



## TECNOLOGY AND INFORMATION SYSTEM

SECP1513 – 02

### Design Thinking Project Report:

Library or study space utilization

(Analyze peak times, seating capacity, and resource borrowing to enhance accessibility and comfort)

*PREPARED FOR: DR ARYATI BINTI BAKRI*

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## **1.0 Introduction**

### **1.1 Background Information**

Overcrowding is often faced by the library in University Technology Malaysia, especially during study weeks, midterm test nights, and project submission periods. Empty seats or available discussion rooms are frequently searched for by students as they walk around the premises. If a seat or a room cannot be found, time is wasted, frustration is felt, and the library is eventually left by the students. The negative impact of poor facility accessibility on student productivity is further supported by research in the International Journal of Environmental Sciences (2018), where the importance of optimized institutional space was emphasized. Additionally, a significant amount of time is needed for the location of references during research. Thus, to solve these problems, an app called “Maroon Space” was designed by the team to help students plan their study schedules effectively.

### **1.2 About the Project**

“Maroon Space” is an Internet of Things (IoT) application-based technology that incorporates four main elements for efficient data processing: sensors, connectivity, data processing, and interface. By integrating sensors within library seats and rooms, occupancy can be tracked in real-time by students. Every seat is monitored by sensors or cameras, if a seat is detected as occupied, the live map is automatically updated. The collected data is processed and transmitted through a network to the application interface, where current availability can be easily viewed and online bookings can be made by students. In addition, the library catalog is integrated with “Maroon Space” to provide information on book categories and their corresponding rack locations. Resources can be quickly identified and located, allowing study sessions to be made more efficient. Through this system, the time wasted in searching for seats is aimed to be reduced, online booking is enabled, and the overall study experience is enhanced.

### **1.3 Objective and Overview**

The experience of students is intended to be enhanced by reducing overcrowding, shortening wait times, and providing a seamless digital space management interface. Features such as real-time seating maps, room reservations, automated notifications, and integration with the university's identity verification system are included so that study sessions can be planned more effectively and resource accessibility can be enhanced.

## **2.0 Target User**

This app is designed specifically for University Technology Malaysia students, who require quiet study open spaces or discussion room to study or discuss project, assignment with course mates and friends. This app enables students track real-time availability of seats and rooms, make online bookings, find resources and save their time when searching for available spaces to enhance the overall study experience.

### 3.0 Problems and Solutions

The problem and solution are listed up in the table below.

<b>Problem</b>	<b>Description</b>	<b>Solution</b>
Unclear seat availability	Empty seats cannot be identified without walking through the library.	Seat occupancy is displayed in real-time using IoT sensors.
Inefficient Room Booking	Physical registration at the counter was previously required.	A mobile app is provided for instant reservation and cancellation. These actions can be performed remotely without a physical visit to the library. Upon a successful booking, the message "Booking successful! Study diligently... and success will follow suit" is displayed. If a booking is cancelled, the notification "Cancel booking? Do not waste time... Success is earned, not given" is shown.
Lack of Automated Session Management	Booking durations are easily forgotten, often leading to slots being overstayed by students.	Automatic notifications are transmitted both before and after study sessions. Alerts such as "Don't forget your booked discussion room; 5 minutes until it starts" are received by the user. Prior to the conclusion of a session, a reminder stating "5 minutes left" is triggered. Through this feature, users are kept well-informed and time is managed more efficiently.
Difficulty finding library resources	Excessive time is spent searching for books by genre, which may cause study sessions to be delayed.	Bookshelf locations can be searched by genre within the application. For example, when a search for "Technology and Information System" is conducted, a list of corresponding bookshelf locations is displayed by the app.

Table 3.1 Problem statements and solutions

#### 4.0 Team Working

A smooth flow in the work process was ensured by dividing tasks based on the strengths of each group member. An important role in the creation and development of the prototype was played by Aidil, where focus was concentrated on promoting technical improvements and ensuring that proposed functions were correctly reflected. The creation of the prototype and the distribution of Google Form links for data collection were managed by Li Jing.

Additionally, assistance was provided by her in the interpretation of data results and the compilation of the final report. Video editing tasks for the project presentation were handled by Anis, who also contributed to the prototype creation process. Effective communication and collaboration were maintained throughout the project. Most tasks including the discussion of design concepts, testing, feedback sessions, and interviews were performed as a group to achieve consistency. By focusing on individual strengths and collaborative efforts, the project tasks were effectively accomplished by the team. Task within group members are shown in table below.

Task \ Name	Muhammad Aidil Farhan bin Zamri	Lim Li Jing	Puteri Anis Annisa binti Mat Lazim
Prototype Development	√	√ (Design support)	√ (Design support)
Data Collection (Google Form)		√	
Survey Analysis	√	√	
Report Writing	√	√	√
Presentation Slides	√	√	√
Video Editing			√
Team Discussion & Feedback	√	√	√

Table 4.1 Task distribution within group members

## **5.0 Design Thinking**

### **5.1 Design Thinking Process**

#### **5.1.1 Empathy**

To ensure a deep understanding of user needs, the '7 Types of Questions' framework proposed by Bryan Kitch (2023) was adopted during the interview design process. Furthermore, the principles of user-centric design, as detailed by the Interaction Design Foundation (2024), were applied to effectively empathize with the students' daily struggles. Data collections were shown in 5.2.2.1 and interviews in table 5.2.2.2.

#### **5.1.2 Define**

Based on the collected data, core problems were identified, including unpredictable seat availability leading to wasted time, cumbersome room booking process requiring physical presence, lack of automatic reminders causing overstays and also difficulty in locating library resources, which can increase the time students spend searching for materials and reduce the time available for studying. The problems were defined in Table 5.2.2.3.

#### **5.1.3 Ideate**

This phase consists of looking at the problem from different angles and brainstorming creative solutions for the problem statement. During this phase, strategies on how the problem can be efficiently addressed have been brainstormed by our team. Different solutions for addressing the problems faced by the students have been come up with by us, which have been categorized into two approaches based on web portals and mobile app solutions. The comparison between web portal and application was shown in Table 5.2.2.4.

#### **5.1.4 Prototype**

It was decided that a mobile app solution would be developed rather than a web portal. This decision was made because direct push notifications can be sent to students' phones via an app. The interface was designed using Canva to create a functional prototype. The best solution is shown in table 5.2.2.5 and the the final features with prototype.

#### **5.1.5 Test**

The "Maroon Space" design was tested with local students in the library. Feedback was gathered to ensure the application is useful and meets the needs of the target users.

## 5.2 Design Thinking Evidence

### 5.2.1 Sample Work

A sample work process was shown in table below.

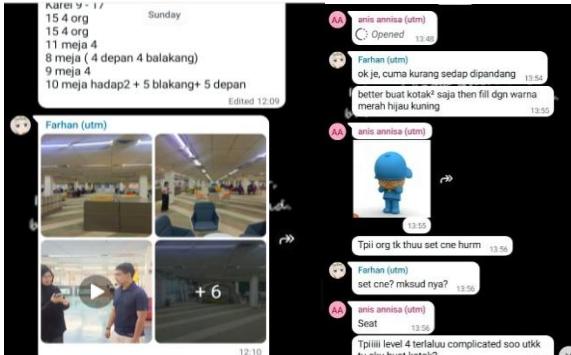
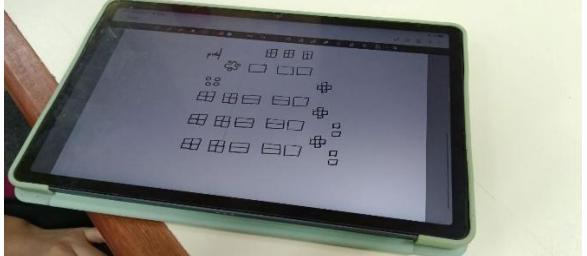
<table border="1"> <thead> <tr> <th>Respondent</th><th>Name</th><th>Year</th><th>1 How often do you visit the library or study a week</th><th>2 How difficult is it for you to find a seat during peak hours</th><th>3 What do you usually read in the library</th><th>4 What area do you usually study in</th></tr> </thead> <tbody> <tr><td>2</td><td>JOSHUA JONAS</td><td>Year 1</td><td>1-2 times a week</td><td>Very difficult</td><td>Afternoon (1pm-4pm)</td><td>Quiet study area</td></tr> <tr><td>3</td><td>KHENG YEE JUN</td><td>Year 1</td><td>3-4 times a week</td><td>Neutral</td><td>Night (After 6pm)</td><td>Quiet study area</td></tr> <tr><td>4</td><td>WEN HUI XIAO</td><td>Year 1</td><td>3-4 times a week</td><td>Difficult</td><td>Morning (8am-11am), Afternoon (1pm-4pm), Evening (6pm-9pm)</td><td>Open study space</td></tr> <tr><td>5</td><td>NURUL IRMAN BINTI MAZ</td><td>Year 1</td><td>1-2 times a week</td><td>Difficult</td><td>Morning (8am-11am), Afternoon (1pm-4pm)</td><td>24-hour room</td></tr> 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Table 5.2.1.1 sample work

## 5.2.2 Record for each phase

### 1.Empathy

#### 5.2.2.1 Data Collection

A Google Form survey was completed by 67 students.

Figure below shows respondent's current study year , and also questions related in finding available spaces based on the survey.

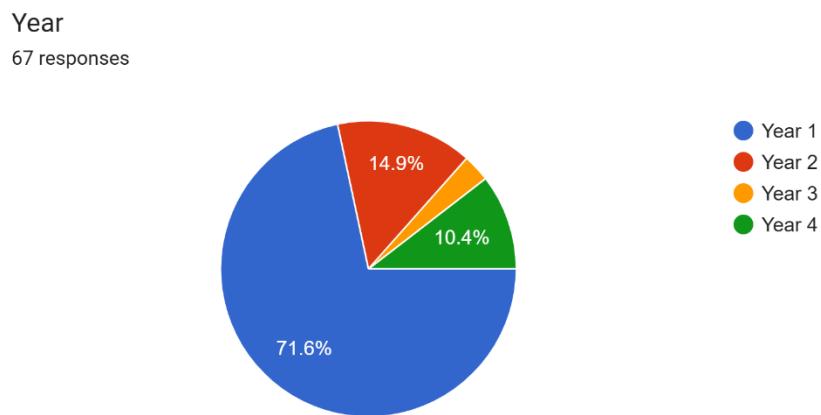


Figure 1. Respondent's current study year

Figure 1 illustrates the participating rates across study years for the 67 students who have completed the survey. First year students represent the largest group of respondents at (71.6%), while Year 2, Year 3, Year 4 students contributed (14.9 %), (3.1 %), (10.4 %) of the total form respectively.

#### 1.How often do you visit the library or study spaces?

67 responses

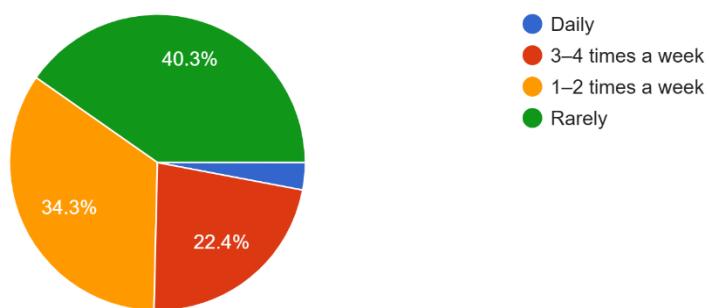


Figure 2. The frequency with which respondents visit the library

Figure 2 details the frequency of library and study space usage among 67 respondents. The data indicates that more than half of the people will spend their time in the library at least once a week (59.7%).

## 2. How difficult is it for you to find a seat during peak hours?

67 responses

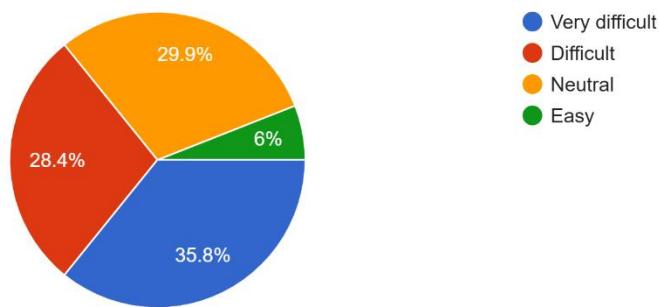


Figure 3. Difficulty respondents faced in finding seats during peak hours

Figure 3 outlines the stage of difficulty for respondents finding a seat during peak hours. The data shows that a lot of respondents (64.2%) could not secure seats easily during peak hours while the other respondents that find it neutral (29.9%) and easy (6%).

## 3. What time do you usually visit the library? (Select all that apply)

67 responses

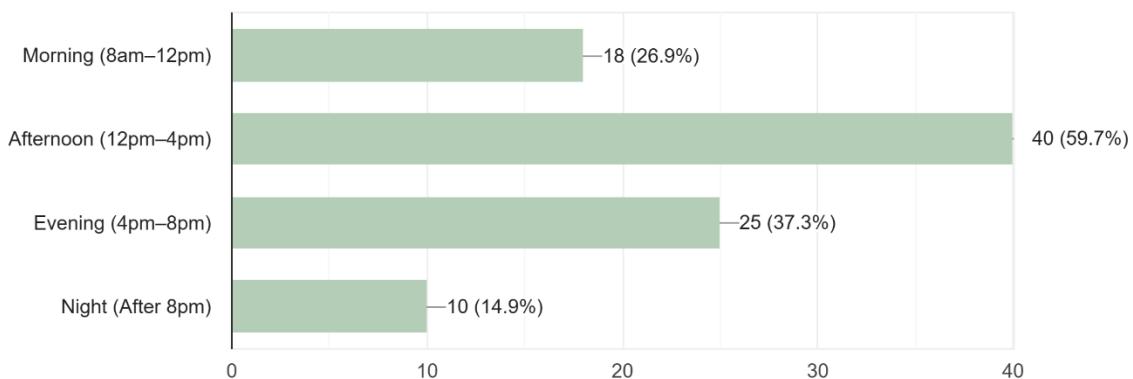


Figure 4. Times respondents visit the library

Figure 4 breakdown of preferred visiting times for students who utilize the library. The afternoon is the most popular time for library usage with nearly 60% from the respondents has selected this period. Evening, morning and night usage has been selected by 37.3%, 26.9% and 14.9 % of the respondents respectively. These findings indicate that peak hours for

the library are during afternoon and declines significantly as the day progresses into the late evening and night.

4. Which area do you usually use?

67 responses

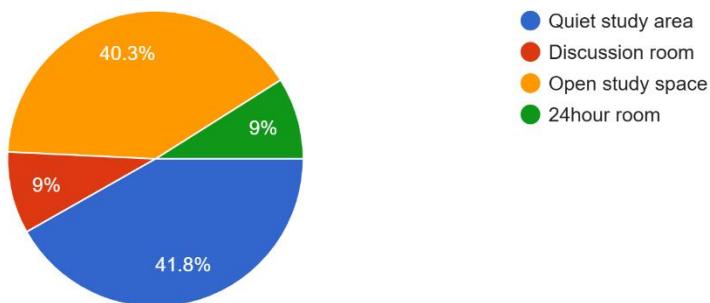


Figure 5. Respondents' preference study area

Figure 5 demonstrates that the number of respondents that prefer quiet study space area and open study space area are nearly equal. The choice of discussion room and 24-hour room are significantly less with only 9 % of the respondents prefer this type of space.

5. Have you ever left the library because no seats were available?

67 responses

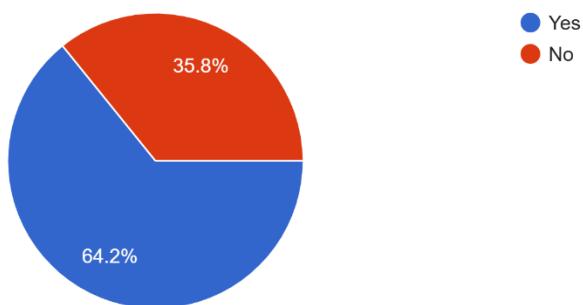


Figure 6. Impact of seating shortages on library attendance

Figure 6 shows a significant majority of respondents (64.2%) reported has left the library due to lack of available seats while others have not experienced this type of problem.

6.On average, how long do you spend looking for a seat?

67 responses

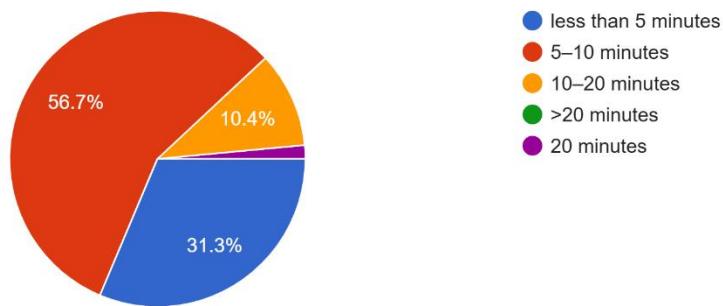


Figure 7. The time spent in finding a space

Figure 7 reflect in the time required to secure a seat. Only (31.3%) of the respondents can find a seat in less than 5 minutes. Majority of them spend between 5 to 10 minutes in finding available seat while (10.4%) must wait or search for 10 to 20 minutes before they can begin their work.

7. Do you find it easy to locate the books or resources you need in the library?

67 responses

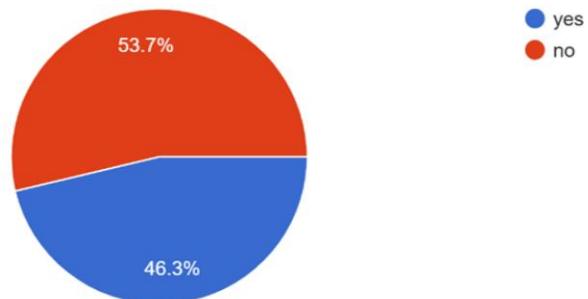


Figure 8. Difficulty in finding academic resources

From Figure 8, most respondents do not find it is easy to locate the books or resources they need in the library. This indicates a system where students can easily search for the academic resources they need.

8. Do you think online booking can help reduce time wasted in finding a room?  
67 responses

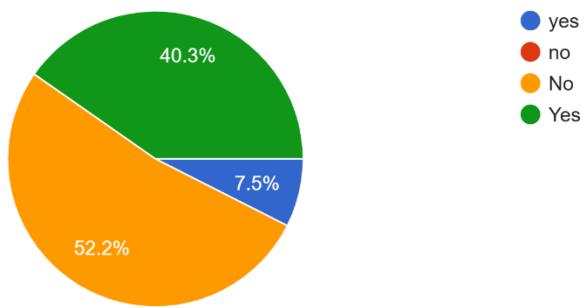


Figure 9. Perceived utility in of online booking in reducing time waste

Based on Figure 9, the statement that online booking would help reduce time wasted in finding a room was agreed upon by almost half of the respondents.

9. Do you feel the library has adequate resources for students?  
67 responses

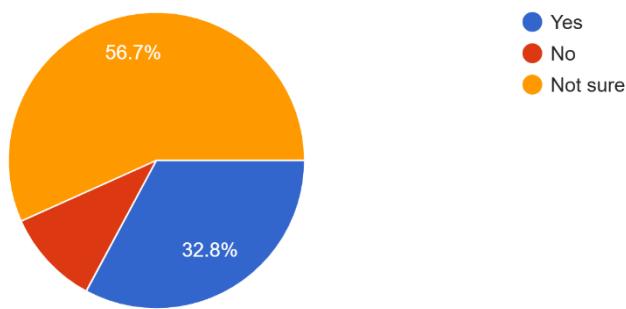


Figure 10. Respondents' perception of library resource adequacy

As shown in Figure 10, 'Not Sure' was selected by over half of the respondents, reflecting a lack of awareness or infrequent use of the materials. While adequate resources were reported by approximately one-third of the participants, the remainder was accounted for by those who found the resources inadequate.

#### 10.How is the environment?

67 responses

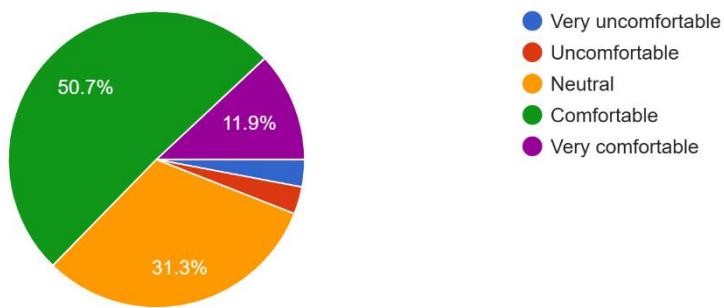


Figure 11. Respondents' satisfaction regarding the environment in the library

As illustrated in Figure 11, a positive rating of either 'Comfortable' or 'Very Comfortable' was provided by more than half of the respondents. Specifically, 'Very Comfortable' was selected by 31.3% of the participants, while negative reviews were recorded for the remainder of the sample.

#### 11.What do you find uncomfortable? (Select all that apply)

67 responses

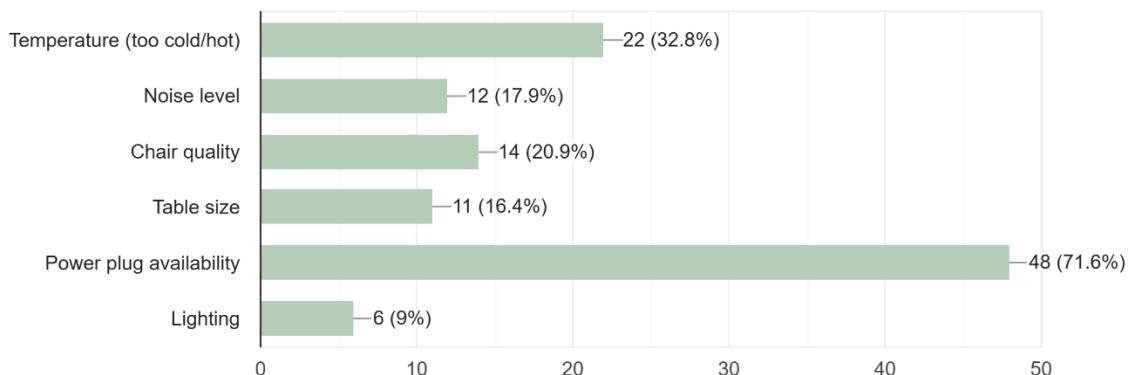


Figure 12. Factors of discomfort among respondents

As indicated in Figure 12, a struggle with power plug availability was cited by 48 respondents, representing the majority of the sample. The second most frequent discomfort, temperature (excessive cold or heat), was reported by 32.8% of the participants. Comparable levels of dissatisfaction were observed regarding noise levels, chair quality, and table size, whereas issues related to lighting were raised by only six respondents.

12. Would you need to use a system that shows real-time seat availability?

67 responses

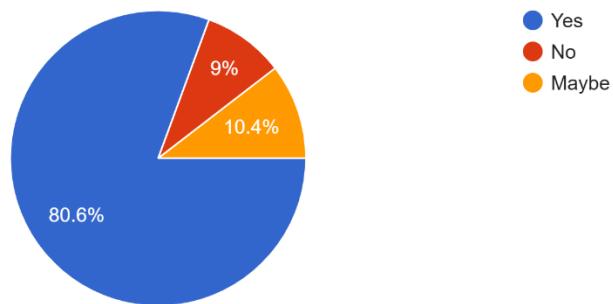


Figure 13. Respondents need in real-time seat availability

Figure 13 represents over eighty percent of the respondents find that a system that shows real-time seat availability would be helpful for them.

13. What improvements would you like to see in the library or study space?

online booking seat  
notification reminder, online booking, live map & location of book type  
a system that can show any space seat in the library  
It's better to have list of books and references available in library so that we know where to find it easily.  
a booking system is needed  
booking room & notification live map  
live map to check availability seat  
need a booking system  
Better resources navigation  
real time check seat and book room online with notification  
booking discussion room system  
More seating spaces and better vibe  
online booking discussion room and also notification reminder before end our session  
Can add more private personal study room  
a system can book a seat and show the space seat  
Improve power plug availability  
Plug availability  
Real-time seat availability as suggested  
Open to booking study room online  
Can book the discussion room early  
updated technical reference  
Increase power outlet availability  
more power plug availability

increase the number of single study room  
 live seat show and notification and online booking please!!!  
 more seat with power plug  
 notification reminders with booking system  
 People usually study at night so library need to enlarge the space of 24 hour room  
 Seat available to check and more plugged  
 do a system that can check are they any space seats time by time  
 a system that can check the updating table time by time  
 Provide more individual study room.  
 provide a good app for students to check whether the seat available or not. improve the security too please  
 More power plug  
 isolated room with optimal privacy with CCTV to prevent misuse.  
 book discussion room with notification reminders  
 More group discussion room and stronger WiFi  
 More space and electric supply  
 system that easily to find the genre of course  
 Improve seats  
 add on power plug  
 More plugs available  
 a system that can booking space and discussion room  
 Other than seat availability, more working power plugs  
 book discussion room and live map provided  
 more tables and chairs

### *Interview*

The questions and answers obtained during the interview are presented in the table below.

Question	Answers
1. Hallo, what is your name and what is your course?	Hello, my name is student A and I am from India. My course is related to faculty of engineering.
Can I ask you some question?	Okay.
How much time do you typically spend searching for a suitable place to sit, especially during peak hours?	Too much because I want to find a seat to study.
What type of space like quiet zone, collaborative table, private pod do you look for when you need to study?	I like study quiet and library is too big so there are much quiet.
Okay, Thank you.	Okay, Welcome.
2. Can you please introduce yourself what is your name, what is your course and which you are like?	I am Student B. I am from FKE.I am year 2 electronics student.
Okay. So, for the first question how often do you visit the library?	Quite often. I mean maybe 5 days a week.

So when you decide to go to the library, what time of day is it usually?	After breaktime. Actually, my course like don't have a day so after that I will usually be like.
Can you recall a recent time when you left the library or a study space without finding a good spot? What happened?	Yes, that have a quite often.
If you can instantly check in your phone about the availability of the room, there a bit helpful for you. Did that helpful for you?	Much.
Okay, that's all. That's all for the question. Thank you.	Welcome.
<b>3.(Interview with library staff)</b> When is the peak time where people usually go to library? And do you think the spaces is enough for students?	Students come when study week and the new registration. When the new semester started, there are most crowded because they want to explore library. At that moment, space is not enough.
What things that you think must be improve?	We don't have the check availability seat system yet. For all student I also want to upgrade facilities, improve the environment and this service.

Table 5.2.2.2 Interview with two international students and a library staff

## 2.Define

The following table presents student core problems as synthesized through empathy research.

Problems	Descriptions
Unclear seat availability	Empty seats cannot be identified before students arrive at the library. This leads to wasted time and frustration, particularly during peak periods such as study weeks.
Inefficient Booking	The process for booking study rooms is managed manually. Real-time confirmation is lacked, often resulting in students arriving to find no available rooms.
Lack of Automated Session	Allotted slots are often overstayed because a reminder system is not in place. Inconvenience is caused to other users, and scheduling conflicts are created for the library administration.
Difficulty finding library resources	Identification of book categories and the location of correct racks are often struggled with by students. Time spent searching for materials is increased, and study efficiency is consequently reduced.

Table 5.2.2.3 problems faced by students

## 3. Ideate

The table below shows the possible solutions that can be used to solve students' problems.

Problems	Web Portal	Application
Unclear seat availability	A website is provided where room and seat statuses are listed in a table format,	A mobile app featuring a color-coded floor plan is developed. Live updates are provided via IoT sensors,

	accessible via personal laptops or library computers.	where green indicates availability and red indicates occupied seats.
Inefficient Booking	A webpage form is used for room reservations, with confirmation sent via email.	A seamless flow is created within the app, allowing a room to be selected, a time slot to be chosen, and booking details to be confirmed instantly
Lack of Automated Session Management	Reminder emails are automatically sent by the system at set intervals before and after the booking.	Automatic push notifications are sent directly to the student's phone before the booking starts and 10 minutes before the session ends.
Difficulty finding library resources	Book categories and rack locations are displayed on a webpage, allowing searches by genre.	A search function is integrated into the app, enabling book categories to be mapped to their corresponding rack locations quickly.

Table 5.2.2.4 Possible solutions to solve the problems

#### 4. Prototype

The reasons for this decision are outlined in the table below.

Reasons	Web Portal	Application
Accessibility And Convenience	A browser is required, and usage is optimized for larger screens. Excessive scrolling is often needed when the website is accessed via mobile phones, making it less convenient for quick, on-the-go checks.	Seat availability can be checked from anywhere and at any time using smartphones, which are always carried. Additionally, the application can be downloaded onto a Laptop or Mac for versatile access.
Reminders	Reminders are sent via email, which are easily ignored or overlooked by users.	Direct push notifications are enabled, ensuring that reminders are received and noticed immediately on the device.
Login status	Re-authentication is required during every session, as the login status is not maintained.	The login session is maintained within the menu, so repeated logins are no longer required after the initial access.

Table 5.2.2.5 Comparison between Web Portal and Application

#### Our final prototype



Firgure 14 Login Page

Access to “Maroon Space” is secured by requiring the use of a UTM student ID and password.

The image shows the features page of the UTM Study Space app. It has a sidebar with "Good Afternoon" and user icons. The main content area includes three cards: "Sultanah Zanariah Library" (Seat Availability Map, Booking a room, Schedule and Operating Hours), "24 Hours Study Room" (Seat Availability Map, Booking a room, Notice on Closing For Renovation), and "Zarith Sofea Library". At the bottom, there's a "Log out" button and a lock icon.

Figure 15 Features Page

The features required can be selected by the students.

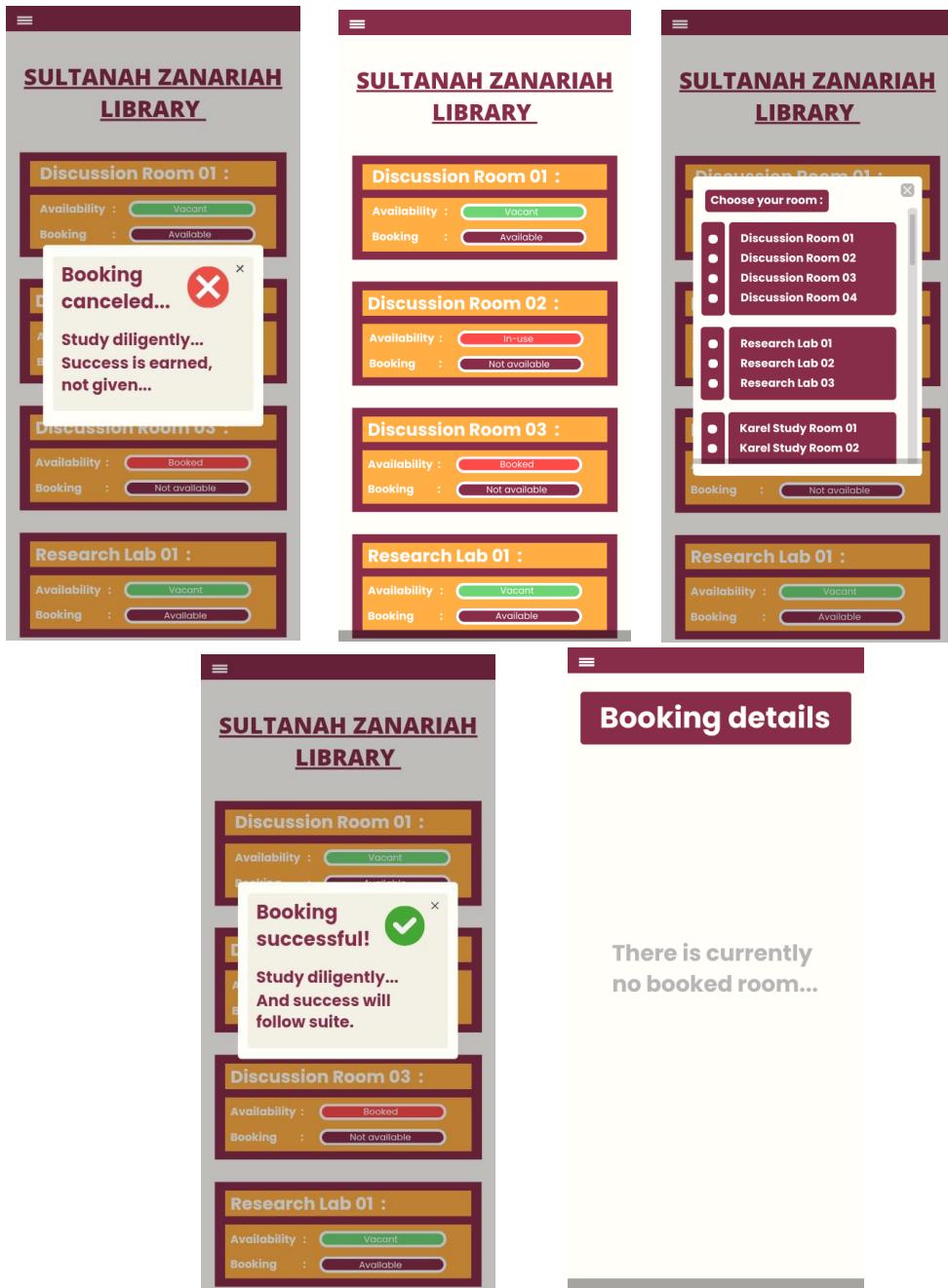


Figure 16 Booking Room Features

Current and upcoming booking details can be checked directly within the application. The booking of preferred or empty discussion rooms can be performed instantly by students through a single tap. Existing bookings can be cancelled by students if a scheduled slot is no longer required.

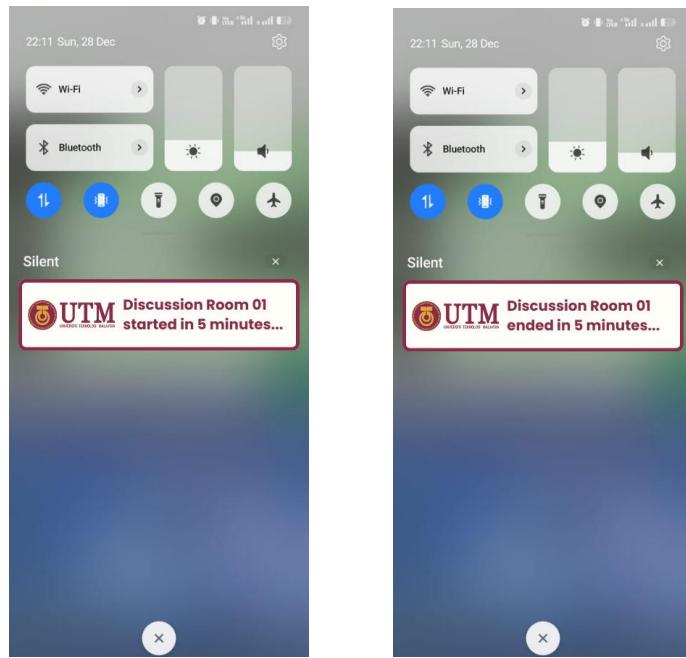


Figure 17 Notification reminders

Direct push notifications are enabled, ensuring that reminders are received and noticed immediately on the device.

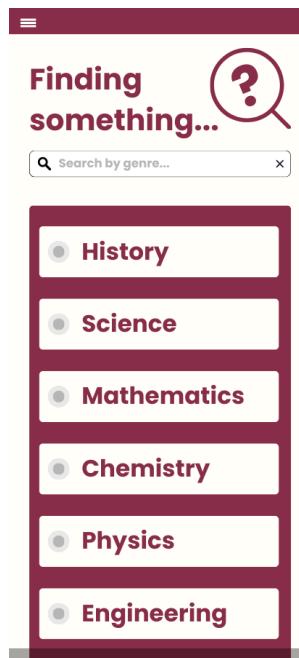


Figure 18 Finding library resources

Bookshelf locations can be searched by genre. For example, a search for "Technology and Information System" will result in a displayed list of corresponding bookshelf locations.

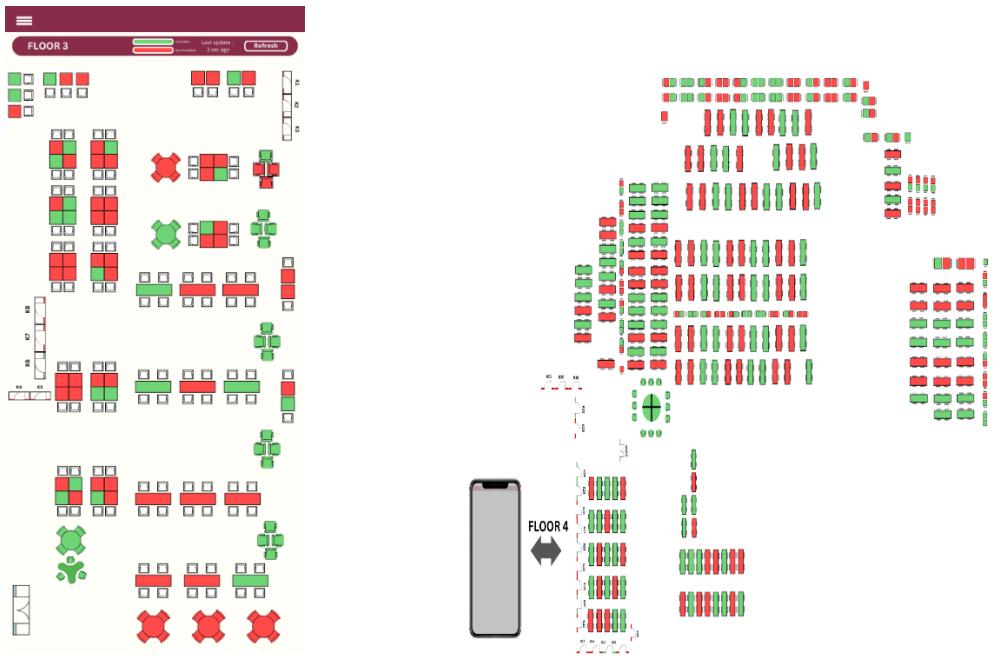


Figure 19 Live seating map

Real-time updates for available seating are provided to ensure students are informed of seat availability. For example, seating on floor 2 or floor 3 can be viewed before arriving at the library.



Figure 20 Schedule of operating hours

Library operating hours are displayed within the app, so the library website no longer needs to be checked manually.

## 5. Test

Dialog with interviewees

### First interview

LI JING: Hello, what is your name and can you self-introduce yourself?

STUDENT D: My name is D. I am 19 years old and year 1 FKE student.

LI JING: Do you always go to the library?

STUDENT D: Yes, almost three time once week

LI JING: Did you feel that find a space is so difficult?

STUDENT D: Yes, over than 5 minutes especially during peak hour like midterm test night.

LI JING: Did you think that find a resources in library are difficult?

STUDENT D: Yes, because the library is too big and I can't find where actually the book locates.

LI JING: Okay, now I have designed an app to improve the library system? Let's see on our app and give me some feedback.

STUDENT D: Wow, this looks like so nice. I can check the live seat every time when I want go to library. This really help me a lot because if that seat is almost fully, I not need to go to library. The booking system also looks like useful. I can book early for a single room or discussion room to study with my friends. I see that I can also find the resources by genre to know where the resource locates.

LI JING: Did you think that this app will help a lot of students in UTM?

STUDENT D: Of course, we don't need to get on the bus or walk to library if seats already full. The notification reminder also can help me a lot to avoid overstay. For me, this app really convenience and I like it.

LI JING: Is there any improve for this app?

STUDENT D: I think your app can search more details to find the book. Maybe which rack and which row.

### Second Interview

ANIS: hello we are here today with E for testing our prototype design looking project.

Okay so before we go through our prototype. I would like to ask E, have you ever facing any problems before in like finding available places that you want in library before this.

STUDENT E: yes, Puteri Anis because every time I finish my bus, I want go to library and then it's already book or it's full with people so I still want to find a solution with the problem.

ANIS: Okay, as you need to overcome the problems that you will face before this, we actually have thinking in an app that we can look about availability of the spaces in library in UTM. Okay so you can see this is our prototype here.

STUDENT E: It's good that your prototype working like it do not put a difficult to students because some students need to go around in the library to find their seats and somehow, they need to go into the counter and ask for the key for room. But then this application might be working in the future, it might have a lot of students to actually not waste their time in go around and then they can actually organize their study time and all of them.

ANIS: Yes! So that's all from us. Thank you so much for joining us.

## **5.3 Design Thinking Assessment**

### **5.3.1 During the end of the project demonstration**

In the conclusion of the project, it can be acknowledged that while making an application is a complex task, it offers several practical applications. A significant shift away from personal opinions was made possible by the initial research conducted through interviews and Google Form surveys, which provided proper insight into the frustrations experienced by UTM students. Through this research, the development of ideas was made easier; however, considerable effort was required to convert those concepts into a seamless and efficient digital tool. For example, the design concepts for the real-time seating map, booking system, library resource guidance, and notification reminders were required to meet the students' desires for ease of use and accessibility.

### **5.3.2 During the transition between design thinking phases**

The transitions between the design thinking phases were considered critical for the success of the project. In the transition from Empathize to Define, user feedback regarding seat availability, room booking, session reminders, and library resources was summarized into clear problem statements. As the process moved from the Define stage to the Ideate stage, several solutions were identified, including real-time seating updates, discussion room reservations, alert reminders, and book category browsing. In progressing from the Ideate stage to the Prototype stage, ideas were narrowed down to a mobile application enhanced with features such as push notifications and improved accessibility. Finally, during the transition from Prototype to Test, the proposed solutions were validated by assessing the usability of the application in fulfilling the requirements of the students.

## **6.0 Reflection**

Question:

- 1.What is your goal/dream with regard to your course/program?
- 2.How does this design thinking impact on your goal/dream with regard to your program?
- 3.What is the action/improvement/plan necessary for you to improve your potential in the industry?

MUHAMMAD AIDIL FARHAN BIN ZAMRI

1. The mastery of the basics and foundations of computer science is desired before skills in data engineering are further developed. This ambition is to be demonstrated by the attainment of a GPA of 3.5 or above every semester. By the end of this journey, it is expected that any problems regarding computer science will be solved effortlessly.
2. The importance of good communication skills for effective interaction with group members was taught through the design thinking process, allowing opinions to be expressed clearly. Furthermore, the ability to communicate with and interview strangers was acquired, through which fear, social anxiety, and nervousness were successfully overcome.
3. To ensure that a distinction is made from thousands of other applicants, new technologies that advance rapidly each year will be learned so that a competitive advantage may be gained. Additionally, a variety of skills that are considered crucial or beneficial within the industry will be identified and acquired.

LIM LI JING

1. The development of skills required for a future career is aimed for, especially technical skills in app development and programming languages such as C++, Java, HTML, CSS, JavaScript, and Python. Mastery of all topics and subjects within the course is aspired to. Simultaneously, soft skills, particularly communication, must be developed to ensure greater confidence when interacting with others. Since an extended internship period is provided by the course, skills must be enhanced so that the responsibilities of a future internship can be effectively managed.
2. An impact is made on these goals by design thinking, as not only were communication skills improved, but critical thinking, team collaboration, and problem-solving skills were also sharpened. For example, problems faced by students were analysed and solutions were discussed with team members to resolve them. Efforts were also made to become more extroverted so that interview sessions with strangers could be conducted successfully.
3. To enhance my potential in the industry, more activities and competitions that can social with other people are planned to improve my communication skills and confident. To improve my critical thinking and problem-solving skill, more workshops are planned to be attended, which can help me refine my abilities and gain useful tips. To improve other technical skills, club like Cyber X I have joined to learn new knowledge and technique.

## PUTERI ANIS ANNISA BINTI MAT LAZIM

1. The goal for this program is that all skills required in the industry will have been mastered upon graduation. Through the design of reliable pipelines, messy and complex data can be transformed into useful, easy-to-understand information that can be used by others to solve both corporate and daily problems.
2. A significant role in the achievement of goals is played by this design thinking project, as many new skills were gained to ensure the project's completion. Critical thinking and decision-making were sharpened through this process. Importance was placed on interacting with people and understanding their frustrations so that problems could be solved collaboratively with teammates. Insight was gained into how future professional interactions with various departments will be handled to solve real-world human problems. Furthermore, experience in building a real-world data pipeline was provided by designing the prototype. Overall, it is shown that being a good data engineer is not solely about code, but about ensuring that technical solutions are built to provide a helping hand to those who use them.
3. To improve industry potential, continuous learning must be ensured, and an updated knowledge of new tools must be maintained. It is considered important that all necessary skills be listed and a plan be established for each semester. Focus will be placed on enlarging professional networks and upgrading soft skills through club involvement in the first year. Technical skills required for future employment will be upgraded and critical thinking will be sharpened by joining competitions such as Hackathons in the second year. By ensuring these steps are taken, preparation for any future challenges and difficulties will be achieved

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## **8.0 Video**

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