

HUMAN CENTERED COMPUTING

Redesign the given system in terms of usability and user experience goals, and interaction design principles.

Module Tutor: Terry Jacob

Module: BSC(hons) Computer science

Link to the app :

<https://drive.google.com/file/d/1t6zthYjskyE7vhxDct66RcWEuKkS31PO/view?usp=sharing>

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INTRODUCTION

As smart technology becomes increasingly integrated into daily life, the need for home automation systems that are both intelligent and easy to use has grown significantly. Our team of five set out to design **Lumina**, a smart home security app that prioritizes real users and their unique needs.

Lumina goes beyond merely automating tasks like controlling lights or locking doors. It's about building trust, simplifying complex processes, and creating a seamless experience across a wide range of user types. Our five personas - Asha, Ayush, Maria, Malhotra, and Oliver represent diverse needs, preferences, and challenges. Their stories shaped our design choices, ensuring the app is accessible and adaptable to various users, from tech-savvy professionals to those with limited digital experience.

To bring Lumina to life, we used **Figma** to design a prototype featuring clean, accessible layouts and intuitive user flows. Special attention was paid to two main tasks: creating a personalized security checklist and verifying its authenticity. These tasks laid the groundwork for the app's structure, wireframes, and overall functionality.

Our design decisions were guided by key usability goals such as **safety, learnability, utility, and efficiency** to ensure the app is user-friendly, functional, and secure. We also focused on user experience goals like **emotional fulfillment, satisfaction, and support for creativity**, aiming to create an experience that is both enjoyable and easy for users of all levels.

This report will explore our design journey, from how our personas influenced the approach to the usability and UX goals that guided our decisions, to the wireframes and interactions that bring Lumina to life.

PROJECT OBJECTIVES


The core goals of the Lumina project include developing a smart home security application which meets different user requirements through basic and advanced functionality. Users will access an intuitive interface via the app but developers can unlock additional features through their dedicated mode. The application design includes flexible features that allow users to modify text dimensions as well as implement voice command functionality to address diverse requirements. Lumina focuses on achieving a user-friendly experience by making safety a priority as the app builds seamless access for user experience through learnability and efficiency. The application interface implements visibility principles together with feedback and consistency rules to establish a user-friendly experience for everyone. Lumina seeks to present home automation systems through its objectives so users achieve accessible and customizable smart home solutions which improve their control of automated home features.

ACTIVITY 1

USER PERSONAS

An effective design of Lumina required thorough understanding of the different requirements among potential user groups. Our team designed five different personas as models for various user types thus the app features were developed to accommodate diverse user preferences and experience levels.

1. Customers who are keen to try the new smart home solutions and have no issues in accessibility of digital resources



"If my house isn't two steps ahead of me, what's the point of calling it smart?"

AGE	32
JOB TITLE	Product Designer
STATUS	Single
LOCATION	Atlanta, GA

Tech-Savvy

Automation-Obsessed

Futuristic

Perfectionist

Oliver

ABOUT

Oliver is a 32-year-old product designer working at a smart appliance startup in a bustling metropolitan city. Living alone in a modern, tech-filled loft, he thrives on automation, ensuring his home anticipates his needs. From lights adjusting to his mood to coffee brewing before he wakes up, Oliver seeks a seamless, interconnected smart home experience. He enjoys hosting friends, often impressing them with his latest tech gadgets. However, his enthusiasm comes with high expectations, leading to frustrations when things don't work as intended.

GOALS

- Achieve a fully automated and seamless smart home experience.
- Stay updated with the latest smart home technology.
- Improve home security and energy efficiency.

FRUSTRATIONS

- Hates devices that needs separate apps
- Gets annoyed when voice assistant misunderstands
- Setting up and troubleshooting new smart devices can be time consuming
- Worries about hackers exploiting vulnerabilities in smart home devices

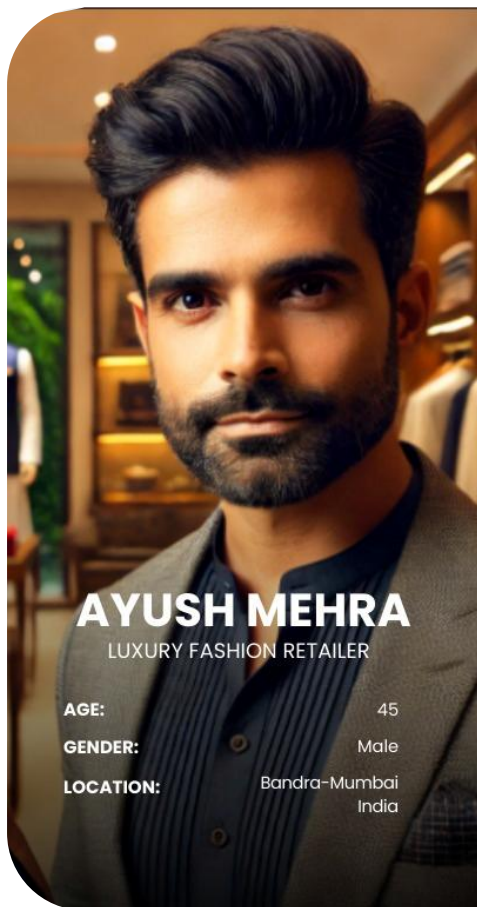
MOTIVATIONS

- Wants everything in his home to sync seamlessly
- Tracking energy consumption and optimizing efficiency
- Ensuring Top tier smart home security for his home
- Impressing Guests with latest tech innovations

PERSONALITY

Introvert		Extrovert
Analytical		Creative
Busy		Time rich
Messy		Organized
Independent		Team player

2. Customers who do not have easy access to remote digital platforms and rely low spec computers and possibly use traditional feature phones (eg:non android phone)



AYUSH MEHRA
LUXURY FASHION RETAILER

AGE: 45
GENDER: Male
LOCATION: Bandra-Mumbai
India

ABOUT :

Ayush Mehra is a 45-year-old boutique owner from Bandra, Mumbai, specializing in luxury fashion and high-quality craftsmanship. He values tradition and simplicity, opting for offline transactions and minimal digital tools, managing his business with a 2015 MacBook Pro and a basic Samsung feature phone. Passionate about fashion, fabric curation, and customer experience, Ayush enjoys networking with designers, attending fashion exhibitions, and having meaningful conversations over tea in his free time.

PERSONALITY

Design Thinking



Resource



Analytical



Technology Usage

- Uses an older MacBook Pro (2015 model) for business operations like inventory and customer records.
- Owns a feature phone (Samsung) primarily for calls, SMS, and basic banking
- Limited access to high-speed internet, primarily using 3G mobile data for browsing.
- Prefers offline solutions and avoids using data-heavy apps.


Goals & Needs:

- Needs simple, low-data platforms for managing his boutique's inventory and business transactions
- 1. SMS notifications and basic invoicing tools would streamline his workflow.
- Offline solutions for payments and record-keeping are preferred over internet-dependent tools.
- Wants an easy-to-use digital experience for growing his business without feeling overwhelmed by complex tech.

Pain Points:

- Data-heavy websites and apps don't function well on his devices, leading to slow user experience.
- Limited internet speed hampers the use of modern digital platforms, making transactions or browsing cumbersome.
- Prefers cash payments or traditional banking, hesitant about adopting new digital wallets or payment solutions.
- Lack of technical literacy limits his ability to use new tech and digital services efficiently.

3. Customers who have accessibility challenges to the system such as impaired vision , mobility or cognition challenges




"Vision isn't just about sight;
it's about perspective."

AGE 45
JOB TITLE HR Manager
STATUS Single
LOCATION Atlanta, GA

PASSIONATE EMPATHETIC
CURIOUS

FAVORITE BRANDS



USER PERSONA

Asha Patel

ABOUT

Asha Patel works for Enterprise Fourtunes company in Atalanta,GA HR manager born with impaired vision, faced early challenges but never let define her capabilities. With a passion for people and organizational growth, pursued studies in human resources, leveraging adaptive technology to excel in the field. Over the years, she built a career marked by resilience, inclusivity, and innovation, proving that vision isn't just about sight—it's about insight. Today, she lead with empathy and determination, ensuring workplaces are welcoming and empowering for all.

GOALS

- Work towards shaping company policies that support accessibility, work-life balance, and equal opportunities for employees with disabilities.
- Collaborate with organizations that support individuals with disabilities, championing awareness and employment opportunities for all.

NEEDS

- Opportunities to engage in discussions, panels, and collaborations that promote workplace diversity, equity, and inclusion.
- Tools and programs to enhance communication, team-building, and professional growth for all employees.


PAIN POINTS

- Difficulty navigating certain HR systems or platforms that are not fully optimized for assistive technology.
- Facing misconceptions about her capabilities due to her impaired vision, requiring continuous efforts to prove her competence.
- Juggling the demands of her HR role while also pushing for inclusivity initiatives can be overwhelming.

PERSONALITY

Introvert		Extrovert
Analytical		Creative
Busy		Time rich
Messy		Organized
Independent		Team player

4. Company engineers who are typically more tech savvy and have access to the back end of the home automation system



"I pour my passion into every design, always keeping the user's needs at the forefront of my mind."

AGE	38
JOB TITLE	Senior Smart Home Engineer
STATUS	Single
LOCATION	Bangalore , INDIA
EDUCATION	Computer Science M.Tech

PASSIONATE

EMPATHETIC

CURIOUS

ADVENTUROUS

Malhotra Rajiv

ABOUT

Malhotra Rajiv is a systems engineer in smart home automation based in Bangalore. Passionate about technology from a young age, he pursued a Master's in Computer Science and now specializes in backend development, IoT systems, and security. With over a decade of experience, he ensures seamless connectivity and efficient troubleshooting for smart home devices, making automation smarter and more reliable.

GOALS

Enhance system efficiency by optimizing

- backend infrastructure for seamless smart home automation.

Improve security and troubleshooting to

- ensure reliable and secure IoT device management.

NEEDS

Reliable backend access for real-time

- system monitoring, updates, and maintenance.

Secure and scalable APIs to integrate

- smart home devices seamlessly.

PAIN POINTS

- Complex IoT integrations with multiple protocols like Zigbee, Z-Wave, and MQTT.
- Security vulnerabilities in smart home networks pose constant risks.
- Time-consuming troubleshooting due to lack of automated diagnostics.

PERSONALITY

Introvert

Extrovert

Analytical

Creative

Busy

Time rich

Messy

Organized

Independent

Team player

5. Customers who do not have easy access to remote digital platforms and rely low spec computers and possibly use traditional feature phones (eg:non android phone)



*Rooted in Tradition,
Growing with Simplicity*

Maria Thomas

ABOUT

Maria Thomas is a 62-year-old retired government school teacher from a rural village near Chennai, Tamil Nadu, India, who now manages a small farm. She values her Tamil heritage, participates in church activities, and relies on her modest pension and farm income. She visits local markets to buy essentials like rice, vegetables, and spices, preferring traditional shopping over digital alternatives.

GOALS

- Optimize farm management with
- accessible tech tools and stay updated on agricultural trends.
- Enhance communication with family and
- community using her feature phone while accessing local digital resources.

PAIN POINTS

- Limited internet access and slow connectivity at the Common Service
- Center restrict her ability to use digital platforms.
- Difficulty adapting to new tech interfaces
- due to her reliance on outdated devices and lack of advanced features.

NEEDS

- Low-data, Tamil-supported apps for
- farm updates and market prices that work on her feature phone.
- Basic tech training and support to use
- her low-spec computer and phone more effectively for record-keeping and communication.

PERSONALITY



AGE 62
JOB TITLE Retired School Teacher
STATUS Widow
LOCATION Tamil Nadu, India

DEDICATED

CARING

INQUIRING

OPEN-MINDED

ACTIVITY 2

USABILITY AND USER EXPERIENCE GOALS

Task 1: Create a Security Checklist & Install the Smart Home Solution

Usability Goals

1. Memorability

Establishing smart home security guidelines needs users to recall their previous installation protocols despite rare use. The system should guide users through the entire process by moving them between each room for device setup along with setting verification while linking steps to the home's physical structure. The system design enables users to preserve information needed for future device installation or troubleshooting operations. An automated summary delivered after setup would support users' recall by providing a summary of the completion steps.

Measuarble Goal: The platform will demonstrate success when 85% of users manage to add new devices within 5 minutes despite not using the application for a prolonged period.

2. Learnability

The system requires a direct setup process which users can understand quickly without additional work. A series of easy-to-understand icons combined with brief instructions and video tutorials that play within the application will help users avoid getting lost. The system must provide immediate feedback and action-guidance through user-based activities in order to enhance procedure smoothness.

Measurable Goal: 90% of users should complete at least 90% of the setup steps without needing prior experience or external help.

3. Safety

Safety is critical for a smart home system, especially for features like alarms, locks, and cameras. The system must limit access to authorized users through strong protections like two-factor authentication, secure data transfer, and alerts for unusual activity. Backup options should ensure devices work during power or internet outages.

Measurable Goal: 95% of users should feel confident their system is secure after completing the checklist.

User Experience Goals

1. Satisfaction

The setup process needs to create positive feelings through user satisfaction. A neat and appealing design with straightforward navigation allows users to experience content pleasure. Automatic updates combined with user-friendly menus increase user satisfaction during the setup and finishing setup awards a sense of accomplishment to users.

Measurable Goal: 90% of users should rate the setup process as "easy to complete" and "understandable," reporting high satisfaction.

2. Helpful

Users should be provided with guidance through the checklist that offers solutions and tips when problems occur. The system will provide notifications to notify users about missing

steps alongside the correct return point to resume their workflow. The system should provide setting recommendations for improved workflow when users overlook parts of the process.

Measurable Goal: 80% of users should say the system was helpful during installation, with little confusion or frustration.

Task 2: Independently Verify the Authenticity of the Security Checklist

Usability Goals

1. Efficiency

Users should encounter smooth and fast performance while checking the checklist. The system needs to present an intuitive flow for users to complete steps and report completed work and system errors. The system performs automatic control checks that both reduce work time and prevent errors from occurring.

Measurable Goal: The verification should take 5 minutes or less, with 90% of users confirming it feels efficient.

2. Utility

The checklist needs to be straightforward to enable users to validate their system security. The security checklist consists of three basic procedures which entail device setting checks and data protection verification and issue detection. The system design promotes straightforward operations which allow users to preserve home security.

Measurable Goal: 90% of users should complete the verification confidently, knowing their system is safe.

User Experience Goals

1. Emotionally Fulfilling

The verification process should provide users with a sense of security and calmness while checking their tasks. Users feel comfortable when the system uses soft notifications alongside detailed information on security measures and adaptation features that respond to their needs.

Measurable Goal: 85% of users should feel reassured after completing the checklist verification.

2. Supportive of Creativity

The verification process should provide users with a sense of security and calmness while checking their tasks. Users feel comfortable when security notifications are subtle along with specific protective measures described along with adaptive user-friendly features.

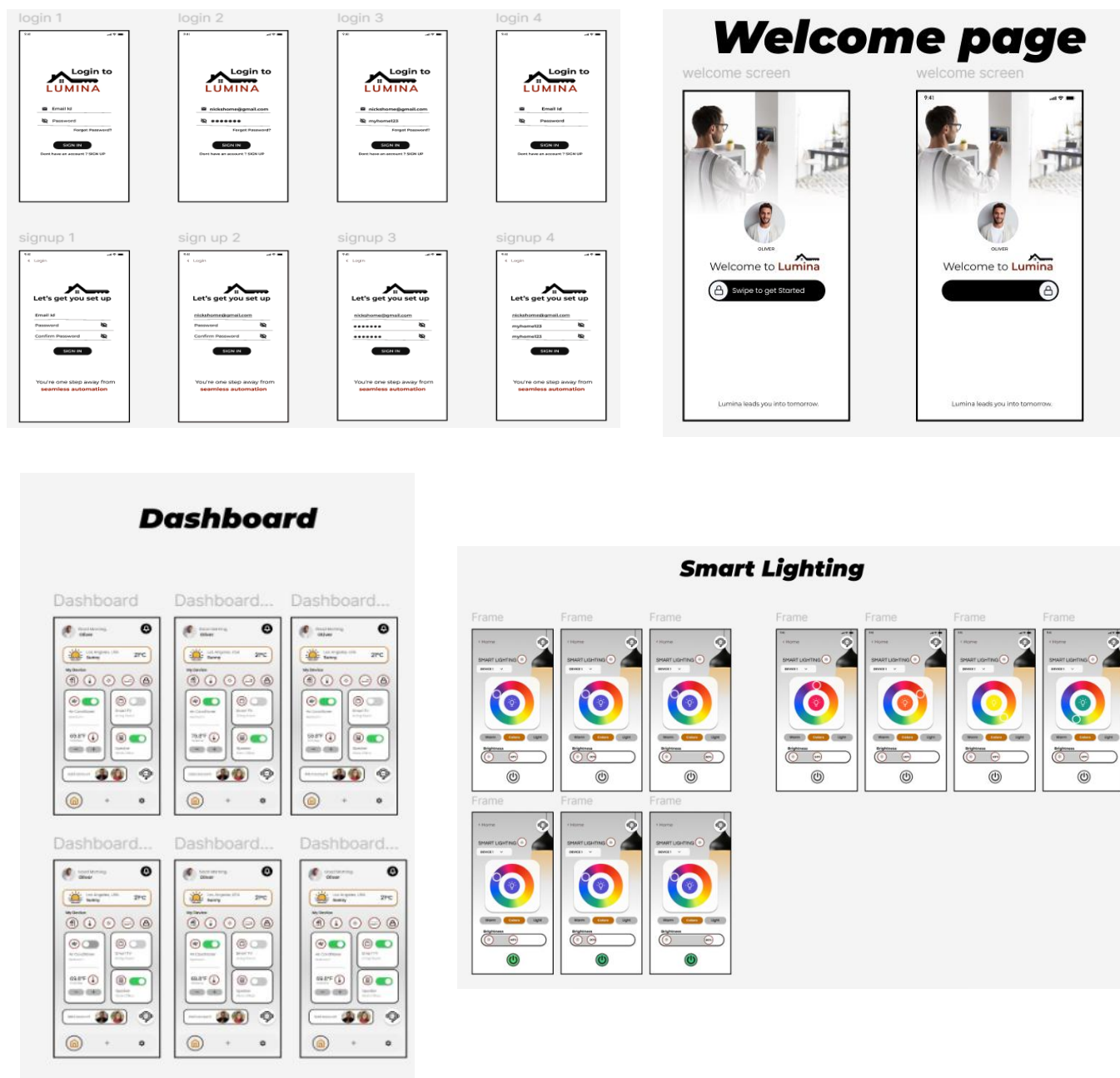
Measurable Goal: 75% of users should feel they can personalize their security system and adapt the checklist as needed.

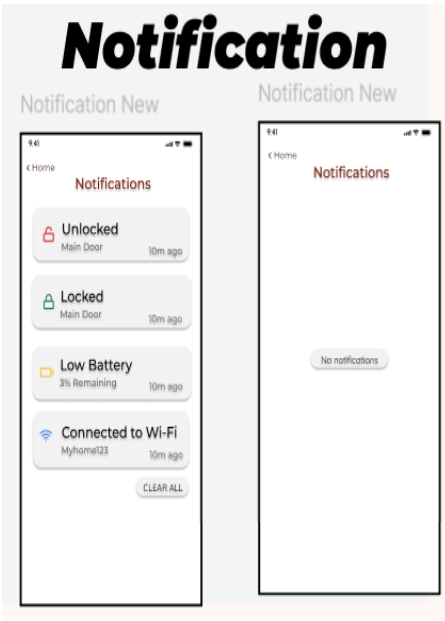
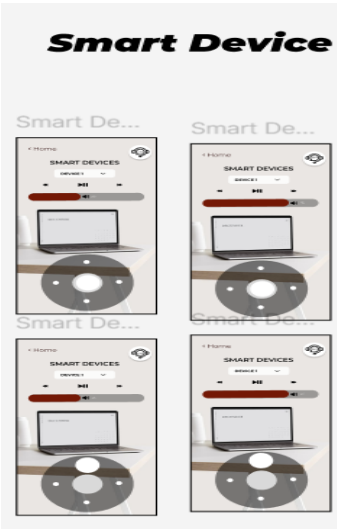
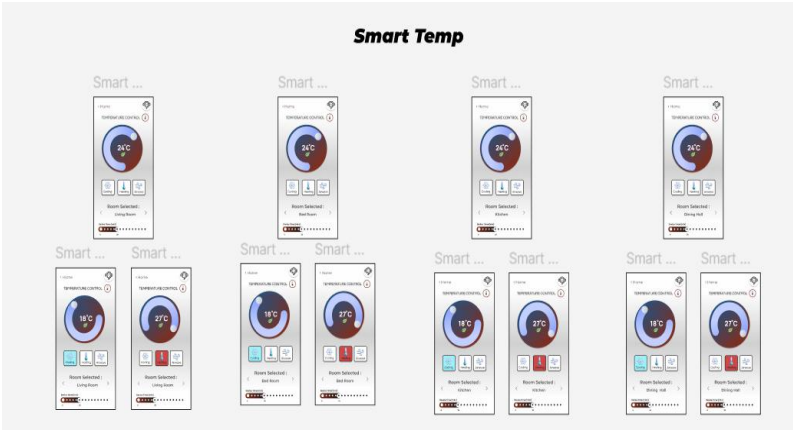
3. Aesthetically Pleasing

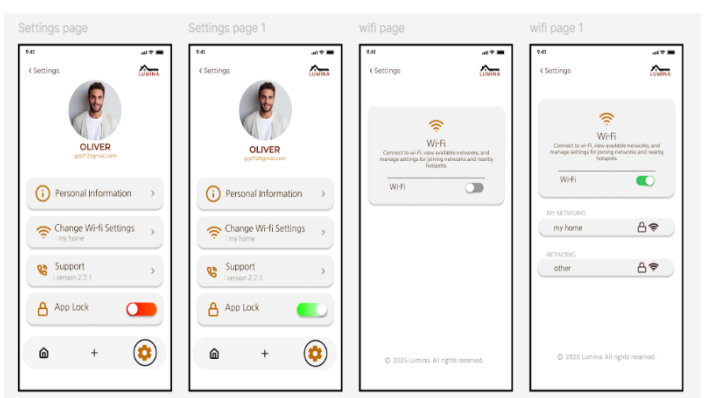
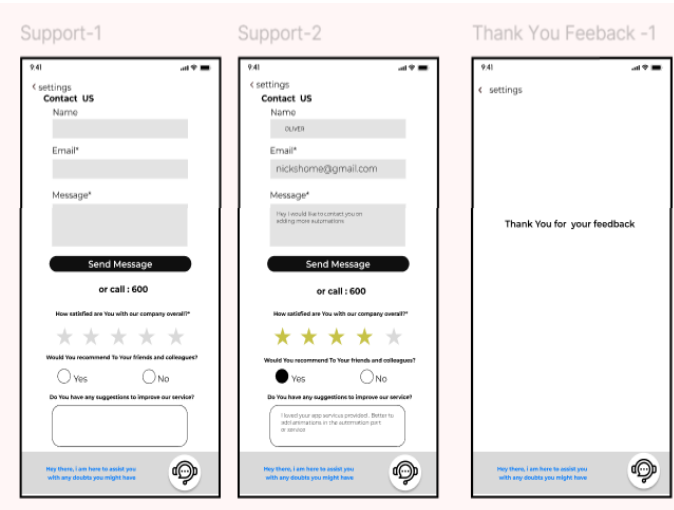
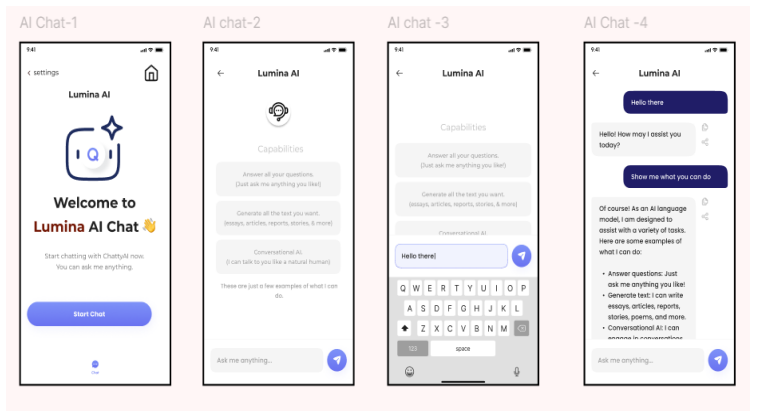
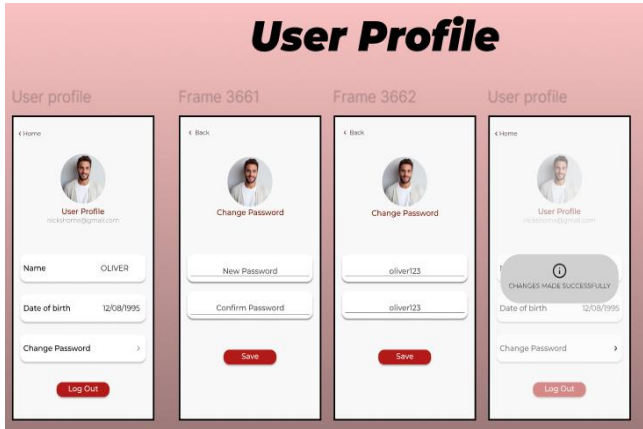
The verification process should look clean and inviting, with an organized layout. Progress bars, color-coded icons, and clear sections can make the task less overwhelming and more engaging. A polished design keeps users focused and reduces confusion.

Measurable Goal: 90% of users should find the interface visually appealing and easy to use, praising its clarity.

STORYBOARD

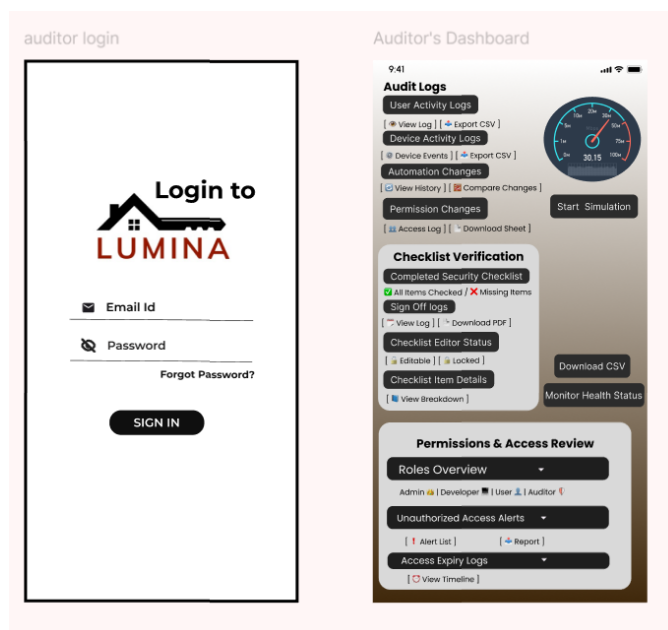






AUDITING

The Audit area functions as a security-controlled interface for authorized personnel to check system-wide important actions after they have been executed. The Audit tracks all system-wide activities including user entries and device operations in addition to automation rule modifications and consent changes. The system tracks complete documentation through timestamped records backed by detailed log files. Through this page users can check the security checklist completion status and test automation flows in addition to enabling external review of exported data. The audit section allows external reviewers to validate system status without altering the app structure while detecting suspicious activities to maintain security excellence.



ACTIVITY 3

APP PROTOTYPE

There are five design principles described in Chapter 1 of the Interaction Design textbook (Preece, Rogers and Sharp)

Visibility Feedback Constraints Consistency Affordance

Develop an interactive prototype for the tasks of **Create a security check list and install the smart home solution** and **Independently verify (audit) the authenticity of security check list by the smart home system** reflecting the usability and user experience goals discussed in **Activity 1** for that part of the system. A link to the actual prototype which can developed in Figma, Axure or Adobe XD should be included.

VISIBILITY

Visibility refers to how easily users can identify available actions and the current status of the system.

IMPLEMENTATION IN THE PROTOTYPE

The Dashboard prominently displays key options such as **Add Device(+)** and **Add Account** , ensuring users are immediately aware of primary functionalities. In the Automation Page, modes such as **Heating** , **Cooling**, and **Airwave**, along with a temperature control slider and device timer, are clearly shown to the user.

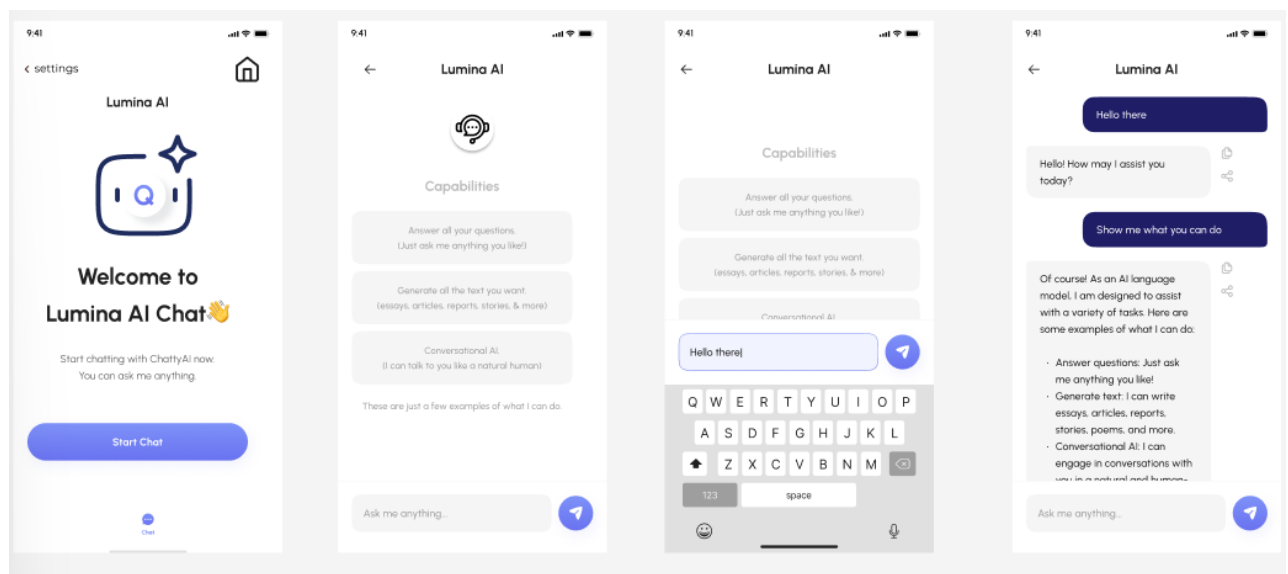
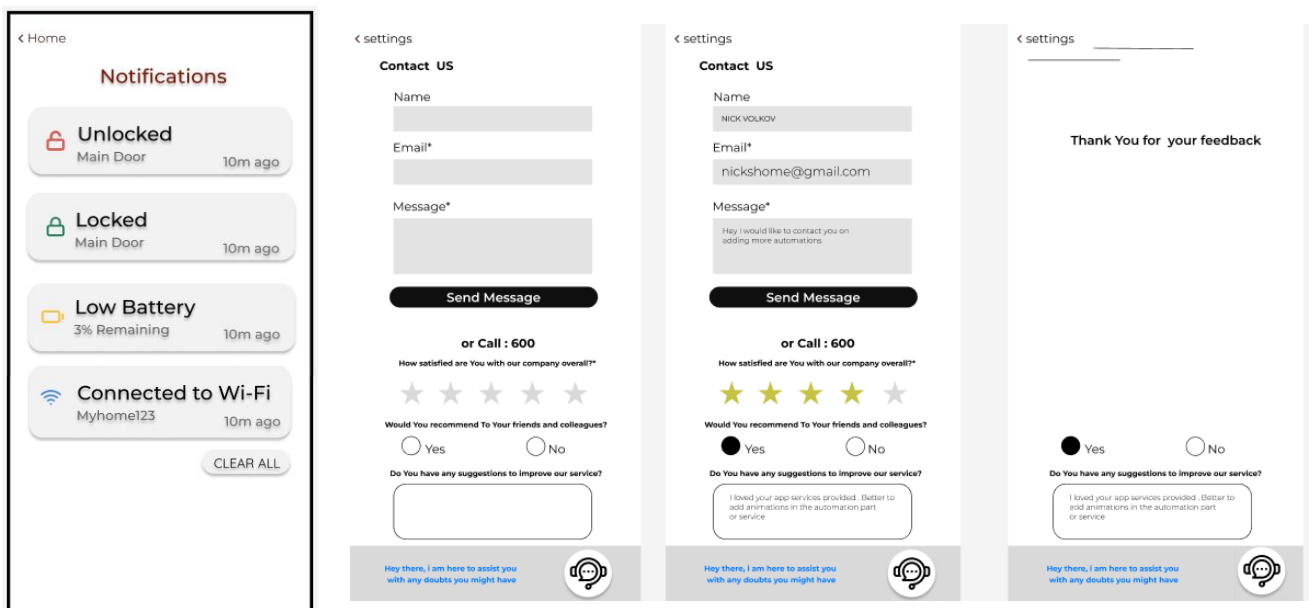


FEEDBACK

Feedback provides users with immediate responses to their interactions, ensuring they are aware that their input has been received and processed.

IMPLEMENTATION IN THE PROTOTYPE

The system provides visual and interactive feedback when users adjust temperature or lighting. For instance, changing a temperature value updates the display in real time. Notifications such as “Low Battery” or “Unlocked” appear in the Notification Page. The built-in AI chatbot also replies instantly to user queries, offering support and guidance.

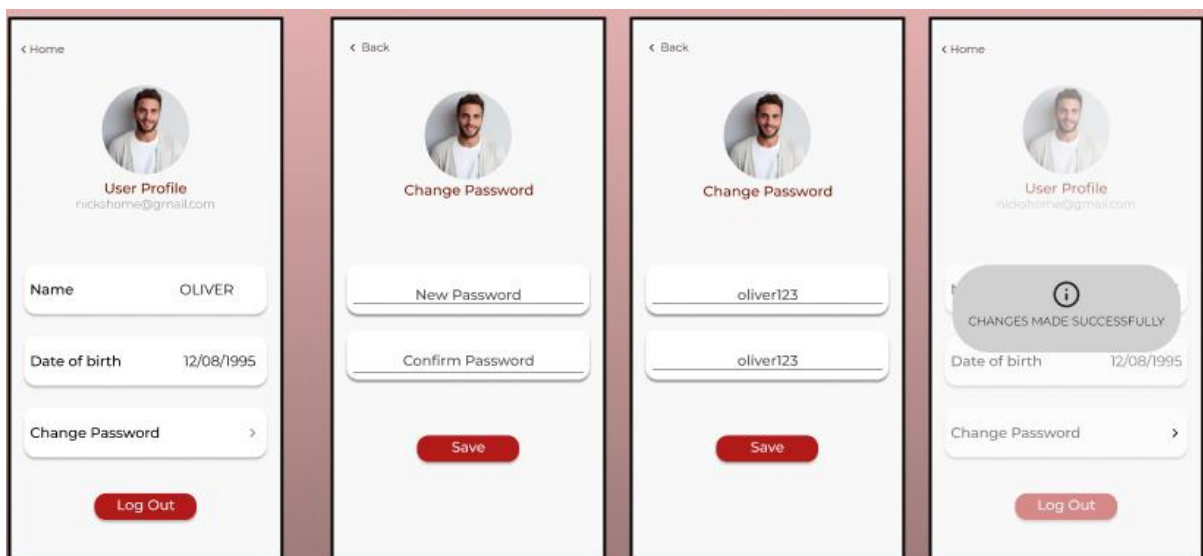


CONSTRAINTS

Constraints restrict user actions to reduce the chance of errors and guide them toward valid inputs.

IMPLEMENTATION IN THE PROTOTYPE

Input fields in the **Sign-Up Page** are validated, only allowing users to continue once all required information is correctly entered. In the **Automation Page**, the temperature control slider has a predefined range, preventing extreme values. The **Add Device Page** limits selections to supported devices, guiding users to appropriate choices.

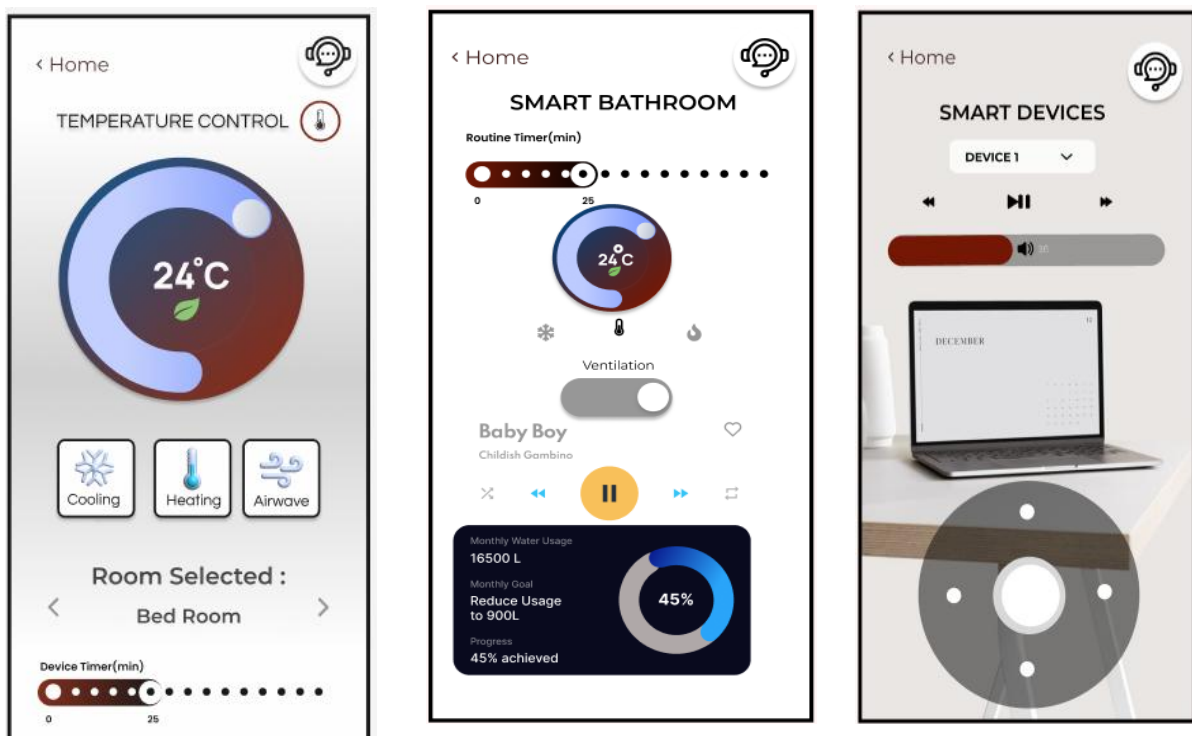


CONSISTENCY

Consistency ensures that similar interface elements behave and appear uniformly throughout the system.

IMPLEMENTATION IN THE PROTOTYPE

Across all pages such as temperature control, smart bathroom , smart devices similar controls such as sliders and toggles are used with the same design and function. The AI chatbot remains in a fixed position across screens. Visual elements such as fonts, button styles, and color schemes are standardized throughout the application.

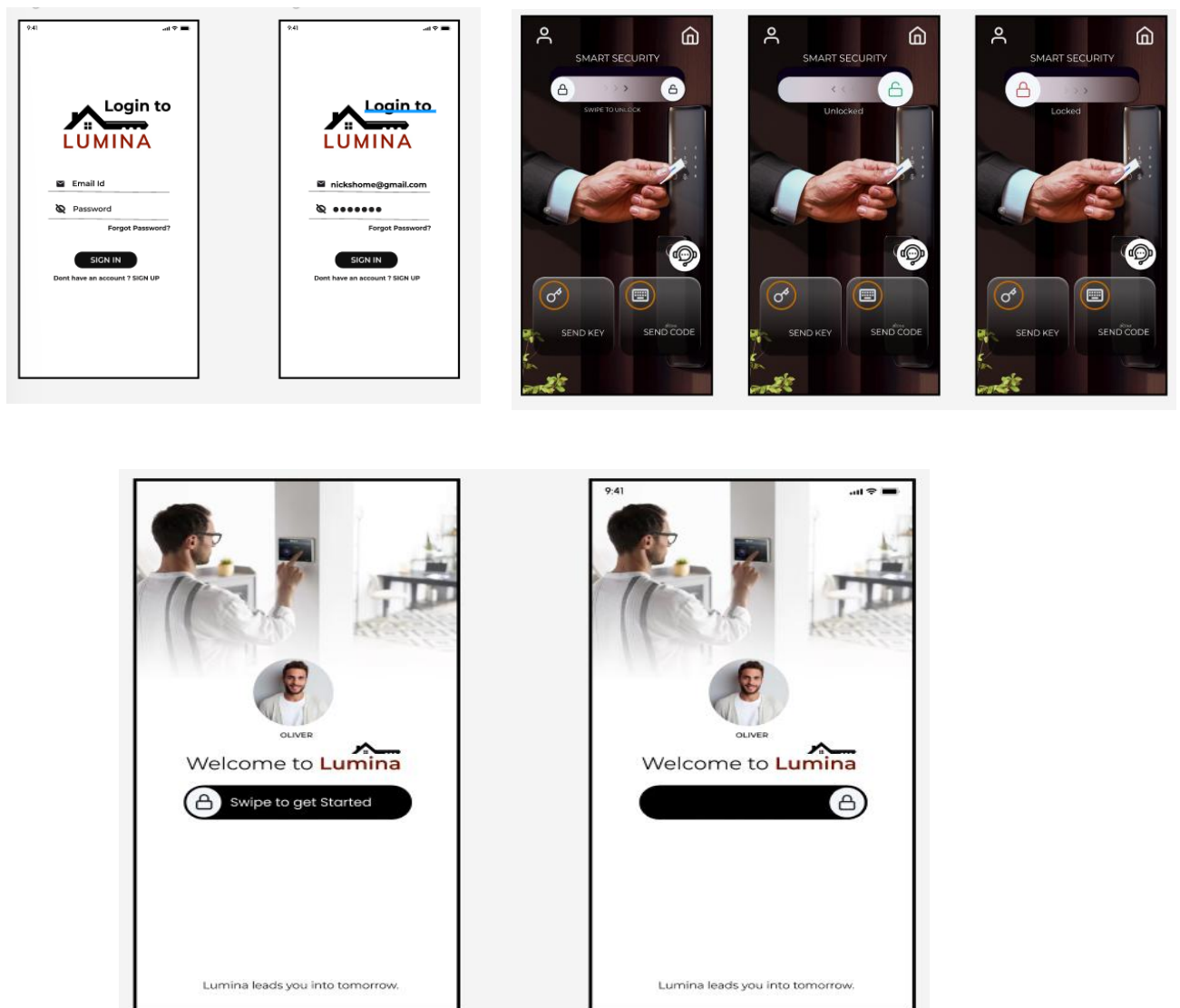


AFFORDANCE

Affordance refers to the visual cues that indicate how an element is to be used (e.g., buttons look clickable, sliders look draggable).

IMPLEMENTATION IN THE PROTOTYPE

Buttons such as **Add Device** are visually designed to resemble clickable elements with a distinguishable shape and color. Sliders for temperature and lighting settings are styled to indicate their interactive nature. In the **User Profile Page**, editable text fields and a clearly marked 'Save' button guide users effectively.



ACTIVITY 4

Integration of Agile Methods, User-Centred Design, and Software Development

Our team adopted an Agile methodology to ensure flexibility, continuous feedback, and alignment with real user needs throughout the smart home system redesign project. Instead of a rigid, linear approach, we worked in iterative cycles - planning, designing, reviewing, and improving progressively.

We maintained regular weekly Google Meet sessions that acted like Agile sprint meetings. During these, we assessed progress, discussed challenges, and made collaborative decisions about the prototype based on user feedback and our defined usability and user experience goals. Communication was consistent via WhatsApp, and files were shared efficiently through Outlook. Additionally, weekly individual logs were submitted on Blackboard to track progress and ensure accountability.

To embed user-centred design (UCD) within the development process, we created five detailed personas representing a wide range of users each with unique needs, technological capabilities, and preferences. These personas, along with clearly defined usability and UX goals, guided the development of the prototype from start to finish.

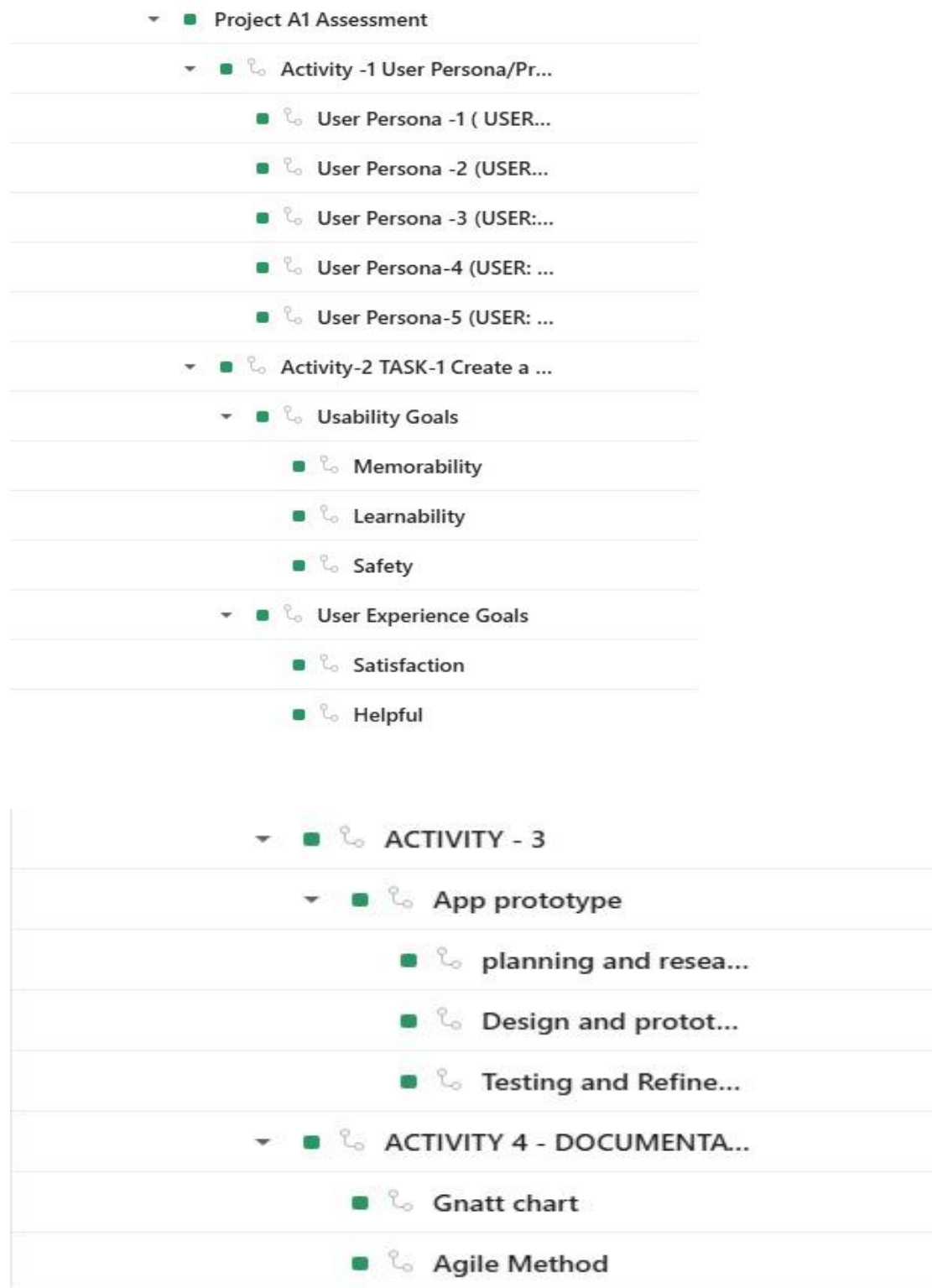
On the software development side, we began by mapping out key app screens, including the Login Page, Dashboard, User Profile, Automation Page, and Home Screen. Using tools like Figma, we translated our ideas into wireframes and prototypes, which were consistently reviewed against our goals for usability (such as learnability, efficiency, and safety) and user experience (such as satisfaction, creativity, and emotional fulfilment).

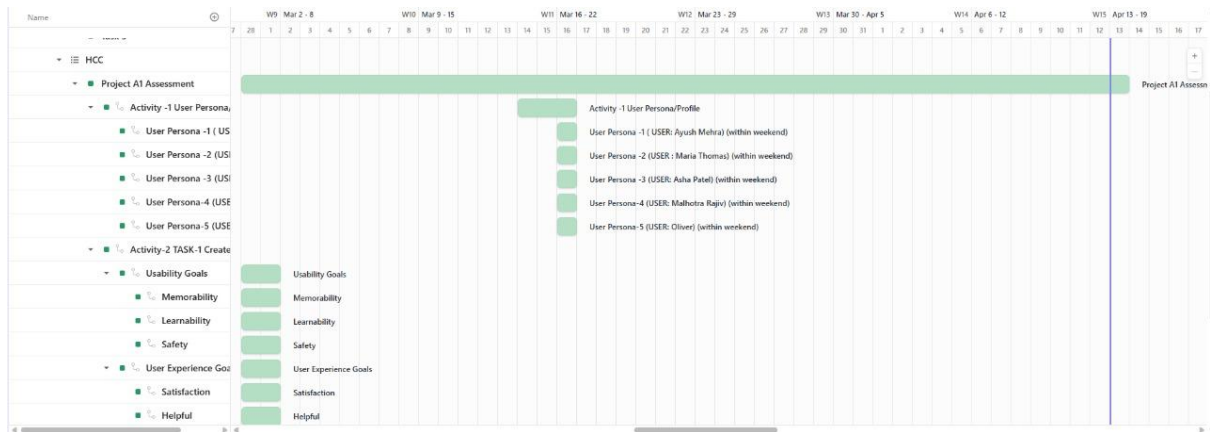
Although we did not implement formal version control systems like GitHub, we ensured effective collaboration and iteration through frequent updates and open dialogue. Every element from the interface design to the prototype's functionality was developed with users at the centre, ensuring that the final prototype reflected not only technical functionality but also inclusivity, accessibility, and real-world relevance.

By combining Agile practices with user-centred design and practical software development strategies, we were able to produce a well-rounded, goal-driven prototype tailored to the needs of our target users.

GNATT CHART

The Gantt chart provides a visual representation of the project schedule, outlining key tasks, milestones, and their timelines. It helped the team stay on track by identifying dependencies, setting deadlines, and managing workload effectively.





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