R-ECO

Deliverable 4

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Contents

1. Prototype creation

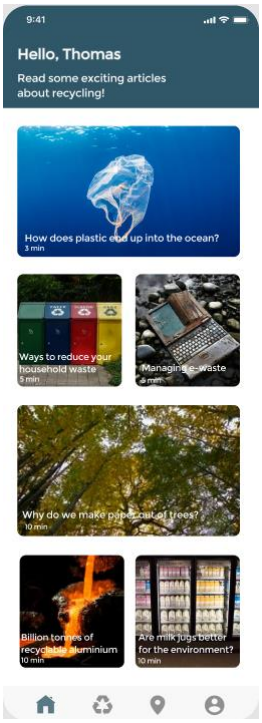
1.1. Functionality of the prototype

Login & Sign up & Tutorial screens

When the user will first download the application, the Sign up/Login page will appear. If he already installed the application, the user can easily login, having its history saved within his account. Otherwise, the Sign up button can be used for creating an account and going through the tutorial.

We wanted to gather as much information as possible from the user, therefore, since the Sign up page, he can enter some preferences about recycling. Afterwards, we provided a short tutorial for understanding better the concepts of map, gaining points, companies and containers and the use of some important buttons or tabs.

Homepage screen



After the tutorial is finished, the Homepage will appear. As we wanted to inspire the user in recycling more or reading from verified sources, we brought him related articles which change every day and which are mostly based on his interaction with the application (history and tendencies).

From this screen, the bellow menu will be always present, highlighting the icon which shows where you are in the application.

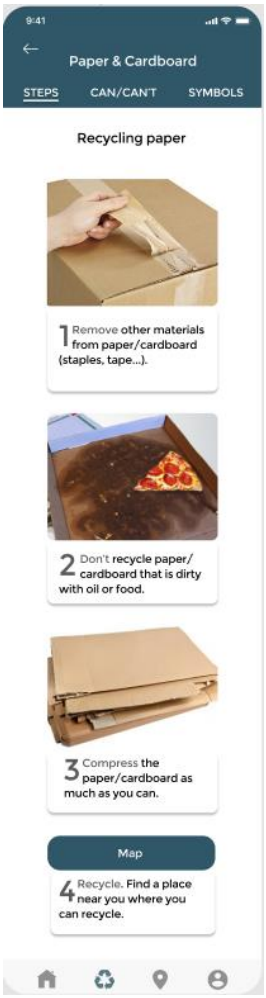
Materials & Information on recycling screens

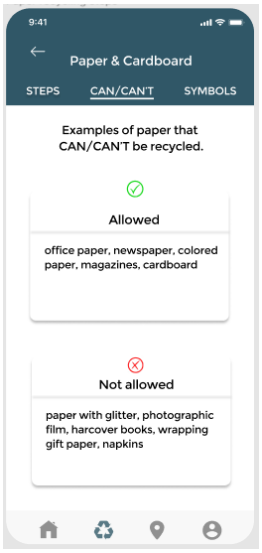
From the homepage, one can simply navigate through the entire application. When pressing the recycling icon, a list of different materials will be present and, by pressing one of it, more information will be available.

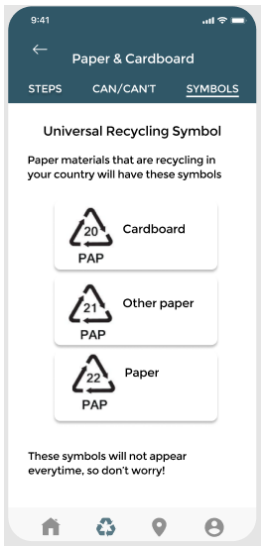
After selecting Paper & Cardboard (in our case), the steps for recycling paper will appear on the screen. During our research and user requirements, we notice that the steps for recycling are the most required in terms of information. Therefore, this is the first screen which will appear after selecting a material. For finding out more about paper, you can go through the other tabs and discover what can and can't be recycled and also which are the symbols for paper.


9:41
Hello, Thomas
Here's your sorting guide
Paper & Cardboard
Plastic
Aluminium
Mixed
Glass
Batteries

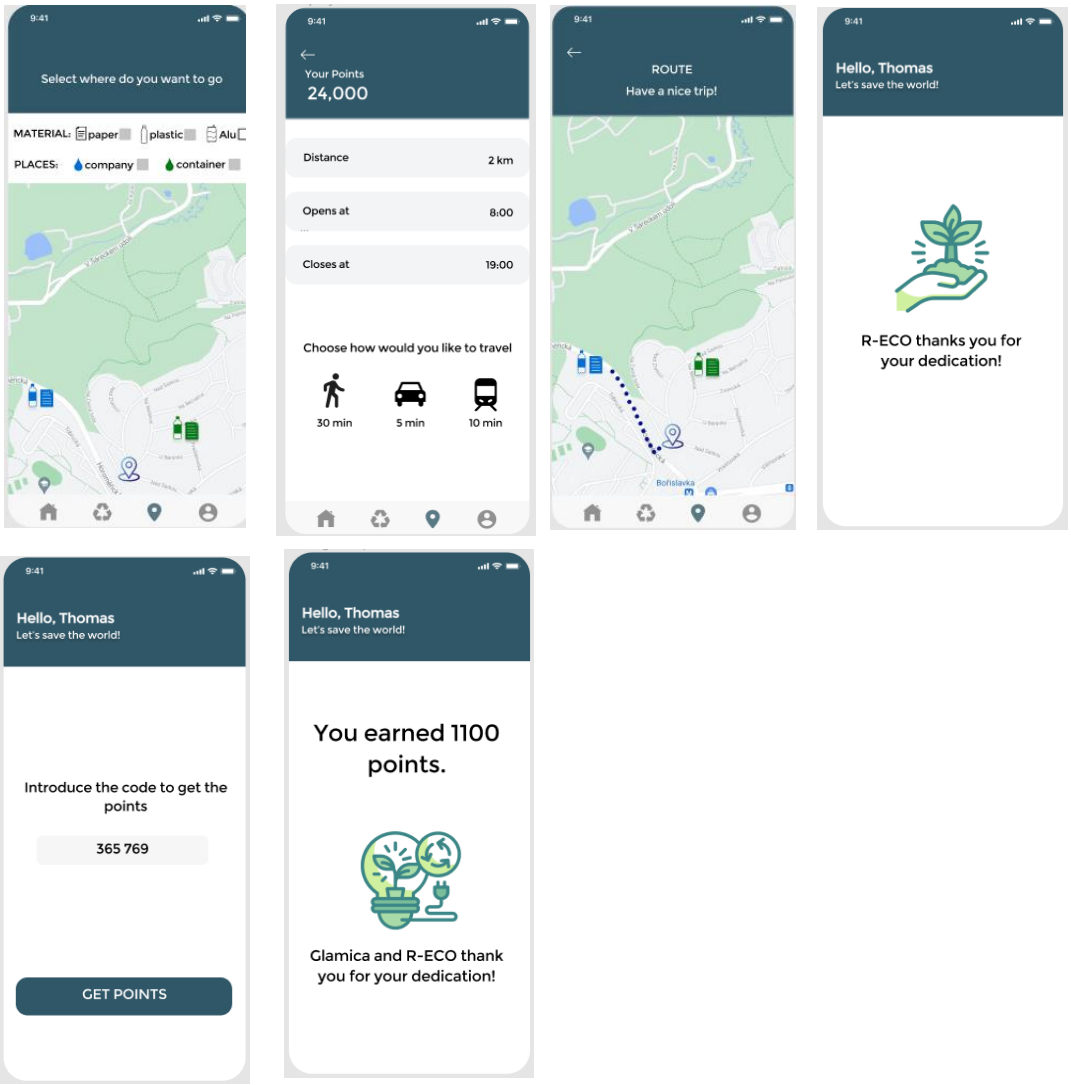

9:41
Hello, Thomas
Here's your sorting guide
Clothing & Textile
Electronics
Oil
Pharmaceutical


9:41
Paper & Cardboard
STEPS
CAN/CAN'T
SYMBOLS
Recycling paper
1 Remove other materials from paper/cardboard (staples, tape...).
2 Don't recycle paper/ cardboard that is dirty with oil or food.
3 Compress the paper/cardboard as much as you can.
Map
4 Recycle. Find a place near you where you can recycle.


9:41
Paper & Cardboard
STEPS
CAN/CAN'T
SYMBOLS
Examples of paper that CAN/CAN'T be recycled.
Allowed
office paper, newspaper, colored paper, magazines, cardboard
Not allowed
paper with glitter, photographic film, harcover books, wrapping gift paper, napkins


9:41
Paper & Cardboard
STEPS
CAN/CAN'T
SYMBOLS
Universal Recycling Symbol
Paper materials that are recycling in your country will have these symbols
20 PAP
Cardboard
21 PAP
Other paper
22 PAP
Paper
These symbols will not appear everytime, so don't worry!

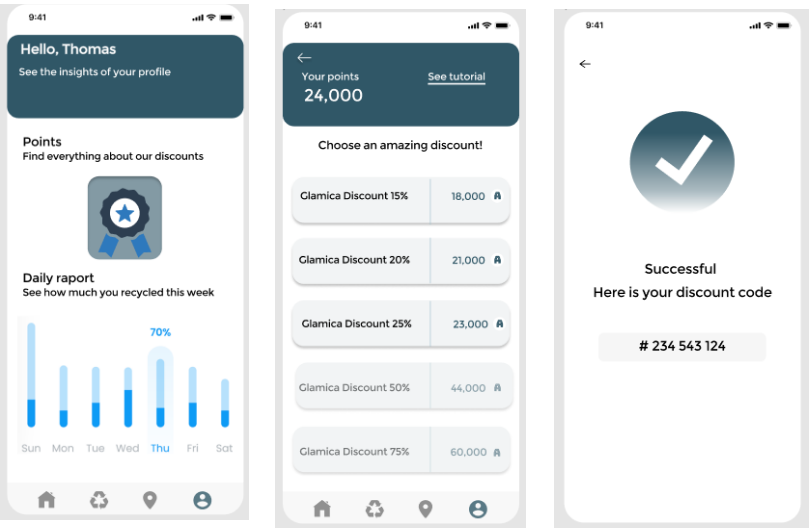
Map screens



If the user will enter the map from the footer menu, no filter will be selected, so he can choose whatever he prefers. If two or more filters for materials are selected, the map will display places where those materials can be found together, but also separately. In this way, if there is no place with both materials, we eliminate the risk of not having any place shown on the map. The filters can also be used for selecting a company (for gaining points) or a simple container.

After he decides where to go, he can choose the preferred way of arriving there (walk, car or common transport). When he arrives at the container, the message from the first sequence will be displayed. After a 5s delay, the homepage will appear. In case he selected a company, the textbox for entering the code will appear on the screen and afterwards the above message. This time, after the 5s delay, the user will be taken to the page with discounts for checking the new availability.

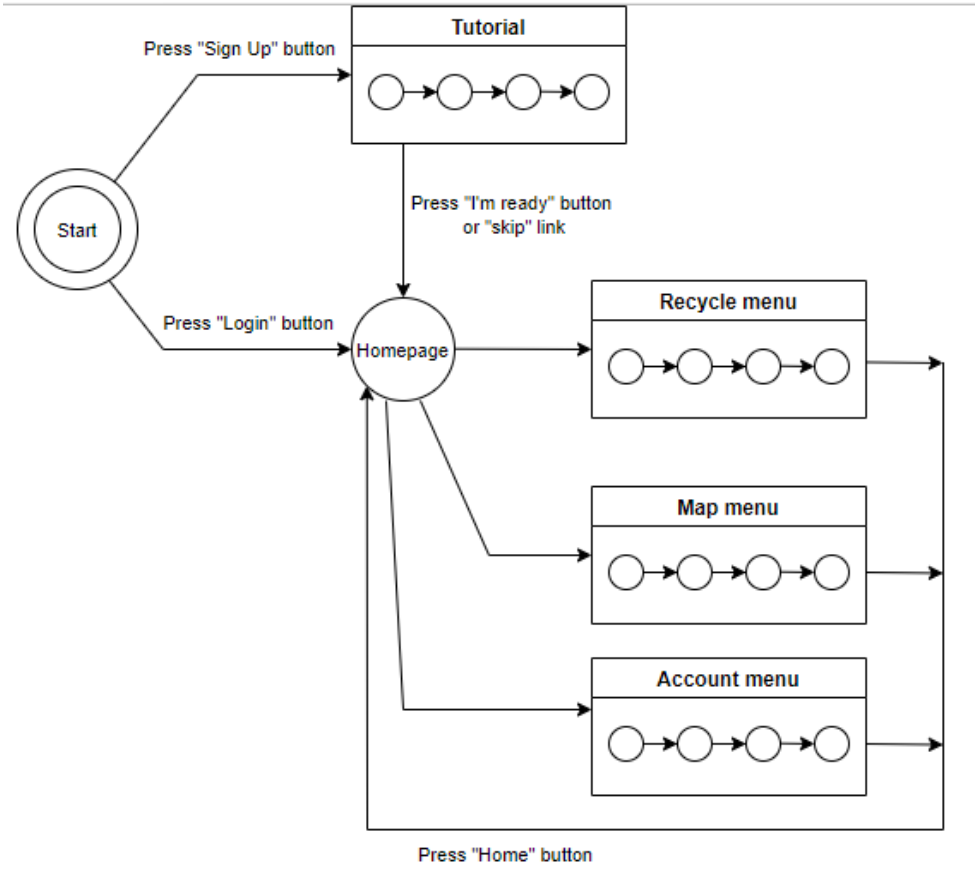
Profile & Discounts screens



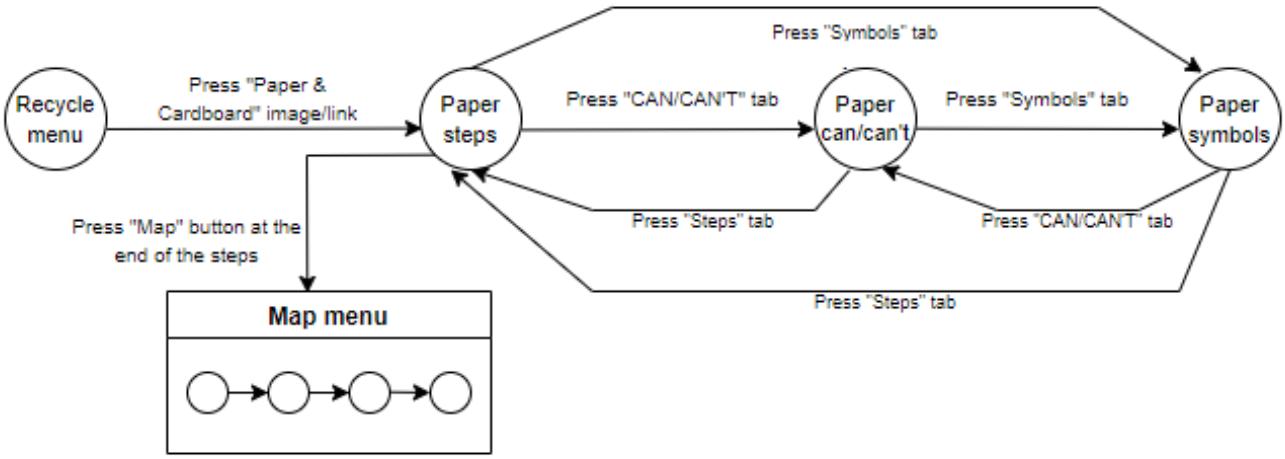
Since the last prototype, we added a new feature for the profile screen so the user can track his progress regarding how much he recycled in a week. In the fist part of the page, he can press the “award” button to see his points and the available discounts. When he chooses a discount, a discount code for different products of that company will be displayed.

1.2. State Transition Networks

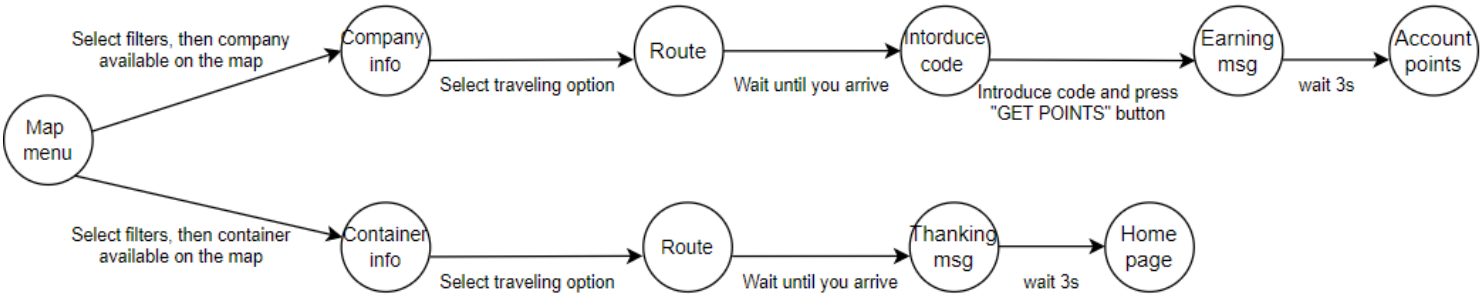
STN for the entire application



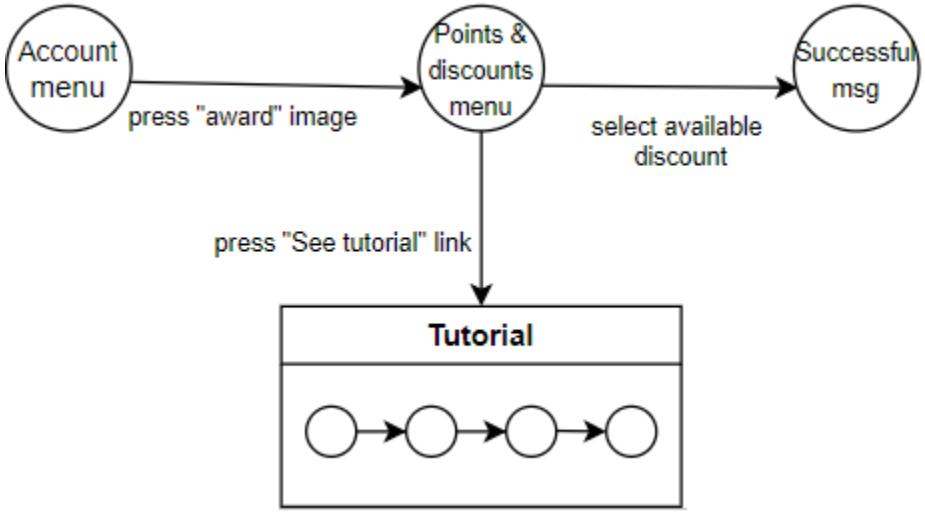
STN for the recycle menu



STN for the map menu



STN for the account menu



1.3. HW/SW technologies

For the software implementation we used a tool called Figma which allows us to create a very accurate implementation of the application in terms of its design and some main functionalities.

Our implementation for the prototype is mostly static, therefore, in terms of animations, we only included delay for two screens and some changes of screen when tapping. This is because, for the covered scenarios in this release, there was no need for deepening the implementation.

Being a mobile application, a hardware for creating a prototype was not needed. Nevertheless, for getting more accuracy in our usability tests, we will need a smart phone for testing the application.

2. Evaluation (usability test)

2.1. First usability test (Andreia)

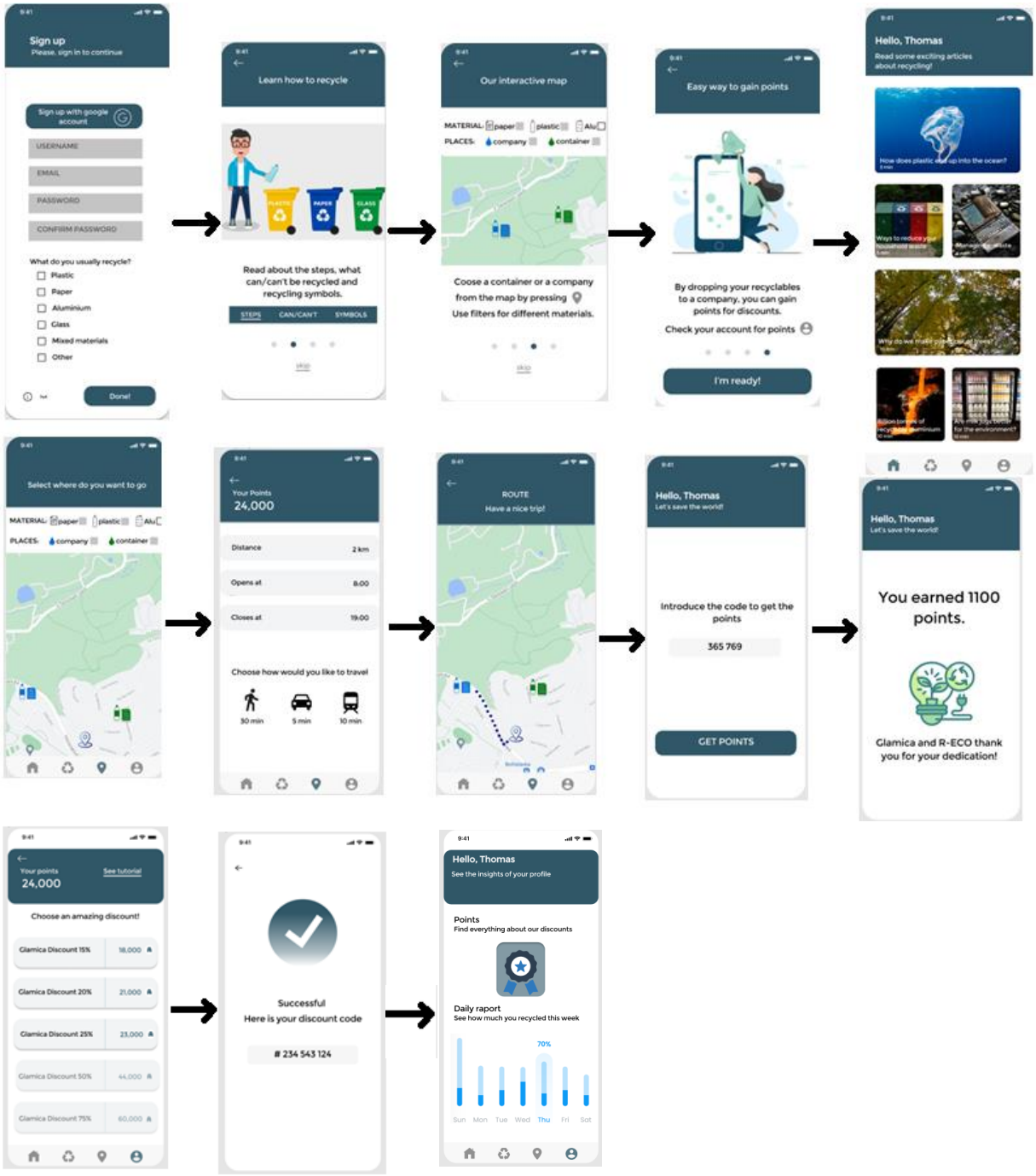
Goal of evaluation

The goal of the first usability test was to let the user interact with the tutorial and observe what he understands from it as well as recycling two materials: paper and plastic (having direct interaction with the map). He already knew how to recycle and wanted just to find a place on the map where he cand drop the paper and plastic. Also, understanding the concept of points, he wants to drop them at a company and then to see his points in the account.

Test setup

The prototype was prepared on a phone which was given for testing. The story which needed to be followed was explained clearly. The user was also informed about some insights of the app regarding its functionality (textbox can't be filled, checkbox can't be checked and about some problems with the sliding). Some features which weren't included in the story were not configured, so the user was informed to not spend time on those. Beside this setup, I also needed to suggest how to press different buttons on the prototype, mostly because of the used tool.

Test execution



Finding and recommendations

The first thing that I notice during the usability test, which was indeed interesting, was the impulse to press the “skip” button on the tutorial even though the user was told beforehand to read it. Therefore, it wasn’t un intentioned move but rather a habit that most of the app users have.

The user struggled a bit with the map regarding the difference between a container and company. He knew the differences between them, what were their meanings, but couldn’t identify their difference by color. He suggested to change the icon for the company so that it could be easier to identify it and not just to stick on the color.

When he had to choose a travelling option, he stayed longer to realize that the icons were meant to be buttons. The same problem was encountered with the button for the discounts which can be found in the account.

Because in the prototype functionality we couldn’t implement the sliding mode in the tutorial (the sliding is made by tapping) he suggested to change it in “next” buttons.

From what could be noticed during the interaction, the user found the footer navigation quite easy and accessible to use and found every information quite fast.

Because there were smaller design changes to be made, we changed the suggested features to further test them in the next usability tests.

2.2. Second usability test (Francisco)

Goal of evaluation

The objective of this usability test was to put into practice the situations described in scenarios 2 and 3 of deliverable 2, which consisted of evaluating the user's experience when trying to learn about "how to recycle" and "what materials can and cannot be recycled" and how the user perceives the information in the application for the first time, drawing conclusions from the user's reaction and leading to possible future improvements to the application.

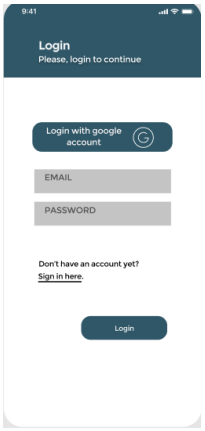
Test setup

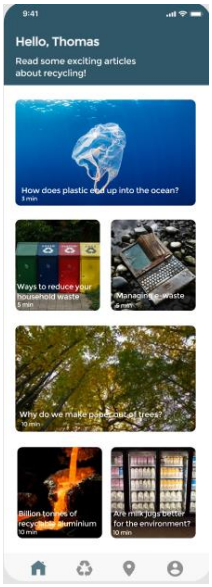
After making improvements on the prototype of the R-ECO application that we already had in deliverable 3 with the Figma tool, we had to make a configuration for the usability test with certain characteristics so that the information transmitted by the user would be useful to perform a research work that would allow usability with the application, adapting the design of the application to the user experience and create a familiar environment in which the user feels comfortable.

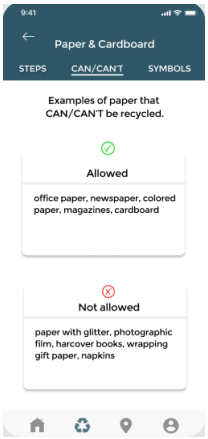
Thus, the test setup was carried out as follows:

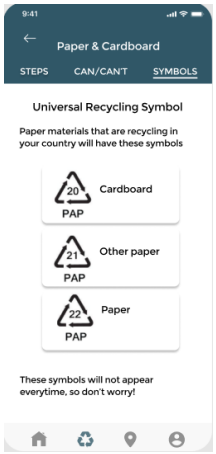
A person was chosen at random by the residence who had no knowledge of the project idea or its subject matter and was given a cell phone with the application loaded (via a link to run the application on the mobile), and the user was expected to interact and find the area showing how to recycle and what materials can be recycled.

Test execution









Findings and recommendations

Unlike the execution of this part of the application with respect to the test of deliverable 3, this time the user reduced the time to perceive and find the sections on how to recycle and what materials can be recycled to 27 seconds, as we can see the result is very satisfactory because the previous time was 40 seconds. The main cause of reducing this time is due to the new component of the bottom tab navigator because it greatly simplifies the user search and navigation through the screens, also the user may have seen tools of this style in well-known applications such as *Instagram*.

As a proposal for improvement perhaps new visual elements could be included. We could implement a meter that indicates how many people are in a recycling point, this may be especially useful to avoid the agglomeration of people at the same point due to the current pandemic situation and loss of time when having to wait in a queue for recycling or how much are other users recycling.

2.3. Third usability test (Clement)

Goal of evaluation

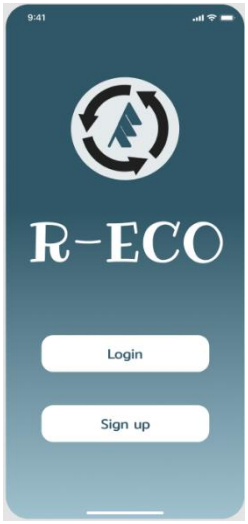
The goal of this evaluation was to verify the usability of the map, and whether it's easy to make a choice with all the map options. The user will login and after reading the steps of recycling paper, he should press the button at the end of the steps to see the map. Afterwards, he should be able to choose a container from the map.

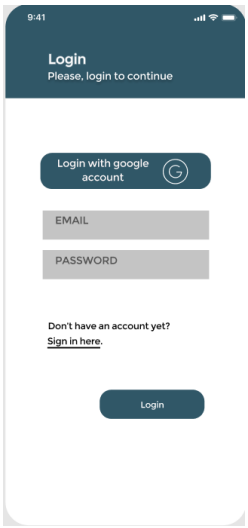
Test setup

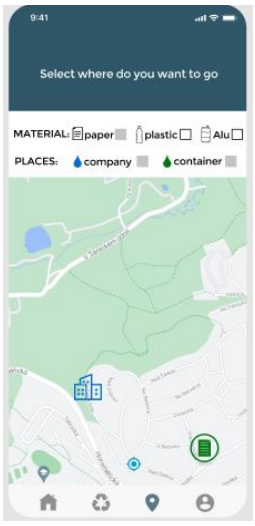
I explained the user that I was working on a prototype for a recycling application, and that I wanted to check if everything in the application was easy to understand for someone who had never used it before. For the first test, the following scenario was given: "You are already a user of the app. So, you want to log into the app, not register. Then you want to learn how to recycle paper and to find the closest container where you can bring your paper waste."

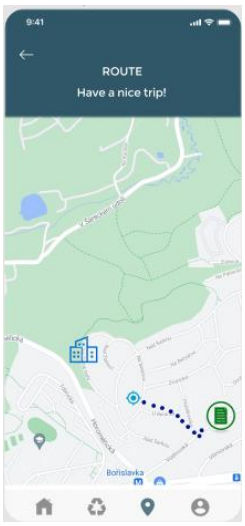
I explained a bit more precisely the concept of the application especially regarding the difference between container and company because the user has never seen the tutorial.

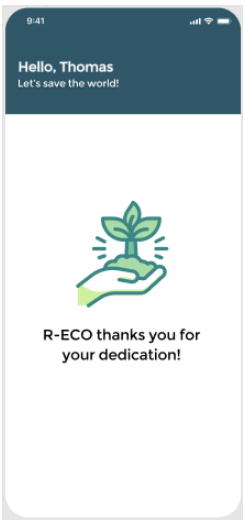
Test execution











Findings and recommendations

The user found the information about recycling relatively easy, being accustomed to this type of application which have navigation with icons.

When he arrived at the materials screen, he took his time to look through those images, but he easily chose paper after 3 or 4 seconds. In this part, there is no necessity to change the icons, someone should take a bit of time with a newly downloaded application.

The steps for recycling were clearly written, the user find it easy to notice the suggested button for the map at the end.

The map was still a bit confusing even after changing the icons. Therefore, we should find another way for expressing the difference between containers and companies.

3. Documentation for developers

3.1. Functional requirements

Information related to the functionality of the application (functionality described on a screen-by-screen basis) is given in *Functionality of the prototype*.

In this part of the document, a more in-depth analysis of the functional requirements has to be taken into account when developing the application will be carried out, and priorities will be established when building the application in order to achieve a complete and iterative development of the application.

When carrying out this application, we must also know the technologies that we will use to translate our *Figma* design into a functional mobile application.

For the development of our application, we have defined that the best language to program the front-end of the app is Flutter, which is a framework that provides us with a toolkit (set of tools) whose purpose is to create software interfaces. One of the great advantages that Flutter provides us with is that it is a multi-platform language that allows us to run the application on any device that has an internet connection.

For the development of the back-end, ASP.NET will be used, as it allows certain advantages that are very interesting for a project of the R-ECO style such as:

- Cross-platform and container compatibility: ASP.NET Core allows developers to create applications that can be deployed on Windows, macOS and Linux platforms.

- Asynchronous: ASP.NET Core offers developers the option of using asynchronous programming patterns. Asynchrony is a common implementation in all .NET Framework classes and many external libraries.

- High performance: Performance is one of the key features of the ASP.NET Core backend framework. The Kestrel web server and ASP.NET Core available to developers now make ASP.NET one of the most agile web application frameworks.

Establishing application functionality with its associated priority (1 is low priority and 5 is high priority):

Functionality	Priority (1-5)
Login & Sign up (Authentication)	5
Tutorials	1
Homepage	3 => simple screen at the first with few details
Materials & Information about recycling	4
Map	5
Profile	3
Discounts	2
Back-end construction	5

Functional requirements

Nº FR	DESCRIPTION
1	A user cannot log in if he/she does not have an account created.
2	A user cannot create an account that has already been created with the same email address.
3	The account password must contain at least 8 characters.
4	The map must be completely up to date.
5	To have access to the map the user must grant location permissions to the application.
6	In case the code is valid, points will be awarded for discounts.
7	The gaining points system must be linked to each recycling company that is our partner.

3.2. Design ideas

We have used this color palette and font according to the application design policies and set in an environment of recycling and sustainability.

We want our application to be understood by anyone regardless of their age and knowledge, so we have made adaptations in the language to make it understandable to anyone.

We have also taken into account the visually impaired in the design, providing them with buttons that simplify the understanding of the application for this group of people.

One of the tools that we included in the previous deliverable that we believe is especially interesting is the bottom tab navigation, as it makes navigation between the different screens much easier and allows the user to avoid getting stuck in any part of the application.

For the creation of the map, we have taken the google maps map as a reference, adapting it to our needs and always looking for the user to be in a familiar environment.

4. Link to the running application

https://www.figma.com/proto/04KMl7fCW61wouCuYoTnSS/Final-R-ECO-app?node-id=9%3A64&scaling=scale-down&page-id=0%3A1&starting-point-node-id=9%3A64&show-proto-sidebar=1