAR library shelves. However, the databases provided is messy and it will be time-consuming to process the data.

5.4 Objectives Evaluation

In this project, there are three objectives are stated and have been achieved into the proposed mobile application. The first objective is to build a mobile application which student can reserve a seat. The user can reserve the seat by select the time, date, floor level and seat. Also, the user can check the seat availability by showing the seat layout. If the seat is available, the user can reserve the seat.

Besides, the next objective is to locate the exact location of the books. In this project, the application provides a search engine to the user and the user can search the book by type the book name. If there is a search result found, the application shows it in a list way. The list shows the book name and call number. Afterwards, the student can click the result and it will show out a layout that point out the exact location of the book. Therefore, the user knows the exact location of the book.

Apart from that, the last objective is to build a mobile application which student can scan the QR Code for seat check in or reservation. In this proposed application, it had implemented a scan QR code feature and the user is required to scan QR when coming to the library. This is to avoid situations where the user sits in the wrong seat. Besides, in case of the user has not reserved seat yet and the seat chosen by the user is not being reserved by anyone, user can use the scan QR feature to scan the seat's QR code and proceed to the seat reservation. After scan, the user is allowed to take the seat.

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.5 Timeline

5.5.1 FYP 1 Timeline

| Project Task | Project Week | | | | | | | | | | | | | |
|--|--------------|---|---|---|---|---|---|---|---|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1.0 Planning | | | | | | | | | | | | | | |
| 1.1 Forming project title through discussion with supervisor. | ■ | | | | | | | | | | | | | |
| 1.2 Researching relevant paper | ■ | | | | | | | | | | | | | |
| 2.0 Analysis | | | | | | | | | | | | | | |
| 2.1 Discuss and defined problems statement, objectives and project scope | ■ | | | | | | | | | | | | | |
| 2.2 Literature review on existing websites and mobile applications | ■ | | | | | | | | | | | | | |
| 2.3 Create comparison table and discuss among them | ■ | | | | | | | | | | | | | |
| 3.0 Design | | | | | | | | | | | | | | |
| 3.1 Identifying methodology | | ■ | | | | | | | | | | | | |
| 3.2 Drawing system design using diagram | | | ■ | ■ | | | | | | | | | | |
| 4.0 Implementation | | | | | | | | | | | | | | |
| 4.1 Develop code | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 5.0 Testing | | | | | | | | | | | | | | |
| 5.1 Test functionalise | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 6.0 Maintenance | | | | | | | | | | | | | | |
| 6.1 Identify bugs or error | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 6.2 Modify code | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 6.3 Re-test functionalise | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

| | | | | | | | | | | | | | |
|------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 6.4 Start a new iteration | | | | | | | | | | | | | |
| Project Documentation | | | | | | | | | | | | | |
| Project Presentation | | | | | | | | | | | | | |

Table 5.5.1. FYP 1 Timeline

5.5.2 FYP 2 Timeline

| Project Task | Project Week | | | | | | | | | | | | | | |
|--|--------------|---|---|---|---|---|---|---|---|----|----|----|----|----|--|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | |
| 4.0 Implementation | | | | | | | | | | | | | | | |
| 4.1 Develop code for other features or functions | | | | | | | | | | | | | | | |
| 5.0 Testing | | | | | | | | | | | | | | | |
| 5.1 Test functionalise of the features | | | | | | | | | | | | | | | |
| 6.0 Maintenance | | | | | | | | | | | | | | | |
| 6.1 Identify bugs or error | | | | | | | | | | | | | | | |
| 6.2 Modify code | | | | | | | | | | | | | | | |
| 6.3 Re-test functionalise | | | | | | | | | | | | | | | |
| 6.4 Start a new iteration by starting to develop code for other features | | | | | | | | | | | | | | | |
| Deploy application | | | | | | | | | | | | | | | |
| Project Documentation | | | | | | | | | | | | | | | |
| Project Presentation | | | | | | | | | | | | | | | |

Table 5.5.2. FYP 2 Timeline

CHAPTER 5 SYSTEM EVALUATION AND DISCUSSION

5.6 Concluding remark

This chapter is to show what has done in the project to achieve the objective. Besides that, several verification plan and test case has been used to test the propped application functionalise. Apart that, this chapter has point out the project challenge which is the seat layout setup problem and data processing time consuming. Afterwards, it also stated that all objectives have been achieved.

CHAPTER 6 CONCLUSION AND RECOMMENDATION

CHAPTER 6 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

In summary, library seat and book availability checking using mobile application is an application that helps users to reserve seats in UTAR library and check book availability in UTAR library. Other than that, the application provides scan QR code function to the users. Users is required to check in and scan reserved seat's QR code. The purpose is to make sure users is not taking a wrong seat. Besides, the application allows users to view all the reservation made. If the user changes his mind, the user can cancel the reservation.

In this project, all the objectives have been achieved. The first objective is to build a mobile application which student can reserve a seat. Users can check the availability of their preferred seat and make seat reservation if it is available. In addition, this project had implemented a seat viewing feature where the users can visualize and reserve a seat. The user can zoom in or zoom out the visualized seat layout to have a better view. Apart from that, another objective is to locate the exact location of the books. A search engine is provided in the proposed application. Users can use the search engine to check the availability of the book. Then, the detail information of the book such as book name and call number will be displayed. After that, this mobile application is able to display the exact location of the book and it can save the user's time from browsing the books one by one on the shelves. Other than that, the last objective is to build a mobile application which student can scan the QR Code for seat check in or reservation. Users is required to scan the seat QR code when coming to the library. The purpose is to make sure that the users do not take wrong seat. Besides, in case of the user has not reserved seat yet and the seat chosen by the user is not being reserved by anyone, user can scan the seat's QR code and proceed to the seat reservation. Then, user is allowed to take the seat.

6.2 Recommendation

There are some recommendations for future improvement of the current proposed mobile application. First, users might not be familiar with the application and does not know that they can use two fingers to zoom in and zoom out the layout. Therefore, in future, the application may add in a guided UI layout to the layout for zoom in and zoom out purposes. Also, the seat layout may not be flexible as the layout is fixed once

CHAPTER 6 CONCLUSION AND RECOMMENDATION

the user enters to the seat layout activity. Even though another user has reserved the seat, the layout could not change directly. The user only noticed the seat is being reserved once the user enters to the seat layout activity again. Also, the user can be noticed the seat is being reserved when the user trying to reserve the seat. The application will pop out a dialog to notify user. Thus, real-time change seat layout can be do in the future in order to make the seat layout more flexibility.

After that, the time provided in the seat reservation form is fixed, and the time offered is 1 hour duration. The user may need to reserve the seat again after 1 hour duration if the user wants to take the seat again. Hence, the future development can be done is to provide user a flexible time to choose.

Other than that, the book searching feature in this proposed application has a limitation which is the user does not know the book is being borrowed by another student or currently read by someone in the library. Therefore, the user may not get the book even through user know the exact location of the book. So, the future development can be do for book search is use a real-time book searching, the application able to know all the books currently available in the library or is borrowed by someone.

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APPENDIX A FYP1 WEEKLY REPORT

APPENDIX A FYP2 WEEKLY REPORT

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

| | |
|--|----------------------------|
| Trimester, Year: T3, Y3 | Study week no.: 1,2 |
| Student Name & ID: Choong Jun Mun 18ACB02887 | |
| Supervisor: Dr Kh'ng Xin Yi | |
| Project Title: Library Seat and Book Availability Checking Using Mobile Application | |

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- i. Plan timeline for Project II
- ii. Design user interface for mobile application
- iii. Add a new feature for mobile application which is scan QR code

2. WORK TO BE DONE

- i. Think the flow need when the user scans the QR code
- ii. Learn how to create QR code and scan the QR code

3. PROBLEMS ENCOUNTERED

Implement scan QR code into mobile application is new to me. It may take time to learnt.

4. SELF EVALUATION OF THE PROGRESS

Self- assigned tasks are able to complete within the expected time



Supervisor's signature



Student's signature

APPENDIX A FYP1 WEEKLY REPORT

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

| | |
|--|--------------------------|
| Trimester, Year: T3, Y3 | Study week no.: 3 |
| Student Name & ID: Choong Jun Mun 18ACB02887 | |
| Supervisor: Dr Kh'ng Xin Yi | |
| Project Title: Library Seat and Book Availability Checking Using Mobile Application | |

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- i. The flow or process when the user scans the QR code
- ii. Fix the mobile application where it has issue click the available seat after zoom the layout
- iii. Learnt how to implement QR code feature into mobile application

2. WORK TO BE DONE

- i. Continue explore and implement QR code feature into mobile application based on the flow or process that has been created

3. PROBLEMS ENCOUNTERED

Implement scan QR code into mobile application is new to me. It may take time to learnt.

4. SELF EVALUATION OF THE PROGRESS

Self- assigned tasks are able to complete within the expected time



Supervisor's signature



Student's signature

APPENDIX A FYP1 WEEKLY REPORT

FINAL YEAR PROJECT WEEKLY REPORT (Project II)

| | |
|--|--------------------------|
| Trimester, Year: T3, Y3 | Study week no.: 4 |
| Student Name & ID: Choong Jun Mun 18ACB02887 | |
| Supervisor: Dr Kh'ng Xin Yi | |
| Project Title: Library Seat and Book Availability Checking Using Mobile Application | |

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- i. Create QR code for each seat
- ii. Implement scan QR code feature into mobile application where the user able to scan QR code and check in the seat

2. WORK TO BE DONE


- i. Continue implement QR code feature where the user can check out the seat before end of the seat reservation

3. PROBLEMS ENCOUNTERED


Implement scan QR code into mobile application is new to me. It may take time to learnt.

4. SELF EVALUATION OF THE PROGRESS

Self- assigned tasks are able to complete within the expected time



Supervisor's signature



Student's signature

APPENDIX A FYP1 WEEKLY REPORT

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

| | |
|--|--------------------------|
| Trimester, Year: T3, Y3 | Study week no.: 5 |
| Student Name & ID: Choong Jun Mun 18ACB02887 | |
| Supervisor: Dr Kh'ng Xin Yi | |
| Project Title: Library Seat and Book Availability Checking Using Mobile Application | |

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- i. The user able to check out the seat before end of the seat reservation
- ii. Simply testing where the application can scan the QR code for check in and check out the seat

2. WORK TO BE DONE

- i. Continue test the QR code feature in more complicated case

3. PROBLEMS ENCOUNTERED

Implement scan QR code into mobile application is new to me. It may take time to learnt.

4. SELF EVALUATION OF THE PROGRESS

Self- assigned tasks are able to complete within the expected time



Supervisor's signature



Student's signature

APPENDIX A FYP1 WEEKLY REPORT

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

| | |
|--|----------------------------|
| Trimester, Year: T3, Y3 | Study week no.: 6,7 |
| Student Name & ID: Choong Jun Mun 18ACB02887 | |
| Supervisor: Dr Kh'ng Xin Yi | |
| Project Title: Library Seat and Book Availability Checking Using Mobile Application | |

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- i. Test the QR code feature in more complicated case
- ii. Start implement book search engine

2. WORK TO BE DONE

- i. Learnt how to implement search engine
- ii. Manage and arrange book data

3. PROBLEMS ENCOUNTERED

Search engine in mobile application is new to me. It may take time to learnt.

4. SELF EVALUATION OF THE PROGRESS

Self- assigned tasks are able to complete within the expected time



Supervisor's signature



Student's signature

APPENDIX A FYP1 WEEKLY REPORT

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

| | |
|--|----------------------------|
| Trimester, Year: T3, Y3 | Study week no.: 8,9 |
| Student Name & ID: Choong Jun Mun 18ACB02887 | |
| Supervisor: Dr Kh'ng Xin Yi | |
| Project Title: Library Seat and Book Availability Checking Using Mobile Application | |

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- i. Implement search engine for book searching feature
- ii. Start design the UI layout for the mobile application
- iii. Start design the layout for the seat layout

2. WORK TO BE DONE

- i. Continue design the UI layout
- ii. Continue design seat layout

3. PROBLEMS ENCOUNTERED


Design layout may consume lots of time as it may interact with code in the future

4. SELF EVALUATION OF THE PROGRESS

Self- assigned tasks are able to complete within the expected time



Supervisor's signature



Student's signature

APPENDIX A FYP1 WEEKLY REPORT

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

| | |
|--|------------------------------|
| Trimester, Year: T3, Y3 | Study week no.: 10,11 |
| Student Name & ID: Choong Jun Mun 18ACB02887 | |
| Supervisor: Dr Kh'ng Xin Yi | |
| Project Title: Library Seat and Book Availability Checking Using Mobile Application | |

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- i. Design one seat layout and interact with coding
- ii. Design UI layout for homepage, login and register page
- iii. Project documentation

2. WORK TO BE DONE


- i. Continue design the UI layout
- ii. Continue design seat layout
- iii. Continue project documentation

3. PROBLEMS ENCOUNTERED

Design layout may consume lots of time as it may interact with code in the future

4. SELF EVALUATION OF THE PROGRESS

Self- assigned tasks are able to complete within the expected time



Supervisor's signature



Student's signature

POSTER

POSTER

LIBRARY SEAT AND BOOK AVAILABILITY CHECKING USING MOBILE APPLICATION
Done by: Choong Jun Mun
Supervisor : Dr. Kh'ng Xin Yi


Background

- This project develop a mobile application for library seat and book availability checking.
- This is because UTAR have not build a mobile application that used for library purpose and the student having some problems when encounter to UTAR Library.
- The problems are :-
 - Difficult to find an available or preferred seat
 - Difficult to find the exact location for the books
 - The traditional seat reservation process is time-consuming

Objective

This project develop an mobile application and consist of **three main function**:-

- Help student reserve a seat in the mobile application
- Locate exact location of the books
- To keep track of the student who is already checked in the correct seat



Methodology and Method

- Develop using Agile Development methodology. Phases involved planning, analysis, design, implementation, testing, and maintenance.
- Android Studio for android application development
- Firebase for store student personal information and google authentication
- Use Adobe illustrator and Adobe XD for layout design

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By Jun Mun Choong

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CHAPTER 1 PROJECT BACKGROUND 1.1 Introduction Traditionally, libraries are the buildings or rooms where kept the collection of books and used for reading and research [2]. Then, the main purpose of the libraries is to provide numerous supports giving factual information to help users find information. The users can find the information that comes from many different resources such as biographies, histories, journals and so on. However, libraries have come to the new norm with the rapid development of technology in the middle of the 20th century. The development of technology such as computer, mobile and telecommunication help libraries store the reading materials in online and the user able to access on any devices. However, libraries have not fully implemented the technology yet as the people still need libraries because it provides a better environment for them to study and reading. Nowadays, the libraries are usually located in higher education institutions such as colleges and universities. It can be called as academic libraries. The main function of the libraries is to provide a comprehensive and tremendous collection of documents that help the students for their study and research [5]. Usually, the students come to the libraries to do their assignments and research papers. This is because the libraries provide a large collection of fundamental researches such as biographies and journals. These fundamental researches can give them ideas to write assignments and research papers while gaining extra knowledge that is usually not written in the textbook. Besides that, the libraries also provide newspapers and magazines to the students for the entertainment and healthy leisure purpose [5]. This is because some of the students use the library as a place to relax and the libraries give student a chance to use their leisure time to read newspapers or magazines instead of just playing with their mobile phone in their free time. Therefore, the students will read the newspapers or magazines and the inside contents of the newspapers such as comics, sudoku and cinema information can give students a fun and enjoyment of leisure time. Besides, the libraries are the place where can provide a quiet environment for reading and studying [6]. In every education institute, there will have a final exam for the students and they are given an exam preparation week for them to prepare for their exam. Therefore, students will choose to stay in the library to prepare for their exam as the library is a quiet environment for them to more focus on studying and learning. Other than that, the libraries have provided a study room to students who wish to do group discussions in the library. Therefore, students can have a group discussion in the library without making noise disrupt other students and the students also can find some reading materials in the library when facing problems during group discussion. We can know that libraries play a very important role to students such as provide a quiet environment, provide various documentation for study and research and giving entertainment leisure time. As mentioned above, the libraries have not fully implemented the technology which is most of the libraries only use computers and the internet to store the resources. Therefore, the

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