
GAS DELIVERY PROJECT

Denis Vreshtazi
Human Computer Interaction
University of Florence
denis.vreshtazi@stud.unifi.it

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ABSTRACT

The technology is changing at an accelerated pace and is being more and more present in our daily life. The use of smartphones has made it possible to have many services offered as an app. Human Computer Interaction is concerned with how humans interact with computers, and how computers interact with humans, so it provides important methodologies to an efficient interaction. There are still states in the world that doesn't have a Gas network, so the distribution is made manually by delivers. In this project I have implemented an native app that makes possible the management of the gas order and delivery. The project is divided in three parts: The first is the study of the problem, then the development of the application and the last the usability testing.

1 Introduction

The Gas is an important element of our daily life. Most of the states have an Gas distribution network, a system of external pipelines from a source to a gas consumer service, but there are other states that still use the gas cylinders. One of these states is Albania and concretely the city I am from Vlora, a city with a population around 200 000 inhabitants. Most of the families use gas for cooking and space heating. Having in average two cooking corners(the kitchen and another small space that is usually used to fry foods or barbeque) and 2-3 rooms, a normal family uses 3-4 different gas cylinders per month. The distribution of the cylinders is made by delivers and the order is still made with the now "old method" call the receptionist. The idea of not having a smartphone is for a lot of people scary. Having an online presence makes you "sparkling visible" to clients who'd otherwise never see an ad or hear about your business, and who would probably never come knocking on your door. Gas Delivery Vlora is a mobile app that make possible the connection between the client and the provider of the service. The implementation is composed by 2 parts:

- **Client Part**, where the client can choose the products he needs, and can specify the time and address of the order.
- **Business Part**, where the workers of the Gas company can view and manage the orders, pack and deliver them to their destinations.

In the first part of needfinding there were asked different inhabitants of the city, business' manager,like restaurants, and workers of companies, in order to know if this is a good service and the benefits that can bring to both parts. After the interviews there were extracted the personas and created some scenarios to fulfill the requirements of the service. To develop the app it is used the Android Studio platform, the Java programming language, the design language Material design and for the database is used Firebase and SQLite. After the development of the application, there are made some usability tests, which are included in the last part. These tests show how the application is efficient and the space it lets for future improvements.

2 Needfinding with problem scenarios

In the first part of the development it is done a step of Needfinding, or with other words a process where are studied the customers and their daily routines to understand the needs and opportunities for improvement. It is organized around three key elements: 1) problem scenarios 2) alternatives and 3) value propositions. The basic idea is to understand the customer's fundamental problem/habit/job/need/task, including their most preferred alternatives. From this process are extracted the personas, the actors that defines the users in the applications and the scenarios, the contexts where the personas are going to use the application.

2.1 Needfinding

In the first step there is done an interview with persons from both parts, client and business side, where is tried to understand more about their needs.

The first interviews are done to 10 potentially customers of different ages, who live alone or in family and is tried to valuate :

- The necessity of an application of this context.
- The frequency of use of an application like this.
- The alternatives to this application.
- How can an order application be structured to fulfill their needs.

From this analysis it is arrived to the conclusion that there is no application to order the gas online, so it is still done throw the phone. This type of ordering is not very convenient, because you have to order in the time interval established from the business, wait for the receptionist to respond, that can be busy on another call, or absent. Maybe when you need to order it is late, so you have to put a reminder for the next day to remind you of that and you have to write down what you need before making the order so you will remember everything. When the order is done by phone, the receptionist can make mistakes while taking it.

In average a family of 5 members, in the period of winter uses 3-4 gas cylinders and around 2 when the weather is warmer. A common requisition was the fact of an easy to use app, comfortable and fast.

On the other hand were asked workers of a Gas company and managers and the questions were about to valuate:

- The interest in an application of this context.
- The type of product and services they offer.
- Increasing of visibility of the company online.
- Advantages of an app like this.
- Alternatives to this app.

After the interviews it is arrived at some conclusions. First of all, ordering by phone is no more convenient. It is not a convenient investment in an receptionist who can take an order per call, at a limited time interval, writing the order and maybe doing some mistakes. By having an application it is going to increase the orders, so finally an 24/7 ordering without the need of someone to take it, and can boost the accuracy, the customer is going to make the order and is responsible for it. From the interviews with workers, it is reached at the conclusion that an application is very important. The orders are managed manually using papers and pens. It is better to use a shared app, where more than one worker can see the proceedings of work. For the shipping address some workers know most of the addresses by heart, but this is not enough, since they also need to use sometimes directions on maps, and the inhabitants are constantly in change. It would be better to have a way to see the directions and to call the customers, if they needed to.

2.2 Personas

From the interviews there are extracted two types of personas. Client part:

- Laura is a 40 years old housewife who uses the app to order products for her house, where she is part of a 5-members family and uses 4 gas cylinders. One for cooking for the main kitchen, one for the smaller kitchen when she cooks stronger smelly foods, in order not to invade the house and the last two for the Gas Heaters.
- Denis is a students who doesn't stay much home, so he uses usually 2 gas cylinders. One for cooking and one for the Gas Heater. Since he study and works, he is home only during lunch.
- John is a manager of a restaurant. The restaurant he manages has 4 cooking ovens.

For the part of the business:

- Kristi is responsible for the delivery of the orders. He checks the details of the orders and confirm the packing. He is confident with using simple mobile apps and mostly Google products.

2.3 Requirements

Client Requirements:

1. **Main Page:** Have a main page able to Sign in through a username and a password.
2. **Registration Page:** For the new users they needed a registration page, where to insert name, email, password and the phone number.
3. **List of categories and products:** To view the products grouped in categories for an easy to use and comfortable structure.
4. **Cart Page:** A page for the cart where the user can proceed to the completing of the order by inserting the address and preferred time of delivery. Here the user can manage the order by deleting the products from the cart, if he doesn't need them anymore.
5. **Order Status page:** After placing the order, the users needed a page to view their order status and details.

Gas Company Requirements:

1. **Log In Page:** A starting Page where only the workers of the company can access, by entering their phone number and password.
2. **Home page where are listed all the orders:** The app needs to be easy and comfortable, so a Home page with all the orders, where the worker can easily see the order id, the order status and the order phone. Furthermore in addition the view should be equipped with buttons to easily navigate at other sessions of the app.
3. **Details Page:** A page for the details of the orders it is important for the workers to check every single part of the order and mark it when packed.
4. **Directions Page:** The page must contain the shipping address and the location of the worker who is doing the delivery. Moreover the shipper should have the possibility to directly call the customer.

2.4 Tools, Mock-up and Flow Charts

After analysing the requirements of both parts, there are done some mock-ups that describes the system in order to have an idea of the structure of the application as shown in Figure1.

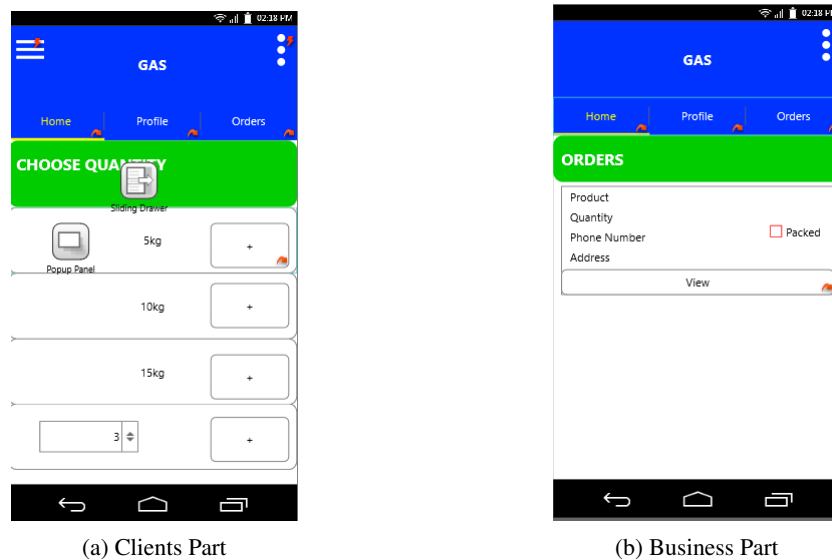


Figure 1: The mockups of the Home pages of both parts

Moreover there are also designed some flow diagrams to facilitate the understanding of the app and to force the idea of the structure. In Figure 2 the is shown all the process of the Client, starting from the main page till the confirmation of the order. The same idea with the Business part at Figure 3.

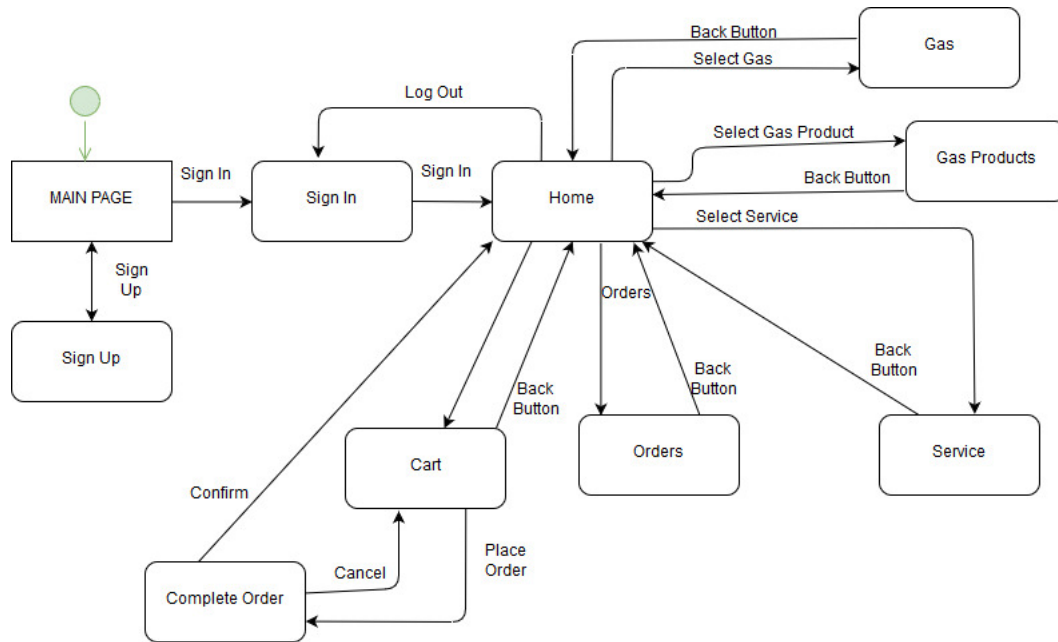


Figure 2: Flow Chart of the Clients Part

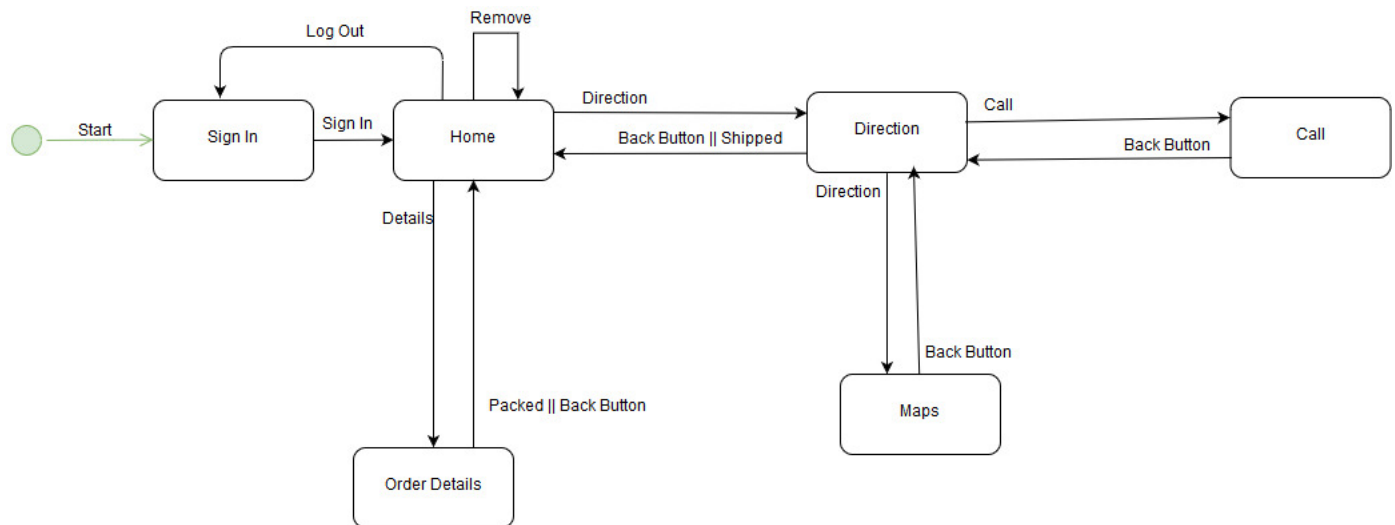


Figure 3: Flow Chart of the Business Part

During the mock-up phase there were some ambiguities, for example how the navigation was more comfortable for the customer, Figure 4, The Clients Part was more complicated so the navigation bar(the number 3) was disturbing for the view. The one that suited the mos was the number 1, because it is more common even in other applications, so the users are familiar with this type of navigation.

For building the mock-up is used Mockplus, an all-in-one prototyping tool to create faster, smarter and easier prototypes with simple drag-and-drop, supporting mobile, web and desktop apps prototyping and for the flowcharts is used Draw.io, a free online diagram software for making flowcharts, process diagrams, UML.

The main tool used for application development is Android Studio, Figure 5, the official integrated development

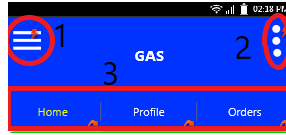


Figure 4: Flow Chart of the Clients Part

environment for Google's Android operating system and designed specifically for Android development. In general a project is composed of three main parts: the folder with the Java code, the res folder containing images, the XML layouts and menus and a configuration file called AndroidManifest.xml to record the activities that make up the application.

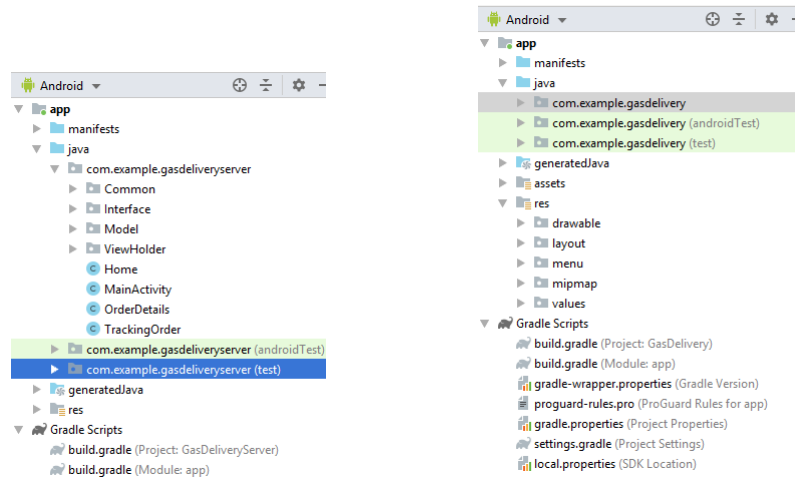


Figure 5: Android Studio Project

To have a better view of the app is used Material design, a design system created by Google. It provides a way for designers and developers to create UIs that are usable and beautiful. For the database is used Firebase, a cloud-hosted database. Firebase provides a realtime database and backend as a service. The service provides application developers an API that allows application data to be synchronized across clients and stored on Firebase's cloud. The programming language used for developing the application is Java and some SQL queries to manage the database used for the cart before placing the order. This database is made with SQLite, a relational database management system. The database consists of a single file on the disk, which makes it extremely portable and reliable.

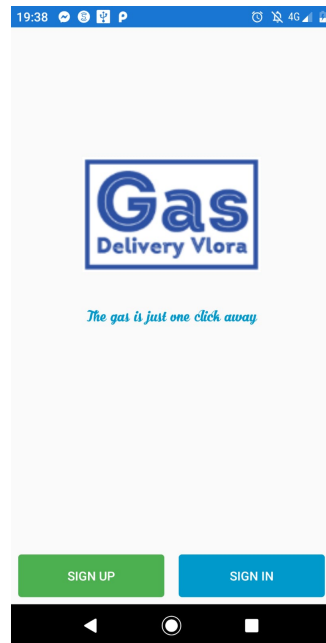
3 Implementation, Interface and Functionalities

For a better organization of the code and to respect the principle of separation of concern, the implementation was structured by referring to the Model View Controller (MVC) pattern. This allows you to split an interactive application into three components:

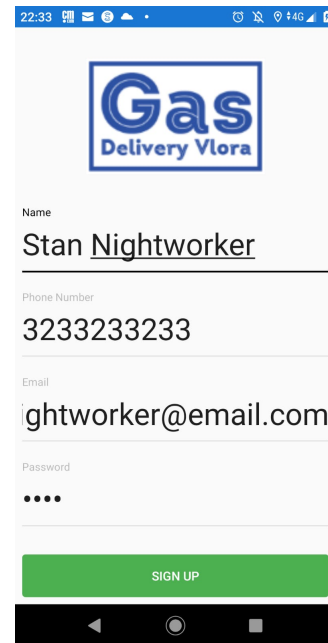
- Model: contains the main data and the related functionalities.
- View: shows information to the user.
- Controller: manages the input and mediates the communication between view and the model.

The view renders the model in a form suitable for interaction and it is possible to have multiple views of the same model; this is the greatest advantage offered by the MVC with regard to separation of concern. The principle of separation of concern states that an application should be divided into distinct elements, with little overlap of functionality. In this way the Software can be decomposed and organized into more manageable parts producing greater comprehensibility, reusability and scalability. As for an application in the Android environment, the MVC pattern is in a sense already implemented, as the views are managed through XML, generated when an activity is created, which instead represents the controller, responsible for processing responses to events (user actions) and can invoke changes on the model and on associated views. Finally, the model is represented by data.

The first view when opening the Client's part of the application is the main page with the business' logo, from which can be chosen to go to the Sign In or Sign Up page Figure 6.



(a) Main Page



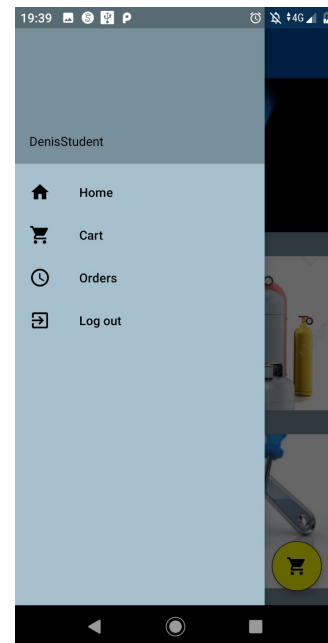
(b) Registration page

Figure 6

After the user logs in, he sees the Home page, where are listed the different categories and in the bottom-right of the page is a floating action button representing the cart. In the toolbar is also a navigation draw where the user can navigate easily through order's list, cart, home and can log out, Figure 7. Each category is compounded by a list of products and



(a) Home Page



(b) Navigation draw

Figure 7

each product is presented as a CardView, the container used in a layout for each item within a RecyclerView. The list of products is represented by an easy view, an image, the name of product, the price, and a button in the left used to add it to the cart. For the combination of the colors is used material design color palettes, Figure 8 The user can use the Back

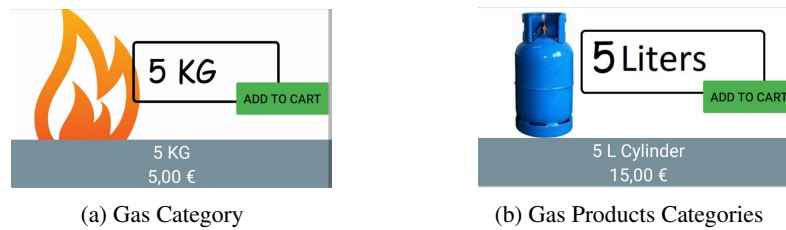


Figure 8: Products

Button to return at the Home page, from where can enter to the Cart to complete the order. In the Cart are listed the products inserted by the user and each of them can be deleted just by pressing the Delete button. Before deleting the product from the cart it is shown an alert box to confirm it. This prevent removing an item by mistake. When the user is sure for the order he can proceed by clicking the Place order Button. The last step is to enter the Shipping address and the Preferred time of delivery as shown in Figure 9(a).

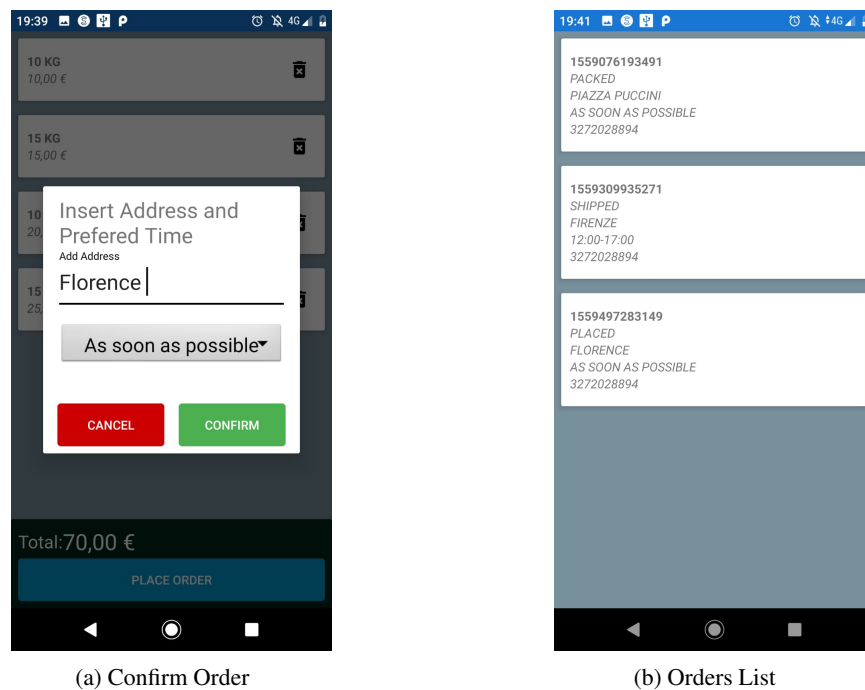


Figure 9

After placing the order the user is redirected to the Home Page, where with the help of the Navigation Draw can access to the Orders, a list of CardViews as shown in Figure 9 (b). Each of them contains:

- Order Id
- Order Status
- Shipping Address
- Preferred time of delivery
- Users Phone Number

For the part of the workers the first page they see is the Sign in page, the same layout as for the clients. There is no need to register, since the number of the workers is smaller and can be added manually to the database, Figure 10.

After the successful login the workers see a list of CardViews containing the details of the orders. Each CardView has:

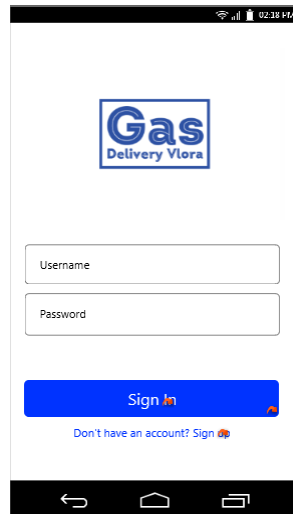


Figure 10: Sign In

- Order Id
- Order Status
- Shipping Address
- Preferred time of delivery
- Clients Phone Number
- Check box to confirm the packing,
- Button to Remove the order
- Button Details, to redirect to the details of the order, where are the single products
- Button Directions, to redirect to another layout containing information about the shipping
- Button Shipped, to confirm when the order is shipped.

When the statuses of the orders are updated and the elements of the CardView change. When the order is Placed, the order status is colored Red the check box is unchecked and the Shipped button is grey. When the order is packed, the status order color become green and the Check box checked. After The order is shipped the Button Shipped become Violet and the status order color become violet too, Figure 11. When the Button Details is clicked it is opened another

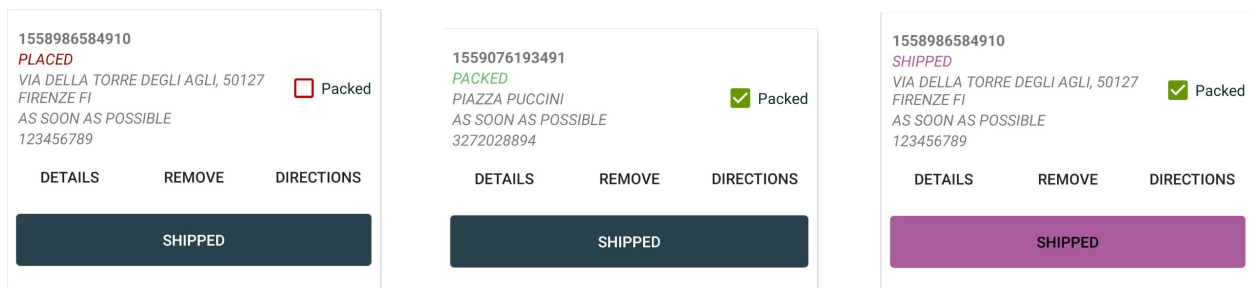


Figure 11: The 3 states of an order: Placed, Packed and Shipped

page, the one containing the details of the order. This page is very simple structured. On top of it is the CardView with the order details and under it the list of products that are part of that order. Every product has on its right a check box that shows if the single product is packed or not. After every product is packed, can be confirmed the packing of the whole order, just by clicking on the green button Packed, that redirects to the page containing all the orders and with the order status changed to Packed as shown in Figure ?? (a).

The button Directions opens a new page where is shown the location of the worker and the destination of the order, the shipping address, represented with an icon of a red gas cylinder. If clicked on the gas cylinder is shown the name of the

buyer, and a small icon on the bottom-right that can redirect to the google maps for live directions, Figure ?? (b). There

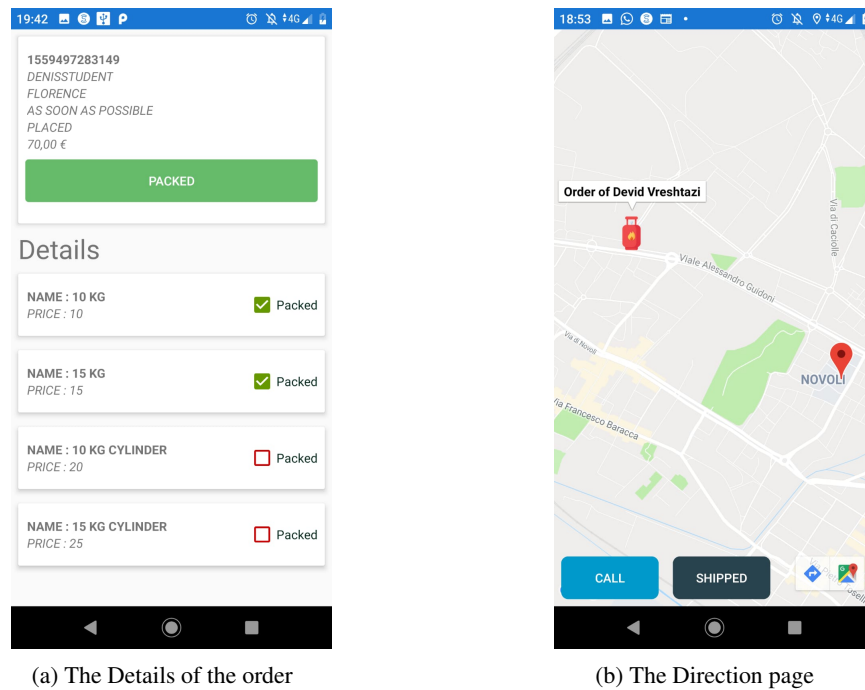


Figure 12

are also 2 more Buttons:

- Button Shipped, after the order is shipped, by clicking it confirms the successful shipping and redirects to the page containing all the orders, and with the order status changed to Shipped.
- Button Call, when the worker needs to call the buyer, by clicking this button is redirected to a dialing panel with the buyers number already in, ready for the call.

The worker can Log Out from the application by clicking Log Out on the navigation drawer.

4 Scenarios, Usability Test and Proposals for improvements

The final phase of the project is the testing of the application. Firstly there were created some scenarios in order to test the application, These results weren't recorded, but only to see if the application fulfills the surveys that the users are going to complete. An example of a Client scenario is:

- You are a user that cooks at home and uses the gas heater. Usually you order the gas by phone, but it happens that the gas is finishing late at night when the shop is closed. So you have heard about this Gas Delivery app, download it, make a registration, and log in.
- You go to the products and add to cart 10 Liters of gas.
- After that, comes in your mind that your friend has given you as a gift a Gas Heater, but you don't know if it has a gas cylinder inside or not and since you are charging your phone you need to close your app, check it and then decide. So you have checked and you need to buy a gas cylinder for it too. This way you add a 10 Liter gas cylinder to your previous cart.
- This way you have all you need in the cart and want to place it. Insert your address and preferred time of delivery "as soon as possible" and finally confirm your order.
- You are curious to see the status of your order, so you go to the Orders to see if it is "Packed" or not.

At the other part is the worker of the Gas company. An example of scenario is:

- The worker starts to work, logs in to the application and checks the orders.

- The ones that are not packed he enters to see the details and start to pack them by checking the check-boxes. After he packs it, confirms the packing by typing the Packed Button.
- All the orders are packed so now is time for delivery. First he needs to deliver the orders with preferred time "as soon as possible". He can notice it in the home page of the application.
- He picks the first of them, but doesn't know the address, so clicks on Directions Button and finds out the location of the buyer. To be sure of the fastest road, he clicks on the directions button and is redirected to Google Maps navigator.
- He is arrived, but needs to call the buyer, because he can't find his flat. He calls him by clicking the Call Button on the Directions section of the app.
- The order is shipped. The worker confirms it by clicking the Shipped Button and than is redirected again to the Home page, but this time with the status of the order changed to Shipped.
- After the order is shipped he can remove the order from the list.

These scenarios have made possible to understand:

1. Intuitiveness
2. Comfortable
3. Easy to use

Firstly there was used the Hallway Testing, but didn't result very effective. Hence there were asked potentially future customers. The total number of participants were 13, 10 of them Client users, 2 of them delivery workers and one entrepreneur, the owner of the Gas Delivery company "Elite Gas Vlora". The workers were all males at the age between 20-45. The client users were both males and females of ages between 18-65. The Table 1 shows the distribution of ages. Every candidate was asked to execute the tasks in order to fulfill all the requirements of the app. Each candidate,

	18-30	31-45	46-60
Client	50%	40%	10%
Worker	66%	34%	0%

Table 1: Ages

once the test was finished, was asked to fill in a questionnaire of 11 questions for the clients and 10 questions for the workers, of which the first about the tasks performed and the last ones of a general nature regarding the application. The questions presented are of type SEQ, with a scale ranging from 1 to 7, where 1 represents Strongly Disagree and 7 Strongly Agree. A free text section was added, in which can be inserted any suggestions. To avoid that the user could always respond with the same score, some questions were formulated with opposite logic, for example: how easy it was to do this task "(positive question) or how difficult it was to do this task" (question negative). Overall, between tests and questionnaires, each user took about 15 minutes. The results of the tests are shown at the Table 2 for the Clients and Table 3 for the Business Part.

During the phase of the test there were some problems. To start with the Client side, the first was with the Registration. Some of the users found incomplete the requests of data.

To continue with the navigation. Having a toolbar only in the Home page and not in the Product Lists, some users found confusing and not very intuitive to use the back button of the phone. Another problem was founded during the phase of choosing the "Preferred time of delivery", even though it is below the address, some users wanted a better specification of it. The lowest average value of the questions about the app's specifications, question number 9, was taken by the images used to represent the products. It was surprising since a lot of time was dedicated to the right selection of them. To summarize it all was asked a question about the overall experience of the app, question number 10. Only 80% of them agreed that the experience was satisfying, but on the other hand all of them wanted to suggest this app to a friend. The next part of the test was the Business part. The first question took the highest average value. All of them agreed to it. This result is thanks to the precision of google maps, and not to the application. The colors of the order status, question number 4, were also an unanimous decision, a 6 value. It was expected a better ranking since to decide it was used the help of material design colors combinations.

The question 5 was about the shipping directions. The apps redirect the user to google maps navigator. Even though this is very accurate, it wasn't very comfortable to the users. A positive ranking have taken the questions 1 , 2, 9. This is very satisfying. The problem comes at the end, question 10, when the app is going to be used at the same time with

N	Question	Average	Standard Deviation	%Agreed
1	I find registration easy	6.5	0.8	100%
2	It was clear how to reach the desired products	6.1	0.7	100%
3	The keys are clicked correctly	6.5	0.67	100%
4	The navigability of the app is clear	6.3	0.78	100%
5	I found it difficult to enter the Delivery Address	1.1	0.3	0%
6	I found it difficult to enter the Preferred Time of Delivery	1.6	0.8	0%
7	It is easy to edit the order before the confirmation	6.7	0.46	90%
8	The sequence in which an order is completed is clear	6.3	0.78	100%
9	The images reflect the content of the products	6	0.63	100%
10	The service provided is satisfactory	6	1.34	80%
11	Would you recommend the application to others	6.5	0.67	100%

Table 2: Result of Usability Tests. Clients Part. The answers are ranked from 1 to 7. % Agreed : % of evaluation more than 4

N	Question	Average	Standard Deviation	%Agreed
1	The app correctly detects my position on the map	7	0	100%
2	I find understandable the display of orders lists	6.7	0.47	100%
3	I find the product packaging phase simple	6.7	0.47	100%
4	I find satisfactory the colors used to identify the status of the order	6	0	100%
5	I found it difficult to locate the buyer	2	0.81	0%
6	The navigability of the app is not clear	1.3	0.47	0%
7	I find clear the sequence in which an order is completed	6.3	0.47	100%
8	I find the use of the app complex without an adequate training	1.3	0.47	0
9	Using the app can help me do my job more efficiently	6.7	0.47	100%
10	I would be happy to use the app in my daily work	6	0.81	100%

Table 3: Result of Usability Tests. Business Part. The answers are ranked from 1 to 7. % Agreed : % of evaluation more than 4

other workers. After confirming the packing or the shipping, the order results packed or shipped to all the workers, so some of them my think that was confirmed by mistake and try to uncheck it or control again if it wasn't an error. At the end of each survey it was section for suggestions for improvements. For the Client parts some of the suggestions were:

1. Complete the registration part with more personal information for example the address.
2. Add discounts to the customers for first registration or after they acquired a number of products.
3. The products can be grouped in other categories like: Camping, Family and Business.
4. It is more comfortable to have a toolbar and navigation draw in the product section.
5. To add a counting button in the cart page for products.
6. To add even a date not only the preferred time of delivery and also a comment box for the deliveryman.
7. At the dialog box of the confirmation of the order, to add an option for fixed address in order not to write it every time or acquire location for live position. This way it can also deliver to another address.
8. Get a notification when the order status is changed
9. Live tracking of the order.

For the part of the Business, Gas delivery company, there can be space for some updates. Some of them are:

1. To group the orders by delivery preferred time and date.
2. In cases where are more workers, to identify the worker of the task completed. This way can be avoided misunderstandings between workers and everyone will be responsible for his actions.
3. Integrated google navigator on the map. This way it is faster and more comfortable to interact with the app.

5 Conclusions

In conclusion the app makes it possible to place the order of the gas or products related to it in an innovative way. This first iteration of the process, even if conducted on a small sample of potential customers, brought interesting results about the application usability. There are still customers who think that the classic way, order by phone, is better for the reason that maintains the communication between people, but nowadays it is not very comfortable for both parts. In a short time, it was able to gather relevant feedback, that will be analyzed over several iterations before moving to the next next step. Overall the users who made the tests were optimist about the idea and how the app was implemented.