

Desarrollo de Sistemas Interactivos



MOVEDRID

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Phase 1: Research

1. Research plan

1.1 Introduction

Movedrid will revolutionize transport throughout the city of Madrid. Our app will aggregate various public and private methods of transport and provide the user with seamless access to these services. Molded to the user's needs, Movedrid will provide customized options, in respect to speed, affordability and distance.

With a single Movedrid account the user will have access to the services of all our partners in Madrid, providing smooth access to scooters, bikes, ride shares...

1.2 Time planning

- Juan Chozas
- Adam DeBoer
- Alejandro Díaz
- Alejandro Díaz y Mario Bocos
- Álvaro López y Diego Movilla
- Alejandro Díaz, Mario Bocos y Álvaro López
- Alejandro Díaz, Álvaro López y Diego Movilla
- Todos



1.3 Interviews

1.3.1 Hypothesis of personas

Persona types:

- Tourists
- Students
- Workers
- Reduced mobility

Ways to affect behavior and needs:

- For every type of person
 - Need to get to a destination => We collect all options in one application
- For reduced mobility:
 - Filter out all options that aren't accessible
- For students and workers:

- Suggest option that best avoids traffic
- For tourists:
 - Suggest outdoor options for sightseeing

Context (behavior/environment):

- People who care about the environment:
 - Suggest electric options/walking
- People with a driver's license:
 - Suggest car/moto sharing
- Fit people
 - Offer bikes

1.3.2 Pre-screening

In case of interviewing a big group of people, we would ask some questions in order to know if the users are suited to our interests. But since we are going to interview four people, we won't do this questionnaire.

1.3.4 Interview introduction

We are studying the attitudes and habits in relation to transport access in Madrid. To do this, we will explore a series of questions about routine, habit, preferences and opinions on the different methods of transportation that Madrid has to offer, and the ways that they access the information regarding these methods. We are also interested in what aspects of transport interviewee finds most valuable, such as the speed, the accessibility, or the cost of a particular service.

1.3.5 Informed Consent

Video Consent Form

To comply with the GDPR (General Data Protection Regulation), we need explicit permission to process, store and use any of your personal data for marketing purposes; this includes still images, moving images, audio, and testimonials. The data will be stored in a safe place for a period of 2 months, the time necessary to analyze it and process it. After that period, all the data will be deleted.

The purpose of saving this data is to carry out a study on the needs of the citizens of Madrid when travelling. Please sign this form to confirm you agree with the conditions of this consent form.

Please note that on signing this form you are agreeing to the statement of conditions:

That without expectation of compensation or any other remuneration, now or in the future, I consent to the Universidad Complutense de Madrid using the photographs and/or video recordings taken today for noncommercial, educational purposes. This data is the responsibility of Adam DeBoer who can be contacted at adeboer@ucm.es if you wish to have this data deleted. I understand these images/recordings may be presented publicly and may be held indefinitely by the Universidad Complutense de Madrid and/or by and current or former students, staff, and faculty of the Universidad

Complutense de Madrid. This research will target randomly chosen people from Madrid and will be carried out by Computer Engineering students from the Universidad Complutense de Madrid.

Print Name: _____

Signature: _____ Date: _____

1.3.6 Interview scripts

Here are the questions of the interview:

1. What are you doing in Madrid?
2. How old are you?
3. How did you get here?
4. List all the different ways that you know in order to travel in Madrid
5. Which is the mean of transport that you use the most? Explain why
6. Would you be able to get around comfortably without using that mean of transport?
7. Are there any means of transport that you don't use? Explain why
8. What do you find challenging about traveling through Madrid?
9. Do you ever get lost while traveling through Madrid?
10. Do you use any app to help you? In that case, why did you choose that app?
11. How do you usually go to work/school?
12. Do you usually use multiple means of transport in a single trip?
13. What would you value more among these options: speed, money, simplicity? Why?
14. Do you consider environmental impact when you are traveling? In that case, would you consider changing your usual path in order to help this issue?
15. Do you follow the same path every day? Why/Why not? If so, what would you do in case this path isn't available?
16. How long does it take you to get to work every day?
17. How much do you spend in public transportation in a whole month?
18. Do you usually find a lot of traffic jams when traveling through Madrid? In that case, do you change the route? And if so, how do you choose your new path?
19. How do you travel in your free time?
20. Do you often use private means of transport? Which one do you like the most and why?
21. Do you usually notice with enough time when a mean of transport is blocked or unavailable? Tell us any experience related with this that you have may experienced

2. User phase results

2.1 Interview results

Included in separated files.

3. Competitive analysis

In order to make this study, first we are going to list the main functionalities that our system covers. Then we will find similar existing products that are direct or partial competitors to ours:

- Show all the possible ways to get to a destination via public transport
- Aggregate all the car sharing/moto sharing services
- Let a user take any of the vehicles from these services
- Aggregate all the private transport services
- Let a user ride one of these services

3.1 Total competition applications

1. CityTrips

- Description: the most complete app to access all mobility in your city
- Platforms: iOS, Android
- Pros: it has an offers section where you can find different codes and promotions to use the services, the app has every kind of transport
- Cons: it is not fully optimized, it has some bugs

2. CityMapper

- Description: the most complete transport app in Madrid and Barcelona
- Platforms: iOS, Android
- Pros: you can share your route via different apps, you can add any route to your favourite, the app has every kind of transport, you can access a news section where you can be informed about all updates related with transport
- Cons: at first it is not intuitive to the user, it only covers Madrid and Barcelona, its size is 200MB

3. Moovit

- Description: an app for all of your trips in the city
- Platforms: iOS, Android, Windows, macOS, Linux
- Pros: you can select the time and day for your trip and the app will adapt to the available options in the time selected, it sends you notifications with the latest updates regarding public transport
- Cons: you cannot use car2go, the map is not really detailed because they use their own map instead of Google's

4. Wondo

- Description: the mobility app in your city
- Platforms: iOS, Android
- Pros: you can get shared taxis
- Cons: the times of the buses sometimes are not very precise

3.2 Partial competition applications

1. EMT Madrid

- Description: this application allows you to have all the information about the EMT service
- Platforms: iOS, Android, Windows, macOS, Linux
- Pros: has a really high precision with the buses times and stops
- Cons: a lot of times the app doesn't work, it only works with Madrid buses

2. Madrid MBC (Metro Bus Cercanías)

- Description: all the information you need from Metro, Bus, Cercanías, BiciMad and TTP Card (public transport card) in real time and in one single app
- Platforms: iOS, Android
- Pros: the user can enter his public transport card number and the app will inform him of the days left or trips left depending on the type of the card, the app informs the user about the ticket cost of every transport
- Cons: it only works with Madrid public transport

3. Google Maps

- Description: navigate the world easily and quickly
- Platforms: iOS, Android, Windows, macOS, Linux
- Pros: really detailed information since it uses Google technology
- Cons: occupies a lot of space

3.3 Table of applications and functionalities

<u>Name</u>	<u>#Downloads</u>	<u>#Reviews</u>	<u>Rating</u>	<u>Ease of use</u>	<u>Type</u>	<u>Area</u>
CityTrips	> 50,000	174	4.0 ★	High	- Public - Private - Car Sharing	Madrid, Barcelona, Valencia
CityMapper	> 5M	74,860	4.5 ★	Medium	- Public - Private - Car Sharing	Madrid, Barcelona
Moovit	> 50M	774,803	4.5 ★	High	- Public - Car Sharing	Worldwide
Wondo	> 50,000	227	3.5 ★	High	- Public - Car Sharing	Madrid
Google Maps	> 5,000M	10M	4.3 ★	High	- Public - Private	Worldwide
EMT	> 1M	4,828	2.4 ★	Medium	- Public	Madrid

MBC	> 1M	12,740	4.5 ★	Medium	- Public	Madrid
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3.4 Factoid list

- Omar:
 - User Omar uses taxis occasionally, not Uber or Cabify
 - User Omar has some issues navigating through different bus and metro lines, especially when first arriving
 - User Omar finds Google Maps sometimes unreliable
 - Omar prefers the most direct route, rather than the fastest but tricky one
- Daniel:
 - User Daniel prefers the metro since it is underneath his home, goes everywhere and it is faster than the bus
 - What user Daniel finds more annoying from the metro is the fact that it closes at 1:30
 - User Daniel does not usually use private means of transport
 - User Daniel hasn't used shared bicycles yet
 - User Daniel doesn't usually get lost through Madrid
 - Daniel has an environmental impact concern
 - For Daniel, speed is by far the most important factor when travelling
 - Daniel has an average expense of 80€ a month in transportation
- Elena:
 - User Elena prefers the metro instead of the bus because she says that every country has its own way of managing things in the buses and metro is easier
 - User Elena never uses electric scooters
 - User Elena doesn't find really challenging to travel in Madrid
 - User Elena has an offline map downloaded in case she doesn't have Internet
 - Elena prefers using just one mean of transport if possible, instead of mixing them
 - Elena values cost over speed and simplicity
 - Elena is concerned about the environment and wants to work on that in the future
 - Elena hasn't experienced any issues with a blocked station or a disruption
- Pablo:
 - Pablo chooses the bus because he thinks it's the fastest method in all aspects
 - User Pablo never uses trains (Cercanías)
 - User Pablo thinks Madrid is crowded and sometimes uncomfortable
 - User Pablo uses Google Maps because it came within his phone
 - Pablo values speed over cost and simplicity
 - Pablo doesn't have environmental concern

- Pablo thinks the taxi customer service is much worse, so he prefers using Uber or Cabify
- Whenever Pablo gets his driver's license, he will reduce a lot using public transport

3.5 Conclusion

From our total competitors, CityMapper, Moovit and CityTrips are the most competitive applications. They aggregate every public transport method available, in addition to some private methods such as taxis, private cab services like Cabify and Uber, carsharing services, electric scooters and bicycle services. They are the most prominent competitors because they combine all the methods of transport we have thought of, and they operate in other cities such as Barcelona and Valencia - Moovit even operates internationally. This gives them the upper hand because their users in Barcelona, for example, will not need to find another application when they visit Madrid, as CityMapper will already provide everything that we provide. We can still improve to offer a more improved version of these applications: since they already offer the services we intend to provide, we will offer an improved interface with a more intuitive and efficient design in order to stand out.

Other competitors such as Google Maps or Madrid MBC are not direct competition because they lack many of the functionalities we intend to provide. Their applications are still useful, however: regarding Google Maps, their map's usability is very refined. We consider that the UI is distributed efficiently, so it will be a good idea to use a similar scheme that builds upon its weak points, while taking and improving on the features that make it such an easy app to use.

Phase 2: Modeling

We followed the bottom-up approach:

1. Behavioral variables

- Use of public transport
- Use of private transport
- Combination of distinct transport means
- Use of own vehicle
- Care of the environment
- Fitness concern
- Regular use of transportation (daily)
- Interest in social activities (restaurants, sightseeing...)
- Concern for safety
- Tolerance to adverse weather

2. Matrix with interviewees

We decided to add two more fictional subjects (Armando and Eustaquio) to our matrix in order to get a more exhaustive study and thus obtain more behavior patterns, with the purpose of acquiring more *persona drafts*.

	Omar	Pablo	Daniel	Elena	Armando	Eustaquio
Use of public transport	High	High	High	High	Low	Medium
Use of private transport	Low	Low	Low	Low	High	Medium
Combination of distinct transport means	Low	Medium	Low	Very low	Low	Medium
Use of own vehicle	None	None	None	None	Very high	High
Care of the environment	Low	Low	High	Medium	Low	High
Fitness concern	Low	Low	Low	Low	Low	High
Regular use of transportation (daily)	High	High	High	Low	High	High
Interest in social activities (restaurants, sightseeing...)	High	Low	High	High	Low	Medium
Concern for safety	Medium	Low	Low	Medium	Low	High
Tolerance for adverse weather	Low	Medium	Low	Low	High	High

3. Behavior patterns

- Interviewees with higher care of the environment tend to use fewer private means of transport or own vehicles.
- Most interviewees don't usually combine several means of transport.
- The private transport means of transport are the less frequently used in general.
- Older interviewees use private transport more frequently than the younger ones.
- Most interviewees are not concerned about fitness when travelling.
- Interviewees who use their own vehicle care less about the weather, while those who use public transport are less tolerant.

4. Synthesis of characteristics and relevant goals

- Persona drafts:

	Andrés Gómez	Enrique Machado	David Householder	Eva Domènech
Location	Madrid, Spain	Madrid, Spain	Manchester, United Kingdom	Madrid, Spain
Age	20	42	32	34
Job	College student	Office worker	Journalist	Waitress
Salary per month	50€	2500€	1700£	1500€
Description	Andrés is an ambitious student but doesn't have too much money. He knows how to prioritize when it comes to spending his limited budget. He can estimate value very well, but he can get carried away when it comes to partying.	Enrique lives the 9 to 5 life. Although it can be miserable at times, he works hard to provide a comfortable future for his family. He finds hope in playing with his children and reducing his CO2 emissions.	David is passionate about his job, which requires him to travel around the world. When his workday comes to an end, he loves to wander around the place he is currently at.	Eva works at night serving dinner at a restaurant and finishes her shift late at night, around 3 A.M. Then, she needs to walk for 10 minutes to the nearest bus stop since she doesn't own a car, so she's always looking for the fastest way to get back home safely.
Knowledge and skills	<ul style="list-style-type: none"> - Medium computer skills - He is up to date with the latest technologies 	<ul style="list-style-type: none"> - Can cook vegan meals - Curling fan - Experienced motorcyclist 	<ul style="list-style-type: none"> - He loves photography - He manages his time very well on his trips 	<ul style="list-style-type: none"> - Can carry more beers than any other person - Enjoys watching Big Brother - Knows how to give tattoos
End goals	<ul style="list-style-type: none"> - Get to the destination as quick as possible - Avoid unnecessary expenses 	<ul style="list-style-type: none"> - Never be late - Avoid traffic jams - Contribute towards a more sustainable city 	<ul style="list-style-type: none"> - Visit all the continents - Win a famous photography contest - Know every city he goes to like the palm of his hand 	<ul style="list-style-type: none"> - Experience the nightlife of the city where she is and meet new people - Have her own restaurant

	- Find late-night transport with no problems			
Life goal	He wants to be rich, then go to Las Vegas and buy a yacht	Lead a conscious lifestyle	Live a fulfilling life with the help of photography	Live her life with no fear
Experience goals	- Control his spending - Have fun	- Make the most of his time	- Be on the lookout for the best snapshot	- Have fun - Feel safe
Phrase	"Build a life needless of vacations"	"Your pain today will be your strength tomorrow"	"Taking pictures is like tiptoeing into the kitchen late at night and stealing Oreo cookies"	"Work for a cause, not for applause"

5. Completeness and redundancy verification

We have reviewed the factoid list and made sure that all the information from our research has been transferred to at least one of our personas.

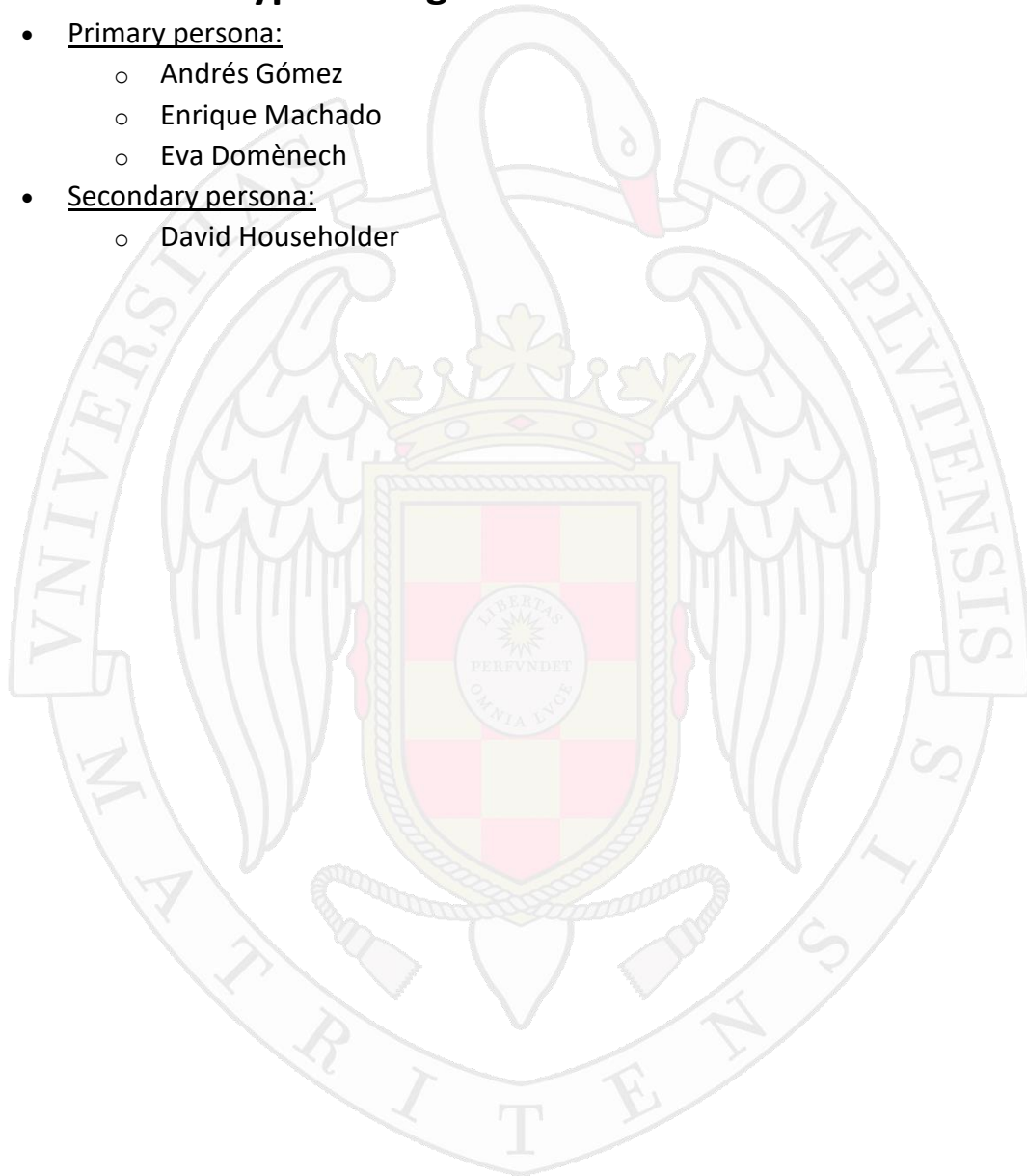
6. Description of attributes and behaviors expansion

- Andrés Gómez:
 - Andrés tends to feel disoriented after a long party night, so he needs an intuitive and easy way to get home without any danger.
 - His lifestyle makes him move through the city late at night, so he needs to know the few transport possibilities left when the sun goes down.
 - Andrés has a limited budget, so he is always looking for the cheapest transport option.
- Enrique Machado:
 - Enrique is very concerned about climate change, therefore he prefers to use more ecological means of transport, such as bikes or electric scooters.
 - Being late is never an option for Enrique, so he is always aware of possible traffic jams or line disruptions.
 - Being a frequent motorcycle user, he has all the necessary accessories at his disposal, making it possible to move around safely in any weather conditions, no matter the season.
- David Householder:
 - Usually David has some problems when it comes to connecting to the Internet in foreign countries, so he prefers to use offline apps.
 - David loves sightseeing, so he is always looking for the best route, so he doesn't miss the most beautiful places to take his photographs.
 - David has visited more than 30 different subway systems on his journeys, so he sometimes has difficulties when trying to understand their structures.
- Eva Domènech:

- Eva feels unsafe when she walks on her own from the restaurant to the bus stop at night
- Some days Eva leaves the restaurant later than usually and she needs to take a taxi to get back home safely since the nearest bus stop is 15 minutes away
- Every Thursday Eva's best friend Javier drives her home in his car

7. Persona types designation

- Primary persona:
 - Andrés Gómez
 - Enrique Machado
 - Eva Domènech
- Secondary persona:
 - David Householder



Phase 3: Requirements

1. Problems and visions

Problem	Vision
Many people who are not from the city are forced to take private transport means instead of public transport because they are unfamiliar with the city and they find it too complicated.	Our app will guide users around the public transport system in a very intuitive way, making sure that every user can use whichever means of transport they prefer.
In specific areas late at night people tend to take private transport means since public ones are not available, especially in airports or very crowded areas.	By specifying the closest stops of night buses and the remaining time, we will help avoid situations where there are no cars available and a lot of people requesting them.
The weather makes certain types of transport much less safe or less desirable to use. Many people aren't comfortable renting motorbikes or electric scooters if it is raining or very cold.	Our application will be aware of weather conditions throughout Madrid and will be intelligent enough to prioritize transport means differently in its recommendations and warn users if forecasts reflect rain or other extreme weather in the near future alongside certain transport means.
There are various laws pertaining to who can drive motorbikes and cars in Spain dependent on age and how long someone has had their license.	To receive recommendations which have legal requirements, a user will have to enter how long they have their license and their age, and any other relevant information. The application will use this information to determine what methods a user can legally use and not suggest methods they cannot use legally.
On days with strikes in the metro, lots of users arrive late to their work/class because they weren't aware of the strikes.	Our app will notify its users in advance (a day before and when the app is opened) so that they are aware of the strike and can adjust their schedule accordingly.

2. Summary of ideas taken from brainstorming

- List of things the application should do:
 - Enable a user that has logged in to use any supported method of transport without the need for separate accounts
 - Allow the user to select preferred methods of transport
 - Notify the user when exceptional events such as strikes, adverse weather, or holiday closures may affect a method of transport they use
 - Provide accurate times of arrival for public transport services, such as buses, metro trains, and Cercanías trains
 - Provide timetables for public transport services, detailed by the hour for every day of the week - including holidays.

- Present the user with several routes for a given trajectory, offering the preferred methods of transport first
- Verify that users who want to use transport services that involve driving a vehicle are legally permitted to do so
- **List of the things the application should not do:**
 - Occupy more than 100 megabytes
 - Offer all functionalities when offline. The only exception would be if the user saved a particular route for offline use
 - Prohibit users with no verified driver license from accessing transport service that involve driving

3. Personas' expectations

Andrés is a really outgoing person and he likes to hang out and meet new people. On weekends, he usually meets new girls from mobile apps or hangs out with his friends. Moreover, punctuality is important to him. Andrés likes to discover new places and he changes a lot the meeting point. He would want the girls and his friends to be on time at the place he meets them. In order to get on time to these places, he uses Movedrid. He expects the app to be always accurate. Moreover, he wants the app to be intuitive for his friends, because he showed them the app and they didn't like it so much.

Enrique is a hard-working person. He has been working at the same company for over 5 years now and has learned to cope with the stress that comes with traffic jams and angry bosses. Despite this, he is concerned about climate change and tries to make a better world for his children by recycling and using eco-friendly means of transport. His job has made him value the times when he's not working but hanging out with friends from University or having dinner with his family, which means he'll occasionally have to take private transport means. He also likes to play curling every once in a while, which means taking the Cercanías train to a nearby sports center, since he can't carry all of the required gear to play curling in his motorbike.

Eva knows the city of Madrid well and feel confident navigating the metro, bus, and rail systems. However, being such a large city she doesn't always know immediately exactly how to get to a new place, let alone the most efficient route to get there. Because of her job and her love of Madrid's nightlife, she often has to get around at night which often proves a challenge. However, she is quite adept with technology is generally competent reading bus schedules, maps, and the like. She prefers to avoid spending extra money beyond her monthly payment for her transport card but at times is willing to pay a bit extra.

David flies frequently and needs to have a guarantee that he will arrive at the airport on time. To him, it is crucial that Movedrid does not fail when it comes to arranging and paying for taxi, Uber, or Cabify rides - he cannot afford to waste time before catching flights. If David pays for an Uber ride, for example, and it was programmed for a certain hour, he expects that Movedrid communicates the whole story to the taxi agent at hand, letting him know at what time they should meet, and that the trajectory has already

been paid for in advance. Once David arrives at a new city, he also expects Movedrid to mark certain methods of transport as outdoor, tourist friendly services: he enjoys sightseeing and wants to be able to view the city with every chance he gets.

4. Context scenarios

1. Andrés is on his way to school intending to take his usual route on the metro but has forgotten that a strike was beginning today and the metro is running much slower than usual. He opens up Movedrid on his phone and types the name of his university as the destination. Movedrid provides a list of various methods, costs and time required for the journey. Andrés sees that he will not arrive to school on time if he takes the metro as Movedrid has adjusted the time estimate based on the strike. He does see however, faster options above the metro, such as busses and ride-hailing.
He decides to take a route with two different bus lines as it will not cost him anything and will get him to class on time. He chooses this over ride-hailing options which were placed below the bus option because while they would get him to school faster, they would cost money - something that Andrés aims to spend only when necessary...
2. It's raining outside and Enrique needs to meet a client in Villaverde. He opens up Movedrid on his phone and types in the address where he is to meet his client. While he often rents motorbikes, the option to rent one is placed lower than usual and has a weather warning. Concerned for his safety, Enrique decides to take an Uber since it the only available option to get him to his destination on time. Enrique selects the option, and since Movedrid already has his payment details he seamlessly orders his uber through the app.
3. Eva finishes her shift at the restaurant at 3:30 AM and needs to get home. She opens Movedrid and selects her home address as the destination. She sees that her usual night bus will take a long time to arrive as she has just missed the most recent one. Seeing that renting a bike will get her home much quicker she decides to select that option.
Because this is her first time using a paid option, she quickly enters in her payment information and Movedrid seamlessly navigates her to the nearest available bicycle to rent. She unlocks the bike through the app and rides home.
4. Andrés has a huge party tonight at Teatro Kapital, near Atocha station. He arrives to the metro and he meets all his friends. After having dinner, they decide to finally enter to the club because it was starting to rain.
After a long night inside the club dancing and having fun, he decides to leave. Due to the alcohol effects, he doesn't know how to get back home properly and he forgets the route he usually takes.
He opens Movedrid and decides to take a look at the different options that the app shows. Due to the intuitive interface of the app and its simplicity, he doesn't find too much trouble to get a Cabify, which will drop him off at home.

5. Eva just went to the library: her favorite author's new book got restocked and she needed to get copy. Now that she has her new book, all she wants to do is go home and relax while she reads on her reading couch.
Upon checking Movedrid, she realizes that she should take public transport so she can start reading on her way home. She also prefers to pick environmentally friendly transport services, which are noticeably marked on the side, so she picks the bus route and heads off towards the bus stop.
Movedrid provides a map with a highlighted route to ensure that Eva does not get lost on her way to the bus stop.
6. David arrives to Madrid after a trip to Poland. He decides to stay in Pozuelo de Alarcón, a village near Madrid, because he has some friends there and he can stay in their house. David is planning a tour around the center of Madrid.
To get there as fast as possible, he needs to take the Cercanías train that connects Madrid with the city's outskirts.
After spending two days with his friends, David decides to visit Madrid. He opens Movedrid and checks the time of the train. Since he's not from Spain, he's not aware of the strike that will occur that day. However, thanks to Movedrid he's able to detect the strike and to plan an alternative route by taking a bus.
7. David is assigned to work in Madrid for a month. He downloads Movedrid to move around the city and he creates an account. He decides to save the route that uses the bus from his work to home and vice versa to his bookmarks.
One day he decides to go shopping around Malasaña, a typical neighborhood of Madrid. After buying some stuff, he finds out that his phone was stolen, probably because of the big amount of people that were in the streets.
David buys another phone and downloads Movedrid. The next day he has to go to work he forgets the exact address and the name of the company. However, when he enters his account credentials in the app, he realizes that the bus route is still in his bookmarks, so he manages to get to work hassle free.

5. List of requirements

1. Enter (action) destination address (object) into application and determine (action) best transportation options (object) based on current time, location, weather, and preferred means (context).
2. A warning appears (object) when there is adverse weather (context) and a user searches (action) for a destination (object)
3. When the user is logged in (context) with a Movedrid account (object), paying (action) for private transport services such as taxis, Ubers or Cabifies (context) is an option.
4. Enter (action) payment information (object) for selected method (context).
5. Scan (action) driver's license (object) to make renting cars or motorbikes possible (context)
6. Once a route is selected (context), the map (object) highlights (action) the path to the next point in the trajectory
7. When choosing (action) a route to a destination, eco-friendly routes (objects) that are available (context) have an indicator (object) that distinguishes them.

8. Find out (action) about news (object) related with the means of transport the user normally uses (context)
9. Select (action) preferred methods of transport (objects) to prioritize them over other methods of transport in searches (context)
10. Upon searching (context) for a destination (object) and selecting (action) a route (object) to inspect it, clicking (action) the bookmark icon (object) will save the route (object) to the account if the user is logged in (context).



Extra Phase: Heuristic evaluation

1. Heuristic evaluation plan

1.1 Description of the application

Movedrid is an application that seamlessly provides users with tailored solutions for navigating the city of Madrid and its many methods of transport. Movedrid intelligently provides different routes through the city tailored to current conditions in the city and the user's personal priorities and desires. Movedrid is aimed at people of age over 8 and with a driver license of any type.

1.2 Tasks to be performed

Experts will execute the following tasks in order to find out heuristics violations which will be given a severity scale

- Create an account
- Log in
- Consult the metro and cercanias map
- Search the route for the “Real Jardín Botánico”
- Sort the different paths with every possible option
- Add (at least one) payment option
- Change the type of a payment option
- Change the license and check the changes in the possible paths to a destination
- Change the age and check the changes in the possible paths to a destinations
- Check “destinations” screen
- Check “news” screen
- Set a Home and a Work address

1.3 List of heuristics

We have applied Nielsen's 10 famous heuristics to critique the user interface designs of the application.

1. Visibility of system status

“The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.”

2. Match between system and the real world (or use familiar metaphors and language)

“The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.”

3. User control and freedom

“Users often choose system functions by mistake and will need a clearly marked ‘emergency exit’ to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.”

4. Consistency and standards

“Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.”

5. Error prevention

“Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.”

In our application, there are some cases in which when searching for the best traveling options, the use of shared vehicles such as cars or motorbikes could cause possible errors. This happens because this type of means of transport must be reserved to prevent others from using them. However, a user can't book it for an indefinite time, so our application must take it into account, by not showing any travel option of this type when the time required to reach the vehicle is greater or similar to the maximum period of time that the vehicle can be reserved.

6. Recognition rather than recall

“Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.”

7. Flexibility and efficiency of use

“Accelerators – unseen by the novice user – may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.”

8. Aesthetic and minimalist design

“Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.”

9. Help users recognize, diagnose and recover from errors

“Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.”

10. Help and documentation

“Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.”

1.4 Severity Scale

We made a severity ranking in order to scale the different problems we encountered during the heuristic evaluation.

0 - No problem to be considered.

- 1 - Minimal problem.
- 2 - Minor problem. Remember to fix.
- 3 - Major problem. Need to be fixed.
- 4 - Catastrophic problem. Important to be fixed.

1.5 Individual Report Template

Task performed	Problem & description	Heuristic violated	Severity Scale
Create an account			
Log in			
Consult metro/cernanías map			
Search the “Real Jardín Botánico” route			
Sort by all possible options			
Add a payment			
Change the payment option			
Change license and check changes			
Change age and check changes			
Check “destinations”			
Check “news”			
Set Home/Work address			

2. Individual expert reports

2.1 Marko’s report

Task performed	Problem & description	Heuristic violated	Severity Scale
Create an account	It’s hard to click the text that says “Not a user yet”	7, 8	1
	I enter age 25 and yet it says I can’t have a car license since I’m under 18	7	4

Log in			
Consult metro/cernanías map	Map is very small - I guess you're supposed to be able to zoom?	7	1
	There is such a big empty gap in the selection screen	2, 8	0
Search the "Real Jardín Botánico" route	The input text field is very small and makes it very difficult to read what you're typing	3, 4, 7, 8	3
Sort by all possible options	Options are very small again, difficult to see what you're choosing	7, 8	2
Add a payment	It's very difficult to count the number of characters you have input due to lack of spaces or "-"	2, 4	2
Change the payment option	Only possible to have one payment option at a time ???	2	1
Change license and check changes	Radio boxes are too small and not clickable by finger, not suitable for mobile	2, 4, 7, 8	4
Change age and check changes	Are you supposed to be able to change your age manually? Anyways, very small accept button.	2, 7, 8	2
Check "destinations"			
Check "news"	It could be more dynamic, for example I would like to be able to read an article, buttons hardly readable	2, 7, 8	1
Set Home/Work address	It doesn't check for example that it's a valid address. The navigation is a bit clumsy	5, 9	1

General comments: You could probably get rid of all the radio buttons as it's not suitable for mobile. A lot of stuff is very small and needs to be made bigger in order for it to be usable on a mobile.

2.2 Ena's report

Task performed	Problem & description	Heuristic violated	Severity Scale
Create an account	I can't see properly the 'Passwords don't match'	1	3
	After that, I can't just retype it, I have to refresh the page	7	2
	The age box isn't working properly, I can't register because of it		4
Log in	There wasn't any problem		0
Consult metro/ceránías map	The maps can't be clearly seen, it would be great if it can be zoomed	7	2
Search the "Real Jardín Botánico" route	There wasn't any problem		0
Sort by all possible options	When you sort by "Least walking" it's not sorted properly	7	2
Add a payment	I get a long error saying all things that might be wrong and then I have to check everything by myself to see where I put something wrong	7, 8, 9	3
Change the payment option	It is not changing but more adding new payment option, so it is the same as previous	It is same as previous	It is same as previous
Change license and check changes	There was no problem, changes were saved		0

Change age and check changes	I changed the age I suppose with no problems, but I can't see this data anywhere which is a - Also if I am under 18 the app disables Cabify+Cercanias option, which shouldn't happen	1, 6, 7	2
Check "destinations"	There wasn't any problem, but there are not any functionalities now Maybe if those "FAVORITES" and "HISTORY" boxes were more visible, like with colors		1
Check "news"	There wasn't any problem, but there are not any functionalities (buttons "Share" or "More info" aren't working) Also maybe to make "METRO" and "BUS" boxes more visible		1
Set Home/Work address	There wasn't any problem		0

2.3 Esther's report

Task performed	Problem & description	Heuristic violated	Severity Scale
Create an account	Can't see not matching password error properly. Can't change password if not matching error has appeared. Can't sing up because of the age even though it's greater than 18.	1, 4, 9	4

	Not possible to go back to log in if any problem registering appears.		
Log in			0
Consult metro/cernanías map			0
Search the “Real Jardín Botánico” route			0
Sort by all possible options			0
Add a payment	Error message not very clear (24 or 12 digits?)	9	1
Change the payment option	Can’t add an account as a payment option (error message appears)	9	3
Change license and check changes			0
Change age and check changes	Changing the age doesn’t disable some of the possible traveling options	4	4
Check “destinations”			0
Check “news”			0
Set Home/Work address			0

3. Assessment of the quality of the evaluation received

In our view, the evaluation that was provided was correct. To start with, the other group was capable of performing the tasks we indicated. They were capable of identifying existing problems and each member of the group explained the problems they found in a concise manner. Apart from that, they knew how to link the problem with the corresponding heuristic.

The fact that each member of the group explained their own point of view helped us identify more problems and the different opinions in the same group made for an

interesting discussion. They also proposed some solution to the issues that they found, which is great.

4. Agreed shared table

1. Create an account task
 - Marco: couldn't click / see it
 - Ena: the write thing is too low - the icon covers it
 - Esther: same as Ena
2. Age problem
 - Error on our behalf
3. Login
 - No problems
4. Consulting maps
 - Ena: couldn't zoom in, should be able to.
5. Searching location
 - Ena: no problem
 - Esther same
 - Marco: input field is very small - hard to see what you're writing
6. Sorting
 - Ena: "sorted" list is not really sorted
7. Payment error message
 - Ena: five fields: an error on one field is highlighted on every field - unclear what is wrong
 - Esther: account number must be 24 digits and card number must be 16 digits
 - Marco: hard to see what is being written - usually, credit cards are separated every 4 digits on input
8. Change payment option
 - Everyone: Only possible to have one payment option at a time
9. Design
 - Marco: radio buttons are barely clickable
10. Change age
 - Esther: 15 years old + set driver's license - should it be allowed?
 - Marco: should the user really be able to manually change their age? Wouldn't it be easier to just input your birth date?
 - Ena: couldn't use Cabify + Cercanías when setting age to 18 and setting driver's license
11. News and destinations
 - All: problems with the buttons - hard to read. Some functions are not implemented.
 - Marco: radio buttons are too small, again. Too small for mobile

5. Final list of changes and priorities

- Level 4:

- Solve the different problems when creating an account
- Fix some errors related to the changing of the age and the abled/disabled traveling options
- Take off the radio buttons in the sign in
- Level 3:
 - Enlarge some tiny input text fields
 - Adjust the visibility of the errors when registering
 - Make a unique error message per error instead of a large error message containing all the possible ones
 - Fix the payment options when adding new methods
- Level 2:
 - Adjust the visibility of the traveling options
 - Help users when typing their credit or account numbers by adding “-“
 - Change the “Edit age” section so the user types his/her birthdate
 - Show the user’s new age when he/she changes it
 - Correct the order of the traveling options in the “Least walking” tab
 - Fix a bug when after typing wrongly the ‘Password’ and ‘Repeat password’ fields, the user can’t just retype it, but has to refresh the page
- Level 1:
 - There isn’t any functionality now in the “News” section
 - There isn’t any functionality now in the “Destinations” section
 - Make the “FAVORITES”, “HISTORY”, “METRO” and “BUS” boxes more visible
 - Being able to add more payment options

6. Applied changes

- Improved the design of the “Not a user yet” button on the “Log In” page
- Fixed an error in which the user couldn’t register with a car license typing a correct age
- Reduced the gap in the screen between the Metro and Cercanías buttons in the “Maps” page
- Fixed the size of the input in the search bar
- Re-designed the “Destination options” pages, where are sorted by the cheapest, fastest, least walking and eco-friendly
- Added dashes (“-“) in order to make clearer the input of a payment method
- Added the option of having 2 different payment methods
- No radio buttons used for changing the type of license, but buttons
- Added sample text on the “News” section when clicking the “More info” buttons
- Improved the design of the “Passwords don’t match” error message when registering
- Fixed an error where you couldn’t type again the passwords when the “Passwords don’t match” error occurred

- Fixed an error where the options were not displayed in order when the Destination options were sorted by “Least walking”
- The error message in the “Add payment method” page has been re-designed, in order to differentiate all the different errors
- Added a message when the user updates his/her age in order to show him the new current age
- Added a link to go back to the “Log In” page in the “Register” page



Phase 4: Design framework

1. Process for defining the interaction framework

1.1 Define the form factor, posture and input methods

Form factor:

Regarding the software, “Movedrid” will not require a big amount of memory or size to run the application effectively. It will not occupy more than 300MB so it can be easily installed on every device. On the other hand, in relation to the hardware, “Movedrid” will base its usability through the device’s touchscreen. It will adjust its size to every kind of screen, from the smallest phones to the biggest iPads. It will be compatible for both Android and Apple devices.

The posture:

Regarding the time the user is expected to use or interact with the application, is short. This is known as Transient posture. This means clear, simple, intuitive and obvious interfaces. The user will just use the app to check a route or at most, to follow for a certain time a specific path.

Input methods:

All type of personas will use the same input methods. Because “Movedrid” is a device application, it will have as main input the whole phone screen. The user will navigate through the app by swiping and clicking in the different buttons and screens. Indeed, it will have a secondary input method, the phone microphone just used in case the user prefers to write a location by speaking instead of typing.

1.2 Construct key path scenarios

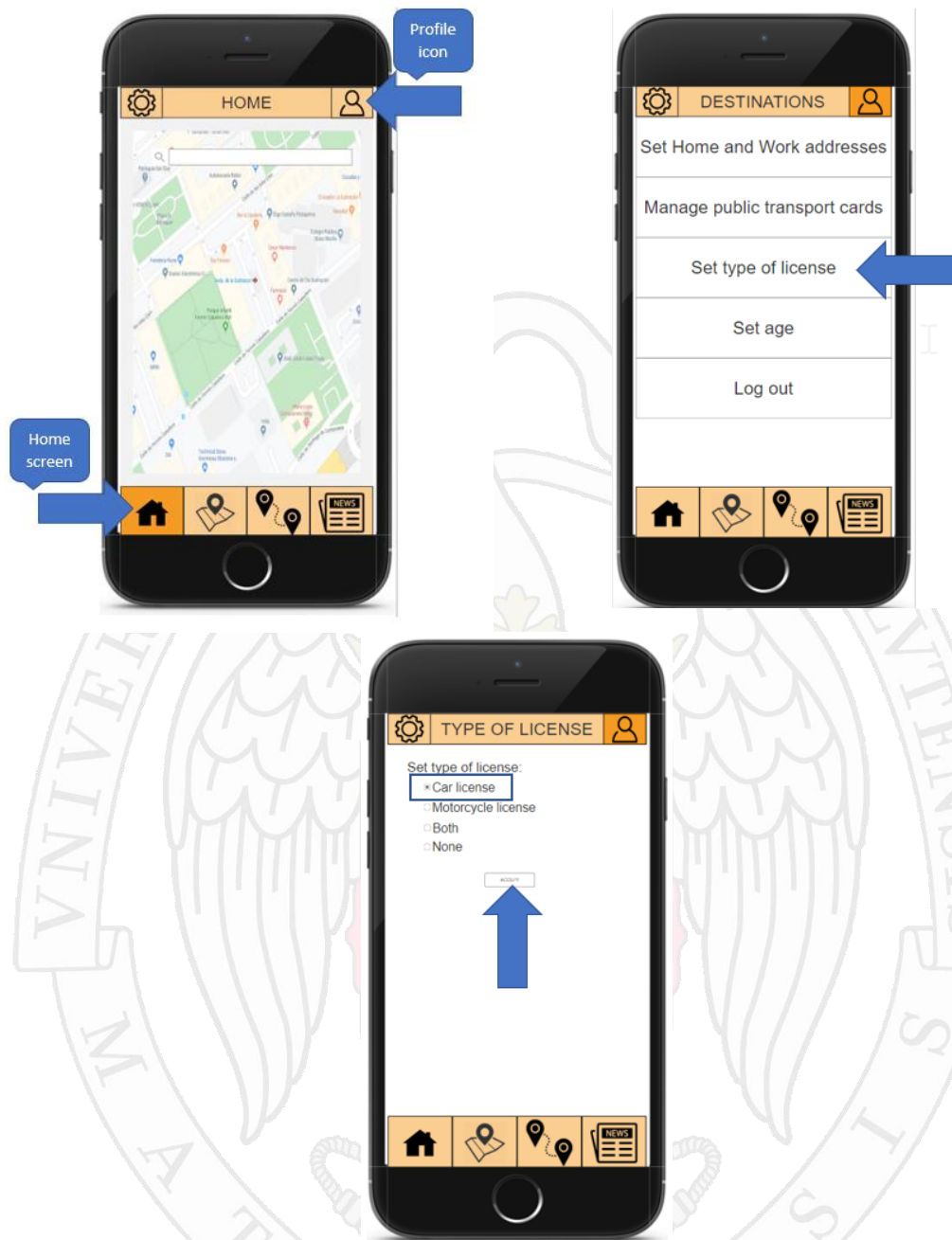
Search for a route:

A user can search for a route in the home screen by typing in the top bar and clicking in the loupe. This will take him to a destinations screen where the user can select one of the many routes he can take. Indeed, he can reorder these routes by the fastest, cheapest one, etc. Once the user decides for one of them, just by clicking on it, the app will display a map visualizing the route in the top and the route detailed step by step.



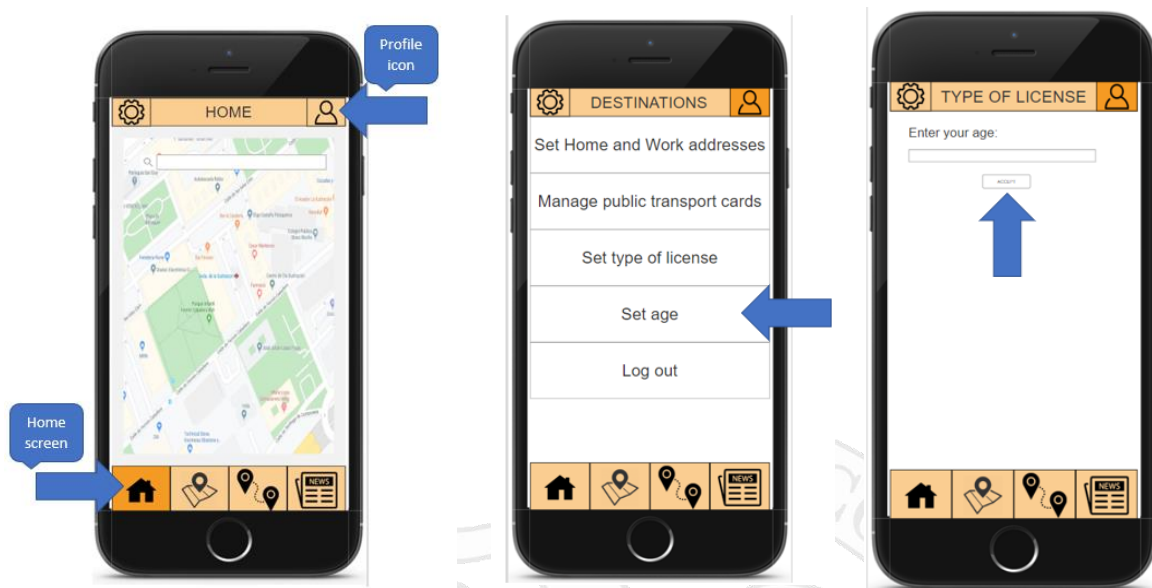
Change driving license:

Once the user has login, he can change his driving license. In the home screen, by clicking in the profile icon and then in "Set type of license", the user can introduce his new license. To confirm changes, click on "ACCEPT".



Change age:

Once the user has login, he can change his age. In the home screen, by clicking in the profile icon and then in “Set age”, the user can introduce the new age. To confirm changes, click on “ACCEPT”.



Log in:

The user will encounter the Login screen when he opens the app. He just need to enter his credentials and click "Log in".

Sign in:

In case the user does not have an account. The user must click on "Not a user yet" in the login screen. This will open a sign in screen with a form to fill in.

1.3 Check designs with validation scenarios

Log in:

State	User input/action	Expected output
One or more fields empty	press "Login" button	Error label message
Both fields fill in. Password and user do not match.	press "Login" button	Error label message

Sign in:

State	User input/action	Expected output
One or more fields empty	press "Sign in" button	Pop-up error window
All fields filled in. Passwords 1 and 2 does not match	press "Sign in" button	Pop-up error window

All fields filled in. Invalid age format entered	press "Sign in" button	Pop-up error window
All fields filled in. Driver license not permitted for the age introduced.	press "Sign in" button	Pop-up error window

Search a route:

State	User input/action	Expected output
Home screen	Click on Loupe	Pop-up error window
Home screen	Invalid destination	*nothing*
Invalid destination entered	Click on loupe	Pop-up error window

Change age:

State	User input/action	Expected output
Set age screen and empty input	Click on "ACCEPT"	Pop-up error window
Set age screen	Invalid age format entered (input not integer, age < 0, etc.)	*nothing*
Invalid age format entered	Click on "ACCEPT"	Pop-up error window
Correct age format entered	Change screen without clicking on "ACCEPT"	New screen showed but the age has not changed

Change type of license:

State	User input/action	Expected output
Type of license screen	License chosen which is not permitted for the user age	*nothing*
License screen and new license chosen which is not permitted for the user age	press "ACCEPT" button	Pop-up error window

Add payment option:

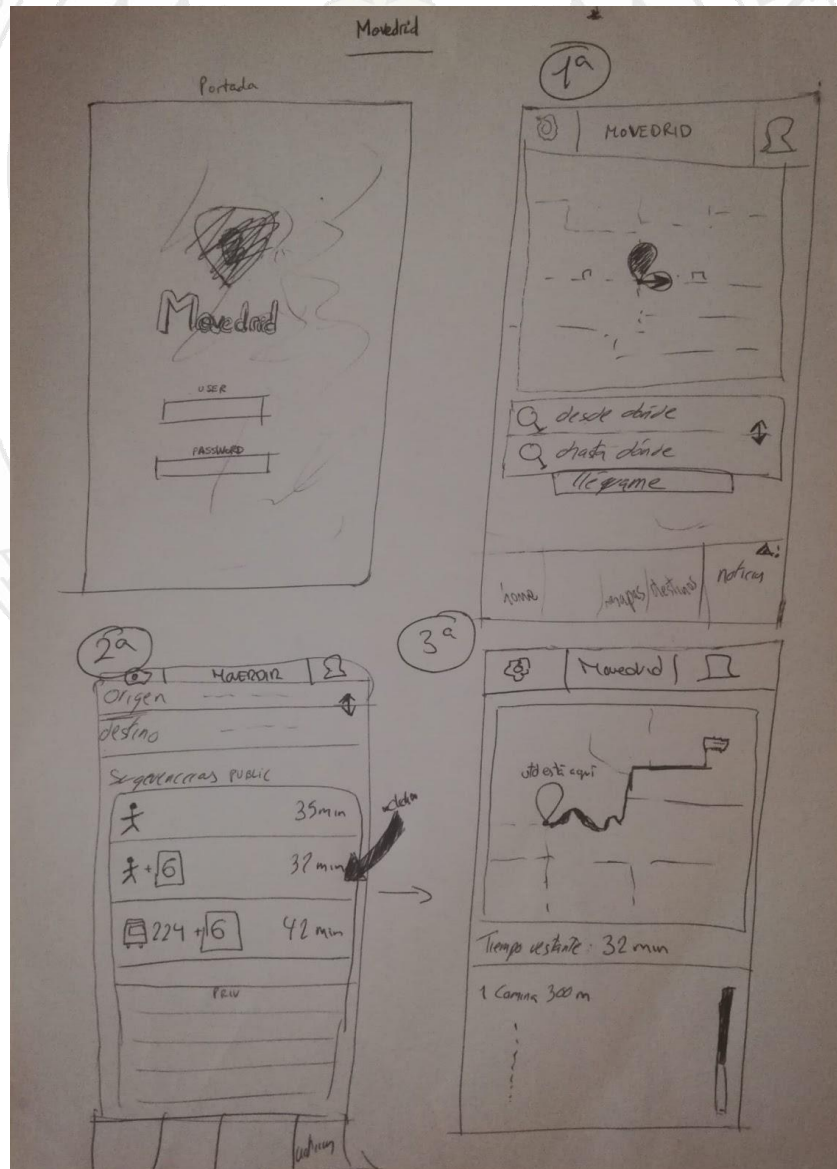
State	User input/action	Expected output
-------	-------------------	-----------------

Add payment option screen and one or more fields empty	Click on "Confirm"	Pop-up error window
Add payment option screen	Invalid input format in any of the fields	*nothing*
Invalid input format in any of the fields	Click on "Confirm"	Pop-up error window

2. Iterative process

Iteration #1:

- Focusing on the brainstorming process that took place in Phase 3, present the user with the main ideas that were drafted from that activity
- Make a sketched-out mockup on paper to have a first approach
- Brainstorm some more in order to have a clear set of ideas when it comes to making an interactive prototype




Iteration #2:

- Implement a solid foundation for the prototype, ensuring that navigation and main screens are covered
- Make the key path scenarios functional
- Design a heuristic plan to review and evaluate the prototype's main scenarios

Iteration #3:

- Use the heuristic evaluation results to locate faulty/improvable areas
- Implement fixes and improvements

3. Design principles applied from class

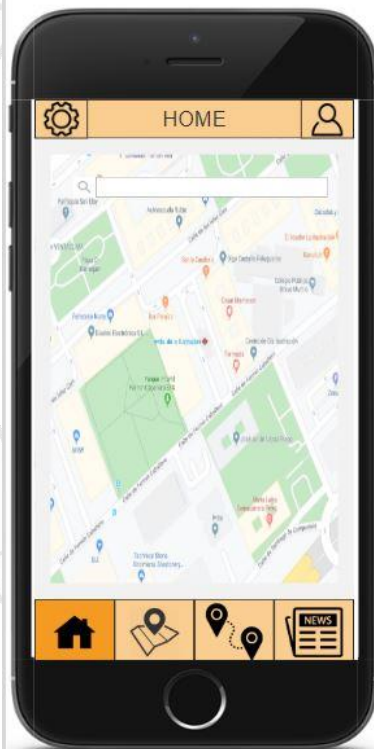
View	Image	Design principles
Login Screen		Closure Visibility and feedback

Registration Screen

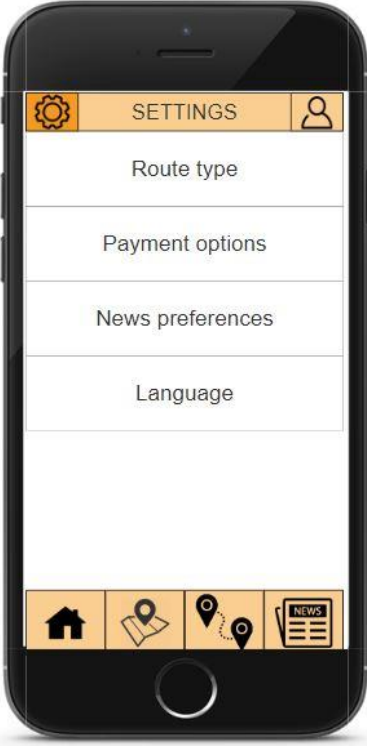
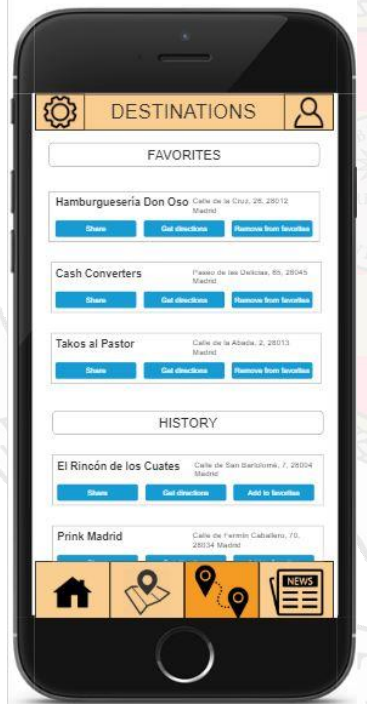


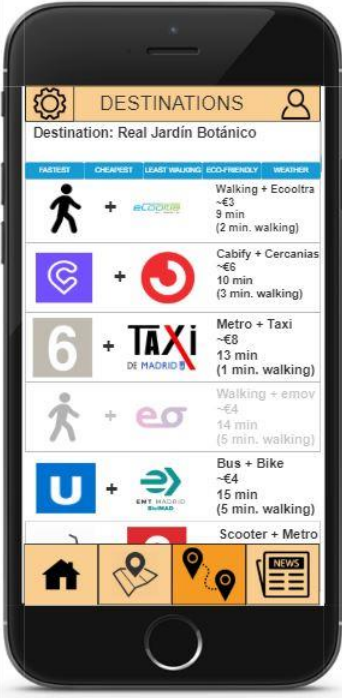
Closure
Visibility and feedback
Visible state management

Home Screen



Closure
Visibility and feedback
Visible state management
User control and freedom

<p>Settings</p>		<p>Consistency User control and freedom</p>
<p>Destinations</p>		<p>Proximity Closure User control and freedom</p>

<p>Route Options</p>		<p>Proximity Closure Consistency Visibility and feedback Visible state management User control and freedom</p>
<p>Route</p>		<p>Proximity Closure Visibility and feedback Visible state management</p>

4. Interactive final prototype

<https://wccyrk.axshare.com>

