In Step Together

REPORT
June 2024

Ageing Well by Enhancing Healthcare Access

HEALTH SERVICES

POLITECNICO MILANO 1863

Digital and Interaction Design

ENVISIONING AI THROUGH DESIGN

A.Y. 2023/24

Group 9

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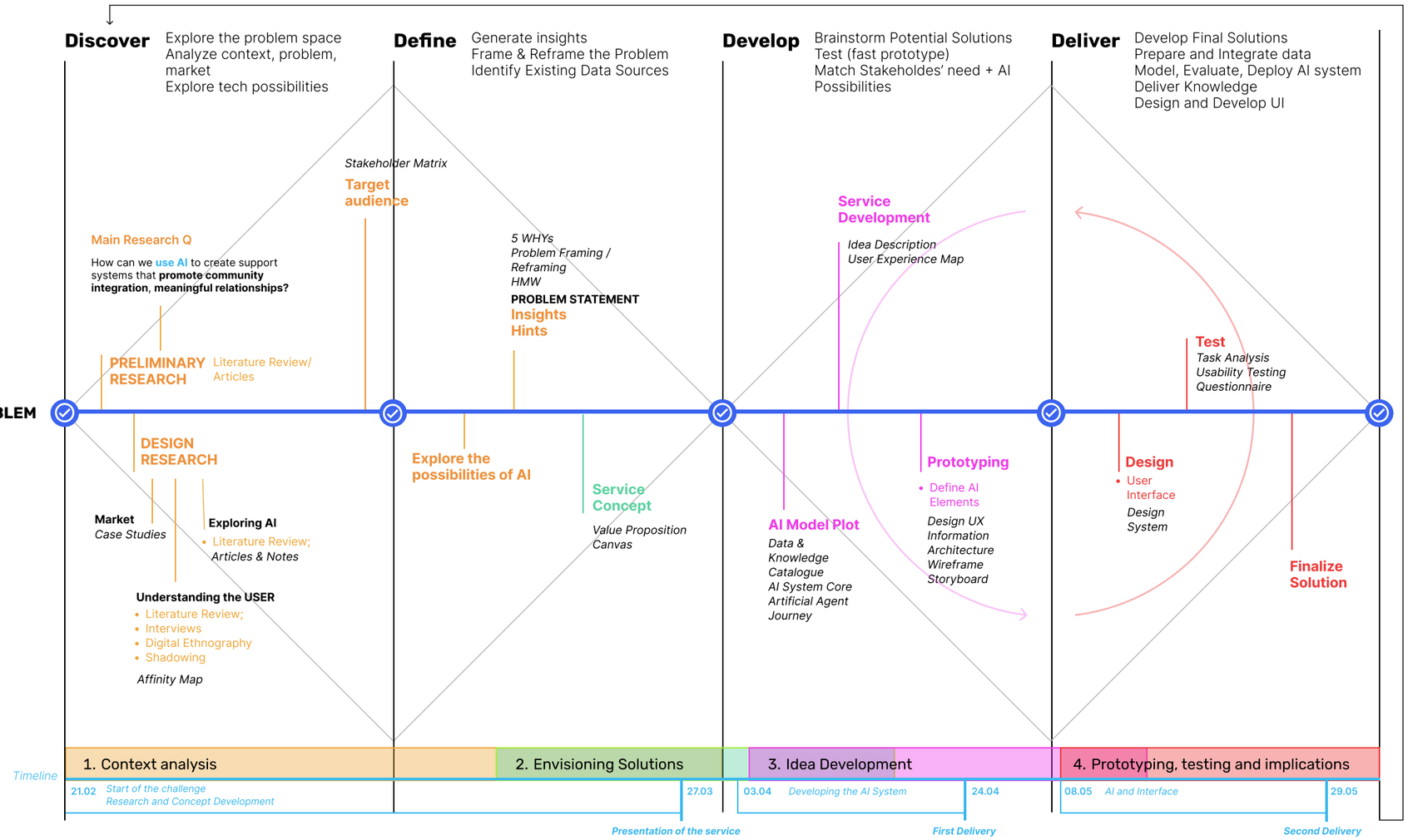
Introduction

Background and Objectives

Urban Services contribute to the functioning and development of the society. **AI** technologies can be important tools in supporting humans to become more efficient and make better decisions.

The **elderly** are and will increasingly be a significant segment of our society. Their primary concerns revolve around their **health conditions**. Seniors were born before the advent of technology, so navigating **online medical platforms** becomes challenging in our modern era.

This report details the **research** and **design process** of the challenge embraced for the **Envisioning AI through Design** for the development of **Plus**: a simplified healthcare management system that helps seniors **monitor** their **health conditions** and obtain **customized healthcare**.



[Fig1] Design Process Plan for the course

Methodology

Preliminary research based on **literature reviews** and **articles** has helped us understand the role of elderly people in the societal context.
We focused on better understanding the **primary needs** of seniors, particularly emphasizing social integration and exploring how **AI** could promote it, to improve the quality of life for the elderly.

Through the **exploration** of case studies and AI, our methodology for understanding users initially employed various techniques such as **shadowing**, **semi-structured interviews** and **digital ethnography** to generate our **problem statement**. Then, we **reframed** the problem statement with **value proposition canvas** and developed initial solutions, to uncover more effective solutions from a more comprehensive perspective.

After that, we developed our **service concept**, focusing on how to solve the main touchpoint and the processes that allows the system to work. Being mindful of our **user personas**, their **goals** and **scenarios**, we **developed our service** by studying data and knowledge, proceeding with service development that included describing the idea and creating a user journey map. We then **prototyped** by defining elements of our AI, including information architecture, wireframes and a possible storyboard highlighting all the main steps involved in using our service.

Finally, through an intense **design research** phase targeting our audience, we developed a **user interface** that we did user testing and got our final solution.

User Understanding

Identify the user

At the start of our design project, we first identified **older people** as our primary user group. This decision was based on a deep understanding of the older population and the **unique challenges** they face in **modern society**. Here there are **five specific reasons** why we chose seniors as our user group: [1]

1. Global aging
By 2050, the proportion of people over 60 will double from 12% to 22%. For the first time, those over 65 outnumber those under five. **Healthcare** must adapt to rising costs and changing demands, focusing on overall well-being.

2. Opportunities for longer life
Longer life offer **opportunities for healthcare** to emphasize preventative measures and value-based care, using innovative detection tools and online services. This benefits older individuals, families, and society by improving overall health.

3. UN Decade of Healthy Aging (2021-2030)
WHO (World Health Organization) leads an initiative **"Leaving No One Behind in An Aging World"**. The report recalls that in setting out a universal plan of action to achieve sustainable development, the 2030 Agenda aims to leave no one behind, particularly the most vulnerable people, including those older. Dedicating to creating age-friendly attitudes and communities, quality care, and access to **long-term care**.

4. Global Influence on Aging
Global trends such as **globalization, technological advancements, urbanization, migration**, and **changing gender norms** impact older individuals directly and indirectly.

5. MIPAA and AAI for monitoring
MIPAA focuses on the **development**, **health**, and **well-being** of older people and their environments. The Active Ageing Index **(AAI)** tracks progress with indicators in employment, social participation, independent living, and enabling environments.

[Fig2] The 2030 Agenda for Sustainable Development

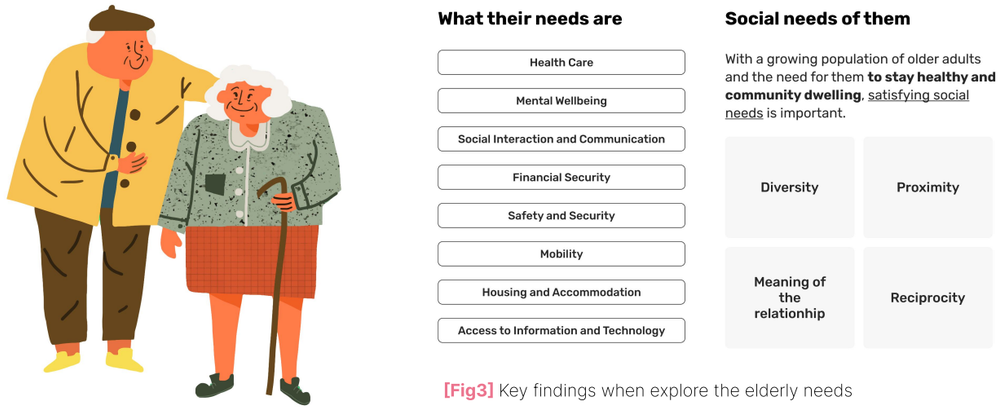
[1] ("World Social Report 2023," 2023)

Define User needs

Preliminary Research

After identifying the elderly as our **main user** group, we conducted a preliminary study to gain a deeper understanding of their needs. Through literature review, questionnaires and interviews, we collected a large amount of data on the **living conditions** and **needs** of older people.

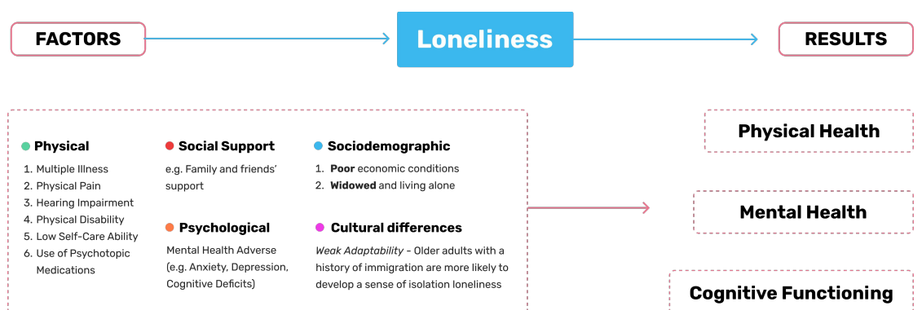
In the course of our research, we found that one of the **main problems** faced by older people is **loneliness**. Loneliness not only affects their mental health but is also associated with a variety of physical health problems. Through our interactions with older people, we learned that they have significant needs in terms of social interaction and emotional support. Here are some of the key points we have identified in our initial research [Fig3]:



[Fig3] Key findings when explore the elderly needs

Literature Review

Then, based on the principle of prioritize user needs, to figure out what makes them feel lonely, we conduct **more detailed research**.Through literature review, questionnaires and interviews, we have collected a large amount of data on the living conditions and social needs of the elderly. A great loneliness grips their lives.



[Fig4] Key findings from Literature Review

Study Goal & Research Quesions

Through in-depth analyses of the factors of loneliness in the elderly and its results, we realize the importance of addressing this issue. We clarified the study goal and research questions.

Study Goal

Our project is aimed to comprehend the primary needs of seniors, particularly concerning **social integration**.

Research Questions

How might we use AI to create support systems that promote social integration, and **improve the life quality of elderly**?

Methodology

In order to gain a comprehensive understanding of the living conditions and needs of older people, and to explore the use of AI to enhance their social integration and quality of life, a variety of research **methods** were used, including **shadowing**, **semi-structured interviews** and **digital ethnography**.

Shadowing

In this study, we shadowed two elders to record their behaviours and interactions in their daily lives. In order to understand the challenges faced by older persons in real life and their daily needs, especially the components related to social interaction.

Chen, 76 Prato, Tuscany

06:00	Wakes up / Cleans / Prepares tea for her son
07:00	Does the laundry / Cooks noodles for her breakfast
08:00	Gets ready / Hangs up the laundry / Has breakfast / Cleans
09:00	Texts and uses social medias / Makes breakfast for her family
10:00	Quarrels with her husband
11:00	Prepares and has lunch / Gets religious content on the radio
12:00	Engages in social activities (chats, calls) with family & friends
13:00	Uses social medias, watches short videos (about songs/family)
14:00	Takes a nap
15:00	Sleeps
16:00	Wakes up / Collects the laundry
17:00	Cooks dinner
18:00	Has dinner
19:00	Engages in social activities (chats, video calls) with her friends
20:00	Engages in social activities (chats, video calls) with her friends
21:00	Waits for her family to return home
22:00	Goes to bed
23:00	Sleeps
00:00	Sleeps
01:00	Sleeps

Notes: She rarely interacts with her husband, fears being alone, has eating disorders, and frequently uses digital technology.

[Fig5] Shadow subject1

Tina, 91 Agrigento, Sicily

06:00	Sleeps
07:00	Sleeps
08:00	Sleeps
09:00	Sleeps
10:00	Wakes up
11:00	Gets ready (with some help) / Has breakfast
12:00	Goes on the sofa / Reads local news and religious magazines
13:00	Watches the TV
14:00	Has launch
15:00	Takes a nap
16:00	Wakes up / Watches the TV
17:00	Talks with the family members that takes care about her
18:00	Talks about the news / Comments the TV programs
19:00	Enjoys to hear about her daughter or nephews' days
20:00	Talks about her past
21:00	Has dinner
22:00	Watches the TV Primetime
23:00	Watches the TV
00:00	Watches the TV
01:00	Goes to bed

Notes：She is not autonomous, rarely goes out, meets people at home, uses a big-button phone for calls, and use a few remote buttons.

[Fig6] Shadow subject2

Semi-Structured Interview

In our study, we interviewed **11 individuals,** from **62 to 86** year-old, to gain insight into their personal information, social habits, lifestyles and use of digital products. The purpose of these interviews is to understand participants' daily experiences, challenges and interactions, with a particular focus on how they manage their lives and how to use electronic devices.

- What is your name? + How old are you?

Personal Information

- Do you live **alone** or with your family members?
- Do you have any existing **health conditions**, and if so, do you receive any support for them?

Lifestyle

- Can you walk me through your **typical daily routine**, including your favorite activities or rituals?
- Can you tell us a story about the biggest difficulties or challenges you face?

Attitude and Motivation

- How do you spend time with your **close friends**, **neighbors**, or family members?
- How often do you feel **lonely**?
- What activities do you do when you be/feel lonely?

Behavior toward digital products

- How often do you use **electronic devices** or gadgets in your daily life?
- For what **purpose** do you use these gadgets in your daily life?
- What kind of **challenges** do you face when using these devices?
- How do you overcome them?

[Fig7] Interview Questions

The **purpose** of these interviews was to collect **qualitative data** in order to gain a comprehensive understanding of participants' lives. By exploring aspects of personal circumstances, social interactions, daily life and technological engagement, we aim to find common and unique experiences to help create better support strategies and service designs tailored to their needs.

Personal Information	Understand their day-to-day **needs** and **support systems** is critical.
Social Habits	Understand their **social engagement**, frequency of isolation and coping mechanisms highlights the social dynamics of their lives.
Lifestyle	Explore subjects' **daily activities**, personal interests and the challenges they encounter to gain a comprehensive understanding of their lifestyles.
Digital Product Usage	Understand the extent and nature of their use of **digital products**, identifying any difficulties they face and how they are addressing these challenges.

User Understanding

At the end of the interview phase, the results were categorised and produced into five main areas.

These dimensions included older people's **daily activities** and **behaviors**, **technology and communication**, **health** and **well-being, social and relationships**, etc.

By analysing these dimensions in depth, we identified several **key insights**, issues and causes regarding technology use. These findings provide important guidance in the design and development of service systems that support the social integration of older people.

Daily Activities and Behaviors | Technology and Communication | Health and Well-Being | Social and Relationships | Others

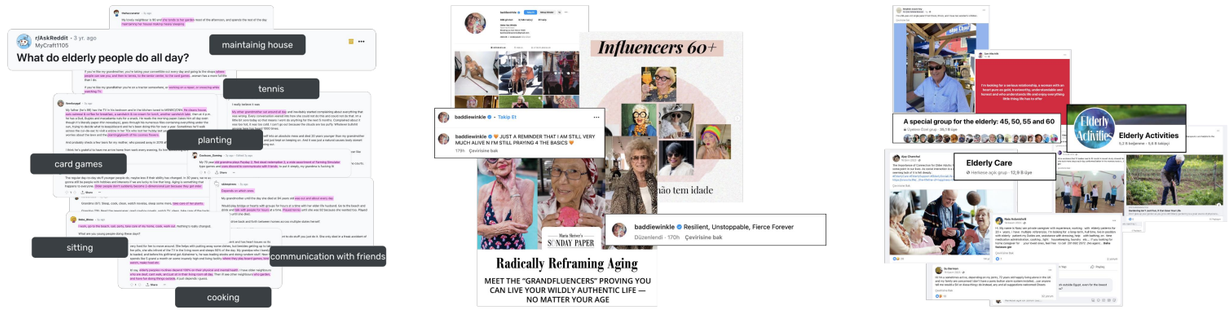
[Fig8] Word Cloud form Interview

Digital Ethnography

Reddit

Instagram

Facebook



[Fig9] Digital Ethnography from three social media

While most of the elderly people prefer to **spend their entire days at home**, taking care of daily household chores, others prefer to spend time outdoors being active.

A few elderly individuals can use Instagram actively and successfully inspire others.

In care groups, questions are asked for the elderly to **exchange ideas**, and caregivers also share their job search inquiries.

Results & Key Findings

After aggregating and collating the data, we took three steps to gain a situated understanding: **observe**, **analyze**, and **understand**. We first conducted observations, then summarized the data to identify commonalities. These commonalities, which have three key aspects, helped us understand what is meaningful for the elderly.

1. **Most of the eldelry deal with health issues.**
2. **Technology might appear difficult and they need and ask for help to use it.**
3. **They frequently visit the doctor.**

Then, we analysed the results of our observations and tried to find out the underlying causes of these phenomena by adopting the **"5 Whys"** method. By asking "why" questions, we began to uncover the underlying causes of the problems, layer by layer.

What	Why
• Most of them are dealing with **health issues**.	1. Because they are older and more susceptible to illness, their physical and mental abilities are declining. 2. Because they may not have full control and understanding of their health conditions. 3. Because they may neglect their health issues.
• They frequently **visit the doctor**.	1. Because they aim to prevent the progression of disease in advance. 2. Because they are increasingly aware of the importance of healthy lifestyles 3. Because they are afraid to die and want to live longer give them security. 4. Because they want to assure others they are in a good health condition. 5. Because they want to stay active, maintain a routine with tasks to complete, and improve their social interactions.
• **Technology might appear difficult** and they need and ask for help to use it.	1. Because they have low cognitive learning ability, which results in memory issues and difficulty remembering the steps required to complete a task. 2. Because they are afraid of technologies that can't control of 3. Because they are not born in a technological age and they are not used to basic signifiers. 4. Because they could face fraud and privacy related issues. 5. Because they are not willing to change behavior. They feel safer in their comfort zone.

Problem Statement & Reframing

After analyzing the reasons behind the problem to better identify **user personas** and **needs**, we collected and aggregated **user stories**.

As a 75 year-old with a short memory.
I want to have a reminder of what and when to take my medicine.
So that I don't forget to do it.

As a grandma living alone.
I want to talk about how I feel today.
So that I will feel better

As a elderly who needs to see the doctor regularly.
I want to access to healthcare system for booking doctor visits.
So that I can easily schedule appointments independently

As a elderly with chronic health issues.
I want to monitor my healthcare daily.
So that I can be prepared for emergencies.

As an extremely healthy and confident senior.
I want to access and browse the internet for healthy purposes.
So that I can be more independent.

As a disabled elderly person.
I want to receive healthcare everywhere.
So that I don't need to go out.

As a 80 year-old widow without friends and relatives.
I want to promptly check my health status.
So that I can feel safe.

As an elderly with low-tech ability.
I want to understand and use an app to easily manage my health issues.
So that I can plan and track my health effectively

As a caregiver.
I want to take care of my patients.
So that I can keep track of their conditions at fingertips.

As a sick 75 year-old senior.
I want to know my health status and how I can be healthier.
So that I can live longer.

As a 75 year-old elderly with low tech proficiency.
I want to manage and handle my own reports.
So that I won't need to ask my children for help every time.

As a elderly with eating disorders.
I want to receive suggestions and plans for meals.
So that I can ensure adequate nutritional intake.

[Fig10] User Stories

Based on the insights we gained through our analysis, using the **3W (Who, What, Why) 1H (How)** methodology, we further refined and validated our findings to develop and articulate our Problem Statement as detailed below:

Elderly people (75+) need tailored help to use online healthcare platforms for appointments and tracking their health because services moved online and they have low tech skills.

User *User characteristics*

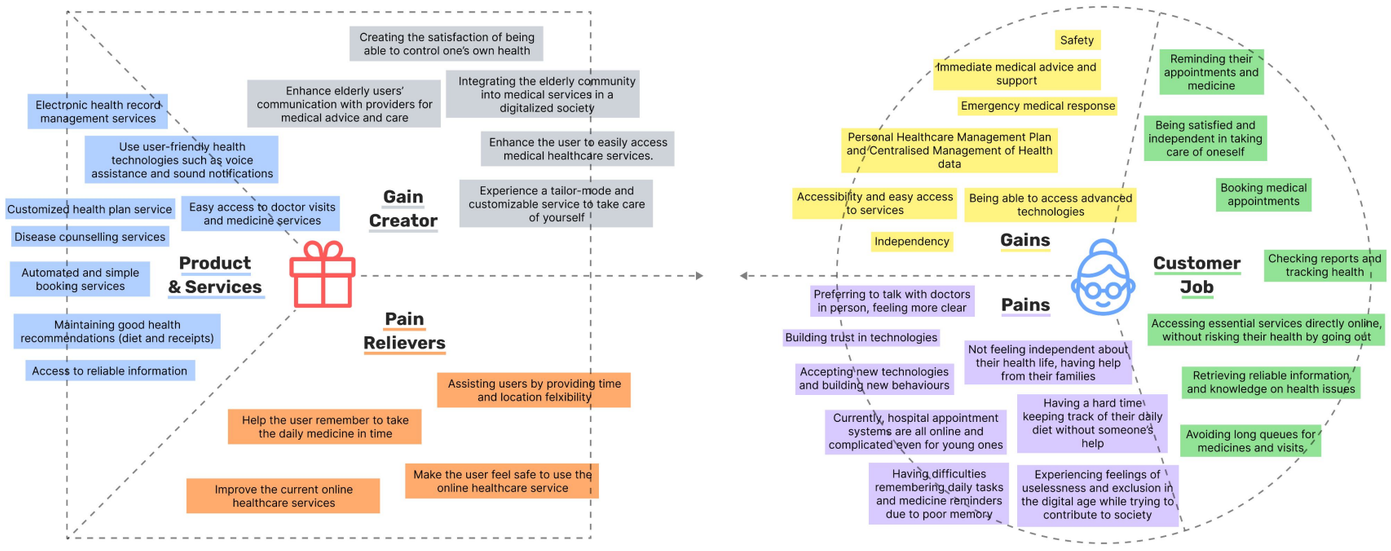
WHO **Elderly** individuals, typically aged 75 and above, have low technological proficiency.

WHAT Healthcare services are **transitioning online**, posing challenges for elderly individuals to manage their health conditions **independently** and **benefit** from it.

Insight

WHY They require access to timely medical care to maintain their health, strive for increased independence, and avoid being marginalized by the digitalization of healthcare, especially as they may face challenges navigating new technologies.

HOW By leveraging AI technology to provide personalized support for accessing medical services, getting the better healthcare experience, offering tailored assistance to simplify the process and empower elderly users to integrate more effectively into society.



[Fig11] Value Proposition Canvas

After framing the problem statement, we used the **Value Proposition Canvas** to further refine and validate our findings and reframe the problem statement. In the the Value Proposition Canvas we cover the following areas:

Products & Services

Specific products and services that we provide to seniors to **meet their daily needs** and enhance **their quality of life**.

Customer Jobs

Tasks to be performed and needs to be met by older persons.

Gain Creators

Positive outcomes and benefits we can create for older people through our products and services.

Gain

Benefits and improvements that older people hope to gain from using our products and services.

Pain Relievers

Specific problems and pain points that we help older adults solve or alleviate through our products and services.

Pain

Difficulties and challenges that older people face in their daily lives.

Reframe the Problem Statement

Problem Framing

- Most of the elderly can't use digital devices for medical purposes.

Problem ReFraming

Today's online medical platforms are inaccessible, difficult to use, and not inclusive enough.

Solutions

- Teach them to use the digital devices/ platforms.

New Solutions

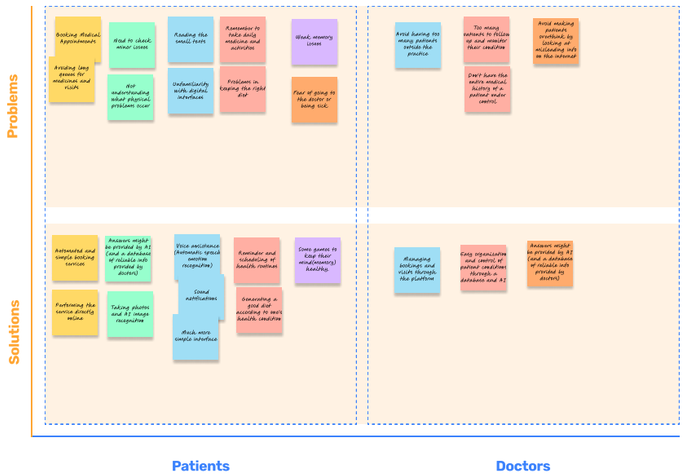
- Make it more user friendly and more accessible;
- Use AI for personalized assistance.

Design the Service

Ideation Process

Envision the Idea

To better solve the problems, we use "**IDEO How Might We questions**" to turn challenges into design opportunities by reframing insight statements and solutions. After formulating HMW questions, we **brainstorm** from both the patient's and doctor's perspectives, listing potential problems and corresponding solutions.



[Fig12] Brainstorming

HMW

How might we ensure elderly individuals aged 65+ with low technological proficiency effectively utilize online healthcare platforms for appointment scheduling and health tracking fostering inclusivity and accessibility in healthcare?

Envision the Idea with AI

To explore how AI can help elderly individuals aged 75+ with low technological proficiency effectively use online healthcare platforms, we focused on **AI's potential** for **appointment scheduling** and **health tracking**. This aims to foster inclusivity and accessibility in healthcare. We aimed to use **classification, clustering**, and **forecasting** in the project, identifying required datasets and relevant AI techniques, and presenting and motivating them.

Issue Setting
As healthcare increasingly adopts online platforms, it's crucial to ensure accessibility and personalized care for elderly individuals aged 75+.

Questions
1. Is comprehensive data available on patient health conditions and histories for effective tracking and monitoring?
2. Are there accessible medical knowledge databases for preventive healthcare tailored to the elderly?
3. Can we access reliable health information sources to better inform healthcare decisions and interventions for the elderly?

Characteristics of Data Include:

1. **User Personal Data**
   - Source: SPID Data (https://www.spid.gov.it/)
2. **Health Data**
   - Health History: Fascicolo Sanitario (http://www.fascicolosanitario.regione.lombardia.it)
3. **Common Health/Medical Databases**
   - EMA Medicines Database (https://www.ema.europa.eu/en/medicines)
   - WHO Data Collections (https://www.who.int/data/collections)
   - Italian Health Data (https://www.dati.salute.gov.it/dati/homeDataset.jsp)

Case Studies

Sanvello

Sanvello is a mental health app designed to help users manage stress, anxiety, and depression using tools from cognitive behavioral therapy (CBT). The app was rapidly prototyped using Ionic, allowing **for quick iterations based on user feedback**.

Health Hero

Heroes Health supports the mental health of healthcare workers. The app collects real-world data through surveys and assessments, **offering timely mental health resources based on user input**. The app has been adopted by numerous hospitals and healthcare institutions across the US, providing critical support to thousands of frontline workers

Wysa

Wysa is an **AI-driven mental health** app that offers text-based emotional support, self-help tools, and access to human coaches. It has been used by various organizations to support employee mental health and reduce distress levels.

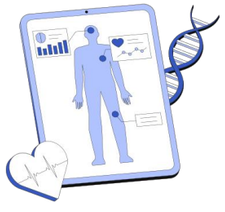
Uplyfe

Uplyfe is an AI-powered health app designed to help users improve their health through **personalized recommendations** on nutrition and exercise.

Service Concept

Service idea

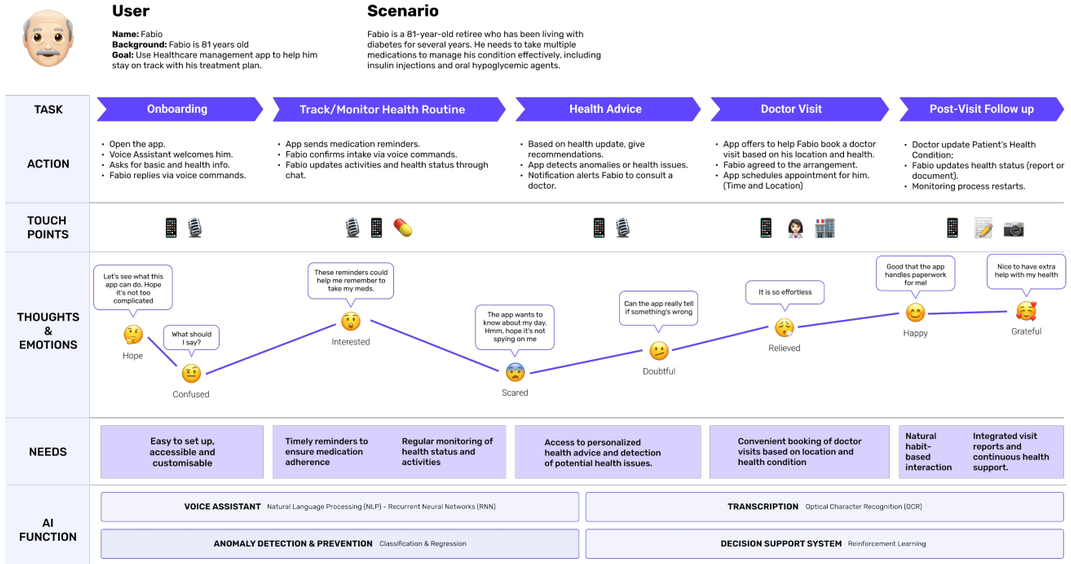
After the ideation process, we thought deeply and asked ourselves: what is our idea? What is its function? Then,we came up with a preliminary service idea.



An **Healthcare** management **system** to facilitate seniors to **monitor their health conditions** to obtain **customized healthcare.**

User Journey Map

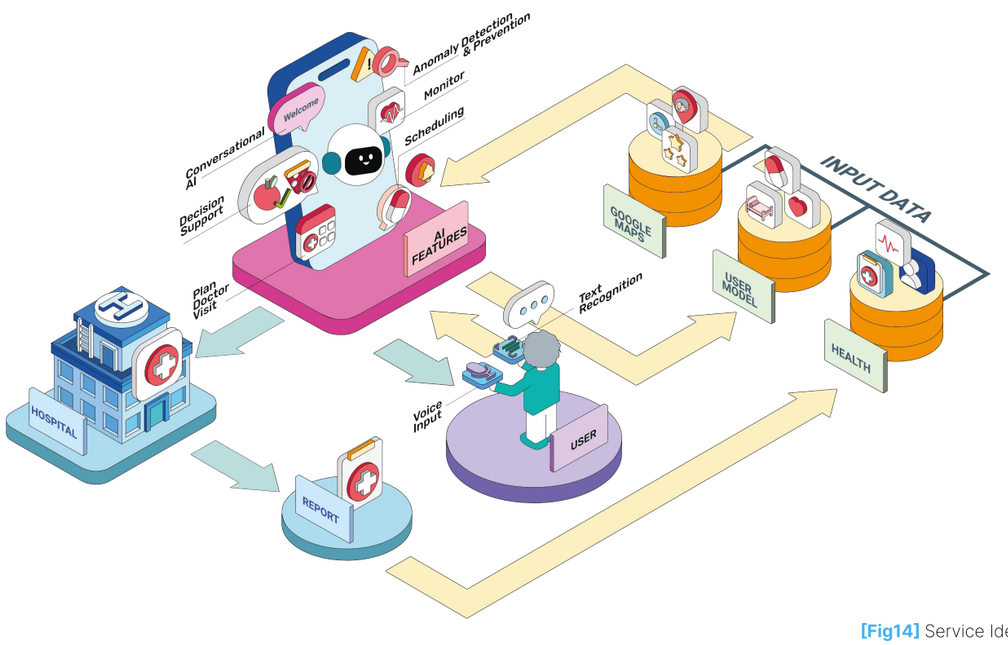
In order to further optimise the service concept, we have created a **User Journey Map** to help us identify opportunities for improvement in order to gain a deeper understanding of the **stages**, **touchpoints** and **emotions** that users experience when using the service.



[Fig13] User Journey Map

Final Service Concept

In the final service concept, we combined the **AI function** and **key features** (AI-Powered Assistant, Health Monitoring, Medication Management, Appointment Scheduling) of the whole service system, and drew a service system diagram, which describes the flow between the systems in detail (including the input & output of data)



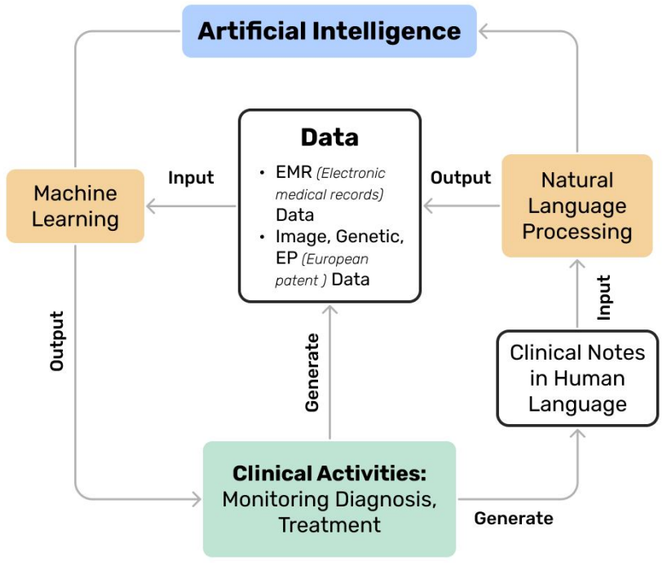
[Fig14] Service Idea

AI System

In this section, we will explain how we **designed** our AI system, how we **collect** and **process** data, and why AI is crucial in the medical field. Additionally, we will address concerns and **limitations** related to current AI capabilities and its integration into healthcare.

Understanding our users' needs was our first step. We designed our system to solve specific problems and meet these needs effectively by following these steps:

1. **Formulate Objectives**: We defined our goals and identified the problems we wanted to solve with AI.
2. **Identify Data Requirements**: We determined the types of data we needed and what was available.
3. **Describe Datasets**: We detailed the characteristics of the data we would use.
4. **Process Description**: We mapped out how we would use models and algorithms to process the data and generate useful outputs.



[Fig15] Machine Learning and Natural Language Processing in healthcare

AI in Healthcare

Artificial Intelligence significantly **enhances healthcare** by learning from large datasets to assist in treatment design and risk assessment, extracting information for real-time health risk alerts, reducing diagnostic and therapeutic errors.

It provides physicians with up-to-date medical information, manages medical records, and analyzes healthcare performance.

AI also accelerates the development of precision medicine and new drugs by processing genetic data faster, and offers digital consultations and health monitoring services, effectively acting as "digital nurses" or "health bots." [2]

[2] Sciforce (2021)

Data Collection and Analysis

Our system will need various types of data to provide comprehensive healthcare monitoring:

- **Healthcare Datasets**: Extensive collections of information related to patients' health, including medical history, diagnostic test results, medication usage, and demographic information. These datasets are used for clinical research, public health monitoring, and quality improvement initiatives. Analyzing these complex datasets can provide insights into patient health outcomes and help develop targeted interventions. [3]
- **Patient Historical Data**: Includes prescriptions, services received, reports, and medical documents.
- **World Health Data**: Contains global health procedures and values for a broader context.
- **Patient SPID Data:** Basic personal information such as name, date of birth, and residence.
- **User Model Data**: Tracks user activities, health metrics, and feedback data gathered from the use and behavior of the application.

We considered data gathering from the **Italian Electronic Health Record** (Fascicolo Sanitario Elettronico), which integrates patient data from multiple sources. This data, processed by **HL7 FHIR,** provides a comprehensive view of each patient's health and can be used for prevention, treatment, and research purposes. [Fig16]

AI Core

Our AI system has several key components designed to address the specific needs of elderly healthcare:

Anomaly Detection & Prevention

Crucial for identifying unusual health patterns early. [4] Using machine learning algorithms, we monitor **health metrics** like blood pressure, glucose levels, and heart rate. If the system detects something unusual, it **alerts** healthcare providers and suggests preventive measures. By both applying supervised and unsupervised learning, including **classification** for anomaly detection and **regression** for predicting future uncertainties. [5]

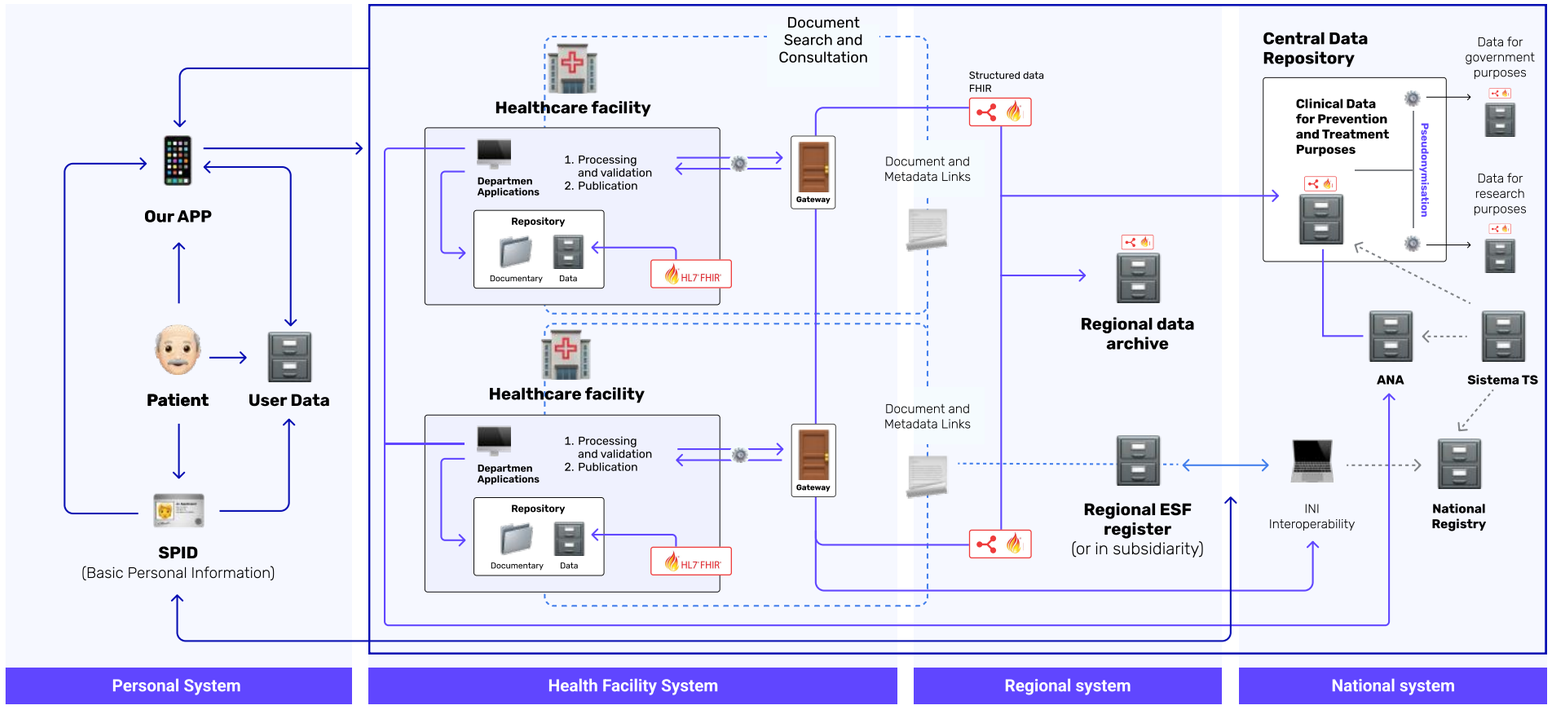
Dialogue Manager

It helps users interact with the system naturally. Using **natural language processing (NLP)**, it understands and responds to user queries, assists with navigation and completes various commands and requests. This component adapts to the user's language and preferences, making the system more user-friendly. [5]

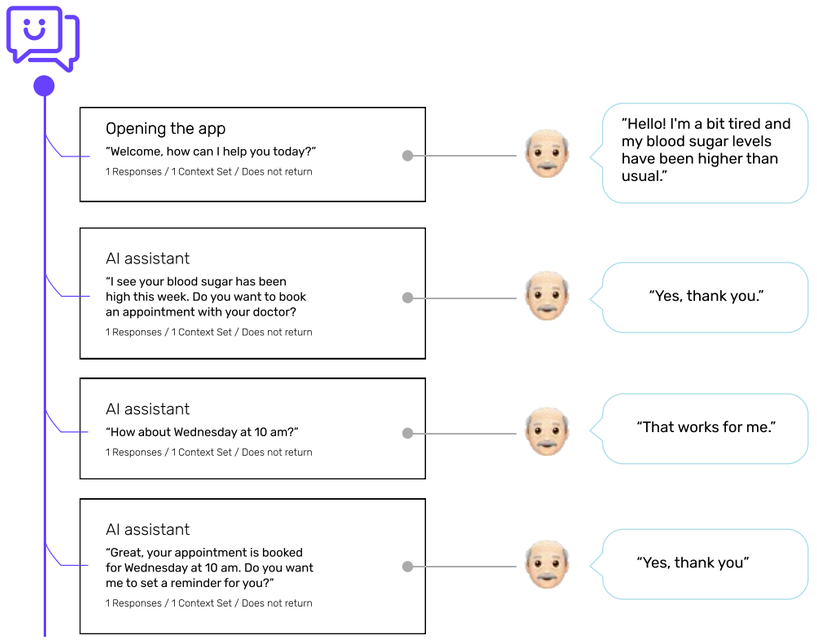
[3](Mangia, 2022)

[4](Teo, J. S. M., Abu-Ghoush, Z. S., Yang, H., & Young, J. D. (2023))

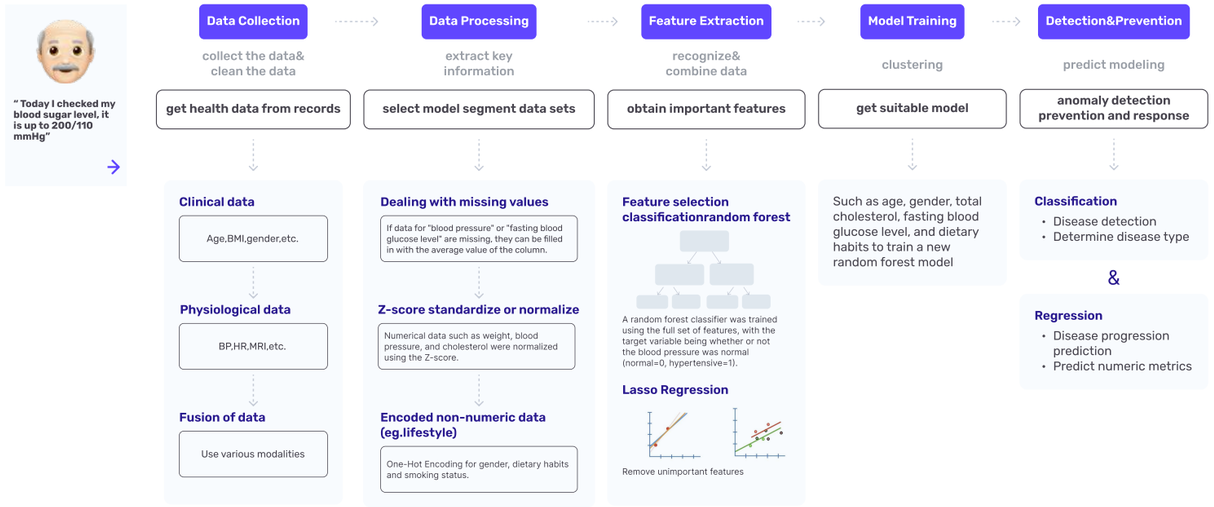
[5](Li et al., 2023)



[Fig16] Italian Healthcare Information System



[Fig17] Conversation AI Example



[Fig18] Data Collection and Processing Workflow for Anomaly Detection & Prevention in Elderly Healthcare

Text Detection

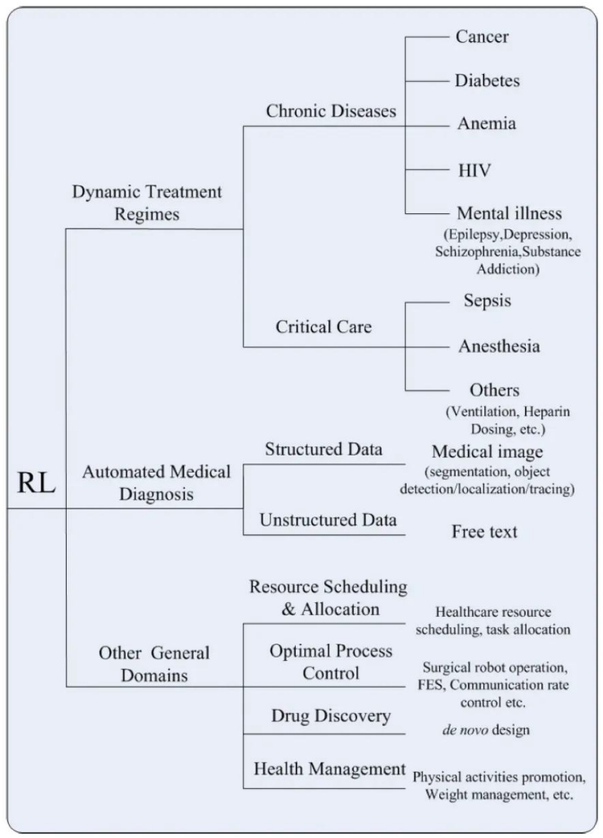
Uses optical character recognition **(OCR)** to read and understand text from medical records or medicine packaging. This technology is particularly helpful for users with **vision problems.** The OCR process involves several steps: acquiring non-editable text content, preprocessing to clean up the source imagery, segmenting and extracting features, training a neural network model, and verifying the results. [6]

Decision Support System

Aids healthcare providers by offering recommendations based on evidence. Using **reinforcement learning**, the system learns from past interactions to suggest **personalized** health activities and schedule appointments. It provides actionable insights based on patient data to enhance care.[7]

[7](DiploDoc, 2023)

[6] (Itransition, n.d.)



[Fig19] Reinforcement Learning Applications in Elderly Healthcare

Further Research

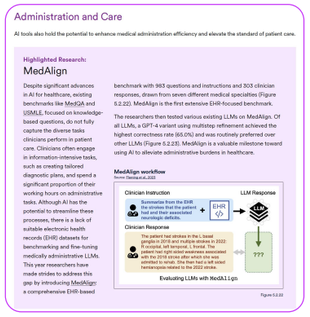
While AI is transforming healthcare, there are still areas we need to explore further:

1. **Ethical Considerations**: Ensuring the ethical use of AI, particularly concerning patient privacy and data security.
2. **Accuracy and Trust**: Addressing the limitations of AI in **medical diagnosis** and building user **trust**. Current AI systems can't guarantee **100% accuracy**, and both patients and clinicians might hesitate to fully rely on AI for medical decisions. Ongoing validation in real-world settings is necessary to build confidence in our system. [8]

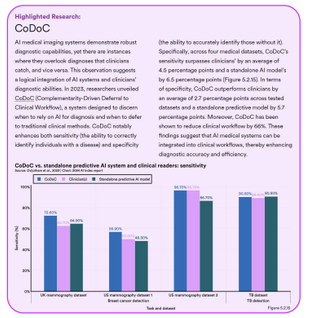
By focusing on these areas in future research, we can enhance our AI system's ability to provide personalized, high-quality healthcare for the elderly. This might make healthcare services more accessible, inclusive, and reliable.

[8](AI Index Report 2024 – Artificial Intelligence Index, n.d.)

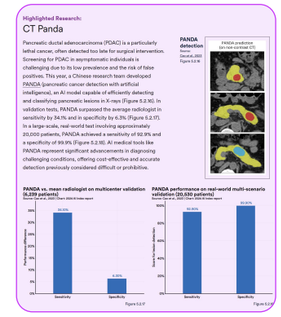
For enhance medical administration efficiency



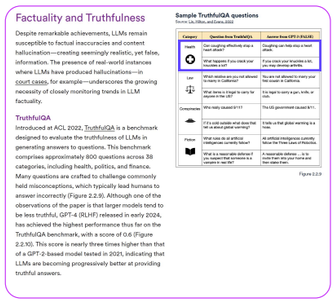
For diagnosis purposes



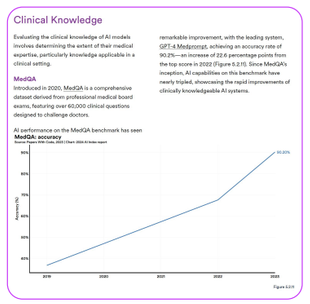
Disease anomaly detection



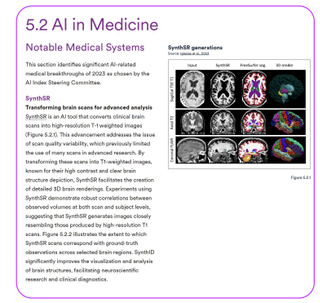
To provide medication information



To answer medical knowledge better



To generate better resources in medicine



[Fig20] Advancement of AI in the Medical Field

User Interface

In this section, we will discuss how we designed the user interface (UI) for our application tailored to the elderly. Our goal was to make the app **easy to use** and **accessible** to current **healthcare facilities** and **medical services** through advanced AI functions and a user-friendly interface design

Design for Elderly

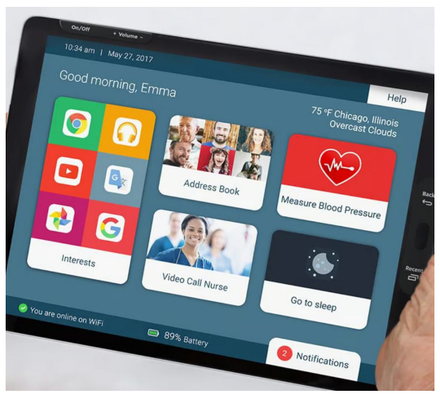
Designing for the elderly requires thoughtful consideration to ensure the user interface is both accessible and easy to navigate. We adopted several principles to make our application user-friendly for seniors. After some preliminary research about designing UI and UX for the elderly, we identified key principles to guide our design:

1. **Simplicity and Clarity**: We aimed to simplify interactions by reducing the complexity of the interface, minimising the number of steps required to complete tasks, and ensuring that navigation is intuitive. [9]
2. **Readable Text**: Ensuring that all text is large and legible with high contrast to accommodate those with visual impairments. We use clear fonts and avoid complex typefaces.[10]
3. **Accessible Controls**: Interactive elements like buttons and links are designed to be easily tappable, considering reduced motor skills. This includes larger touch targets and adequate spacing between elements. [11]
4. **Feedback and Confirmation**: Providing clear feedback for actions taken within the app to help users understand the results of their interactions. Confirmation messages for critical actions prevent accidental errors.
5. **Help and Support**: Offering accessible help options, including voice assistance and camera features, ensure users can get assistance when needed.

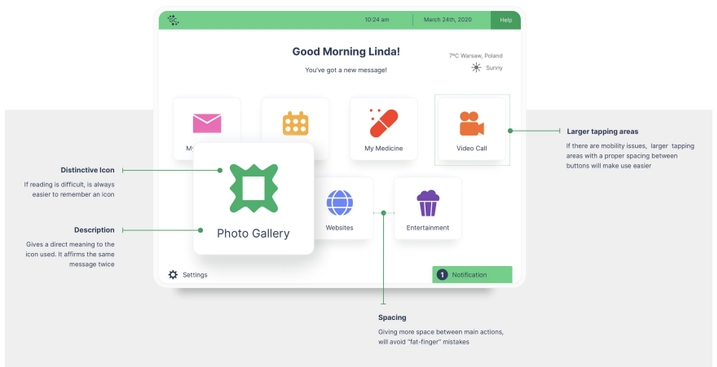
[9] (AARP Research, 2021)

[10] (Frog Voices, n.d.)

[11] (Kłosiński et al., 2024)



[Fig21] (Toptal, n.d.) - Case Study



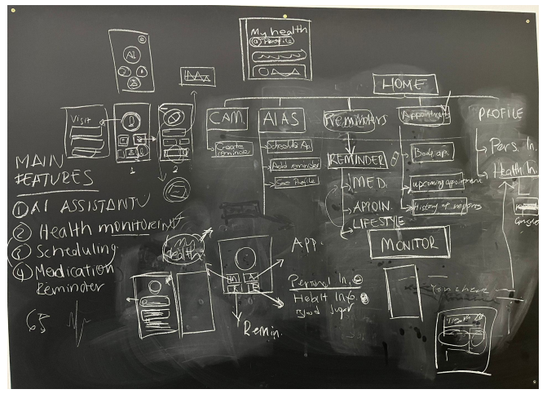
[Fig22] Design for Senior Case Study: https://www.behance.net/gallery/95891617/Design-for-Seniors

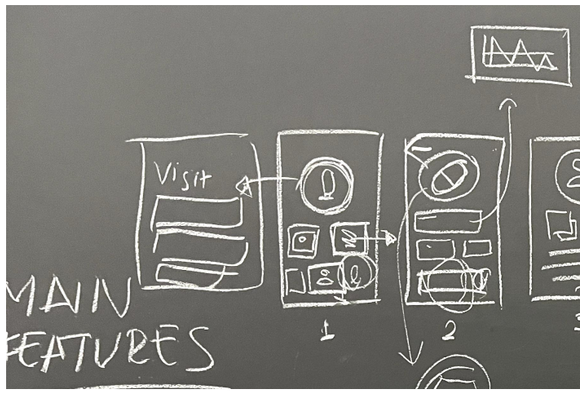
Design Process

Information Architecture

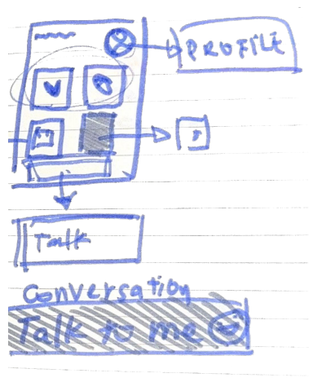
We began by designing the service content and selecting the AI technologies to be integrated, focusing on the **primary functions** offered by our service. Initially, we dedicated time to discussing and **categorizing** the content, assigning appropriat**e names** to each section, and organizing them into a comprehensive **hierarchy**. Our goal is to maintain simplicity to ensure clear and **straightforward navigation** tailored to our user personas.

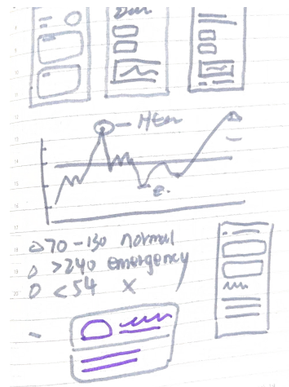
[Fig23] Information Architecture

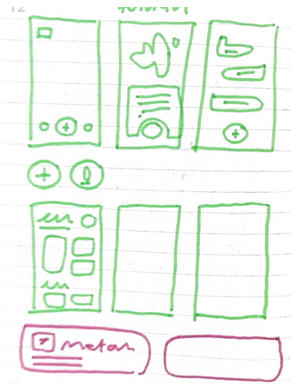




[Fig24] Information Architecture and Wireframe Sketches



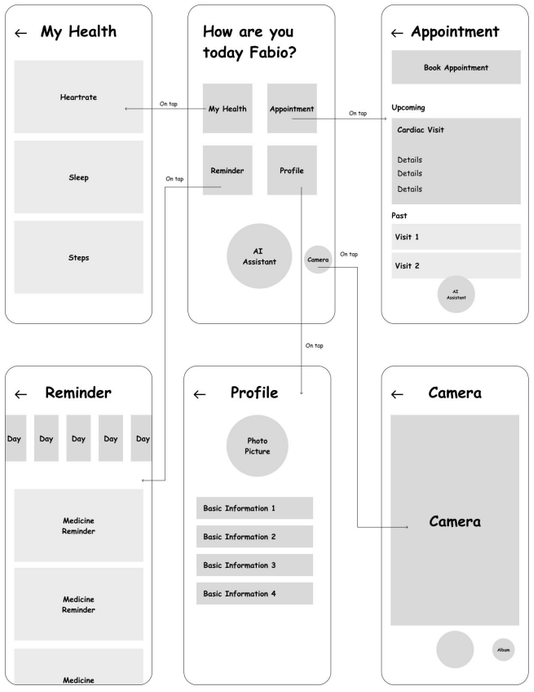




[Fig25] Information Architecture and Wireframe Sketches

Paper and Digital Wireframe

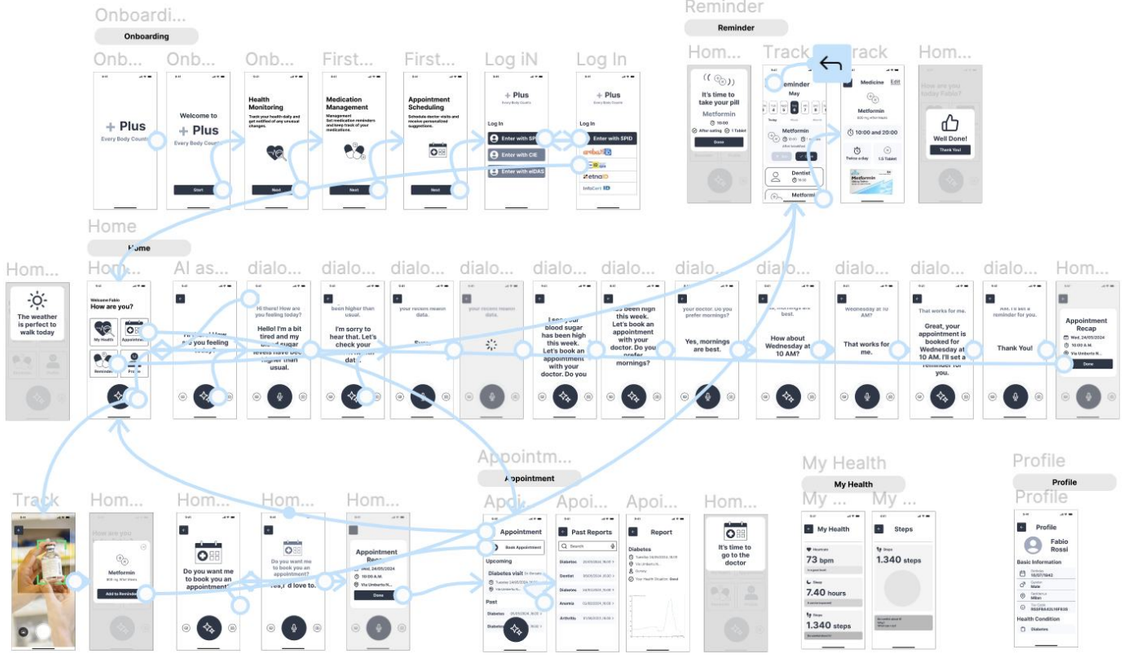
We began with sketches on paper [Fig26], which allowed us to think **creatively** and **iteratively**. This process facilitated team discussions and helped us find optimal solutions for content placement and layout. Once we finalized the paper sketches, we transitioned to **digital wireframes** to create basic visual representations focused on **structure** and **layout**. [Fig27]



[Fig26] Digital Wireframe

Lo-Fi Prototype

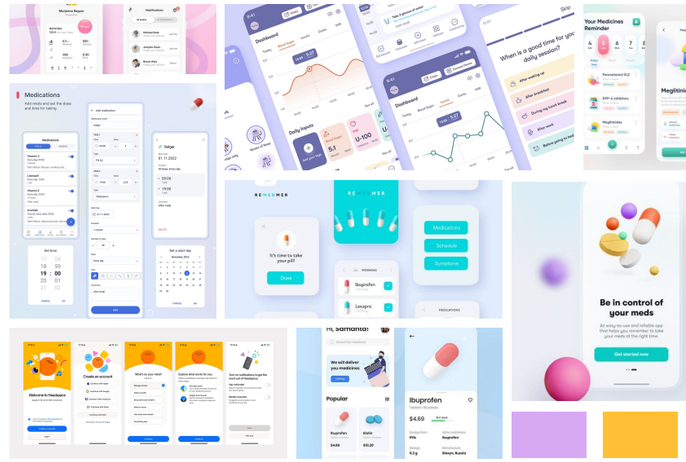
After creating the digital wireframes, we developed a low-fidelity prototype in Figma. This step added basic **interactivity**, simulating **user flows**. We tested navigation and functionality, identifying effective elements and pinpointing any issues. This early testing ensured the user interface was **intuitive** and aligned with our design goals.



[Fig27] Lo-fi Prototype

Moodboard and Benchmarking

Creating a moodboard was crucial for the design process and development. It helped us define the **look** and **feel** of the UI by referencing existing medical applications. **Benchmarking** was continuously used throughout the design process to ensure that our elements were consistent with current applications on the market and respected normal **user behaviour** and **mental model** processes.



[Fig28] Moodboard and Benchmarking

Design System

Every element, including graphics, icons, and illustrations, was carefully chosen and designed to suit our users' needs.

Typography

We chose the font "**Inter**" to ensure readability, influenced by its large font sizes. We considered a minimum font size of **16 pt** for clarity.

Colors and Icons

Icons play a crucial role in the application by **assisting** users in finding content and making **explanations** more **visible**. We spent significant time selecting colors to ensure they adhered to **accessibility principles**. All color combinations were checked using **Stark - Contrast & Accessibility Checker.** [12]

Icons

Inter

Regular | Medium | Bold

Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk Ll Mm Nn
Oo Pp Qq Rr Ss Tt Uu Vv Ww Xx Yy Zz

0 1 2 3 4 5 6 7 8 9

ABCabc

[12] https://www.figma.com/community/plugin/732603254453395948/stark-contrast-accessibility-checker

Brand

#A3ACF9 #F4975E

Primary

#D3EAFF #FFE3A5 #FFDCC8 #E1EF9E #EAF0FF

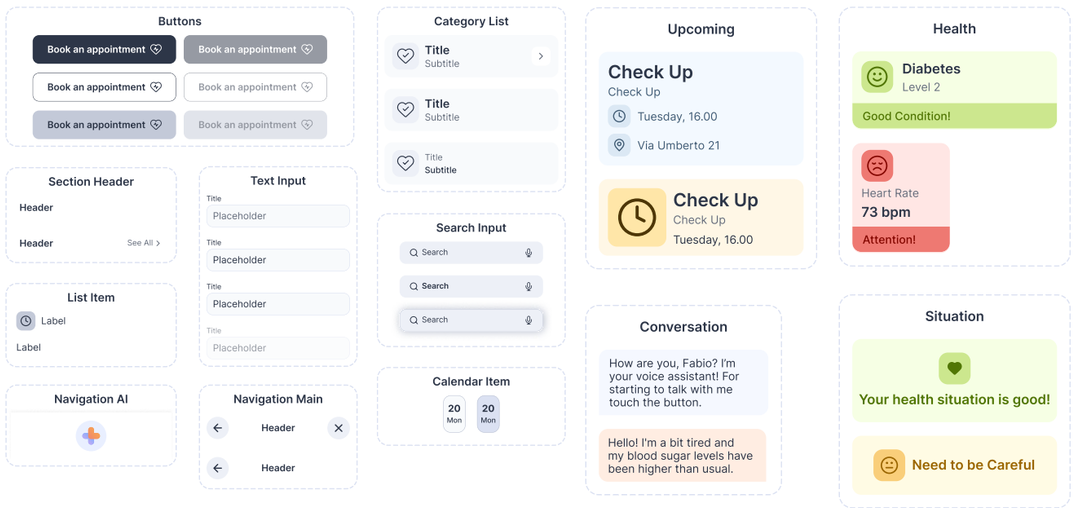
Branding

We designed the **logo** and **tagline** to create an **identity** for our service. Our service is called "**Plus, EveryBody Counts.**" The logo consists of two hearts combined to form a "**+**" symbol, suggesting health, care, well-being, and inclusivity. The tagline "EveryBody Counts" highlights the **friendly**, **inclusive** nature of the application.

[Fig29] Logo Design

Components

Designing the final user interface involved extensive trials and a long process. During the design phase, we created all the components, ensuring that the application and content remained as **consistent** as possible. [Fig30] [Fig31]



[Fig30] Components

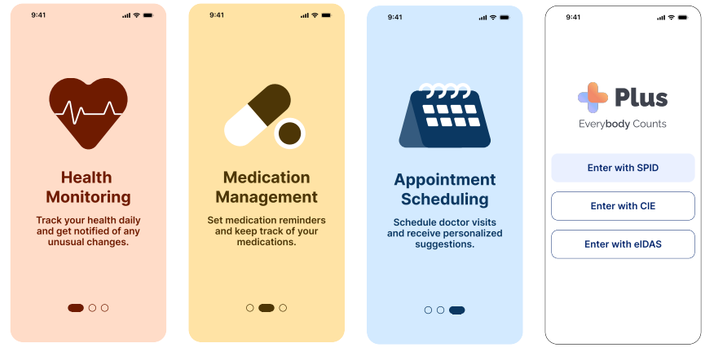
[Fig31] Card Components

Hi-fi Prototype

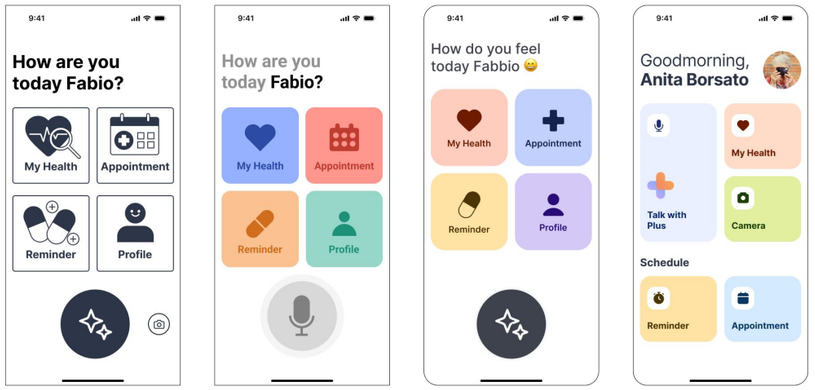
In the final prototype, we developed the main functions into a UI, translating AI functions into visual elements.

Onboarding

During the onboarding process, users are given a brief introduction to the "Plus" application. This includes an overview of the app's features and how it can assist them in managing their health. The onboarding also guides users through the process of accessing their electronic medical records using their **SPID credentials.** This **secure login** method ensures that users can safely access and manage their personal health information within the app.



[Fig32] Onboarding



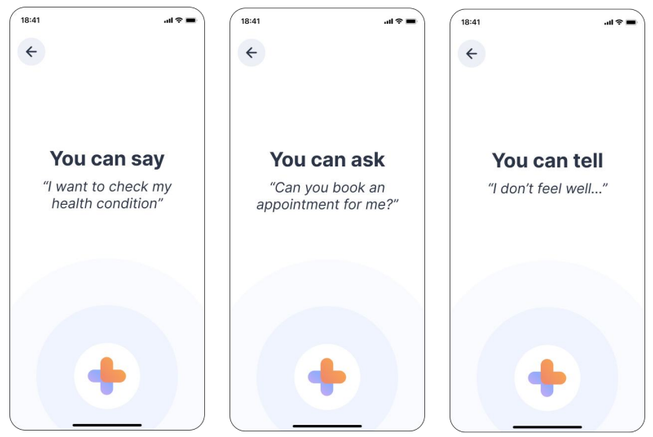
[Fig33] Home Page Design Development

Home Page

The home page embeds all the main functions of the application. Users can **easily find** everything they need in a dashboard.

Home Page

Implementing the voice assistant was challenging in both the UI and prototype phases. We considered how the assistant should look, the types of conversations it should handle, and the type of help it should provide. [Fig34] Using **Protopie** for the prototyping phase, we incorporated voice command functions to simulate interactions. This is how conversational AI is translated into the user interface. The AI-powered voice assistant uses natural language processing (NLP) to understand and respond to user queries and **assists** with **tasks** such as setting reminders, providing health tips, and navigating the app.



[Fig34] Tutorial on How to Interact with the AI Assistant

Camera

The camera function, developed using optical character recognition (OCR) technologies, helps elderly users **quickly add medicine reminders** and access necessary information, especially for those with **vision problems**. The AI analyzes the text captured by the camera, extracting relevant information such as medication names and dosages. This data is then used to automatically create reminders and provide users with clear, **easy-to-read information** about their medications.

My Health

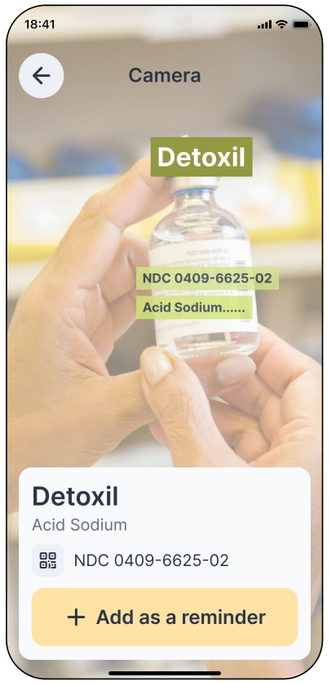
The My Health section includes all health data about the patient, helping them **manage** their **health condition** effectively. We used colored and large cards to make the information easy to understand, with data visualizations illustrating health conditions clearly. In this section, the main AI technology used is **anomaly detection** and **prevention**. AI algorithms continuously monitor health metrics like blood pressure, glucose levels, and heart rate, translating this **data into graphs** and **cards** for easy interpretation. This allows for early **detection of potential health issues** and timely **intervention**.

Reminder

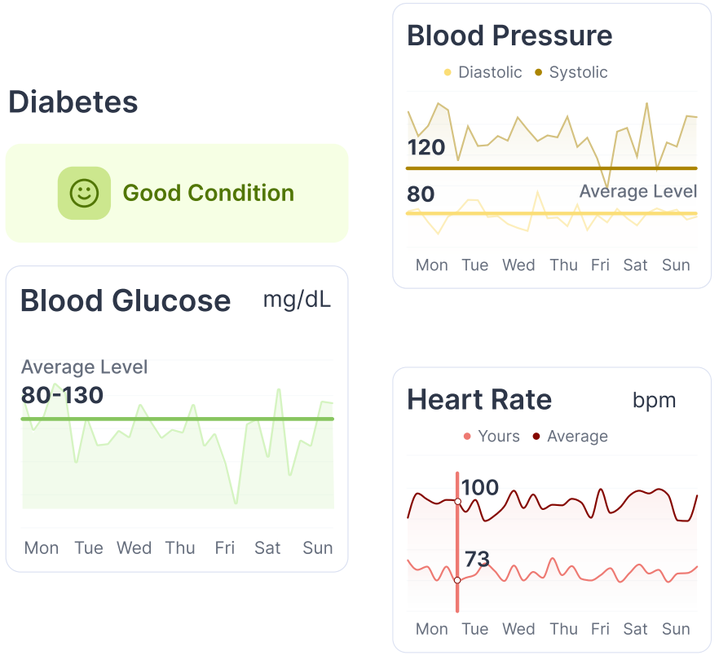
Plus offers reminders for medication intake, doctor visits, and additional activities based on health data. Reminder **cards pop up** to inform users about medications, including dosage and completion status. Notifications are also sent to ensure users do not miss their medications or appointments. The **AI** analyzes health data and **user behavior** to personalize reminders, making them more effective.

Appointment

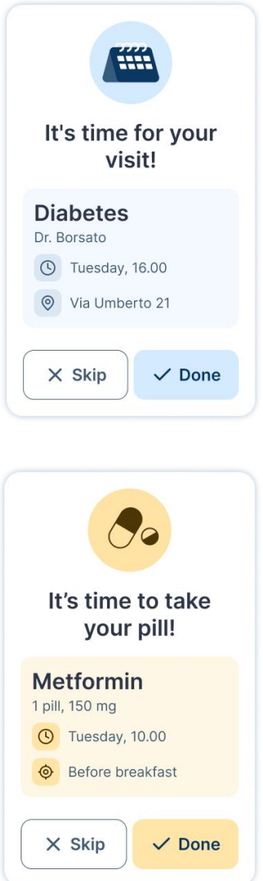
The appointment function helps users access healthcare services, manage past reports, and book appointments. AI **suggests** the **best solutions** for them based on their health condition, location, and time, helping them choose **suitable** visits. The AI uses **reinforcement learning** to improve its recommendations over time, ensuring that users receive the most relevant and convenient healthcare options.



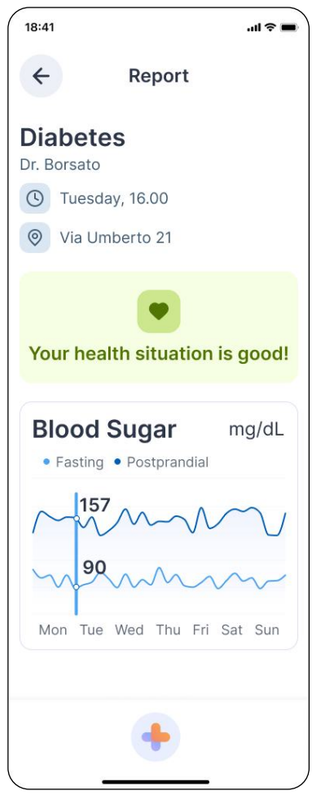
[Fig35] Camera Function

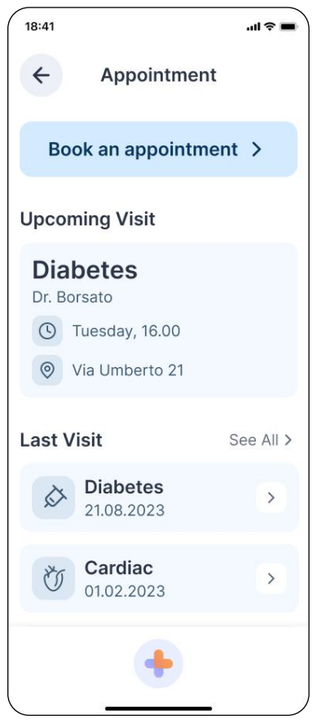


[Fig36] My Health Data



[Fig37] Reminder Cards Pop Up





[Fig38] Appointment Booking

User Testing

Action Plan

Participants	Around **5 elderly** (for quick iteration and qualitative data)
Location	Parco Sempione
Time	9:30
Goal	1. Evaluate the **effectiveness** of the **flow** (Information Architecture). 2. Assess if the **naming** and **content** are well grouped. 3. Determine if all **UI elements** are well perceived. 4. Understand users' **emotions** and if the application meets their **needs** and **expectations** (User Experience)
Methodology	**1. Task Analysis**: Evaluate the flow, content, and UI elements. • Users will be asked to complete 5 specific tasks. **1. Think Aloud Protocol**: Users will verbalize their thoughts while completing tasks. **2. Questionnaire:** Collect qualitative data on user experience and feedback.
Roles	**1. Facilitator:** Introduces the project and provides instructions. **2. Assistant:** Helps prepare the phone and computer (ensures Protopie functions correctly). **3. Note Taker:** Records detailed notes during the testing sessions.

1. Observe seniors in the park.

2. Introduce the project and provide instructions.

3. Prepare the computer and phone, ensuring ProtoPie functions correctly.

4. Take detailed notes during the test sessions.

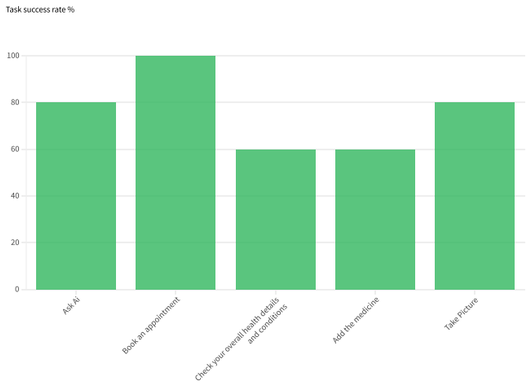
5. She enjoyed our app and provided a lot of feedback.

6. Try the AI voice assistant; he likes it!

[Fig39] User test process

[Fig40] User Test Record

Results

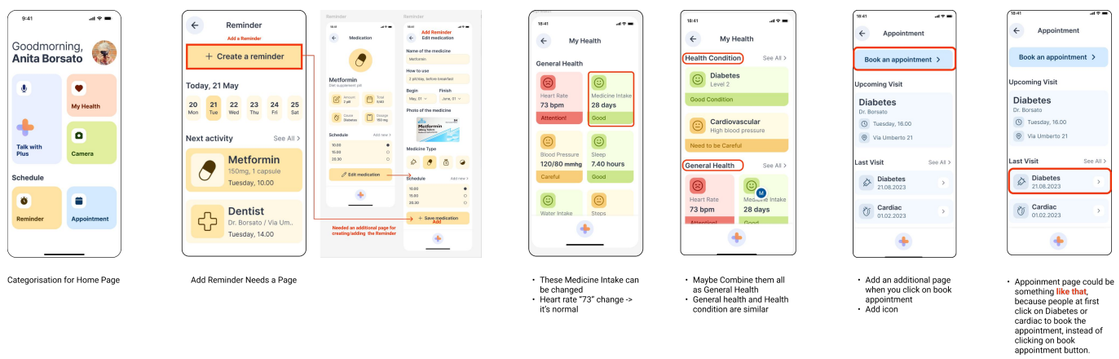


[Fig41] Task Efficiency

[Fig42] Task Satisfaction

Main Changes Required

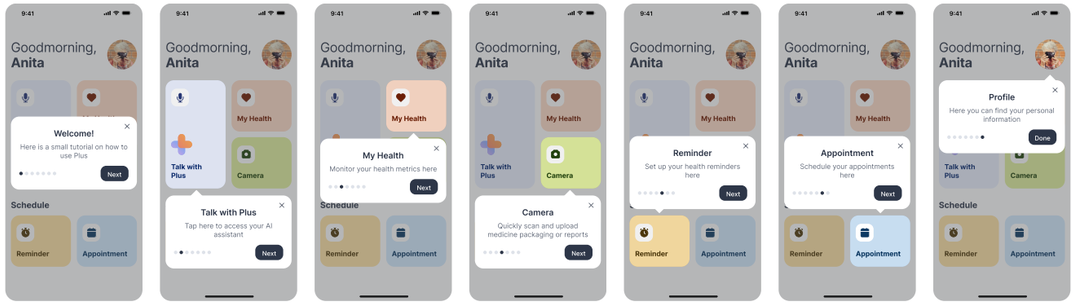
After conducting the user test, we summarized the data, analyzed, and discussed it. Finally, we identified what needed to be improved.



[Fig43] Improvements Requested

Improvements

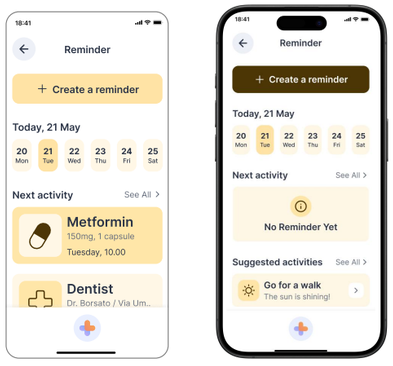
1. Add a tutorial part before entering the home page to make our app more accessible.



2. Reorganize the "**My Health**" page to make each section clearer.

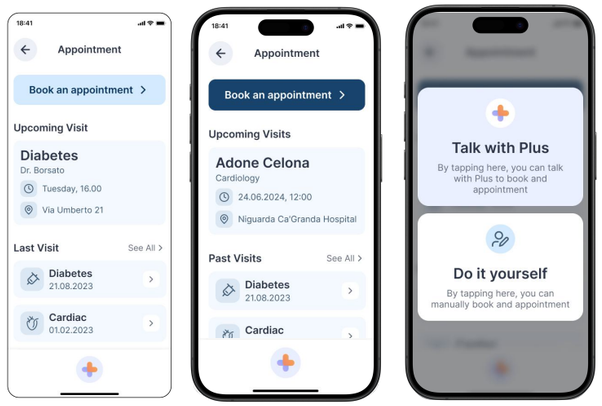
Before After

3. Improve the content on the "**Reminder**" page and reschedule the "**Add Medicine**" part.



Before After

4. Add a specific "**Book an Appointment**" page, giving users two choices: "**Talk with Plus**" and "**Do It Yourself**."



Before After

Conclusion

Following our user test, we observed several issues. Elderly users exhibited **faster actions** and **reactions** than expected, but some participants were hesitant to use AI. Additionally, the voice speed of the AI voice assistant was frequently reported as too slow.

Our findings provided valuable insights into **integrating AI technology** with design for elderly users. They emphasized the importance of making technology accessible to the elderly, aligning with the goal of "Leaving No One Behind in an Aging World."

However, several points require **further investigation**. Understanding the reasons behind user **hesitation** to adopt AI, beyond the scope of our current research, warrants deeper study. Additionally, determining the optimal voice speed for the AI voice assistant needs more research. Addressing these areas will be instrumental in enhancing the usability and effectiveness of AI-assisted health management platforms for the elderly.

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Appendix

This appendix summarizes tasks and data from our user test. Key metrics such as completion time, success rate, and error rate were recorded. User feedback on ease of use, satisfaction, and improvement suggestions was collected.

Task 1

Plus Every Body Counts
User Testing

You are not feeling well and want to ask Plus, your AI voice assistant, for advice.

Task 2

Plus Every Body Counts
User Testing

You often forget when to take your medicine and need help keeping track of your medication schedule.

Task 3

Plus Every Body Counts
User Testing

You are not feeling well and want to book an appointment with the doctor.

Task 4

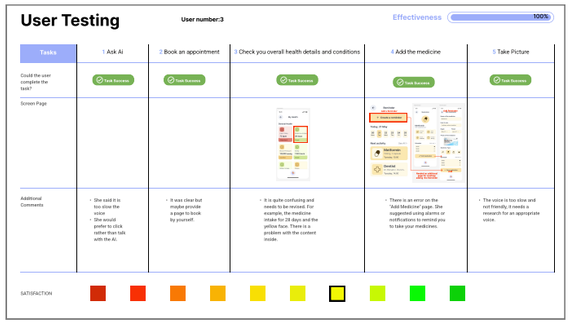
Plus Every Body Counts
User Testing

You want to review the details and conditions of your overall health.

Task 5

Plus Every Body Counts
User Testing

Due to poor vision, you need to take a photograph and utilize AI assistance to interpret the essential information about your medications.



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Digital and Interaction Design

ENVISIONING AI THROUGH DESIGN

A.Y. 2023/24

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