Activity 2: Need-Finding:

Overview:

The aim of this phase was to identify the main usability issues faced by Lumis residents regarding booking arrangements, door unlocking, and rent and payment. To ensure the design would be user-centred and reliable, two complementary methods were used, interviews and a questionnaire survey.

The chosen methodology was to capture qualitative and quantitative data. Through the interviews, we learned about the frustrations and expectations of residents from the place. Meanwhile, there was the gathering of measurable data from larger populations thanks to the questionnaire. As a team, they provided a stable and solid basis on which to define system requirements.

Method Selection:

Interviews were selected because they allow participants to freely express their opinions while ensuring all essential topics are covered. Questionnaires were chosen to reach a wider audience quickly and verify the frequency of the issues identified. This mixed method, as supported by Ahmed, Pereira and J. (2024), ensured both contextual understanding and generalizability.

Before conducting the study, participants were informed about its academic purpose and their right to withdraw. Responses were collected anonymously, and consent was obtained.

Interviews:

Six residents were interviewed for around 10–15 minutes each to explore their experiences with bookings, door access, and rent payments. The interviews followed a flexible format, allowing participants to elaborate freely. Some question were:

"How do you currently book shared rooms?"

"Have you ever been locked out or lost your key card?"

"What difficulties have you faced when paying rent?"

Findings:

All participants criticized the group-chat booking system as confusing and unfair. One resident said, "It's chaos. People just say they booked the cinema room for the evening, and no one knows what time it actually starts or ends."

Most had experienced lockouts, often late at night. A participant shared, "I forgot my card once and had to wait until morning to get in. If I could unlock with my phone, it would be much easier."

The rent process was also described as stressful, mainly due to German-language emails and fines. One student noted, "I had to translate the whole message just to find the deadline," while another added, "I paid on time, but the money arrived late and they still fined me."

Overall, residents expressed a clear need for a structured booking system, mobile door access, and an easier multilingual payment process within one unified app.

Questionnaire Survey:

To validate these findings, an online questionnaire was distributed to all MyLumis residents. Out of approximately 350 residents, 257 responded, achieving a 73% response rate, which is considered statistically strong as said by (Ericson et al., 2023).
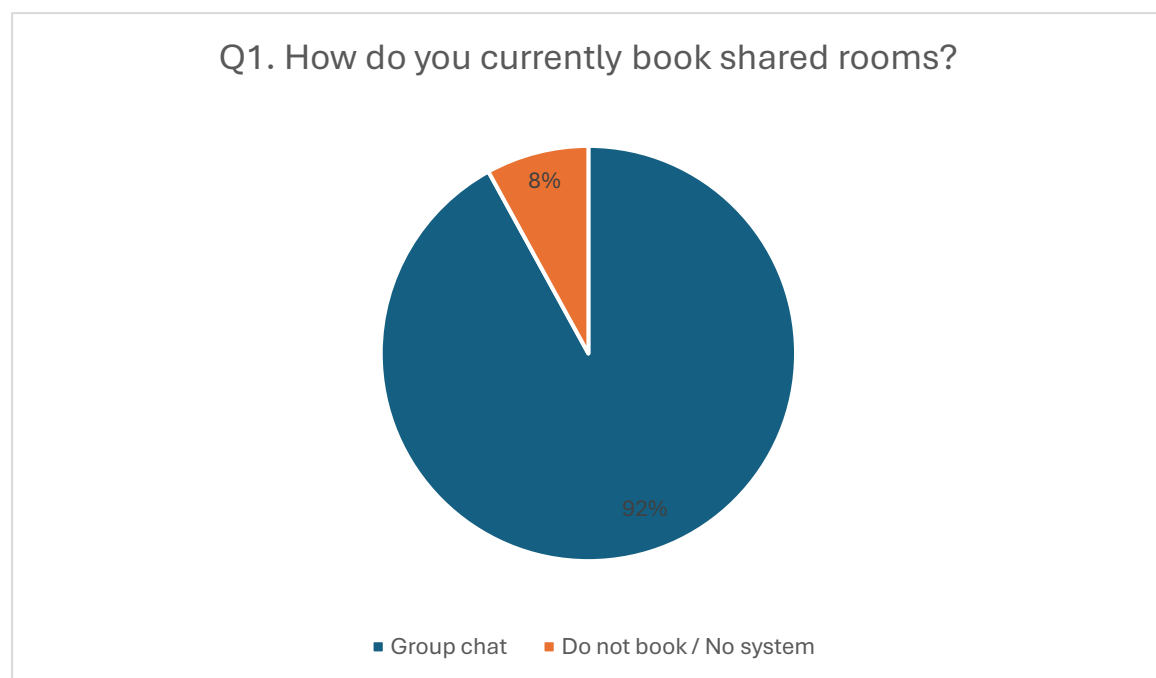

Q1. How do you currently book shared rooms?

- Group chat ■ Do not book / No system

Figure 1:
This chart illustrates how residents currently book shared facilities. A clear majority (92%) rely on the informal group chat, while only 8% do not use any booking system. This confirms the lack of a structured and transparent reservation process.
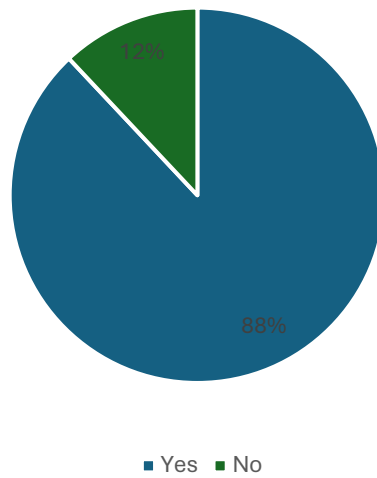
Figure 2:

This chart shows that 88% of residents have faced confusion or conflicts when booking through the group chat, indicating high dissatisfaction and the need for a centralized digital booking platform.
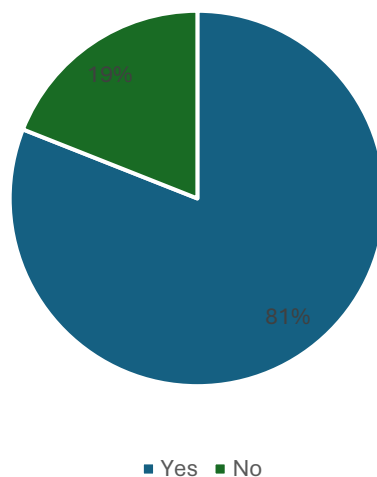

Figure 3:

This figure highlights that 81% of residents have been locked out or lost their key card at least once, demonstrating the need for a more reliable access solution such as NFC-enabled door unlocking.
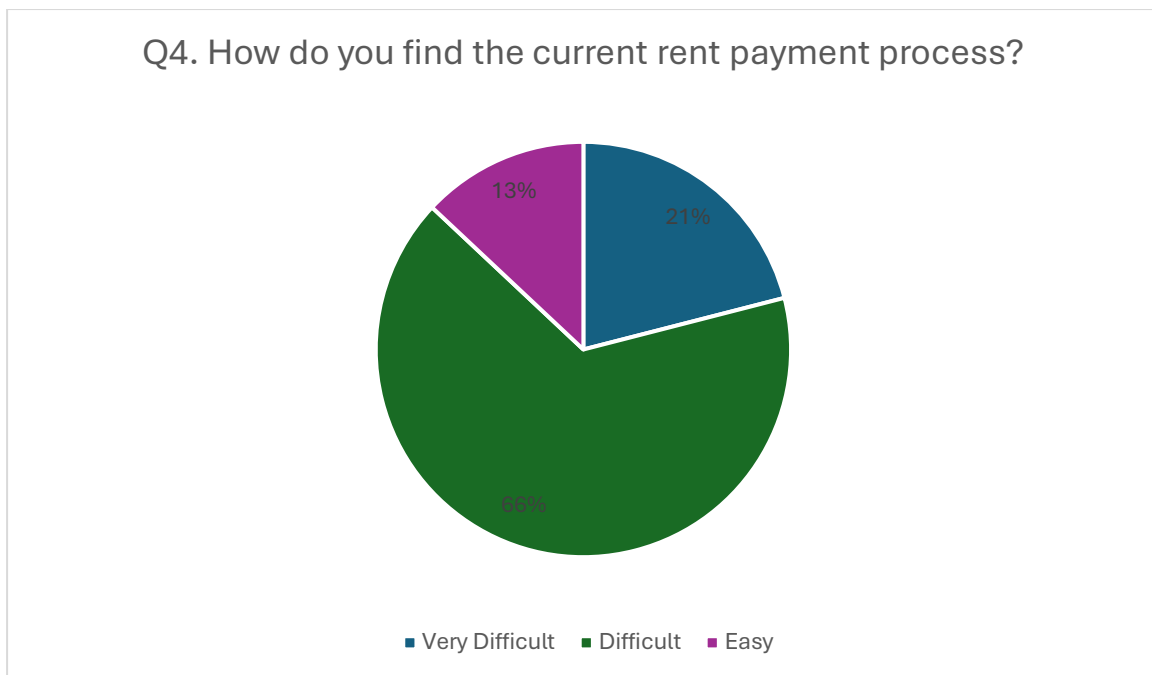
Q4. How do you find the current rent payment process?

21%

13%

66%

■ Very Difficult ■ Difficult ■ Easy

Figure 4:

This chart presents how residents rate the current rent payment process: 21% find it very difficult, 66% difficult, and only 13% easy. The results emphasize the complexity and inconvenience of the current manual payment system.

Q5. Have you received rent-related emails or letters in German?

24%

76%

■ Yes ■ No

Figure 5:

According to this chart, 76% of residents have received rent-related communications in German, which often leads to confusion regarding due dates and payment instructions. So communication is therefore essential and in other languages.

Figure 6:

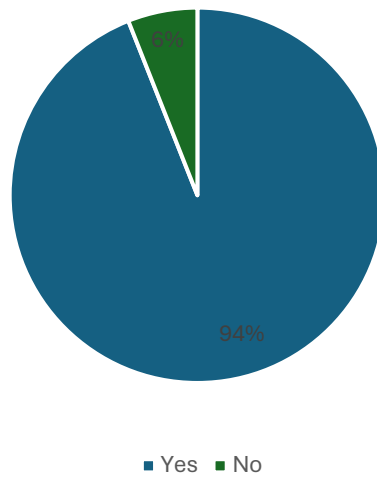This figure shows that 94% of residents would prefer paying rent directly through a mobile app such as Apple Pay or Google Pay, reflecting strong support for digital payment integration in the system.

Figure 7:

Every respondent (100%) agreed that automatic reminders would help them avoid fines or late payments. This underscores the importance of timely notifications within the system design.

Q8. Would you use a single app that manages bookings, door access, and payments together?

■ Yes ■ No

Figure 8:

This chart shows that 97% of residents would use a single mobile app to manage bookings, door access, and rent payments, confirming widespread acceptance of the proposed digital system solution.

These results confirmed that the issues identified during interviews were not isolated but widespread across the resident population.

Activity 2.2:

Functional Requirements:

- The system must allow residents to view and reserve available rooms through a structured booking interface.

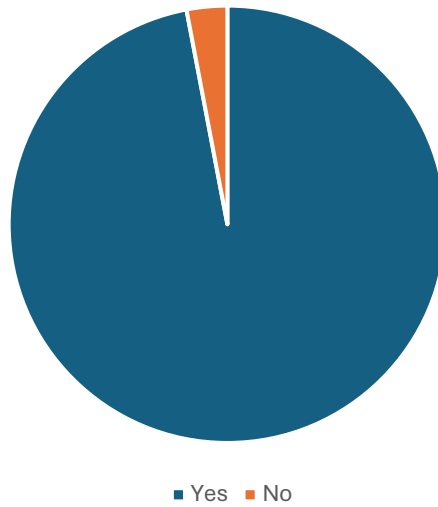- Bookings must be divided into two-hour slots, with a maximum of two consecutive slots (four hours total) per user.

- The booking schedule must be updated automatically to prevent overlapping or duplicating reservations.

- Users must receive instant confirmation and reminder notifications for each booking.

- The app must support dual door access, allowing entry via both mobile NFC and key card.

- The door-unlocking function must work offline to ensure access during internet outages.

- The rent and payment module must enable residents to make payments directly within the app using Apple Pay, Google Pay, debit, or credit cards.

- The system must send automated rent reminders several days before the due date.

- Users must be able to view payment history and download digital receipts.

- Application must be available in English, German and other preferred languages to eliminate language confusion.

Non-Functional Requirements:

- The system must maintain high reliability and uptime, especially for door access and booking functions.

- Performance should ensure that all pages and transactions load within approximately two seconds under normal use.

- All user data, including transactions and door access, must be encrypted and securely authenticated.

- The application must be compatible with iOS, Android, and modern web browsers.

- The system should be scalable, allowing for future integration with additional Lumis residences.

- The app must be maintainable, supporting regular updates and technical improvements without service disruption.

- Core features such as booking and unlocking must be available 24/7, independent of reception hours.

Usability/User Experience (UX) Requirements:

- The interface must be intuitive and minimal, enabling users to complete any core action within three steps.

- Each user action must provide instant visual feedback, such as confirmation pop-ups or color-coded status indicators.

- The app must follow consistent navigation and layout.

- Notifications should be clear and meaningful (e.g., "Rent due in 3 days – Pay Now").

- The design must comply with WCAG 2.1 accessibility standards, ensuring legible fonts, contrast, and large interactive areas.

- The language used must be simple and professional, appropriate for an international user base.

- Users must be able to switch languages easily from the settings menu.

- The overall interface should promote a sense of fairness, independence, and reliability, reflecting residents' priorities and daily needs.

Activity 2.3:

Analysis of Collected Requirements:

The requirements identified through interviews and surveys were further analysed using personas, scenarios, task analysis, and use-case modelling. Each persona represents a distinct user profile reflecting the main themes found during the need-finding phase.

Personas

Persona 1 – Emily (23, Business Student)

- **Primary Concern:** Fair and reliable booking of shared spaces.

- **Current Problem:** The group chat booking system is unstructured, leading to double bookings and conflicts.

- **Goal:** Reserving a room quickly through an organized digital schedule that shows all available time slots.

- **Quote:** *"It's unfair. People say they've booked the cinema room for hours, but no one really knows when."*

Persona 2 – Liam (21, Computer Science Student)

- **Primary Concern:** Secure and easy room access.

- **Current Problem:** Frequently loses or forgets her key card and faces expensive fines for replacements.

- **Goal:** To unlock her room safely and conveniently using her mobile phone, even when offline.

- **Quote:** *"I locked myself out again last month and had to wait all night because reception was closed."*

Persona 3 – Sofia (22, Marketing Student)

- **Primary Concern:** Managing rent and payments accurately.

- **Current Problem:** Receives payment emails in German and has been fined for delayed transfers during bank holidays.

- **Goal:** To manage payments within one app that sends reminders, supports instant transfers, and provides receipts.

- **Quote:** *"I sent the rent on time, but the bank delay made it arrive late and they fined me anyway."*

Scenarios

Each scenario illustrates how the persona currently experiences problems with the existing system and how the proposed MyLumis app resolves them.

Scenario 1 – Emily:

Emily wants to reserve the cinema room for a movie night with her friends. In the residents' group chat, she posts "I'll take the cinema room from the evening till late night". But another group appears to claim they had earlier booked it in the chat. The argument ruins both groups' plans.

In the new system, Emily opens the MyLumis app, checks the live booking calendar, and selects two available slots from 8.00 PM. to 12:00 a.m. The system confirms his booking and automatically blocks the hours, further notifying all residents to avoid clashes.

Scenario 2 – Liam:

Liam has had a long and tiring day at university. He finally Return back to the room after midnight only to realize that his day card is inside. The reception is closed, and he remembers that it cost €100 to replace it last time. He feels anxious and frustrated.

Through the new system, Liam opens a MyLumis app, taps on "Unlock Door," and holds the phone near the lock. The app uses NFC technology, which allows access in seconds without an internet connection. Liam walks into his room in a calm spirit knowing that he has the system to rely on at any time.

Scenario 3 – Sofia:

Sofia gets another rent letter which is only written in German language. She is confused so she does not check it until the due date which she later realizes is a public holiday back in her country. The bank transfer arrives late, and she is fined €50.

With the new system, Sofia gets a push alert three days before the due date: "Rent due 5 May – Pay now using Apple Pay." After she opens the app, she makes the payment and receives the English receipt instantly. The process is simple, clear, and fine-free.

Use Case Diagrams:

Smart Booking System

Confirm Booking
(Receive Room Access)

Choose Up To 2 Slots

View Available Hour Slots

Select Date

Select Room
(Gaming / Cinema / Events Lounge / Kitchen)

Notify Other Residents

Emily

Other Residents

Emergency & Door Access System

Unlock Door via NFC «include» Use Offline Unlock

View Emergency Options

Call Reception «include» Notify Staff

Report Urgent Issue «include»

Liam

Reception Staff

Task analysis:

To better understand how users interact with the MyLumis system, I created a Hierarchical Task Analysis (HTA), which breaks complex activities into clear, structured goals and sub-tasks (Interaction Design Foundation, n.d.). This method helps reveal the logical sequence of user actions, making it easier to design intuitive and efficient interactions throughout the app.
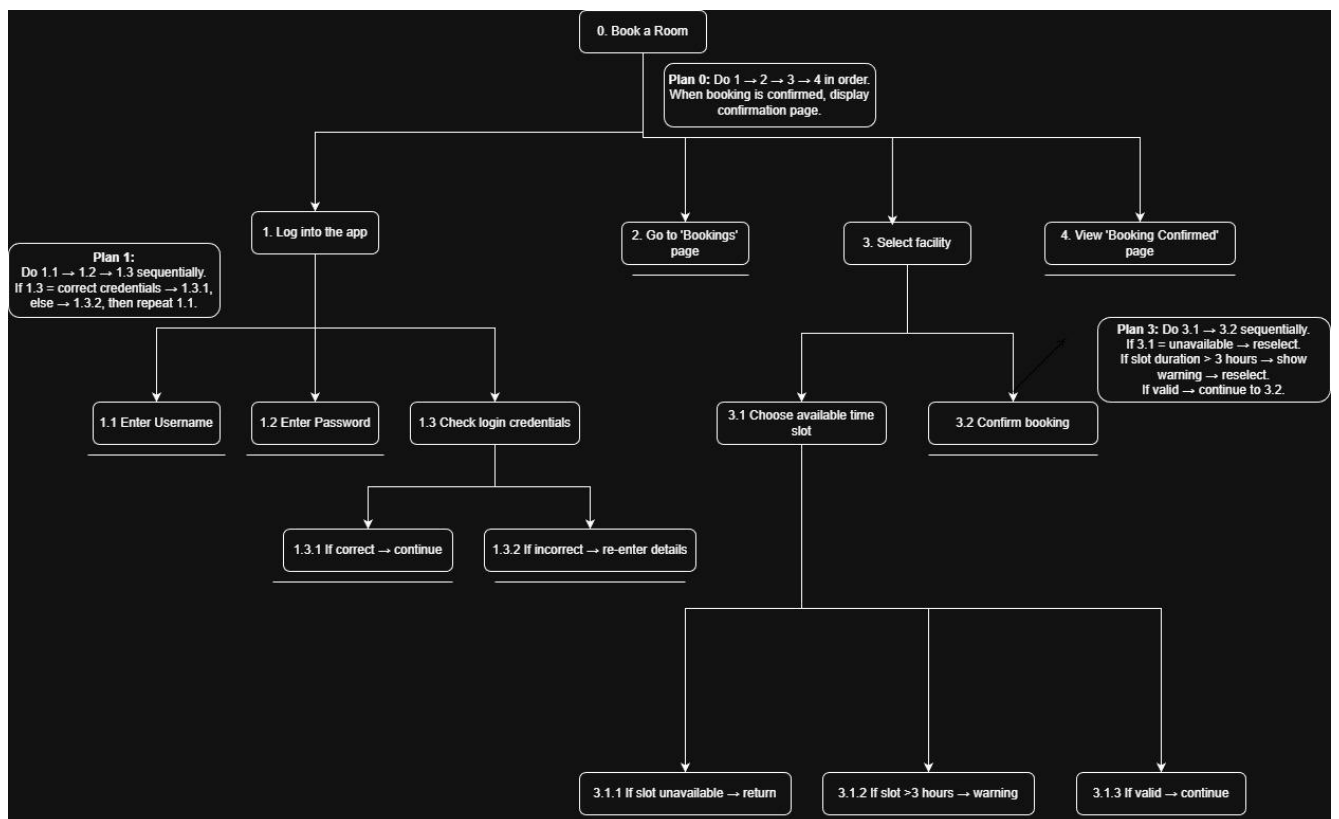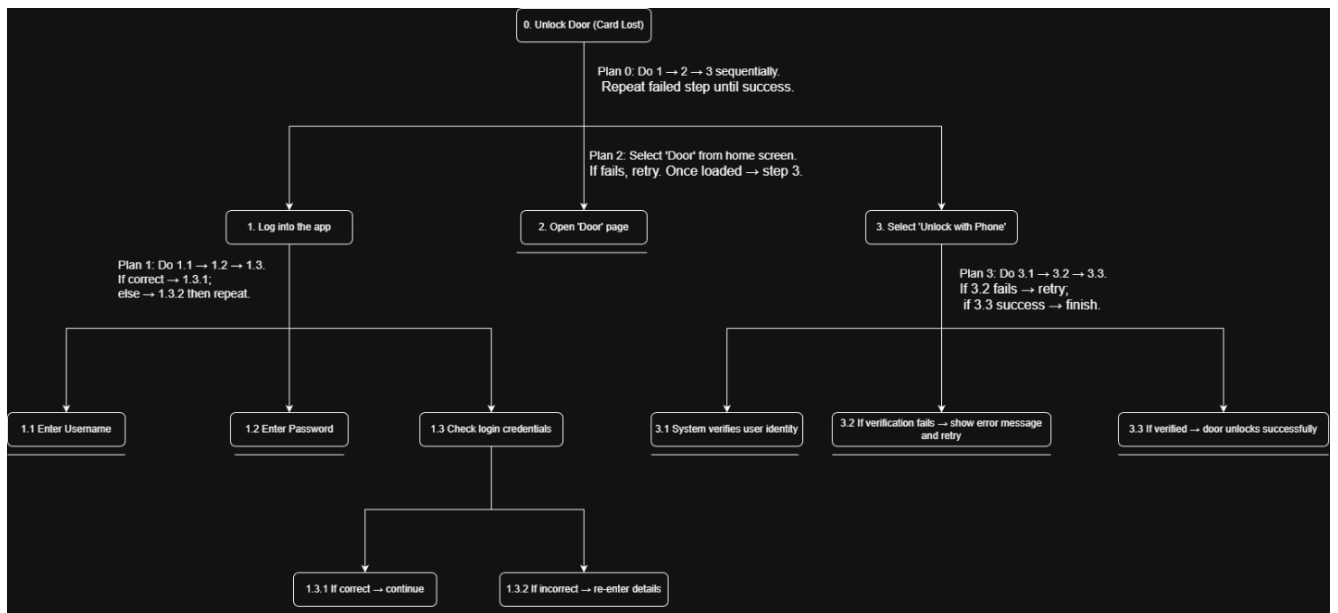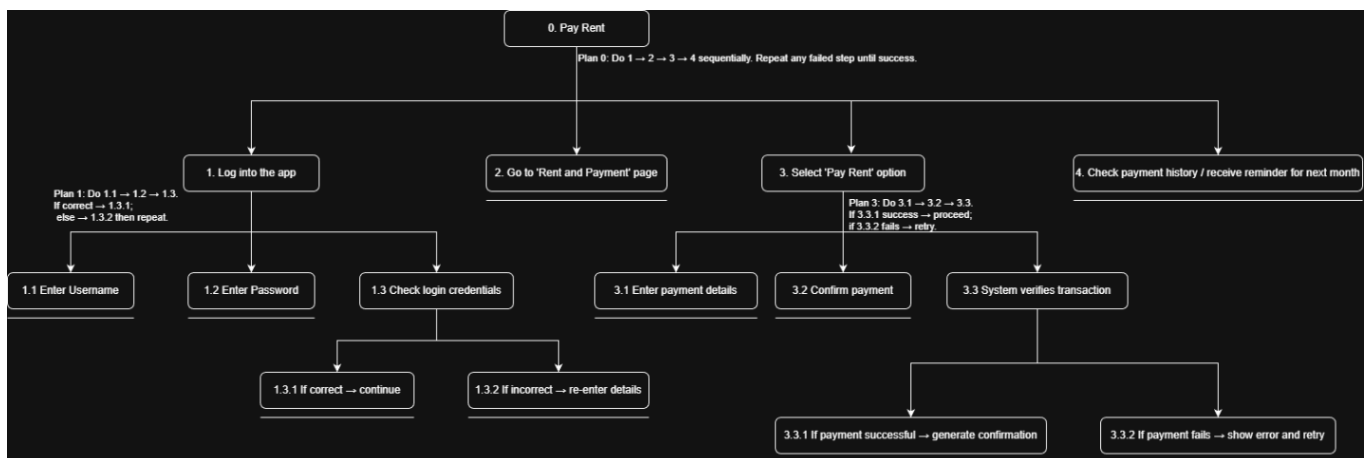
1) Booking a Room:

2) Unlock Door:

0. Unlock Door (Card Lost)

Plan 0: Do 1 → 2 → 3 sequentially.
Repeat failed step until success.

Plan 2: Select 'Door' from home screen.
If fails, retry. Once loaded → step 3.

1. Log into the app

2. Open 'Door' page

3. Select 'Unlock with Phone'

Plan 1: Do 1.1 → 1.2 → 1.3.
If correct → 1.3.1;
else → 1.3.2 then repeat.

Plan 3: Do 3.1 → 3.2 → 3.3.
If 3.2 fails → retry;
if 3.3 success → finish.

1.1 Enter Username

1.2 Enter Password

1.3 Check login credentials

3.1 System verifies user identity

3.2 If verification fails → show error message and retry

3.3 If verified → door unlocks successfully

1.3.1 If correct → continue

1.3.2 If incorrect → re-enter details

3) Pay Rent:

0. Pay Rent

Plan 0: Do 1 → 2 → 3 → 4 sequentially. Repeat any failed step until success.

1. Log into the app

2. Go to 'Rent and Payment' page

3. Select 'Pay Rent' option

4. Check payment history / receive reminder for next month

Plan 1: Do 1.1 → 1.2 → 1.3.
If correct → 1.3.1;
else → 1.3.2 then repeat.

Plan 3: Do 3.1 → 3.2 → 3.3.
If 3.3.1 success → proceed;
if 3.3.2 fails → retry.

1.1 Enter Username

1.2 Enter Password

1.3 Check login credentials

3.1 Enter payment details

3.2 Confirm payment

3.3 System verifies transaction

1.3.1 If correct → continue

1.3.2 If incorrect → re-enter details

3.3.1 If payment successful → generate confirmation

3.3.2 If payment fails → show error and retry

Activity 2.4:

Functional Requirements Justification

- **Structured booking system**

  Justified by 92% of survey participants who confirmed using the *group chat* for bookings and 88% who reported confusion or conflicts. Interview participants described the current process as "chaotic" and "unfair," highlighting the need for a centralized booking platform with clear time slots.

- **Time-slot limitations (two-hour slots, maximum four hours)**

  Introduced to ensure fairness, as residents reported in interviews that some groups "book the room from afternoon till night," monopolizing shared facilities.

- **Automatic booking confirmation and updates**

  Required to prevent double bookings and reduce uncertainty, as residents complained that chat-based reservations had no visible confirmation or system record.

- **Dual door access (mobile NFC + key card)**

  81% of survey respondents stated they had been locked out or lost their card. Five of six interviewees described stressful lockout incidents, justifying mobile unlocking as an essential function for convenience and security.

- **Offline unlocking capability**

  Interviewees mentioned that key issues often occurred "late at night" when reception was closed, supporting the need for offline mobile access.

- **Integrated rent and payment module**

  66% of survey respondents rated the payment process as difficult, and 76% confirmed receiving rent-related mails in German. Participants expressed confusion and frustration, saying they had to "translate messages" and were fined for "bank delays." In-app payments (Apple Pay/Google Pay) were strongly supported by 94% of respondents.

- **Automated rent reminders**

  100% of survey participants agreed that reminders would help avoid fines, establishing this as a key functional requirement.

Non-Functional Requirements Justification

- **High reliability and uptime**

  Residents reported frustration with system dependency on reception hours but 24/7 access ensures independence and reliability.

- **Fast system performance (loading within ~2 seconds)**

  Respondents valued simplicity and efficiency while faster responses reduce waiting time and user frustration.

- **Data security and encryption**

  Since the app involves financial and access data, strong authentication and encryption are necessary to maintain user trust.

- **Cross-platform compatibility (iOS, Android, Web)**

  Lumis accommodates international residents using varied devices. Ensuring compatibility provides equal accessibility.

- **System scalability and maintainability**

  Feedback indicated potential expansion to other residents. A structure system design allows for updates and scalability.

- **Language localization (English/German)**

  76% of residents received rent communication in German, making localization essential for inclusivity and clarity.

- **Constant availability**

  Interview evidence of night-time access problems supports the need for uninterrupted availability of key features.

Usability and User Experience (UX) Requirements Justification

- **Minimal and intuitive interface**

  Interviewees expressed frustration with current multi-step manual processes; core actions (booking, unlocking, paying) must be complete within three simple steps.

- **Instant feedback for every action**

  Residents wanted certainty that actions (bookings or payments) were successful. Confirmation messages will meet this expectation.

- **Consistent layout and navigation**

  The combination of three main functions within one app requires uniform design to reduce confusion.

- **Clear and timely notifications**

  100% of survey respondents supported automated reminders for rent and booking, confirming notifications as a crucial usability feature.

- **Accessibility and readability (WCAG 2.1 compliance)**

  Ensures inclusivity for all users, including those with visual impairments; supports the goal of simple, clear design.

- **Simple and professional language**

  Addressed the 76% who reported misunderstanding German-language emails. Using clear English or switchable multilingual text improves comprehension.

- **Language switching option**

  Derived directly from residents' complaints about receiving communication in German; supports diverse international users.

- **Sense of fairness and independence**

  All data sources showed that users value autonomy and transparency. System design must provide trust, fairness, and equal access for all residents.