GROUP CRITICAL ANALYSIS - TACHIFLUDEC

Tommaso **Bosetti** [185286] (tommaso.bosetti@studenti.unitn.it)
Sebastiano **Chiari** [185858] (sebastiano.chiari@studenti.unitn.it)
Leonardo **Remondini** [184563] (leonardo.remondini@studenti.unitn.it)
Marta **Toniolli** [187839] (marta.toniolli@studenti.unitn.it)

1. EXECUTIVE SUMMARY

During the develop of the project we followed the Gantt diagram given in class. Instead of splitting the work through group members, we decided that each of us should give his/her ideas and contribution in each phase of the project. Thanks to this workflow all group members understood how to face all the different parts of it. The design phase in particular was the only one different: group member Sebastiano Chiari had a big impact because he was already familiar with Adobe XD, the program we used for the creation of the medium fidelity prototype.

First of all we had a brainstorm, that is the benchmarking phase, in which we looked for already-existing sustainable applications and created a design library. We tried to embrace this global issue to understand how we could give our contribute without falling into already-developed applications. After that, we moved on the contextual interviews. First, we created an online survey in order to have some clarification and do interviews more suitable to our application recipients. From this phase, we understood that in most cases people agree in theory with our initiative but have radical habits that are unwilling to change quickly. Whereupon, we analyzed the interviews to collect user requirements and what users want in an application that encourage sustainable mobility.

After we had clear what were users needs, we wrote down some thoughts to ideate a first sketch of our application. Our idea was to develop an application which embraces all major sustainable alternatives in terms of transport means in order to avoid the continuous switching from an app to another, which can result frustrating. We also managed to create a part of gamification in order to keep the user engaged and give him one more reason to use our app. Through the gamification, our aim was also to instruct the user, giving him some curiosity pills and tips regarding a more sustainable way to live. After collecting this amount of data we started drawing the low fidelity prototype. We developed it as a sustainable alternative of Google Maps in order to maintain a well-known interface to a common user. With our application the user can choose among already existing different sustainable means of transport to reach a particular destination and also the service which provide the means for moving. The gamification consists in daily quizzes where the user can answer to one question about pollution, sustainable mobility and in general the impact of human travel on nature. We think is a real way to introduce people into a more sustainable way of thinking. Then we moved to the evaluation phase, receiving people reviews to our low fidelity and we collect some advices in order to improve the design in the next phase. The merge between low fidelity and people feedbacks helped us to create the final stadium of our project: the medium fidelity prototype. We added some new features to our low fidelity according on what people suggested us. Of course if we could have more than just two iterations, our outcome would have a better design and more features, but most of the people told us they were quite satisfied of our medium fidelity prototype.

2. BENCHMARKING

2.1 Analysis of existing systems

Nowadays, sustainable mobility is a very important issue, worldwide recognized, but many people do not seem to be aware of it, even though it concerns them closely. This is why our goal was to create something to sensitize people about this topic, but at the same time to produce something easy to use and helpful in everyday life.

The aim of the benchmarking was to explore the actual panorama, searching for the most used apps for mobility and finding how they relate to the sustainability of it. We were also very curious about where this research would take us and especially what little discoveries we could make.

We have found many applications that allow us to move in a sustainable way (Uber and BlaBlaCar for car-pooling, Ofo, Lime and Mobike for bike-sharing, Car2Go or Enjoy for car-sharing). However, we saw that they do not really emphasize the sustainable mobility side, which goes into the background. On the other hand, we found other interesting applications, less used, like Oroeco (https://www.oroeco.com) and BikeMap (https://www.bikemap.net).

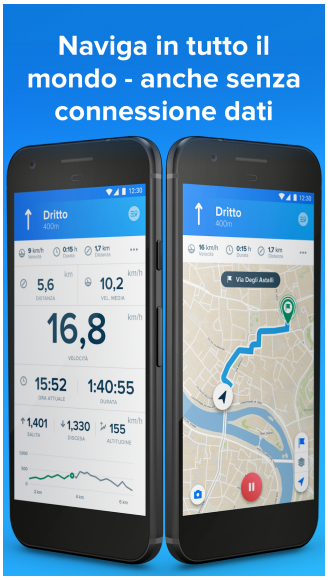
Oroeco is based on a good idea, tracking the pollution someone produces on his everyday life. The problem with this app is the user interface. It is difficult to handle because it shows too many information all on the same page. Also, the colors are too similar and do not highlight important information. One review that stands out:

"US-centric. It's a shame that you don't have metric units and other currencies in your app. [...] I also got very confused about how to use it. I turned on a lot of the "actions" that I already do at the moment but the app thinks that this is a saving whereas, it's my baseline. [...] It looks promising but it needs some refinement and care." (Google Play Store review)

On the other hand, Bikemap is well designed and uses a UI well known to people (similar to the Google Maps interface).

"*This was the easiest bike app to use and free! Easy to learn and overall great! You should give it a try!***"** (Google Play Store review)

However, the problem we found with all these applications is that they are very specific for one limited purpose and there's no way to integrate one with another.



In conclusion, the panorama about sustainable mobility is widely populated and the apps we found are all based on a good idea, generally well designed and easy to use. For this reason, it is difficult to create something based on a new idea/concept or unseen.

2.2 Ideation & design space

Based on the benchmarking results, we all agreed on the idea that to design an app which works as a centralized hub: it collects a variety of sustainable mobility services and it offers them in one single place. We arrived at this conclusion because, as students / commuters that use these kind of applications, we noticed that there is a lot of confusion among them all.

At this point we deduced that one of people's need is, as said before, to have

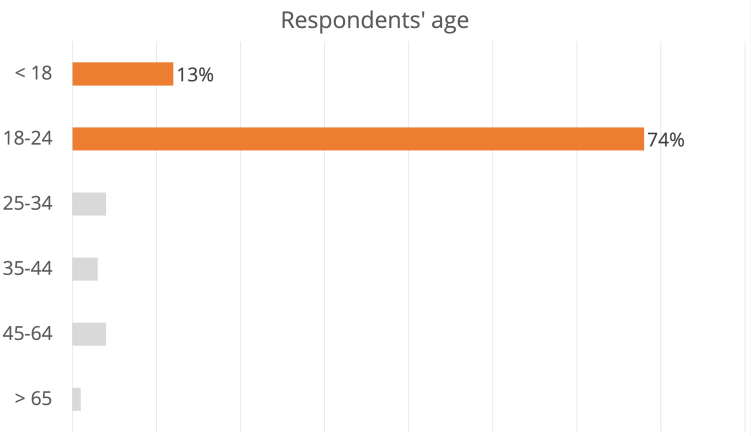
the opportunity to choose among a variety of sustainable applications and compare the results.

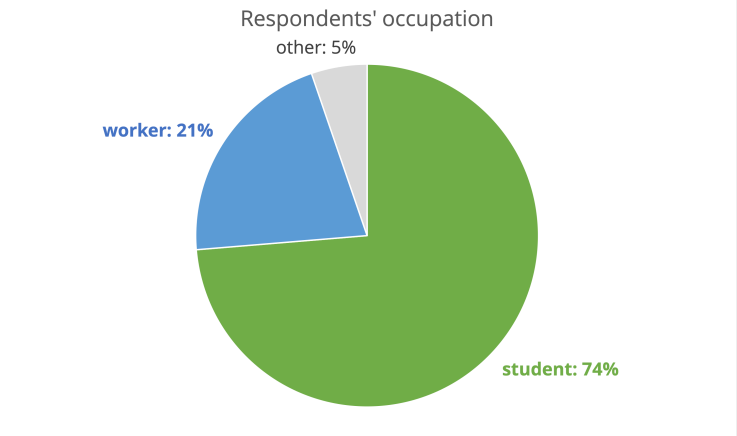
Our idea is easy to develop, also in a short time, but it assumes that each sustainable company collaborates with each other sharing their data. This could be the only major problem, because it could involve users' privacy.

3. PACT ANALYSIS

3.1 Interviews results

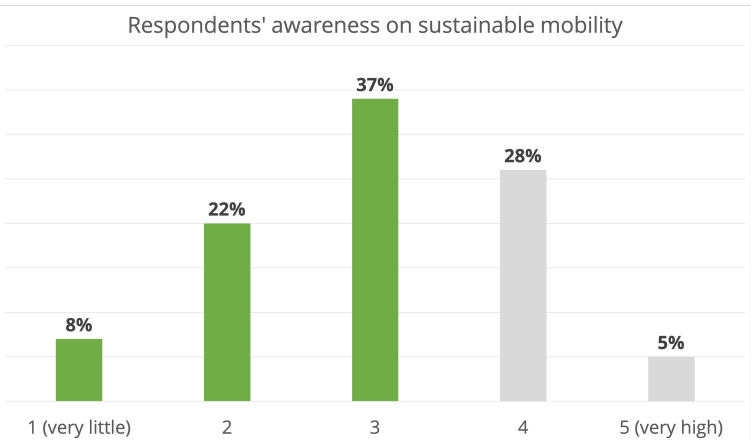
Once we have narrowed the investigation scope thanks to the ideation phase, we started the PACT analysis by submitting a Google Form with general questions about sustainable mobility and mobility in general (a total of 92 people completed the preliminary survey). We also collected information about how much people care about pollution problems and climate changes. Our intention was to probe the territory in order to proceed with more specific contextual interviews. For this reason, we interviewed 18 people in Piazza Fiera, in Trento, and we talked to tourists, students and several commuters, most of them were waiting the bus at the bus stop.

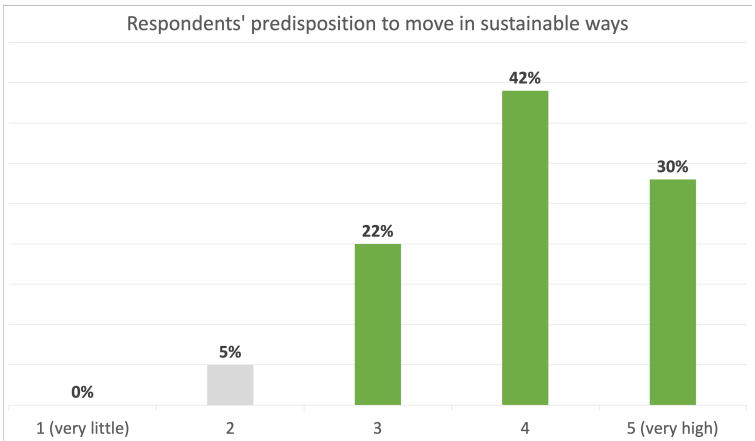




The target we refer to is populated by young people, mostly students (as the graphics enhances). We also have a slice of workers aged between 18 and 44. We found that all the respondents use public transport for their travels, especially the bus. For this reason, most of the them complain about delays and overcrowding of public buses. *"It is hard for me to take a bus because I live in the suburbs. There are few bus rides, connections are poorly managed and bus schedules are inconvenient. Most of the time I am forced to use my personal car, even in the case of medium-short journeys"* (**I7**), "*As a student i experienced that buses are mostly overcrowded and generally late.*" (**Q87**).

However, one characteristic that most of the interviewees have in common is that they are open minded towards the use of new sustainable means of transport. In our opinion, this characteristic is fundamental because a change in habits and thinking is necessary so that we can start to make an effective sustainable mobility. And this is also what respondents think: *"Unfortunately, it is diffi-*





cult to create a valid alternative to conventional means of transport, able to immediately enter people's habits. It's a matter of mentality, so it will take a long time or a global catastrophe" (**I2**).

Then, we investigated the relationship that respondents have with non-conventional sustainable means of transport. In general, we found that people are willing to use other means of travel: "*If there was the possibility to avoid taking buses to more efficient and environmentally friendly means of transport, I certainly would not hesitate to choose this option*." (**I4**). Unfortunately, they will often clashes with an unorganized reality, not inclined to favor the usage. "*For the bicycle it would be necessary to have safe places to leave it in the city, more enlightened streets in the evening and continuous cycle paths: these infrastructures, however, do not currently exist or are impractical*." (**I15**). It clearly stands out that there's a predisposition to make a change, but the bases are lacking for this to happen. As another interviewee highlights, it is imperative that "*[...] schools have the priority to educate and encourage the use of a more environmentally friendly and healthy transport mode, even if it is more inconvenient*." (**I13**).

It is clear that the biggest issue that makes people wary to use sustainable means of transport, beside comfort, is the difficult to approaching them. For this reason we asked the respondents if they would be willing to use an application that would facilitate sustainable mobility and would also help them to raise their awareness about this topic. The majority of the interviewees told us that they would definitely try it despite the skepticism for the reasons given above: "*I do not know. Honestly I should try it and see if it convinces me or not. However, if I had more opportunities, I would like to increase my knowledge in this field*." (**I1**).

People	**Primary**: 18-25 years old people, students, workers **Secondary**: shop owners **Tertiary**: drivers, ticket inspectors
Activities	**Pragmatic/hedonic**: activity mainly pragmatic **Temporal aspect**: depends on the movement of the user **Regular/infrequent**: regular, daily use of the application **Continuous/interrupted**: continuous because the app should work in background like Google Maps, but also interrupted because it can be used several time during the day **Cooperation**: there is no cooperation in the application **Complexity**: the complexity of the app is quite low **Well defined/vague**: the scope of the application is well-defined, because its only purpose is to help people to rethink their movements.
Context	**Physical**: before every movement, because the application has to track the it **Social**: mainly individual, because it does not require interaction with other people
Technologies	**Input**: maps, qr code **Output**: speaker, display **Communication**: communication with the server via Wifi or mobile data, satellite connection (GPS)

3.2 User requirements

The functional requirements are the main features of the application. The main idea is that the app should work as a travel assistant, helping the user to find a quick and sustainable mean of transport to reach his destination. For this reason, the user should be able to easily search for a location on the map or on the search bar. Also, it should be easy to choose between different sustainable means of transport. All the operations about the navigation must be well highlighted and easily reachable.

The discounts/prizes the user can buy with our internal currency (GreenCoin) is tricky. Because it's not strictly related to the navigation, and so to the main purpose of the application, it could seem to be a non-functional requirement. But, on the other side, this feature should be the second reason why users should use our application.

Non-functional requirements, otherwise, are all the things related with the sustainable mobility educational side (for example, the daily quiz), the statistics about the user activity and all small other features that will not be implemented for time reasons and because they are not fundamental.

4. DESIGN

4.1 Personas

- **GINO (*worker*).** He is very pragmatic and a motivated worker. He doesn't like wasting time while on the move (***attitude***). He is a dynamic person who can adapt quickly to every unexpected situation (***dis/abilities***). He has an iPhone and a Mac, he's very good with technology because of his work (***technology proficiency***). Due to his work, he has to go around the city every day, so he uses both car and public services (***resources***). Because of his frequent business travels, he would like to pay attention to a sustainable way of moving (***motivations****).*
  KEY NEEDS: "*To reach my workplace, I often find myself using public transport. However, given the numerous delays and / or disservices, I would rather be able to find more efficient alternative methods*" (**I11**).
- **DIEGO (*student*).** He is a very fussy person and he notes all his date on an agenda to organize his day in the best possible way (***attitude and motivations***). He doesn't have much money to spend (***dis/abilities***). He uses the smartphone with a basic knowledge (***technology proficiency***), and doesn't have a personal car even though he has a driver licence (***resources***). His days are highly bounded by school and bus schedules (***personal context***).
  KEY NEEDS: "*The most frustrating thing is having to wait for the buses and their endless delays. I often have to skip lessons because of these disservices. Unfortunately, the bus is the only method I know that allows me to reach the university comfortably*" (**Q23**).
- **ANASTASIA (*autochthon*).** She lives and works in the nearby and during the weekend she enjoys spending some time exploring places not too far where she has never been before (***attitude and motivations***). She is a well-trained person. So, she likes to travel by bicycle (***dis/abilities***). She uses her smartphone in a confident way, also to track her activities and progresses (***technology proficiency***). She's married and usually her husband joins her weekend adventures (***personal context***).
  KEY NEEDS: "*I would like to have a simple method to find bicycles and use them like a service of bike sharing"* (**I9**).

- **OLGA (*tourist*).** She likes to travel and she would like to find quick and sustainable ways to explore the places where she goes (***attitude and motivations***). She has a smartphone with little memory so she can't have too many applications for traveling (***dis/abilities***). She is trained to use the smartphone as a tool to explore the places she visits (***technology proficiency***). She is used to using different travel methods more than conventional ones (***resources***). She travels alone (***personal context***).
  KEY NEEDS: I have too many traveling applications on my phone. It is very confusing. I would like to have all their functionalities grouped in one single application.

4.2 Scenarios

- This week **Gino** has several appointments in the city centre. In the last two days, he tried to move around the city using his personal car, but he had serious trouble finding the parking area because the traffic was sky-high. Today he decides to try a new app that helps to find bike sharing locations to avoid traffic troubles. He easily finds one bike in his neighborhood and reaches his destination even in advance of his schedule, making a good impression to his clients.
- **Diego** is at the bus stop waiting for the bus that is late as always. He does not want to lose more lessons due to bus delays. So, he decides to try EcoMaps, the new application he downloaded yesterday after seeing an advertisement. He opens the app and after login, he immediately sees some alternative options, such a car-sharing nearby his position. He is hesitant to use this new means of transport, but the bus is very late, so he decides to look for a ride with car2-go. Fifteen minutes later he is already in the class waiting for his friend Giorgio that is on the bus stuck in the traffic.
- **Anastasia** and his husband Dimitri have only one bicycle. However, they want to do a bike ride together. Because they have only one bicycle, Anastasia opens EcoMaps to find a bike to rent with bike sharing. Fortunately, she finds a station just 2 minutes away, so Dimitri can join her on their trip.
- **Olga** has just arrived at the hotel and wants to visit the cathedral. She does not know the city, so she has already downloaded an application to help her during the visit to the city. Olga opens the app and sees that she cannot get to the cathedral with bike sharing because the nearest station is 30 minutes walk away. She could use car sharing, but he is wary of strangers. Fortunately, she sees there is a bus in 2 minutes near her hotel that stops exactly in front of the cathedral.

4.3 Interface

Taking a cue from the benchmarking phase, as learned from Bikemap, the interface would be similar to the Google Maps' one, so that the user is facilitated during the use and the learning curve is fast. The base concept is that the user can search a destination and the app presents ways to reach it only with sustainable means such as car sharing, bike sharing, bus stop, by foot, etc.

We thought also that it could be a good idea to include a section with some statistics, as Oroeco does, about pollution, user trends and other indicators, to raise users awareness about sustainable mobility.

A possible problem that came out during this first phase of ideation is how to encourage people to use our app. We all agreed that was necessary to insert some kind of gamification to keep the user engaged, but at that moment we had not identified a definitive solution.

5. PROTOTYPING

5.1 Low Fidelity Prototype

Thanks to the benchmarking, we have started designing the low fidelity having clear in mind that a good design is one of the most important thing in an application.

After the user has signed into the app (or has done the login), there is the main page of the application, which is a Google Maps like interface. At the bottom of the screen, there are three buttons to navigate inside the main sections of the application, while at the top there is a hamburger menu and a search bar to choose the destination.

In the hamburger menu, there are some sections, such as “I tuoi luoghi”, “Cronologia”, “Statistiche”, “I tuoi premi” and “Quiz”. There is also a button for the settings page, where the user can logout.

During the benchmarking phase, we saw an application (Oroeco, https://www.oroeco.com) that had a really fascinating statistics section. Unfortunately, it was very difficult to understand: there was displayed too many information and the navigation was very confusing. This is why our idea was to design a statistics page that highlights the most important ones, as the usage percentage, in one single simple page.

When the user click “I tuoi premi”, the application moves to a page where all the activated prizes are shown.

If the user search a destination, like in Google Maps, there is a new page where the results are shown. In this new page at the bottom the user can choose the means of transport he wants to use. When he/she has chosen, appears a sliding page where the user can choose between different providers for that specific means and the map will show the nearest places where the user can find the sustainable means chosen of that provider. When the user is ready, he/she can tap a button to start the navigation. The navigation works exactly as Google Maps one.

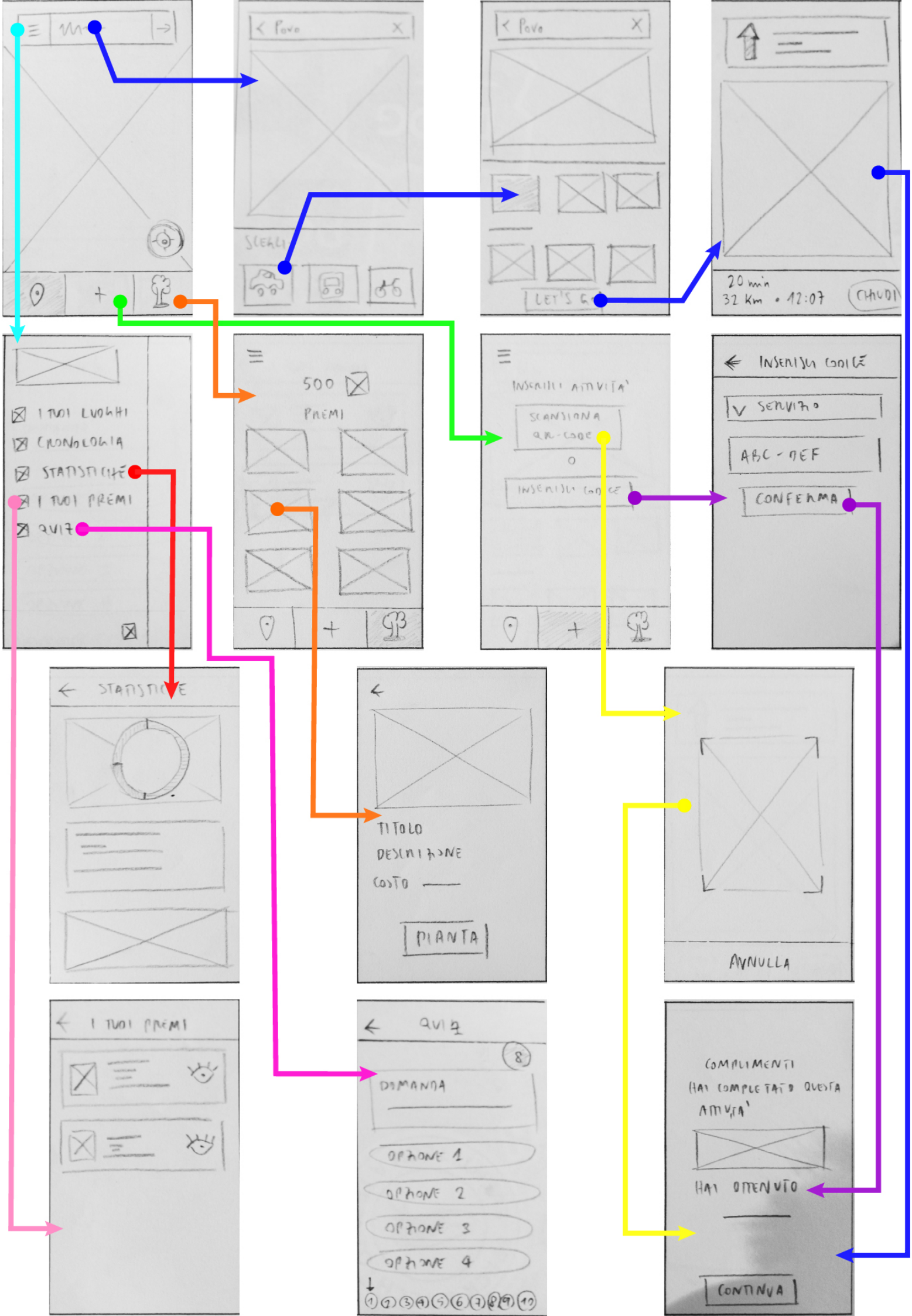
On the footer navbar, with the central button (the plus) the user moves to another page where he can add a new activity, while with the rightmost button (the three) the user can move to the page which displays the amount of GreenCoins the user owns and all the purchasable prizes.

In the page to register a new activity, the user can choose between insert the code provided by the service he used or scan the QR code. If he/she choose the QR code option, the app opens the camera where the scan can be done. Otherwise, if he/she chooses to insert the code, a new page with more information is shown and the user actually inserts the code.

After the new activity has been registered, the app congrats with the user, showing how many GreenCoins he earned.

If the user taps the rightmost button on the footer navbar (the one with the tree) the app shows a page where are shown all the prizes of the user. Then if he/she click one of the prizes the app opens a new page where there is a detailed description of the specific prize, the cost in GreenCoins and a button to activate it. When the prize is activated, the application shows the same page that is shown when the user taps “I tuoi premi” in the hamburger menu in the starting page.

Finally, if the user clicks on the Quiz section in the hamburger menu, he can start a quiz of 10 questions that can be done every day to increase the awareness about pollution and sustainable mobility. Once the user completes the quiz, he receives a certain amount of GreenCoins, calculated on the basis of the number of right answers he gave.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5.2 Low Fidelity Prototype Evaluation

We have subjected the low fidelity prototype to 5 testers. In a world almost completely digital, it was a challenge to show and explain how our application works on paper. And it was even more difficult for everyone to try the basic usage of EcoMaps. But, once everybody was more confident and thanks to the easy design library we used, the evaluation phase proved to be very profitable. We collected some appreciation, but also some important critics and advices. Here's the most important points we collected:

1. Some testers claimed that the daily quiz was too demanding because it is very long and it takes too much time to complete all the questions. Also, it decreases the attention on the curiosity after each question because the user focuses only on finishing the quiz in the shortest amount of time.
2. One particular tester suggested us to implement the torch when the user has to scan the QR code. He also suggested us to look the way Open Move implements it.
3. A common point among all the testers was the criticality of the awards section. Almost all the testers told us that was unclear the use of the rightmost button because it was showing a tree. It was not clear what was the purpose of the section. Few testers suggested us to separate the page of the prizes because it was showing too many information, both all the possible prizes and the amount of GreenCoins; it was a bit confusing. Several testers also suggested us to make the overall prizes' section more consistent by moving the section "I tuoi premi" from the hamburger menu to the profile page.

5.3 Medium Fidelity Prototype

During the design of the medium fidelity prototype, we kept the features that were already good in the low fidelity prototype, according to evaluation results. In particular, we focused on solving the problems found by the testers.

1. We solved the problem of the daily quiz by changing the approach: we decided to do only one question per day. As suggested by a tester, we also add a section, into the statistic page, with the ranking, that shows the comparison between the user's friends.
2. We add the torch button on the bottom right-corner in the scan page of the QR code.
3. The major updates were into the prize sections. We changed the icon of the footer navbar, from a tree to a classic profile icon. This button leads into a new page, which shows the total amount of the user's GreenCoins, a button ("Scopri i premi") to view all the purchasable prizes and another button ("I tuoi premi") to view all the prizes the user has. In the section "Scopri i premi" we put a grid with all the purchasable prizes. From here onwards the application works in the same way as it was conceived in low-fidelity prototype. The section "I tuoi premi" is the same as the low-fidelity prototype. We moved the "I tuoi premi" option from the hamburger menu to the profile page.

Another major improvement of the profile page was the addition of a forest image. This idea came to mind when Professor Mencarini presented in class the app Forest (https://www.forestapp.cc/). We thought it was a nice idea to represent the amount of user's environmental friendliness with a forest that slowly grows thanks to the user's sustainable movements. The user starts with a single empty bush; every time he makes a sustainable journey, he will see his forest grow and populate

with flowers, other bushes and trees. It's important to underline that the forest grows independently from the amount of GreenCoins; if the user spends GreenCoin, the forest will not decrease.

In the statistics page, we also add some milestones to stimulate the user to use sustainable means, like travel 100 kilometers with bicycles. Every time the user will complete these milestone, he will receive a certain amount of GreenCoins.

The user will also be able to share a referral link to his friends. If they register to the application with that link, the user will earn GreenCoins.

Our medium fidelity prototype can be found at this link: https://xd.adobe.com/view/10c2fd1b-a8c1-4538-7805-3cbf0bbc4e0d-66f3/?fullscreen (password for login is Tachifludec4).

5.4 Medium Fidelity Prototype Evaluation

We have submitted the medium fidelity prototype to other 5 people. Two of them were the same who tested the low-fidelity prototype: we did this both to get an opinion of someone who already knows the app and to see their reaction to the improvements made. All of them agreed that the prototype was well-done and its interface was clear enough. Of course in the prototype not all the possibilities were implemented and some of the testers complained about that because they wanted to see how the application would respond with real inputs and not purpose-built.

We invited the testers to talk aloud about their actions and their thoughts. We gave them a scenario to interact with and we watched them interacting with our mid-fidelity prototype. All have managed to complete the set goal without any kind of effort, thanks to the easy and family interface, that reminds them other applications.

One tester pointed out that, in his opinion, the "Quiz" and "Statistiche" sections are too hidden: he would hardly find them during his test if we had not addressed them. It is a very interesting point, but as we have specified in the user requirements these functions are not fundamental during the app usage.

Another tester (we have the video recording for this, https://youtu.be/TzDjT3nVOi0) suggested to specify better the use of the "Add activity" section, because, in his opinion, it is not clear what is its function.

6. CONCLUSIONS

During this months we have understood what are the main process to think and design an application with a good user interface. We have realized that find solutions on real-world problems is quite difficult because we had to keep in mind user requirements and user needs. This is an aspect in which we, computer science students, are not very trained. For this reason, the whole process was much more complicated than it might have seemed at first.

Of course, in a real situation, we would continue to iterate over the prototyping and the users' feedbacks to improve the application design and features, until reaching a final product to update regularly over its lifetime.

We know that changing people's habits is a very difficult goal, but we believe that step by step people can be convinced to become "more green". Of course until will exist easier/cheaper but sustainable means of transport, it will be very hard for people not to choose them. We hope that such an idea can find a future development to really contribute to the creation of a real sustainable mobility.