

MEETING ROOM BOOKING MOBILE APPLICATION DESIGN

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1. Abstract

In the modern workplace, efficient meeting room booking is essential for productivity. Organizations often grapple with challenges like double bookings, ad-hoc reservations, and a lack of transparency in room availability. This project aims to design a user-friendly mobile app that addresses the issues with the current booking system and streamlines the process for DSTA Employees.

2. Introduction

In a modern workplace such as that of DSTA, using meeting rooms is an essential part of the workday. Yet, many employees face challenges while navigating the existing meeting room booking system that operates on Outlook — leading to difficulties such as not being able to find a suitable room, the need to manually ask for availability from others, delays caused by overrunning meetings, or unreported malfunctioning equipment. Furthermore, the existing system's complexity makes it difficult to navigate and adds to the tedium of booking a meeting room.

In order to foster greater communication and open collaboration among staff, a more streamlined meeting system will promote a friendlier work environment by facilitating mutual support in the process of booking a meeting room. Such a system will also allow for a more optimal and efficient usage of meeting rooms.

This project aims to explore and address the pain points of the current meeting room booking system, as well as incorporate greater use of technology to provide easier access to the system in the format of a mobile application and tablet displays, ultimately contributing to a more cohesive and efficient workspace.

The process was carried out via the Double Diamond method, consisting of Discover, Define, Develop, and Deliver.

3. Discover

Discover consists of researching and exploring the problem in order to understand the users' needs better. Research in the form of interviews was conducted with current staff with varying time spent in DSTA.

3.1 User interviews

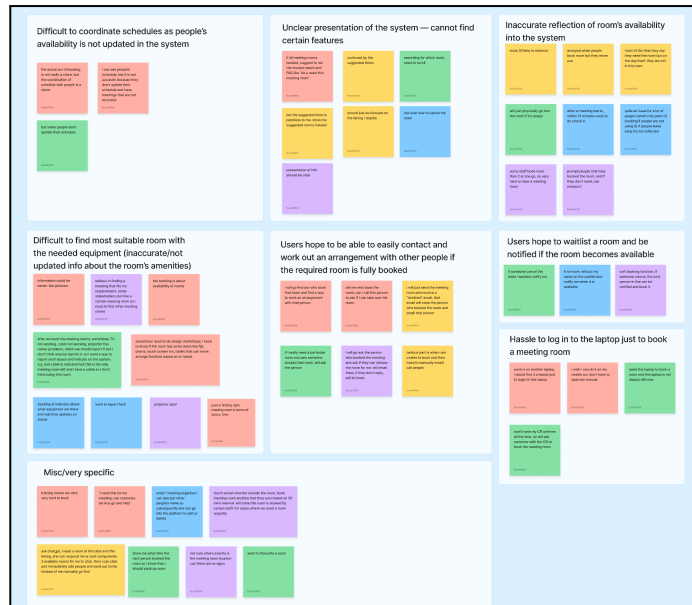
The interview questions were crafted to include open-ended questions and an observation of how the users used the existing booking system. These types of questions allowed for the identification of existing pain points without being too broad. The full list of questions can be found in Appendix A.

A total of 5 users participated in the user interview, with each interview taking 30 minutes. The interview participants were chosen for their varying time spent in DSTA, from just one month to over twenty years. This provided the basic features required in the lo-fi prototypes.

3.2 Affinity mapping

The salient pain points brought up in the interview were grouped using affinity mapping, which highlights the most important and common issues that users have with the existing system. The affinity mapping results can be found in Appendix B.

Figure 1 (Right). The affinity mapping process consists of sorting the points brought up in the interview.



4. Define

The second step of the Double Diamond method, Define, synthesizes and analyzes the data collected from step one in order to define the goal that the project will solve.

4.1 How Might We statement

A How Might We statement is then crafted in order to accurately pinpoint what the project is trying to achieve. The final iteration of the How Might We statement for this project is as follows:

How might we create a meeting room booking system that fosters collaboration among staff, while ensuring a streamlined and intuitive design that reduces the tediousness of booking meeting rooms and creates a smarter office?

4.2 User journey map

The live demonstration of the process of booking a meeting room also provided information for the as-is user journey map, from which opportunities to improve on the pain points can be identified.

| Phase | Pre-Booking | Booking | Pre-Meeting | Meeting | Post-meeting | | | | | | | |
|---------------|---|----------------------|---|---|--|----------------------------------|--|---|----------------------|---|---|--|
| User Action | Finding a common time for the meeting | Fill in meeting name | Add involved people | Find suitable room | Message those who booked rooms, if there are no available rooms | See upcoming meeting for the day | Make way to the meeting room | Ask previous meeting to leave if they are overrunning | Hold meeting | Find faulty equipment | End meeting | Book next meeting |
| Touchpoints | Slack/Whatsapp/Other communication device Polls features Outlook week view | Outlook | Outlook | Outlook Room view/ scheduling assistant | Outlook Email Those who booked the room previously | Outlook calendar | - | People involved in previous meeting | Meeting participants | Meeting participants | Meeting participants | Outlook |
| Emotions | Annoyance Difficulty in finding a common time Tired (having to set up the poll and list all available timings, or cross-reference own calendar while filling in the poll) | - | Annoyance, if the person needed doesn't show up in the search immediately | Annoyance due to not knowing which room is suitable | Difficulty finding and hunting down who the person is Annoyed at people who might have booked the room but no longer intend to use it | - | Frustration if they cannot find the meeting room | Slightly annoyed, if the previous meeting runs way overtime | - | Irritated since they cannot use the equipment despite booking a room with them | Happy that meeting is over? :) | Slightly tedious while re-inputting everyone's names and details again |
| Pain Points | Tedium of a poll to find a common time | - | No easy way to search for people | Not seeing at one glance the details of each room | Difficulty finding the person and no quick way to contact them | - | Difficulty finding the meeting room | Inefficient scheduling leading to clashes | - | Faulty equipment that they are unaware of | May forget to turn off certain appliances May run over time | Tedious to schedule another similar meeting |
| Opportunities | Common place to keep updated schedules for easy access Connect app to other services to quickly generate polls/suggest timings | - | Intuitive people-searching system Suggested people based on existing selected ones | Provide the most important details of each room while choosing room Add photos of the room | Built-in "request room" function to contact the person who booked the room with a message to check whether they still need it Reminders in-app for people to cancel their meetings if they are no longer using it | - | Show map/directions to the meeting room in the app | Notify meeting participants to leave the room at least 5 minutes before the next meeting commences Show to current meeting participants when the next group is coming in | - | Include equipment reporting in the app so that it can be seen when booking the room | Checklist in app after meeting ends + Notifications so they do not run overtime | Functions to quickly book another similar meeting |

Figure 2. The as-is user journey map shows how users book rooms using the current system, providing areas for analysis and improvement.

Following the pain points identified, improvements were made to steer the user experience toward the ideal defined in the How Might We statement, resulting in the to-be user journey map.

| Phase | Booking | | | | | | Pre-Meeting | | Meeting | | | Post-meeting | | |
|-------------|------------------------------|------------------------------------|---|---|--|--|--|--|-----------------------------------|----------------------------|--------------|-------------------------------------|-------------------------|-----------------------|
| User Action | Input meeting name | Input participants | Select common time for all participants | Select from suggested rooms based on classification; OR | Select required equipment and filter rooms | Message those who booked the rooms if there are no rooms available | Other participants accept meeting invite | Look at calendar view for meetings for the day | Make way to meeting | Check-in/confirm meeting | Hold meeting | Receive notification to end meeting | Report faulty equipment | Schedule next meeting |
| Touchpoints | Meeting app - booking screen | Meeting app - meeting participants | Meeting app - booking screen | Meeting app - booking screen | Meeting app - booking screen | Meeting app - Those who previously booked the room | Meeting app or email | Meeting app - overview | Meeting app - overview/directions | Meeting app/ notifications | - | Meeting app/ notifications | Meeting app | Meeting app |

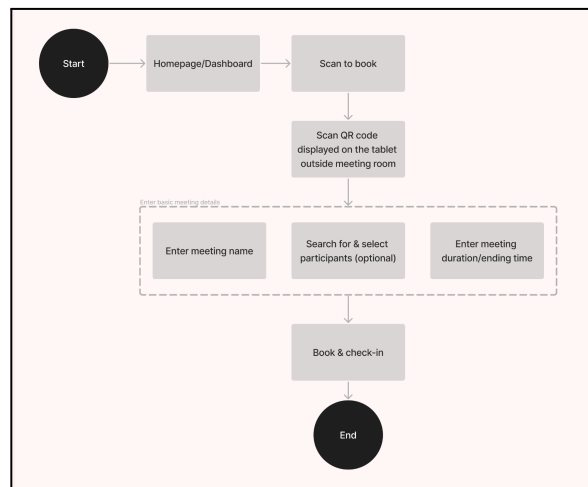
Figure 3. The to-be user journey map provides an updated way for users to book meeting rooms, with more smart suggestions and easier, more straightforward steps.

4.3 User flow

The user flow diagram, built on top of the to-be user journey map, shows more clearly the screens that the user has to navigate through in the application.

The full list of user flows can be found in Appendix C.

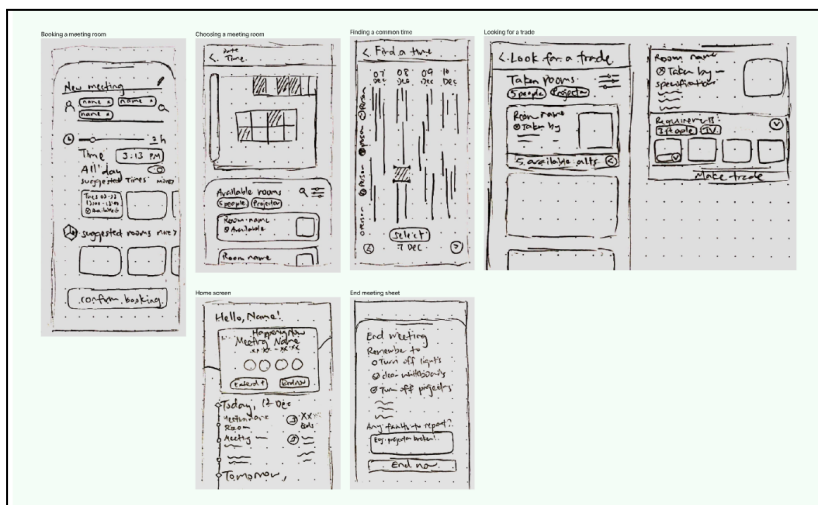
Figure 4 (Right). The sample user flow for booking a meeting room on the spot via scanning a QR code.



5. Develop

The third step of the process, Develop, consists of wireframing and prototyping the app to plan the user interface for production.

5.1 Lo-fi mockups



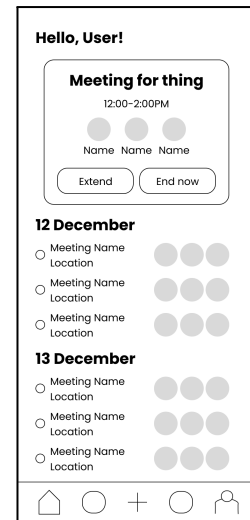
Drawn using pen and paper, the low-fidelity mockups allow for a quick way to test different layouts and plan the screens of the application.

Figure 5 (Left). Low-fidelity mockups of the main screens of the app, such as the homepage and the creation of a new meeting.

5.2 Wireframes

The lo-fi mockups were converted to wireframes to prepare for the mid-fi interactive prototype. These wireframes provide the basic structure of the app.

Figure 6 (Right). Wireframe of app's homepage.



5.3 Mid-fi prototype feedback and iterations

Finally, the black-and-white wireframes are recreated in full color and interactivity for the mid-fidelity prototype. A total of three rounds of feedback was conducted, and the prototype was iterated upon for each round. Below is an example of how the feedback changed the prototype.

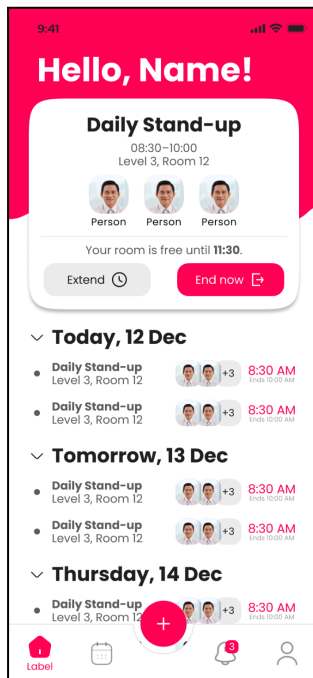


Figure 7 (Left). Version 1

Version 1 feedback:

1. The user greeting “Hello, Name!” steals the attention away from the important information presented on the screen.
2. The box highlighting the details of the ongoing meeting contained too much information, and it was difficult to distinguish the most important one.
3. The ending time for the meeting should be presented larger.
4. The schedule of meetings looked too cramped.
5. The meeting items in the schedule did not look clickable.

Steps taken:

1. The “Hello, Name!” text has a decreased font size.
2. The name of the meeting is larger, and information that is less important is removed.
3. The ending time for the current ongoing meeting is bolded.
4. The font size of all the items on the schedule is made larger and more spread out.
5. Instead of a list, the meeting items on the schedule are turned into cards so that they look more clickable. This also provides the added benefit of being able to indicate the status of that meeting through the way that the cards look.

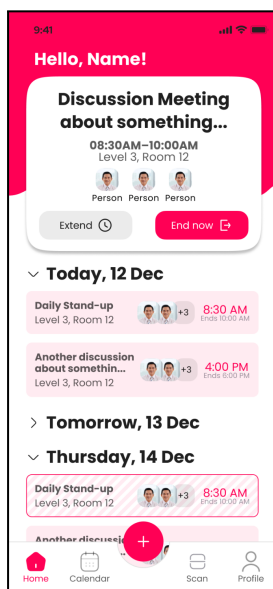


Figure 8 (Left). Version 2

Version 2 feedback:

1. The hierarchy of the app is confusing as many of the headings are bolded and large.
2. Users did not need to know who was a part of the meeting while they were in the meeting.
3. The text for the ending time of the scheduled meetings is too small and may be difficult to see.
4. The cards, in general, were too small and may not be easy to click on a mobile device.

Steps taken:

1. Many labels in the app are no longer bolded, such as the date

- in the schedule and the greeting to the user.
- The participants of the current meeting are no longer displayed on the ongoing meeting box.
- The text for the ending meeting time is changed from “Ends 5:00PM” to “To 5:00PM”, which allows the font size to be bigger. It is also made slightly darker to increase the contrast.
- Additional padding was added to the cards so that it looked less cluttered and would be easier to select.

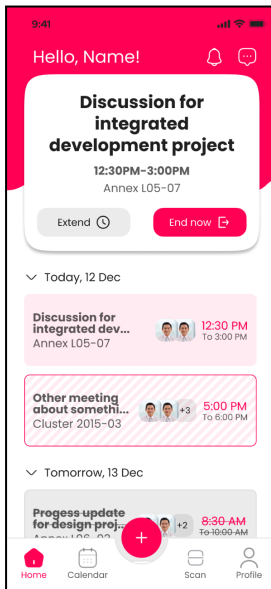


Figure 9 (Left). Version 3

The final version after the feedback and iteration is drastically easier to understand by the user and presents the information in a much clearer manner. It also includes more buttons such as the user notifications and their messages from other users, which were features of the app that cannot be accessed from the previous versions.

These rounds of feedback are largely focused on the design and visual layout of the app.

6. Deliver

6.1 User testing

A further round of user testing was conducted after the mid-fi prototypes were created, allowing for them to be refined based on the users’ understanding and interaction. A total of four users participated in user testing.

The testing procedure consisted of tasks that the testers had to carry out using the prototype. The task list can be found in Appendix D.

| System Usability Scale | Clio | Jun Rui | Jasline | Jacelyn |
|---|--------|---------|---------|---------|
| 1. I think that I would like to use this system frequently | 5 | 5 | 3 | 5 |
| 2. I found the system unnecessarily complex | 1 | 2 | 4 | 1 |
| 3. I thought the system was easy to use | 5 | 4 | 3 | 5 |
| 4. I think that I would need the support of a technical person to be able to use this sytem | 1 | 1 | 2 | 1 |
| 5. I foundthe various functions in this system were well integrated | 5 | 5 | 3 | 4 |
| 6. I thought there was too much inconsistency in this system | 2 | 2 | 3 | 1 |
| 7. I would imagine that most people would learn to use this system very quickly | 4 | 5 | 4 | 4 |
| 8. I found the system very cumbersome to use | 1 | 1 | 3 | 1 |
| 9. I felt very confident using the system | 5 | 5 | 3 | 4 |
| 10. I needed to learn a lot of things before I could get going with this system | 1 | 2 | 1 | 2 |
| Final Score | 95 | 90 | 57.5 | 90 |
| Average Score | 83.125 | | | |

The participants then rated how satisfied they were with the prototype. With an average System Usability Score of 83.1, the new system is considered easy to use, above the worldwide average of 68.

Figure 10 (Left). System Usability Scale analysis from the results of the usability test.

The new system also had a significantly higher Net Promoter Score than the old system, showing that most participants prefer the new system over the old system greatly.

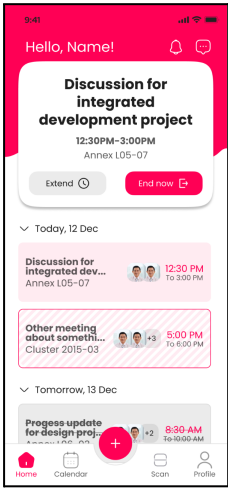
| Net Promoter Score | Clio | Jun Rui | Jasline | Jacelyn | Final Score |
|--------------------------|------|---------|---------|---------|-------------|
| Recommend current system | 2 | 6 | 5 | 4 | -75 |
| Recommend new system | 9 | 10 | 7 | 9 | 75 |

Figure 11. Net Promoter Score places the new system at 75, while the old system is -75.

Further changes were made to the prototype after the rounds of user testing to produce the final application.

6.2 Final app features and demo

The final completed application consists of various features that will be elaborated upon below.



Home screen

In the home screen, users can look at an overview of their scheduled meetings for the upcoming days. The boxes signify the status of the meeting: confirmed, tentative, or canceled by other users.

If the user is currently in a meeting, the home screen will also show them details about the ongoing meeting with options to extend and end the meeting early.

Users will also be recommended to book another room instead if they attempt to extend, but another employee has booked the room afterward. They can also easily provide feedback about the room while ending the meeting.

Extend Meeting

Your room is free until 4:30 PM.

30min

45min

1h

1h 15min

1h 30min

Updated timing: 12:30 PM-4:00 PM

Book another room instead

Confirm

End Meeting

Remember to...

- Turn off lights
- Clean whiteboard
- Turn off projectors

Any faults to report?

Missing cable for the projector...

Bookmark room

End Now

Meeting extended!

Your room is now booked from 12:30-4:00PM.

Done

Figures 11, 12, and 13.

Home screen: interacting with upcoming meetings

Users can also view details of upcoming meetings by selecting them. From here, they can view further directions to the meeting room, or edit details of the room.

If they select a tentative meeting, they will have the option to accept or decline the meeting. For meetings canceled by others, they will be able to remove the meeting from the schedule.

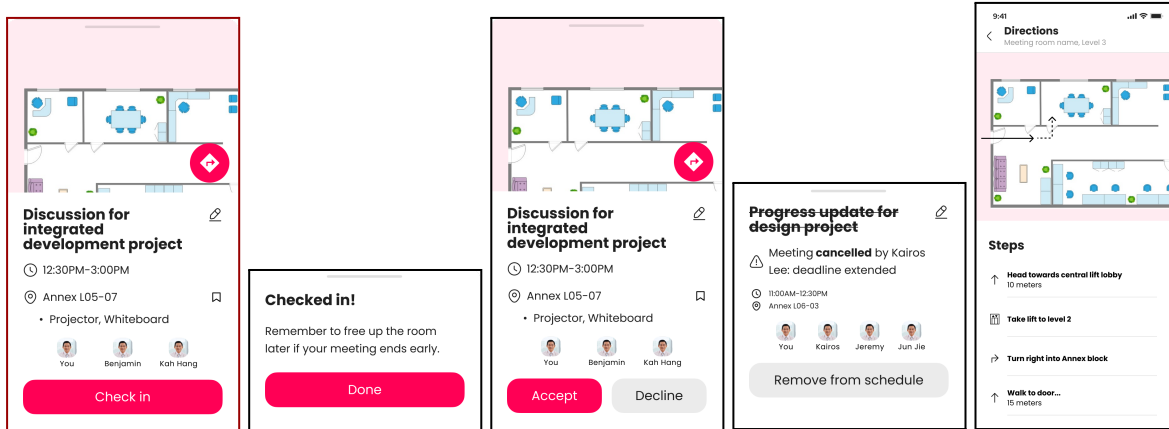


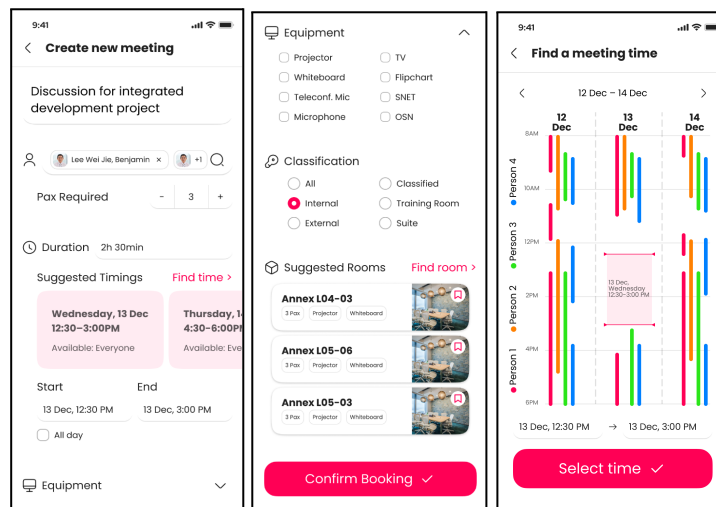
Figure 14, 15, 16, 17, and 18.

Creating new meetings

By clicking on the plus button from the home screen, users can create new meetings. After confirming the meeting details, they can either input a timing, select from the list of suggested timings for the participants, or manually look for a time when everyone is free. Users should then select the equipment and classification.

The “Find a Meeting Time” screen shows all of the participants’ schedules by day, where a line indicates “busy” and white space means that they are free. Users can use this to quickly look for timings when most people are free and select these times for the meeting. This reduces the need and hassle to navigate to another application to correspond and find a common time.

After a time has been decided, the app will suggest suitable rooms that fit their timing and requirements.



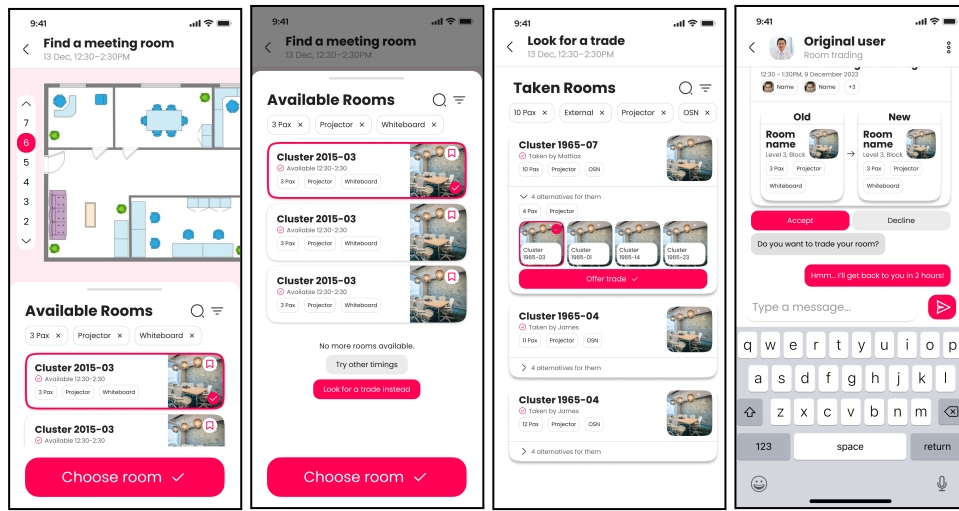
Figures 19, 20, and 21.

Finding a meeting room

Users will be able to see the location and equipment of each meeting room and can search for specific meeting rooms or filter by their requirements. They can also navigate via the map.

If there are no suitable meeting rooms, they can offer a trade to another user for the rooms — the user can choose a room that most suits their needs and offer an alternative for the one who booked the room. The system automatically swaps the rooms upon acceptance.

This also provides a chat function so that users can discuss their trading of meeting rooms without the hassle of leaving the application.

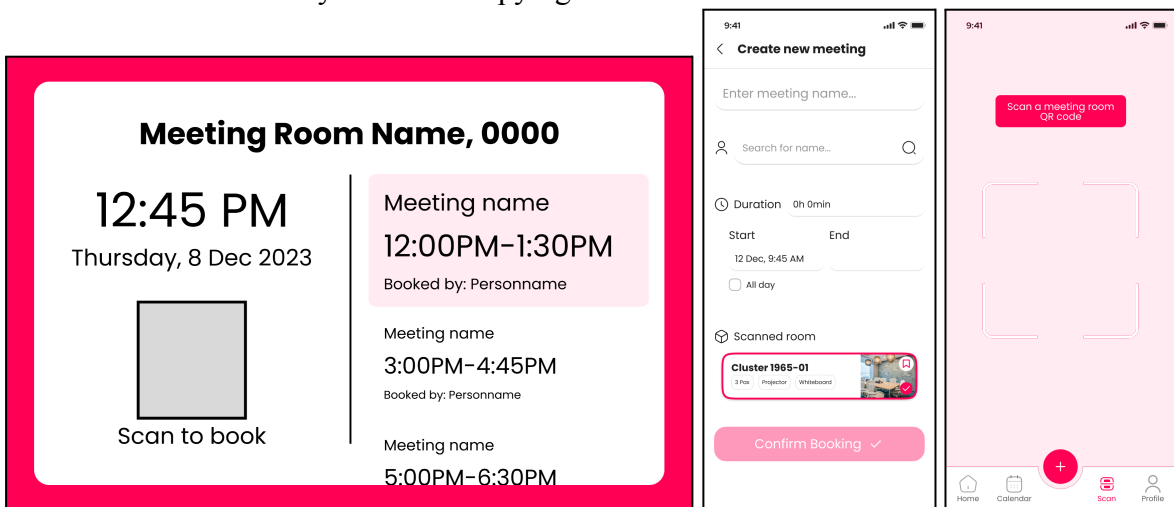


Figures 22, 23, 24, and 25.

Scanning QR code

If the user is standing outside a meeting room and wants to quickly book it for their usage, they can scan the QR code displayed outside the room.

This brings them to a streamlined “new meeting” screen where they only have to input the name and the time that they will be occupying the room.

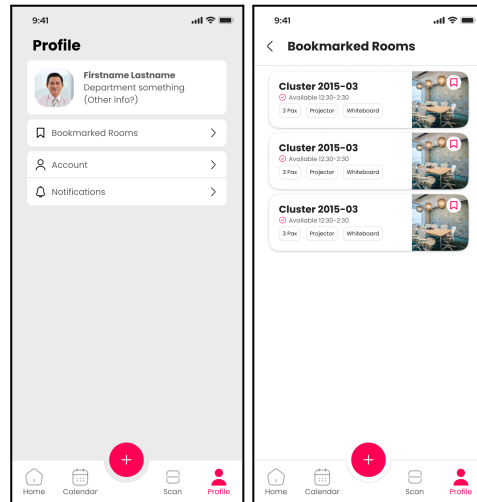


Figures 26, 27, and 28.

User profile & bookmarking rooms

Users are also able to change their display name for others, as well as update preferences such as where they sit. This will tailor the suggested rooms to fit them better.

At any time, users can bookmark rooms to quickly find again later by clicking on the small bookmark icon next to the room. They can find a list of their bookmarked rooms by navigating to it in their profile.



Figures 29 and 30.

7. Conclusion

In designing the meeting room booking mobile application, I used the Double Diamond Method, consisting of Discover, Define, Develop, and Deliver in order to explore what DSTA employees need in a meeting room booking app and how they interact with the existing system. I also identified areas of the existing system to improve, as well as designed and iterated upon a new system to ensure that it is user-friendly. This provides a streamlined system that fosters collaboration among staff and reduces the tediousness of booking meeting rooms, creating a smarter office.

In the future, this mobile application can be improved upon to utilize more physical aspects of the office, such as using Bluetooth beacons in the office to allow the user to navigate to their desired meeting room while knowing their precise location using the app.

8. Acknowledgements

I would like to thank my mentors, Eileen Leong Yi Qing and Goh Jun Rui, for their invaluable guidance and support throughout the project.

I would also like to thank Chang Yong Chia, Ng Jiu Andy, Tan Zi Ting, Choo Yi Ning Coslynn, Shermaine Foo Wan Ting, Lee Kee An, Cheryl Koh Shi Hua, Tan Kuan Hong Rollin, Clio Chuang Chia Hsin, Jacelyn Lau Cheah Yee, and Jasline Lee Jie Yu for their feedback and participation in the interviews. This project would not have been possible without them.

Appendix A: Interview Questions

| | |
|---|--|
| 1 | What is your role in the office? How long have you been working here? |
| 2 | Can you walk me through a typical day for you in the office? <ul style="list-style-type: none"> • Who do you usually work with? How frequently do you have meetings? |
| 3 | Can you walk me through how you would book a meeting room? <ul style="list-style-type: none"> • What do you consider when choosing a meeting room? Which are the most/least important parts? • How did you handle it when there were no available rooms in the time slot? |
| 4 | What do you feel about your experience with the existing meeting room booking system? <ul style="list-style-type: none"> • Is there anything that you find tedious? • Which are your favorite or least favorite features? • Are there any features that you wish existed? |
| 5 | Can you tell me about the last time you experienced difficulties in meeting rooms? <ul style="list-style-type: none"> • Have you had issues when booking the room? • Have you encountered things like missing amenities etc |

Figure 29. Questions used in the interview.

Appendix B: Affinity Mapping Results

The main points are as follows:

1. Users found it difficult to find a suitable time for the meeting as the built-in schedule coordination feature did not accurately reflect the availability of the participants.
2. Users had trouble interpreting certain information presented by the system, such as “suggested timings” when they wanted to look for rooms.
3. Conflicts between meetings occurred when overrunning meetings were not reflected in the system; similarly, many unused booked rooms meant that users could not find available rooms, even though no one was using them.
4. The amenities and features of each room were not clearly presented and may not be updated at times, resulting in complications when needed equipment was not in the meeting room.
5. Users hope to be able to easily contact and work out an arrangement with those who booked the room if they cannot find an available room.
6. Users found it a hassle to log in to their laptops just to book a meeting room or to check on upcoming meetings.
7. Users hope to be able to “favorite” or “bookmark” a room for easy access.

Appendix C: User Flows

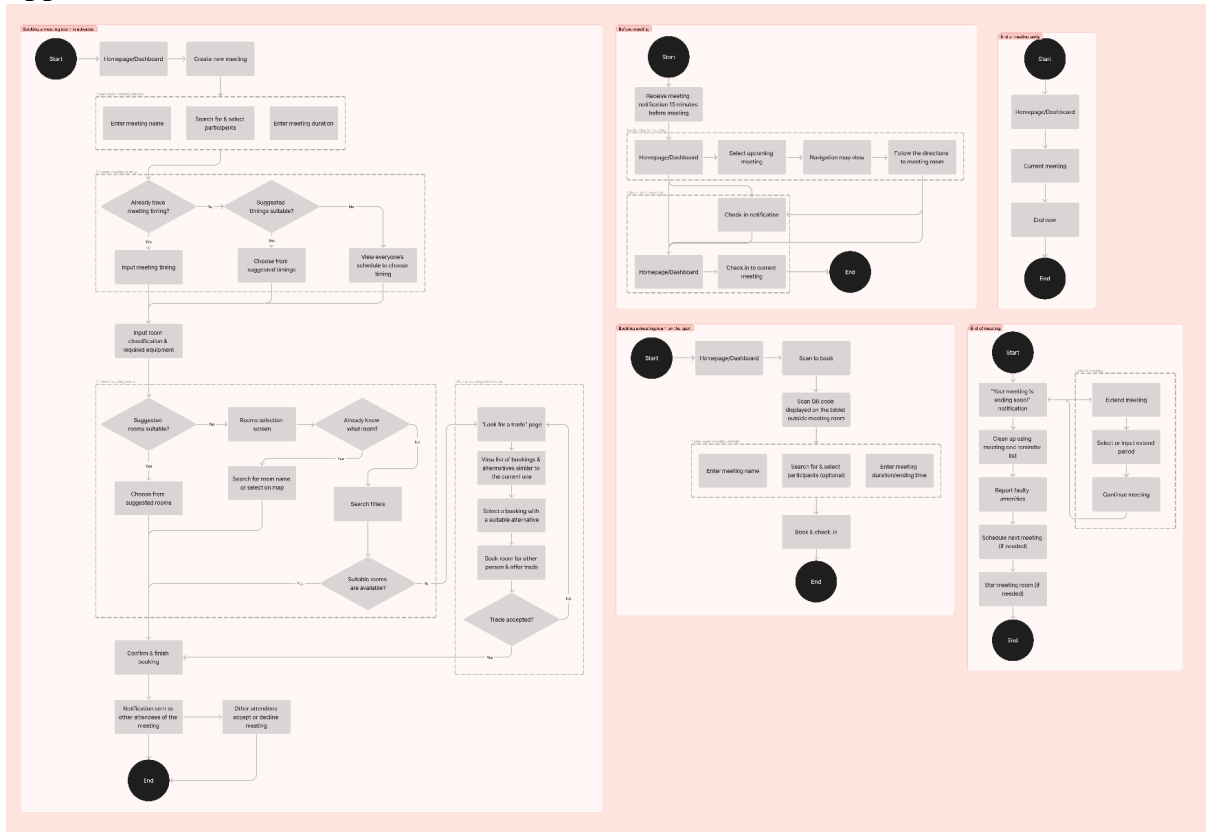


Figure 30. All user flows for the application.

Appendix D: User Testing Tasks

Scenario 1

| | |
|--------|--|
| Task 1 | <p>You need to meet with Lee Wei Jie Benjamin and Lee Kah Hang to discuss the “Integrated Development Project”.</p> <p>Use the app to book a 2.5h meeting in an internal room for this discussion. You will need a projector and whiteboard for the meeting.</p> |
|--------|--|

Scenario 2

| | |
|--------|--|
| Task 1 | It is now the day of your meeting. Find the location of the room using the app and check in. |
| Task 2 | Your meeting is about to end, but you have not finished the discussion yet. Extend your meeting by an hour. |
| Task 3 | <p>You ended up finishing the discussion in 30 minutes. End the meeting early so that the room can be freed up for other people.</p> <p>Before you end, you would like to report faults and save this meeting room for future use.</p> |

Scenario 3

| | |
|--------|--|
| Task 1 | <p>You need to meet with 7 other DSTA employees and 2 external guests for an external client meeting. Ensure that the meeting room can accommodate 10 people. The meeting time has been discussed beforehand and set to be 15 Dec, 4-6PM.</p> <p>Use the app to book a 2h meeting in an external room for this discussion. You will need a projector and OSN for this meeting.</p> |
|--------|--|

Scenario 4

| | |
|--------|---|
| Task 1 | <p>You are standing outside a meeting room that is free, and you would like to book that room for 1 hour.</p> <p>Use the app to quickly book the room by scanning the room's QR code.</p> |
|--------|---|