

Design and technology documentation

THE HOC

SO3

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Abstract

This document describes the development process of "The HOC" device, whose main goal is to interact with gadgets facilitating specific tasks for the elderly.

The statement of the identified problem is based on a detailed analysis of the needs and of the stakeholders, as well as taking into account the requirements for the system, based on the goals set.

Within the framework of this document it is considered how feasible it is to create such a device as the proposed solution, as well as to evaluate the prospects of this system in the implementation of such technology in daily life.

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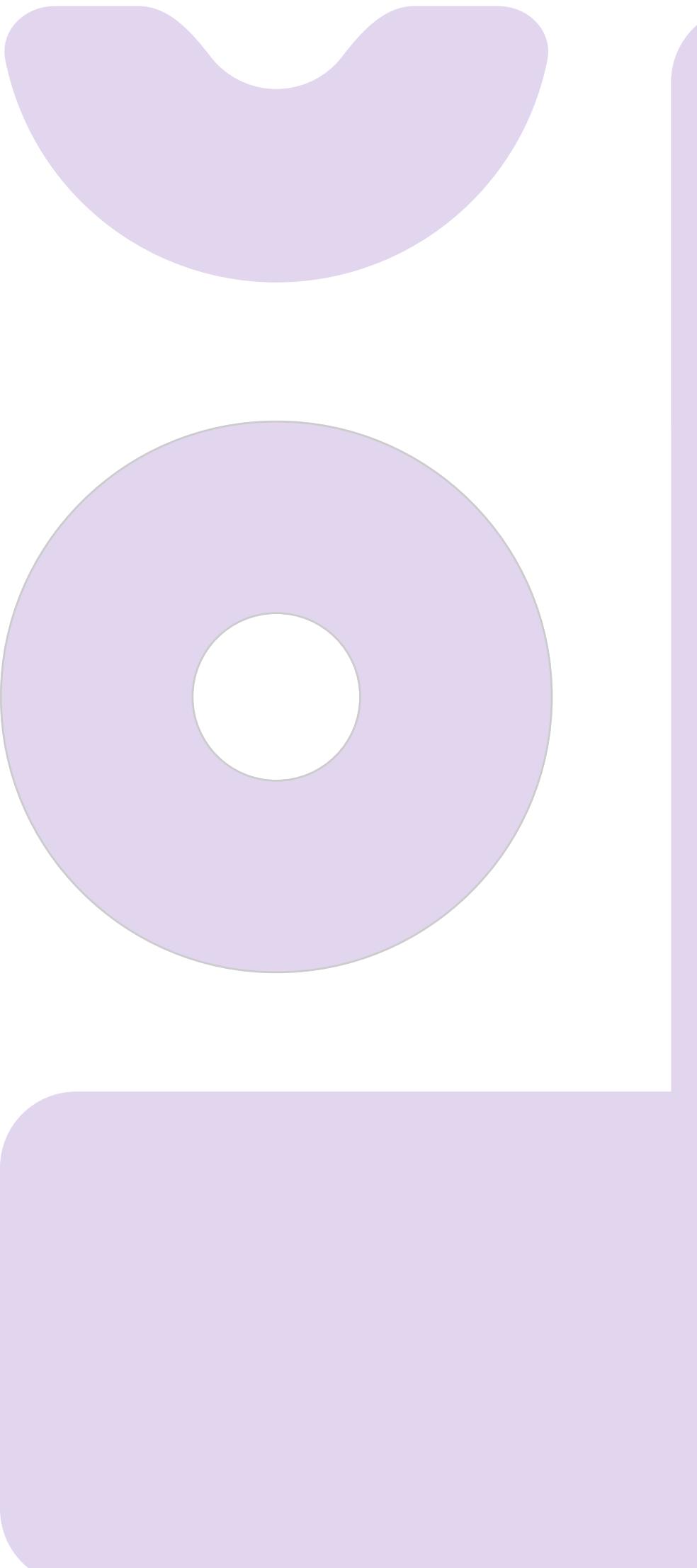
Introduction

The exponential growth in the usage of technologies in our everyday life has left the elderly confused. In combination with the problem of the Covid-19 pandemic, nowadays, the elderly are especially vulnerable. And, as quarantine times have shown, the younger generation may not always be able to be near and help the elderly.

As we live in a globalised world it is very difficult to be in the same place where the family is. Everything is based on remote interaction, it's incredibly important to keep in touch. Because if you're out of contact, it immediately brings a lot of anxiety to your loved ones. However, it is quite difficult for the older generation to master modern technology, even when it comes to cell phones.

That is, because of quarantine restrictions, many people are not only deprived of the opportunity to see their elderly parents and grandparents, they are also literally not always able to contact them by phone. Which brings a lot of problems and nerves in the already difficult circumstances of life.

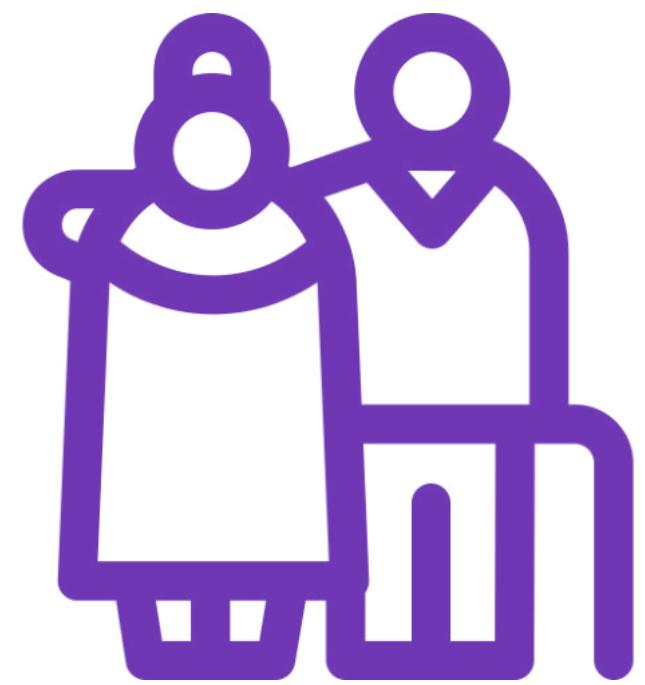
So, based on this problem, it was decided to create a device that would facilitate the interaction of elderly people with their personal gadgets, which, in turn, will allow to be in touch with their relatives, even if you are separated by cities or countries. That is why this document describes the actions taken by our team in the process of creating a device called "The HOC".



Requirements

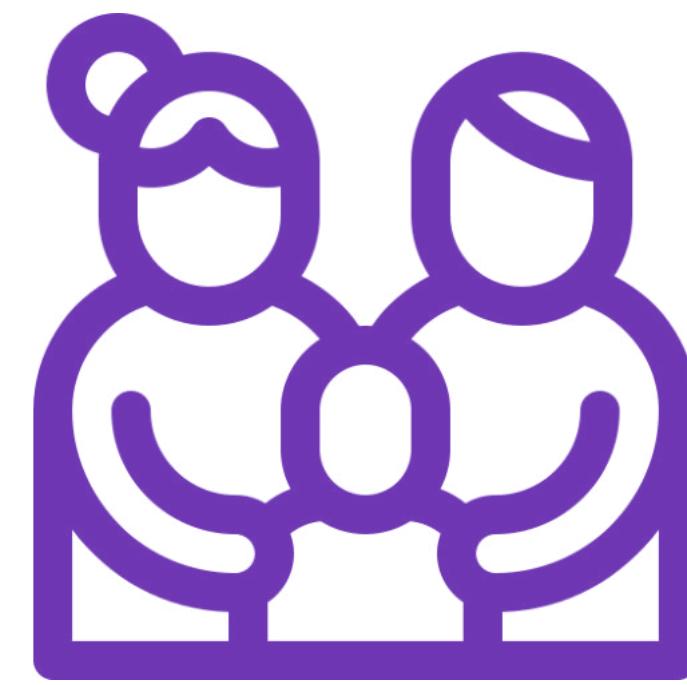
Stakeholders

At this point, there are several problems that we would like to address with our project work. We are talking about the fact that elderly people often have problems with mastering modern technology (including cell phones) - they have difficulty using gadgets. And also the point that with the onset of the pandemic, had to stick to isolation, family members are not always able to be near.



An elderly man or woman
(end-user)

After analysing the current situation, the main stakeholders in the use of the device created in the framework of the project are **elderly people**, as well as their **family members who live separately**.



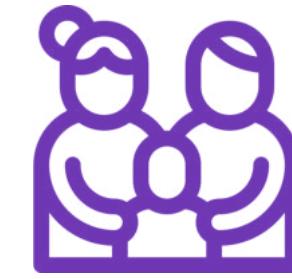
Family member
(son, daughter or grandchildren)

Requirements

Needs of the user



- To easily use the basic features of digital devices
- To be in touch with family members



- Remotely facilitate the elderly person's interaction with technology
- To stay in touch with the elderly person at all times

Context

Regarding the context within which the use of the device is envisioned:

- When the elderly person is at home (alone)
- When relatives are far away and unable to come quickly to provide assistance or simply to visit
- Or when there are severe quarantine restrictions

Requirements

Goals for the system, based on user needs

- Provide a user-friendly, adapted interface
- Connect people in a quick and easy way
- Be remotely controllable
- Provide a stable communication

Available restrictions

- Time: The deadline for the study course
- Human resources: 3 developers and 1 designer
- Social set-up: server capacity

Solution – UX Design

General approach

We propose a solution in creating a system based on a physical portable smart object called "The HOC", which will have the basic functionality of modern digital devices. Management will be possible by scanning identifying tags. The device is equipped with direct voice functionality for the reproduction and creation of audio content. Also, the corresponding mobile application, which is connected to the smart object, will be managed by a family member to simplify the process of personalization of the device for the elderly person. Thus, the main idea is to provide a connection between the actions set via the mobile application and the actions to be performed in reality by the smart object to facilitate daily tasks.

That is, the functionality of the device "The HOC", which will be available to the main user:

- phone calls
- voicemail
- calendar events
- alarm clock
- weather information
- play music
- current time

All these functions are assigned to each sticker, so that the elderly person scans the sticker and can perform the function he/she wants.



Solution – UX Design

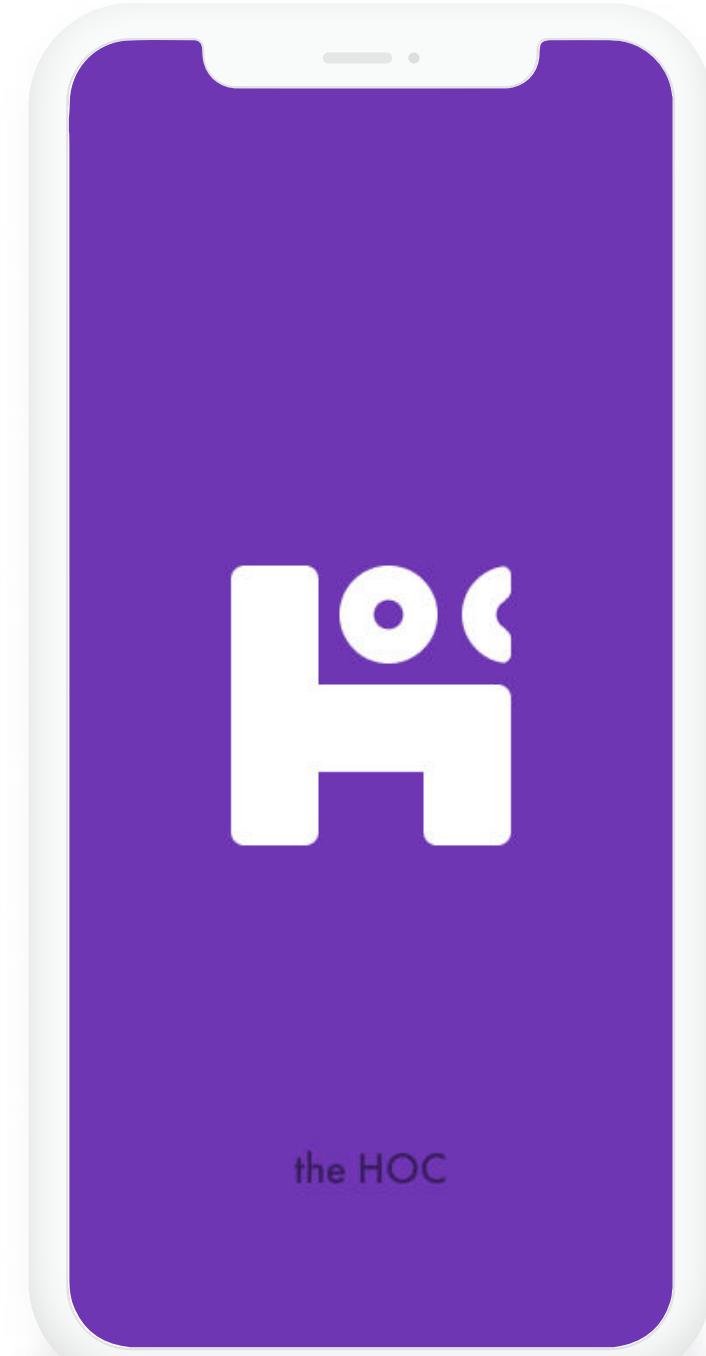
"The HOC" system



Smart object
(for elderly)



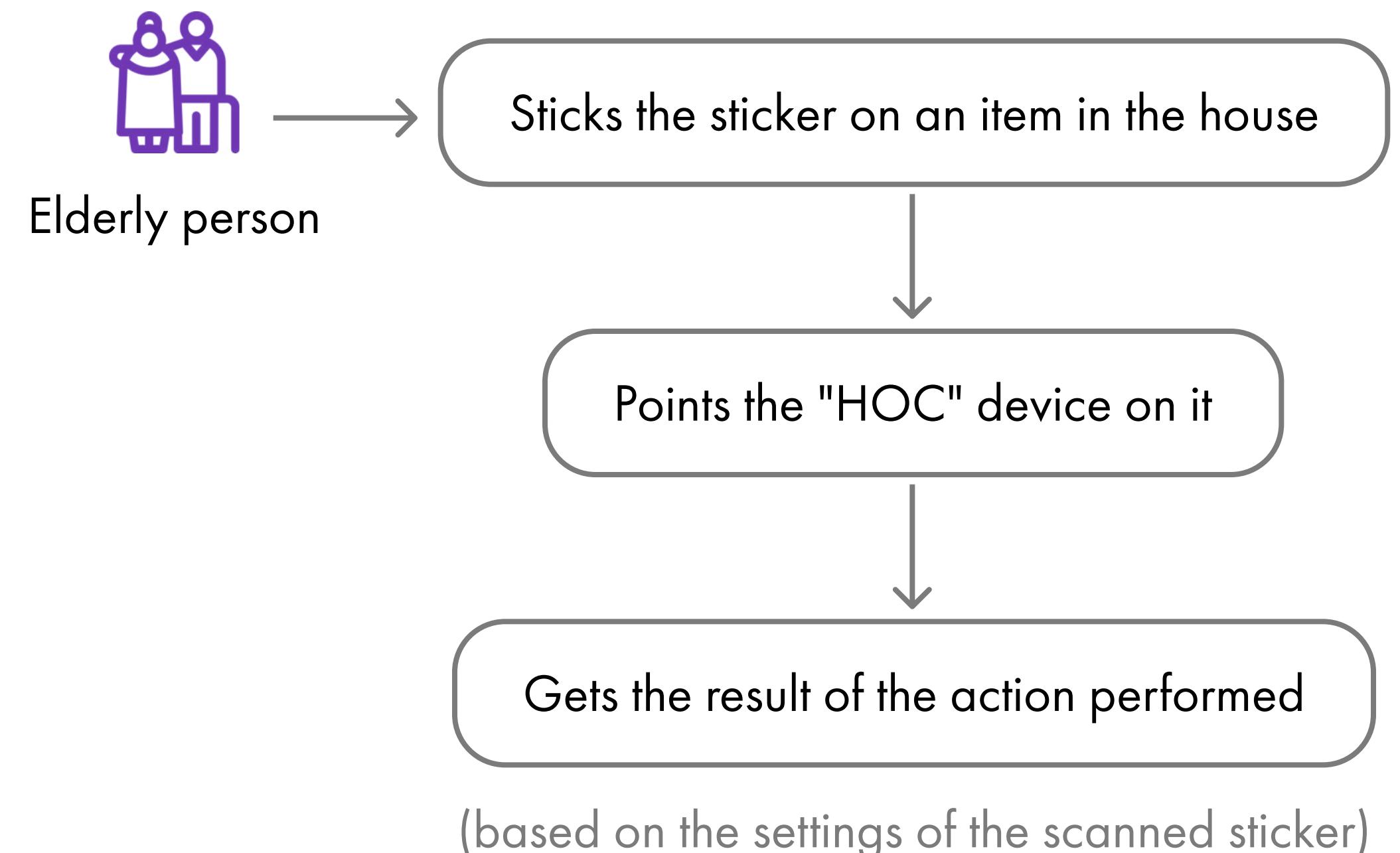
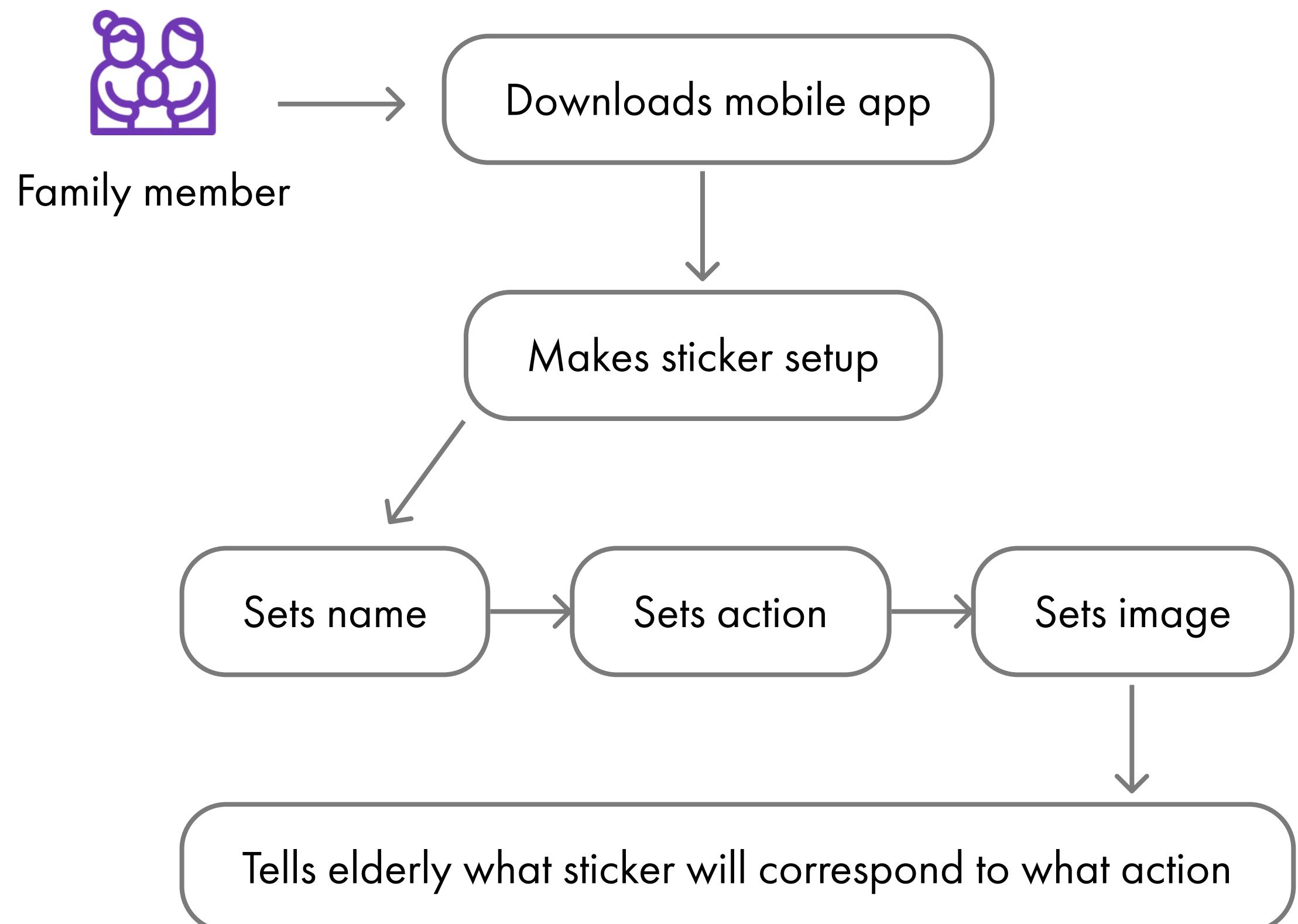
Identifying stickers
(for elderly)



Mobile application
(for family member)

Solution – UX Design

User workflow



Solution – UX Design

Personas



Luca

- 👤 73 years old
- 🏠 Lives in Milan
- ℹ️ Has some memory problems

Has at his disposal:

- Smart object (the HOC)
- Identifying stickers

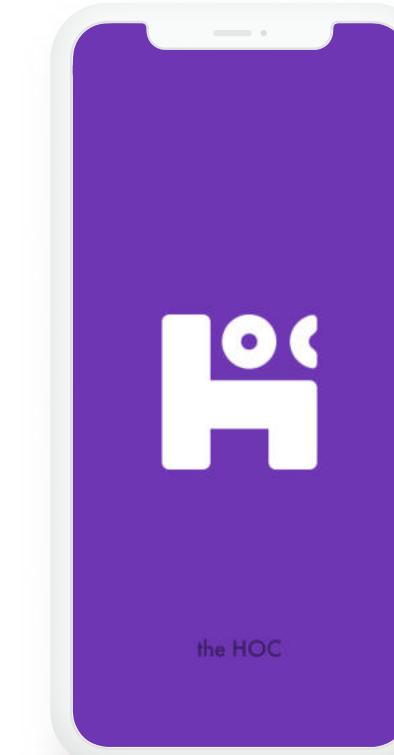


Andrea

- 👤 42 years old
- 🏠 Lives in London
- ℹ️ Son of Luca

Has at his disposal:

- Mobile application

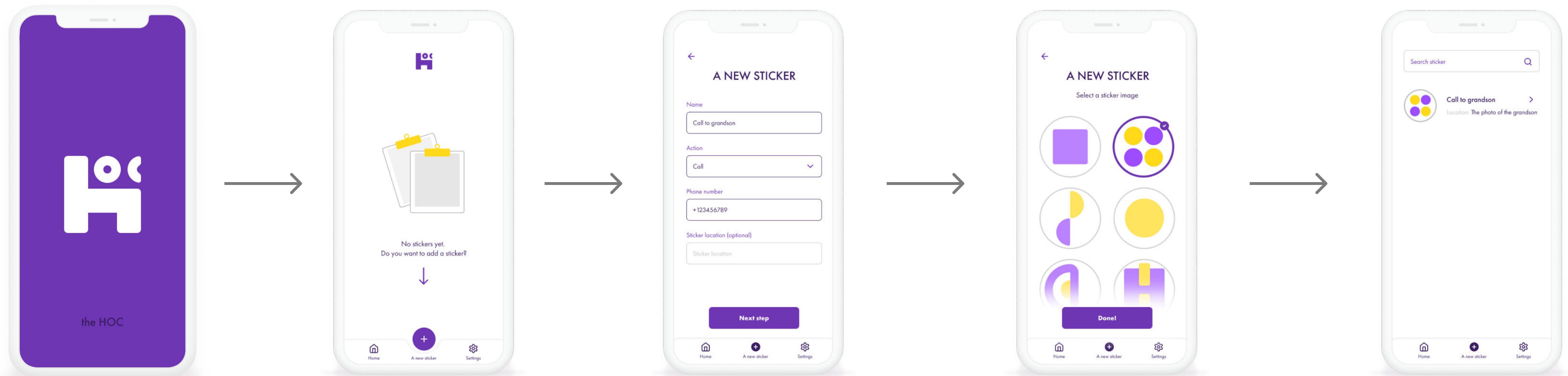


Solution – UX Design

Scenario 1 (Family member)



Finds out from his father that he needs help setting up the HOC.
He wants to get in touch with his grandson quicker.



Andrea launches
"The HOC" mobile app

Clicks "A new sticker"
button

Setting up a sticker to
call the grandson

Selects the image of the sticker
that will perform the call

The sticker is ready to be
scanned by "the HOC"

Solution – UX Design

Scenario 2 (Elderly person)



Finds out from his son that now he can use the sticker with two purple and two yellow circles to call his grandson.



Luca takes a set of "The HOC" stickers

Takes out a sticker with two purple circles and two yellow ones



Puts a sticker on his grandson's photo



Points "The HOC" device at the sticker, thereby scanning it



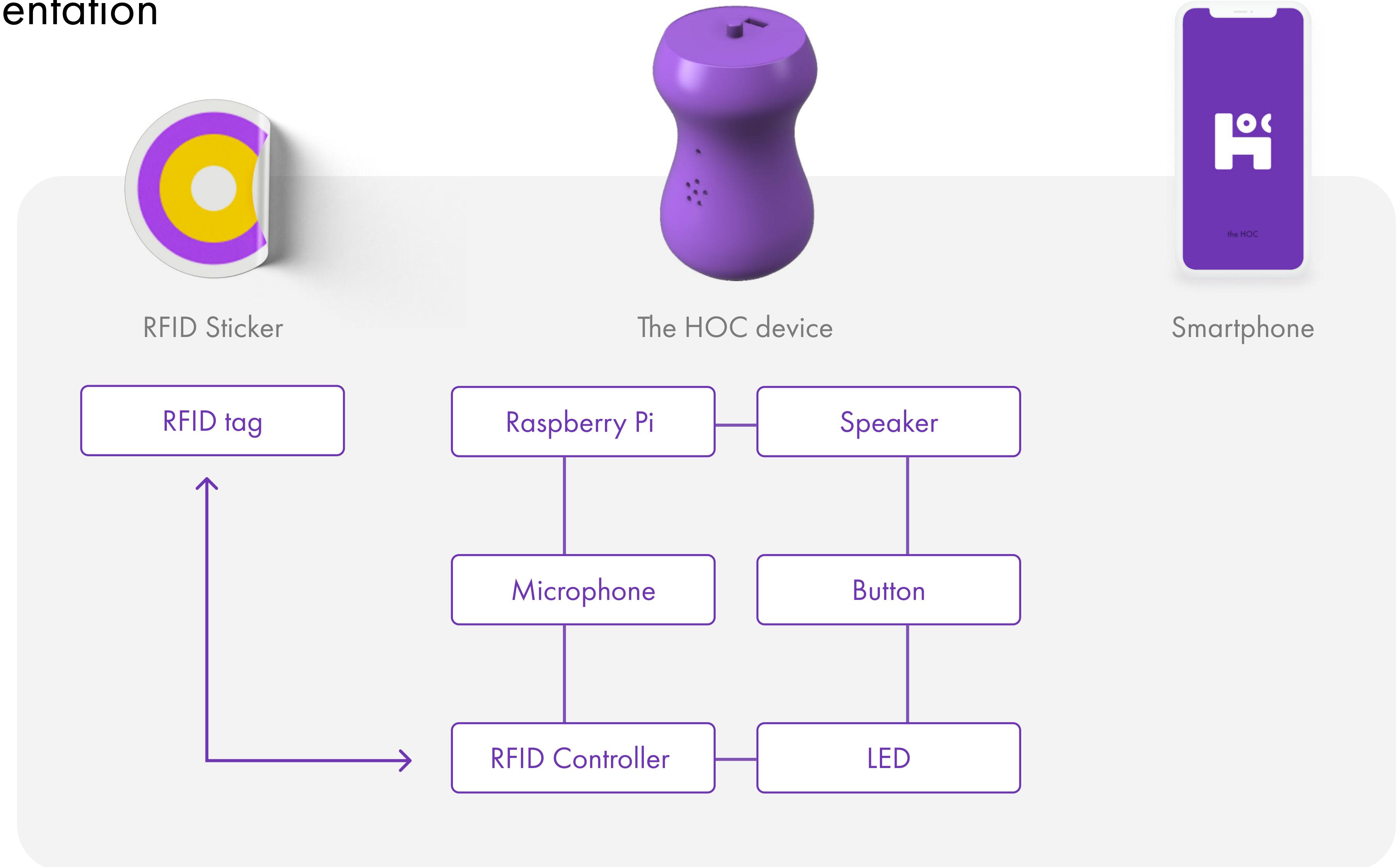
The smart object calls Luca's grandson. The conversation has begun!

Solution – Implementation

HW architecture

Tools:

- Raspberry Pi
- Cable of Raspberry
- RFID Stickers
- RFID Controller/Reader
- Cables
- Battery
- Speaker
- LED
- Confirmation button
- Microphone

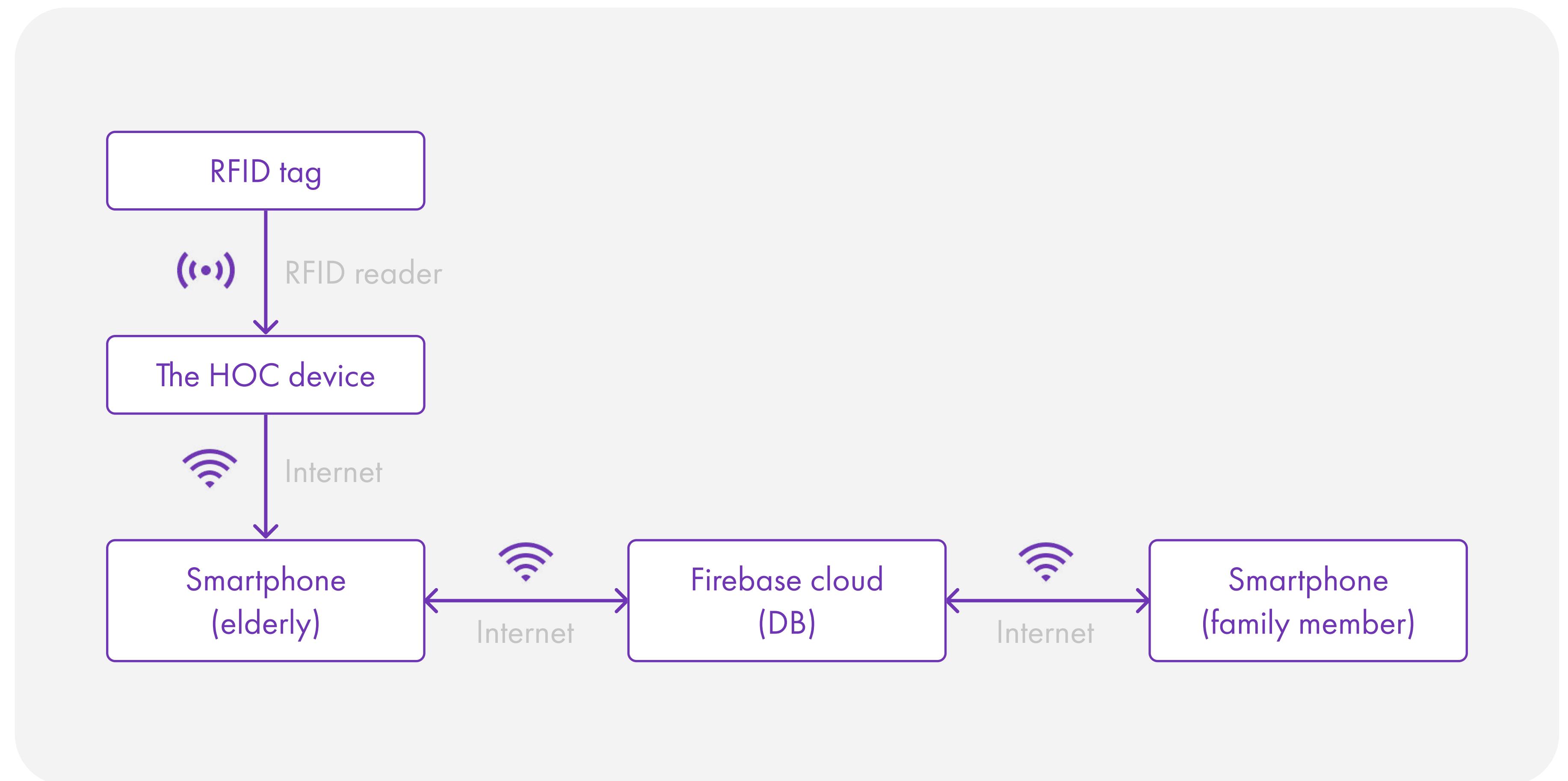


Solution – Implementation

SW architecture

Tools:

- Android Studio
- Firebase Database
- Github Desktop
- Figma
- Autodesk Fusion 360
- Bash linux
- Python
- Java
- SQL
- XML



Solution – Implementation

"The HOC" device (3D model)

"The HOC" device has a shape that allows to hold it comfortably in the hands.

There are holes:

- for the USB port
- for the LED
- for the speaker
- for the microphone
- for the button

Supporting elements have been created, which will contribute to the reliable fixation of the internal parts (such as the button and the speaker).

Also thought of the bottom removable cover, which will cover the RFID-controller when necessary.



Solution – Implementation

Mobile application structure

Login

Login

Choosing a role

- Family member
- Elderly

Instructions

Onboarding pages

- For elderly:
how to use the device
- For family member:
how to use the mobile app

Main screen

Add a new sticker

- Call
- Music
- Clock
- Alarm
- Calendar
- Weather

Settings

Settings

- Language
- Notifications
- Technical support
- Log out

Tasks

Add a new task

- For today
- For tomorrow
- Coming soon

Calendar

Calendar

- List of tasks depending on
the selected day

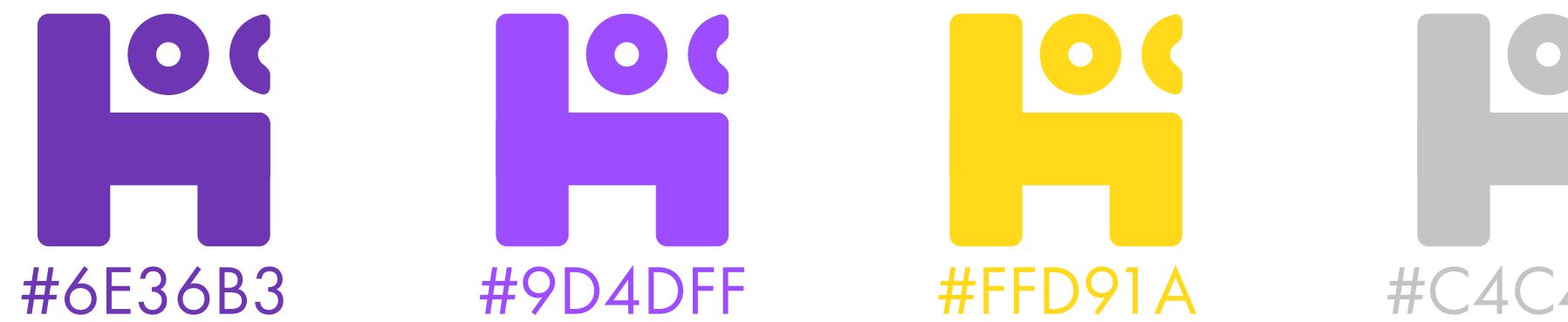
Edit a sticker

- Change the name
- Change the function
- Change the sticker
- Delete the sticker

Solution – Implementation

Mobile application design

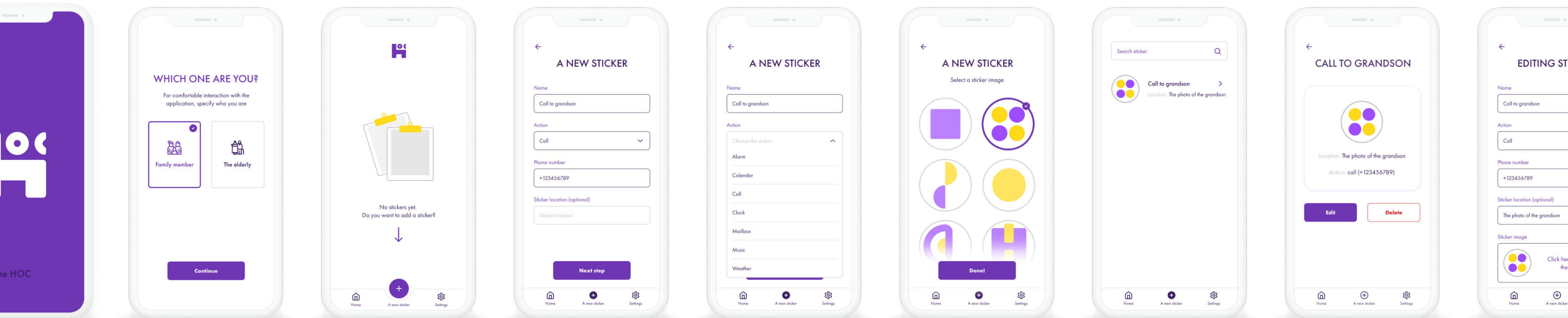
Color palette



Font

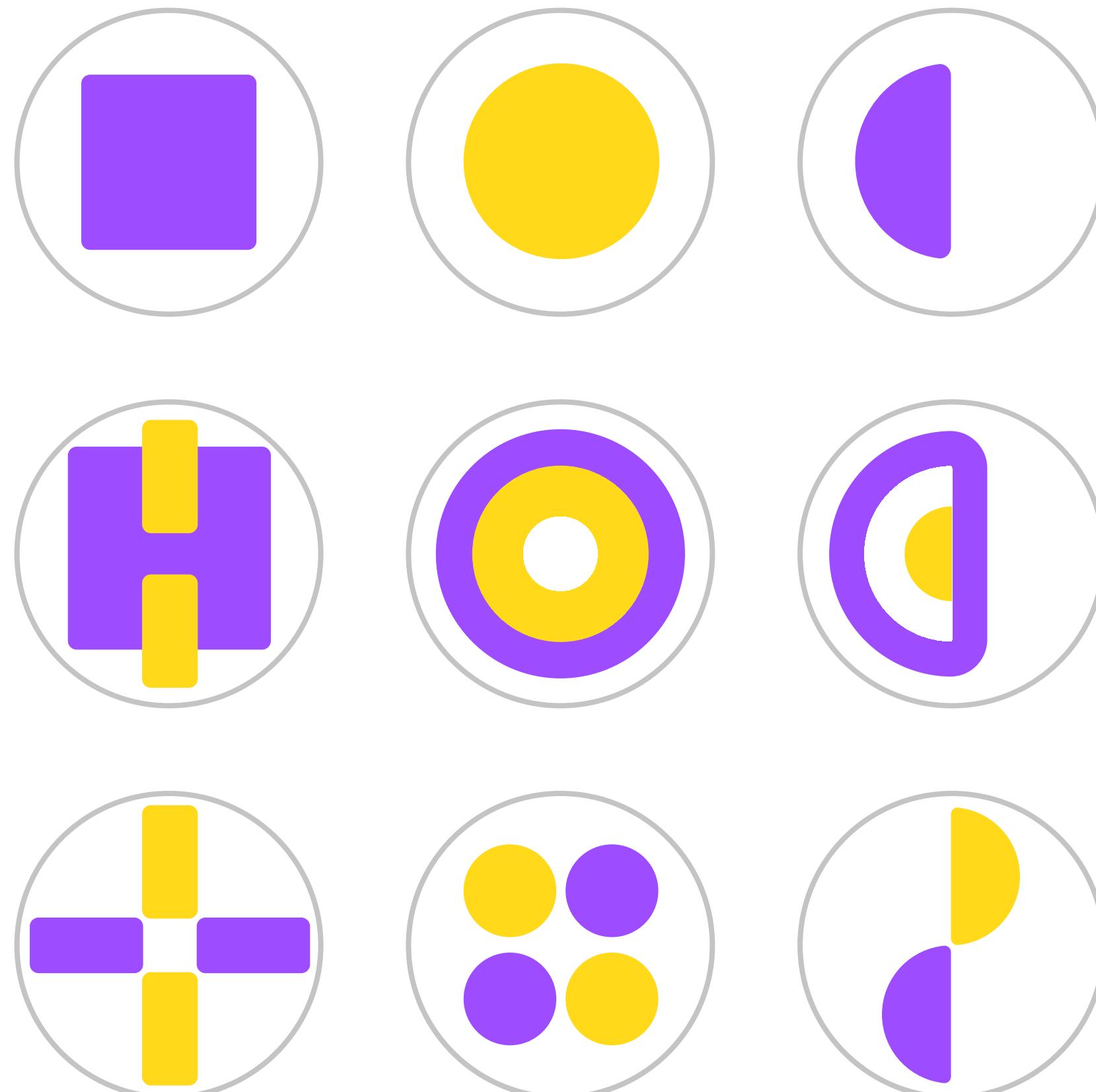
Futura PT
Bold Medium Book

An intuitive interface has been designed for the mobile app for easy interaction with it. The main function is the management of identifying stickers that ensure that "The HOC" device performs the functions for which it is intended.



Solution – Implementation

Sticker Set



Therefore, complementary colors of bright hues (purple and yellow) were chosen for the stickers. These colors create a high contrast, making them easier to identify.

Since the shapes of the drawings had to be completely different and without small details, variations of the images of the letters H, O and C were used. From simple geometric figures to abstract patterns.



State of the art

Related works/projects/products in the research or market arena

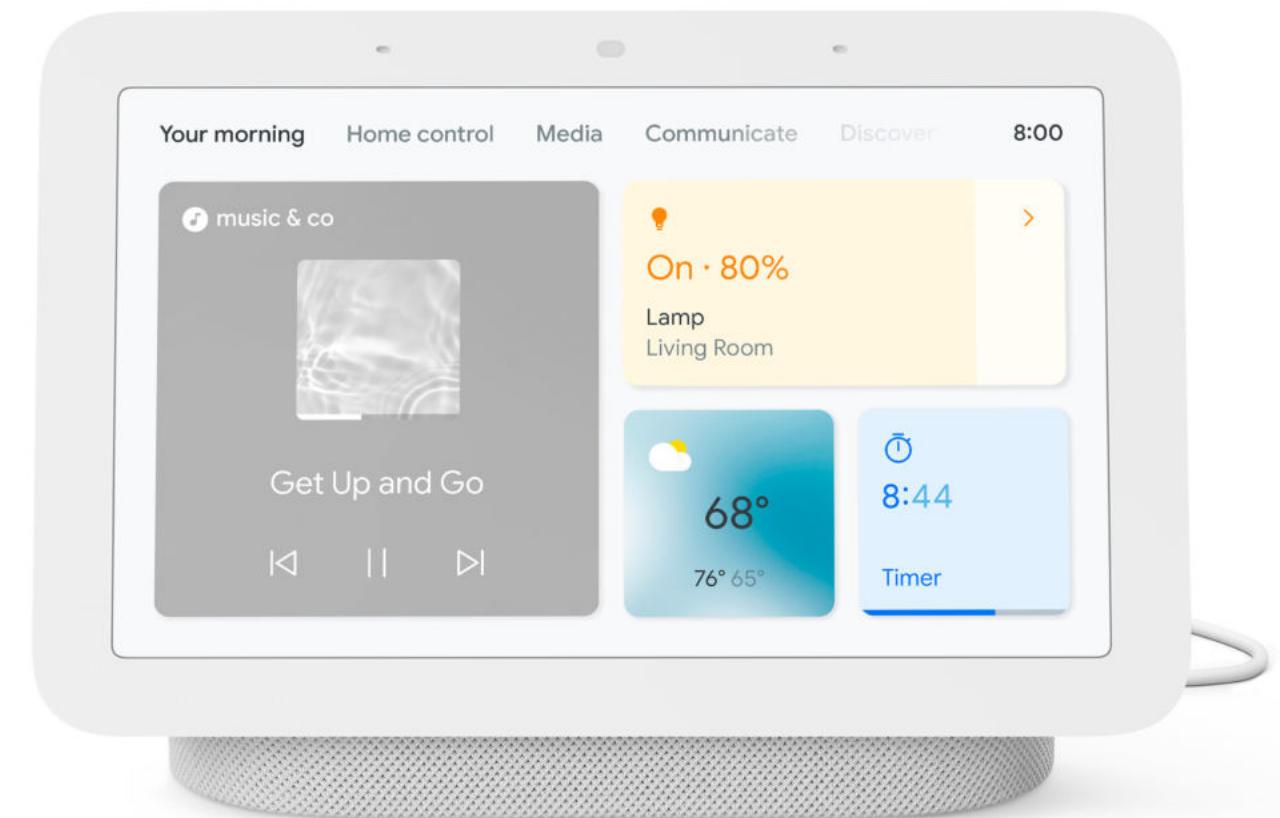
Alexa

It is a virtual assistant that responds to voice commands and performs user tasks. With the help of the Echo speaker you can: make to-do lists and activities, give the device smart home management tasks, find out the weather, news, interesting facts, call a cab, listen to music and create playlists on Spotify, make cocktails using The Bartender extension and so on. Alexa's capabilities are initially limited to a standard set of features, but any user can develop their assistant using Skills extensions.



Google Nest Hub (2nd gen)

It's a smart voice assistant with a 7-inch touchscreen display that acts as a speaker for music and radio, a photo frame, a clock, and a hub for controlling smart home devices that support Google Assistant. It also uses low-power Soli radar technology to track your sleep and detect non-camera movements (such as certain gestures). Setup is done through the Google Home Hub app on your phone or tablet.



State of the art

Related works/projects/products in the research or market arena

Siri

It is a personal voice assistant built into Apple devices. You can use it to answer calls and messages, create notes and reminders, set alarms, route, listen to music, and perform minor tasks such as translating phrases, doing calculations, and so on. Also, supports Apple's smart home system. Siri is a useful assistant that minimizes the time spent on everyday tasks. Machine learning allows the algorithm to improve and adjust to the needs of the owner.



Hey Siri

Xiao Ai

This is an artificial intelligence-based voice interaction system that belongs to Xiaomi and is also its virtual AI. Just say a single phrase to send a message, find out all the details about traffic jams, get information about the weather outside the window, listen to the latest important news, record a reminder, set an alarm for a certain time, call a cab, and so on. In addition, the Xiao Ai voice assistant is great at managing a smart home.



Value Proposition

Initially, we wondered to what extent the elderly, who often do not react very positively to the implementation of various technologies in their lives, would be ready to accept the new device - "The HOC"?

So we were challenged to create a system that the main user would really be interested in and want to use in his or her daily life.

"The HOC" is a good solution because it satisfies the needs and closes all kinds of fears of the end user (the elderly person). After all, many people in this category are constantly haunted by fears such as being confused by the buttons, not understanding the technology, or breaking something with their wrong action. But now older people will not have any questions about the sequence of buttons that need to be pressed to achieve results. All it takes is pointing the device at a particular sticker. The device is like a guide for the older generation to the world of technology and new possibilities.

"The HOC" is a system that allows you to use the main functions of your smartphone without any problems thanks to a simple and clear control.

Competitors for this system are various voice assistants (both embedded in smartphones and separate devices). And the advantage of the system "The HOC", created by us, is the possibility to help with the personalization remotely. It is easy and intuitive thanks to the user-friendly interface. Synchronising the mobile app with your device will help you make changes quickly, no matter where you are. And just that contributes to the needs of users in the category of family members who live far away but want to be able to help an elderly person.

Future work

Improvements

- Implement a method in the register section in order to force the user to create a more secure password such as a minimum number of characters, requiring a symbol and even capital letters.
- We have designed a 3D model for the HOC device, but due to the unavailability of laboratories to print on a 3D printer, we have been forced to create an "arts and crafts" model.
- Create in each activity or window of the application, an auto-refresh for the correct obtaining of the data retrieved from the database. Because sometimes there is a small milliseconds delay due to the database connection, so that the user has to refresh the page by clicking again on the section or or by making a section change so that it then returns to the desired updated section.
- We have configured only 10 RFID stickers for the use of the HOC device as a test, in addition we have created a per-user limitation of 10 stickers for the bd and the mobile application. It would be very trivial to add more stickers by scanning with an RFID reader and get their id, then add a new entry to the database and design new logos or images.
- We have designed that the created tasks remain in the database in case the elderly user forgets what he/she did in previous days. However, only the family member user is in charge of deleting and adding tasks. So in case we want to optimize the database, we could delete the tasks by monitoring them with a 48 hour timer for example.
- Implement the cross-platform application as well as make an iOS compatible version.

Future work

Future directions

This work has been carried out over approximately six months, which is the expected time for the development of this project. However, the work done here can be improved by extending its utilities as indicated below.

When a user creates a task, and at the moment the "Pending Task" pop-up notification appears, knowing that the application is closed, the application can be accessed through the notification by simply clicking on the pop-up, showing the task information of the notification.

As for the call system, we would have liked to improve its call processing performance and efficiency:

- Implementing phone calls instead of generating meeting links by scanning a sticker.
- Produce call or call pop-up notification (with the online meeting link) to other users who do not own or have installed The HOC application.
- The call notification can be received while the app is closed.

