UTM UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING
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Section 08

Project:
SpaceSync: Real-Time Campus Study Spot & Facility Manager

Lecturer: **Dr. Shafaatunnur Binti Hasan**

Prepared by: **Group 6**

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1. Introduction:

Despite advancements in educational technology, students frequently struggle to find available study spaces, leading to wasted time and reduced productivity. To address this, this project proposes SpaceSync: Real-Time Campus Study Spot & Facility Manager, a digital solution designed to help the campus community locate and manage facilities efficiently. By applying a design thinking approach, SpaceSync aims to support the vision of a future digital campus, ultimately enhancing the learning experience through improved accessibility and space utilization.

2. Design Thinking Process:

2.1. Empathy *(Mashrur)*

- **Interview Transcript (Simulated):**

Interviewer (Mashrur): Could you explain how you usually go about finding a place to study on campus?

Participant (Ahmed): I usually find a place in the Library , sometimes I don’t find a place in the Library because now it is finals so I study at the Mosque.

Interviewer (Mashrur): How do you feel about that process?

Participant (Ahmed): I feel is very Nice

Interviewer (Mashrur): Have you ever attempted to reserve a lab or discussion room in advance?

Participant (Ahmed): I don’t think so I haven't attempt

Interviewer (Mashrur): How would you solve this issue if you had a magic wand?

Participant (Ahmed): If I have a magic I maybe map or to find a place empty to study

- User persona (age, role, background, pain points):
- **Name:** AHMED GALAL ABDULGHANI AHMED MAQTEA
- **Role:** 3rd Year Software Engineering Student
- **Background:** Lives off-campus (Kolej Perdana), relies on campus facilities during classes.
- **Current Behavior:** physically walks from building to building (library to student union) to find study spots.
- Empathy insights

  Uncertainty: The user suffers from anxiety because they never know if a facility is available until they physically arrive.

  Physical Fatigue: The current method of finding space requires excessive walking, which lowers energy for actual studying.

  Inefficiency: The user perceives the "manual search" for seats as a direct loss of academic productivity.

2.2. Define (Youssef)

Problem Statement (Point of View—POV):

We reframed the gathered insights into a Point of View (POV) statement (Section 5.2). The core problem is not a lack of space, but a lack of *information*.

Reframing the Problem (How Might We):
"How might we make the existing invisible vacancy of campus facilities visible and actionable for students in real time?"

2.3. Ideate (Youssef)

Brainstorming Process:

Using divergent thinking, the team brainstormed solutions ranging from "Human Waze" to "Smart Tables" (see Section 5.3). We selected the IoT Sensor & Booking App (SpaceSync)

because it is feasible (using existing Wi-Fi/sensors) and directly solves the user's anxiety by providing a "movie theater" style map view of occupancy.

2.4. Prototype (Fares)

Interface-only prototype description:

Prototype SpaceSync was developed as a non-functional, high-fidelity interface using Canva. The design focuses on visual cues (green/red indicators) to facilitate quick decision-making.

Screens Flow explanations:

Login: Secure authentication via UTMID.

Dashboard: A graphical overview of facility usage and quick-action icons.

Live Map: An integrated view of sensor readings showing seat occupancy with 86-97% accuracy.

Booking: A confirmation page serving as digital proof of reservation.

2.5. Test *(Fares)*

Testing Process:

We performed a walkthrough with three different types of participants, a student, a member of faculty staff, and a member of library staff as described in Section 5.5. All three participants agreed that this system represents an innovative way of conducting library operations; however, they experienced some areas where there were gaps in the operations of the system. As one example of their feedback, they suggested using artificial intelligence to provide recommendations for study spots.

3. Problem, Solution & Team Working

3.1. Problem Description

Inefficient allocation of campus study space is a current problem. Booked library seating is often unused, and rooms for group discussion are frequently reserved but vacant ("phantom reservations").

3.2. Proposed Solution

SpaceSync is a centralized online platform designed to improve system efficiency. Its features include:

1. **Real-Time Visualisation:** Live map shows occupied/unoccupied seating.
2. **Online Booking:** Allows remote spot reservation ("chope").
3. **Notifications:** Sends reminders to use or cancel bookings.
4. **Management Dashboards:** Provides staff with utilization analytics for better resource dispersion.

3.3. Team Working and Collaboration

Project success stemmed from assigning tasks based on team strengths. Ali, the team lead, coordinated workflow and compilation. Mashrur handled the Empathy stage (user needs). Youssef managed the Define and Ideate stages (logical problem-solving). Fares oversaw Prototyping and Testing (practical solution visualization).

4. Design Thinking Assessment Points

Quality and user alignment were validated through two key assessments.

1. **Phase Transitions:** At the end of each phase (e.g., Empathy to Define), outputs were reviewed to ensure alignment with user data. For instance, Empathy insights were validated before defining the Problem Statement to ensure we addressed the correct problem.
2. **Final Demonstration:** The prototype was summatively assessed against all user feedback during testing to check the overall flow and identify usability improvements. This demonstrated where AI recommendations were beneficial, resulting in a user-centered proposal.

5. Design Thinking Evidence

5.1. Empathy Evidence *(Mashrur)*

- **Interview table**

Question	**User Response (Simulated)**	**Key Insight / Pain Point**
Could you explain how you usually go about finding a place to study?	**The** crowded Level 3 of the library (PSZ) after morning class is frustrating. I often spend ten minutes searching aisles for a seat near a power outlet. If unsuccessful, I leave for the Student Union (SUB), hoping to find space.	**Physical Fatigue:** The current process requires excessive physical movement and wasted time just to find a simple amenity.

How do you feel about that process?	**Searching** for a study space is exhausting, stressful, and wastes valuable time. Finding a seat often leaves me irritated, sweaty, and unmotivated. This issue is significantly worse during busy exam weeks when spaces are highly contested.	**Productivity Loss:** The search for space negatively impacts mental focus and academic performance.
Have you ever attempted to reserve a lab or discussion room in advance?	**The** room reservation system is confusing. I often find rooms empty even being marked as booked, yet I cannot use them without a reservation, which feels like a waste.	**Uncertainty:** Users do not trust the current manual/legacy systems due to lack of real-time data verification.
How would you solve this issue if you had a magic wand?	**I** need a mobile app displaying a map, similar to a seating chart, to pinpoint empty (green) tables. The app must allow me to "chope" (reserve) a specific seat for fifteen minutes while I walk there, ensuring I have a spot.	**Need for Real-Time Data:** Users prioritize immediate visual confirmation of availability over general schedules.

- **Persona summary**

Profile Attribute	**Description**
Name	AHMED GALAL ABDULGHANI AHMED MAQTEA
Role	Year 3 Software Engineering Student
Demographics	21 years old, lives off-campus (Kolej Perdana).
Goals	To maximize her 3-hour gap between classes for coding assignments; requires a quiet space with reliable power outlets and Wi-Fi.
Behaviors	Carries a laptop bag; visits multiple locations (Library, Labs, SUB) in a single day searching for space; hesitates to ask strangers if a seat is taken.
Frustrations	• **Wasted Time:** Spending 20+ minutes walking between buildings to find a spot. • **Anxiety:** Fear of running out of laptop battery because can't find a seat near a plug. • **Uncertainty:** Not knowing if a "booked" room is actually occupied or abandoned.
Quote	"I feel like a nomad wandering around campus"

5.2. Define Evidence *(Youssef)*

5-Why's Analysis

Ahmed feels anxious because he does not know where to park. There is no way to check occupancy online. There are no sensors in the parking lot. Therefore, the root cause of Ahmed's anxiety about finding a parking space is a lack of digital transparency for parking availability.

How does this affect Ahmed's point of view?

Once class ends, Ahmed needs to know he has a parking space; otherwise, he risks spending 20 minutes "looking" for a place to park.

5.3. Ideate Evidence *(Youssef)*

Selected Idea: SpaceSync (IoT Sensors + App).
Rejected Ideas: Rental Pods (too expensive), Drone Scout (privacy issues), and Manual Reporting (unreliable).

5.4. Prototype Evidence *(Fares)*

Figure 1: Secure UTMID and Login Screen

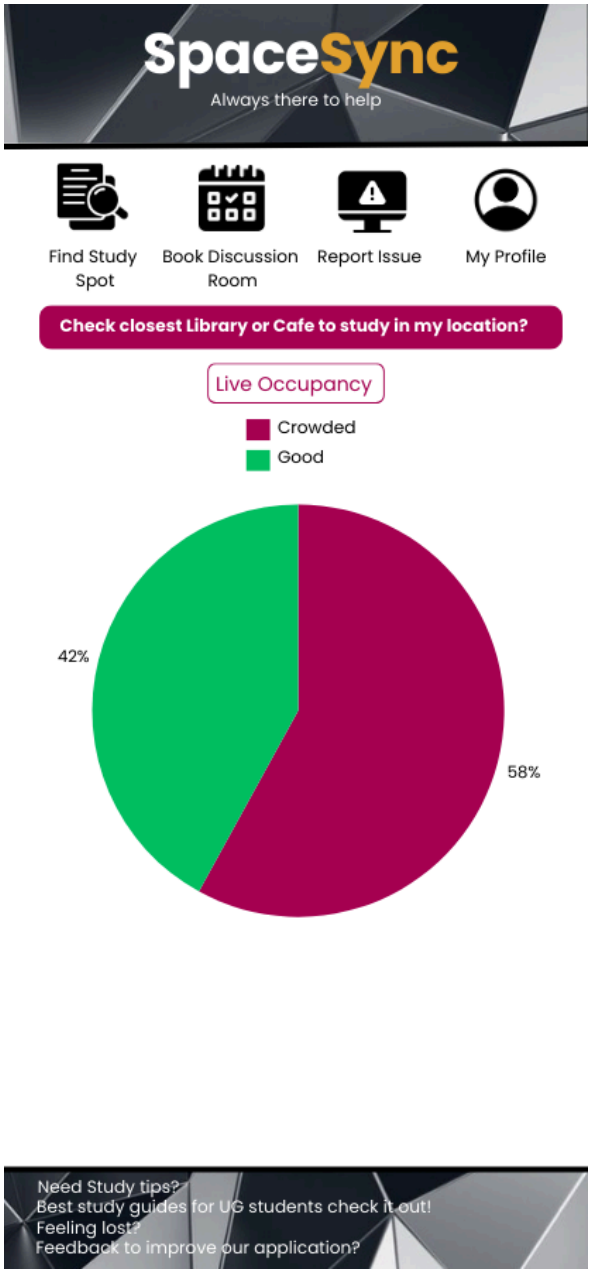

Figure 2: Dashboard/Home screen where users can check general sensor analysis

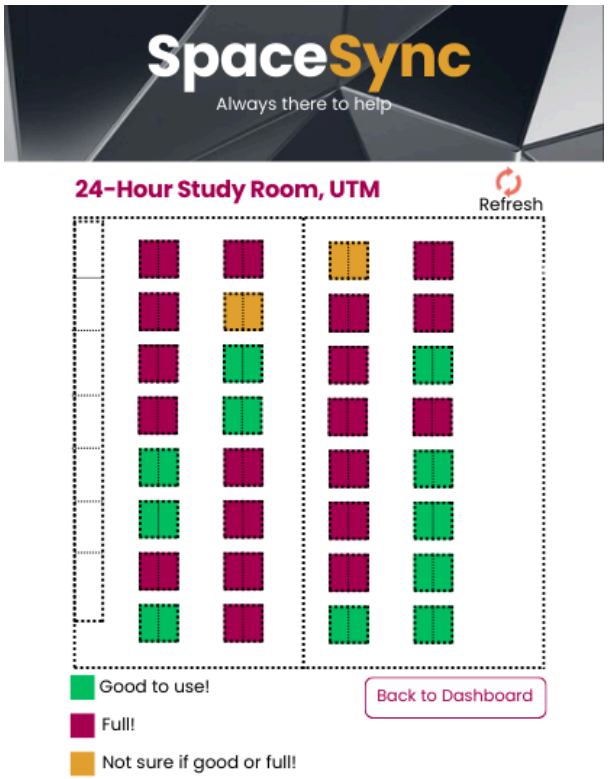

Figure 3: Screen showing actual real-time available and occupied tables

Figure 4: Confirmation screen for booking verification

5.5. Test Evidence *(Fares)*

Tester	Task Assigned	Feedback/Comment	Action Taken
Student	Checking design and overall features	The user noted the interface appeared simple. Too minimalistic.	Enhanced design elements by adding more features and focusing on specific details raised in the feedback.
Staff	Check the logic of the application	The logic was sound, but the user raised concerns about the algorithm's recommendation accuracy.	Proposed an AI recommendation algorithm where students can input their specific needs (subject, group size), allowing the system to suggest the most suitable table or room.
Staff	Checking related features with real scenario in library	The user validated the concept ("Not bad") but expressed concerns regarding the hardware feasibility of installing sensors in a real-world scenario. They also questioned	Proposed complex algorithms and robust security protocols to ensure system scalability. We focused on a modular design concept to ensure updates can be deployed without

		how analysis data is managed.	disrupting the live system.

Tester	Task Assigned	Feedback/Comment	Action Taken
Student	Checking design and overall features	The user noted the interface appeared minimalistic. They stated they would use the app upon release but might revert to physical searching if the app showed no availability.	Add more design features and improve features and focus on details of the feedback
Staff	Check the logic of the application	She found it logical but bothered when knowing the system is actually not very logical when comes to solve real issues with table like she said “student always can find place even in hard times but issues is where the best recommended for	Add recommendation algorithms in the system using AI tools where student can ask where to go and what his subject is so system will find quite most suited place for them to study maybe for group so find good table or condition

		each one”	
Staff	Checking related features with real scenario in library	“Not bad”, he says but in the real scenario it is hard to install the system since the technology is still starting and it is not available. how to manage the analysis page he said?	So we add more complex algorithms and use better code and security features to protect the knowledge for UTM and keep it safe and use more suitable design concepts so it won’t affect when we update the system anytime or add more features.

6. Individual Reflections

6.1. Ali Isameldin Ali

My goal is to become a skilled technology professional, and this design thinking project helped me understand how user-centered analysis improves system design, while motivating me to further develop my technical, leadership, and problem-solving skills for future industry challenges.

6.2. Mashrur Rahman Arnob

This project helped me understand the importance of empathy in system design. By focusing on user needs, I learned how real challenges can influence solution development. The experience improved my analytical thinking and teamwork skills, which will be valuable in my career.

6.3. Youssef Mostafa Badr

My goal is to strengthen my problem-solving abilities, and the design thinking process helped me structure ideas more effectively, motivating me to enhance my technical knowledge and creativity for future projects.

6.4. Fares Hamed

My goal is to become a competent system developer, and working on prototyping and testing helped me understand practical design implementation, encouraging me to improve my technical and communication skills for industry readiness.

7. Task Distribution:

Ali:	Introduction, problem, solution, compilation
Mashrur:	Empathy (interviews, persona, insights)
Youssef:	Define & Ideate (problem statements, brainstorming)
Fares:	Prototype & Testing (screens, flow, feedback)

8. Links

Presentation of the project

Interview of the Tis project with Ahmad