INTELLIGENT VALIDATION DETECTOR

Access control of customers without ticket or without a valid ticket in underground stations of Metro do Porto

TABLE OF CONTENTS

EXECUTIVE SUMMARY

In the context of the User Centered Design course, of the IST's Computers Engineering Masters, this team was challenged to discuss, design and implement an interactive system for a real problem: **reduce the number of non-paying customers in the Metro of Porto!**

As a way to realize the customers' needs and how a technological solution with this purpose can affect the business model of the client, this project started with the definition of a clear Value Proposition and Business Model Canvas.

To understand what the customers do / need / want / expect / think, we conducted a questionnaire to a big number of customers and also performed a few field observations. The analysis of these user research actions was synthetized in some personas and scenarios that fuelled the next phase in terms of main tasks and customer goals.

The development phase started with low-fidelity prototypes that helped us validate the idea and the design by receiving feedback from the various user tests performed.

These low-fidelity prototypes evolved to functional prototypes to demonstrate the overall interaction flow for each task.
For these functional prototypes, this team adopted Virtual Reality as this is the best way to demonstrate the solution for the challenge.

The result of this project is a system that detects invalid customers with the use of thermal cameras and displays the status of the customers in big monitors placed next to the validation areas of the underground stations of the Metro of Porto. The valid customers won't feel any impact on their normal use of the Metro. On the other hand, the invalid customers will be affected by the shame factor associated with this solution.

MEET THE TEAM

THE BRAINS BEHIND THIS PREOJECT

André Rodrigues

Development

João Henriques

Management and Research

Luís Loureiro

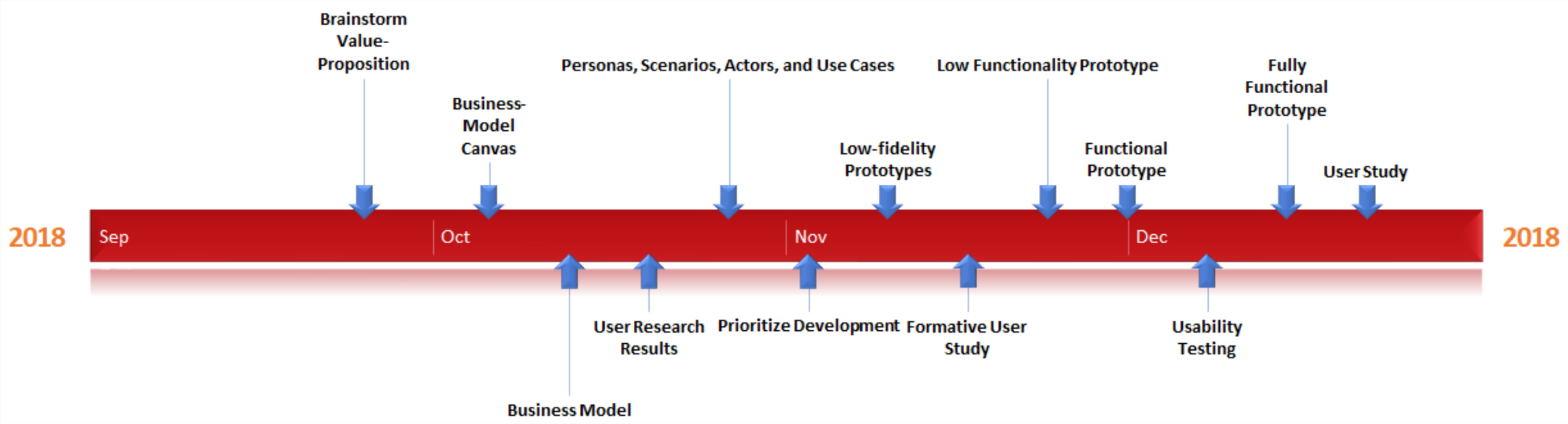
Design

OUR CLIENT

The project was proposed by Inocrowd in partnership with metro of porto.
InoCrowd is the only inovation company in Portugal that have the purpose of facilitating the connection between System Entities World Scientific and Companies / Organizations that need to innovate and accelerate all processes of innovation in your organization.

The Metro of Porto wanted a solution to reduce the number of non-paying customers (around 20%) maintaining the barrier-free system.
A solution for this problem would only be applied in 14 underground stations.

SCHEDULE


Brainstorm Value-Proposition
Business-Model Canvas
Personas, Scenarios, Actors, and Use Cases
Low-fidelity Prototypes
Low Functionality Prototype
Functional Prototype
Fully Functional Prototype
User Study
2018
Sep
Oct
Nov
Dec
2018
Business Model
User Research Results
Prioritize Development
Formative User Study
Usability Testing

OVERVIEW

WHO ARE THE USERS?

Before starting to make the prototype, it was crucial to understand how the Metro of Porto works and who the customers are, their needs and why some of them don't validate their tickets.

So we started by investigating the Metro and their system. We wanted to understand why they use the barrier-free system and what customers earned from it.. What was the advantages and disadvantages, and how could we make a solution to their problem.

To understand our users, we did different types of user research that we will explain in the next chapter.

THE PROCESS

BUSINESS MODEL

USER RESEARCH

DEVELOPMENT

BUSINESS MODEL

With the intention of improving creativity and help us think about how our concept could come to life, the first step of the process was to draw a business model canvas.
With it, we could visualise and describe the principle of how the Metro of Porto creates, delivers and captures value.

The right-sided diagram shows the infrastructure related segments, including the Metro of Porto's financial consequences while operating.

Key Partners

- Bus
- Shops inside Metro
- Parking lot companies
- Airports (In some cases)
- Investors (Government, City Council, ...)

Key Activities

- Public transport service
- Promote sustainable mobility for users in some area

Key Resources

- Urban network of stations
- Customer-oriented

Cost Structure

- Maintenance of the network
- Infrastructure security
- Employees payroll

Value Proposition

- Fast
- Cheap
- Low waiting time
- Easy access

Customer Relationships

- Automated / Non-automated
- Impersonal / Personal

(depending on the station, different combinations can exist)

Channels

- Stations
- App
- Media

Customer Relationships

- Workers
- Students
- Occasional users
- Tourists

Revenue Streams

- Tickets
- Advertisement

BUSINESS MODEL

On the left side, it's represented what the Metro of Porto offers to meet the needs of its customers and the segments related with the customers, including how the Metro of Porto makes income from each customer segment.

USER RESEARCH

INVESTIGATION

FIELD OBSERVATION

ONLINE SURVEY

FINAL RESULTS

INITIAL USER RESEARCH

We start the project by making a little investigation about the current metro of Porto system, and a search about other transport system without barriers around the world. We tried to understand who were the clients that didn't paid their tickets, and why they do that.

FIRST RESULTS

With our investigation based in metro of porto website and material given by the teacher we came to our firsr user segmentation, we divide them by the reason they didn't valifate their tickets. And we tried to undertand the occurence, their intetions and fellings

	1. Accidental evader	2. 'It's not my fault' evader	3. Calculated risk-taker	4. Career evaders
Occurrence	Rare	Occasional	Fairly often	Always
Intentions	No intent – evasion by accident	No intent – evasion due to barriers	Intent – evasion due to low risk	Entirely intentional
Feelings	Guilt / embarrassment	Nervous, worried but no guilt	Dispassionate, vigilant, no guilt	Pride
View of fare evaders	Condemnation	Range – empathy, injustice or condemnation	Range - understanding to condemnation	Empathy

FIELD OBSERVATION

What \ Who	< 30 years old	Middle age	> 60 years old
Without paying	27	6	4

After that we did a field observation in Metro of Lisbon, to see how people behave. We used the Quick & Dirty method.
We tried to see some people cheating the system, so we could understand better the faults.

We concluded that there isn't only one type of person that cheat the system. We could find people from all ages, and gender cheating the system. But we could conclude that the majority of the people that don't validate their tickets are under 30 years old.

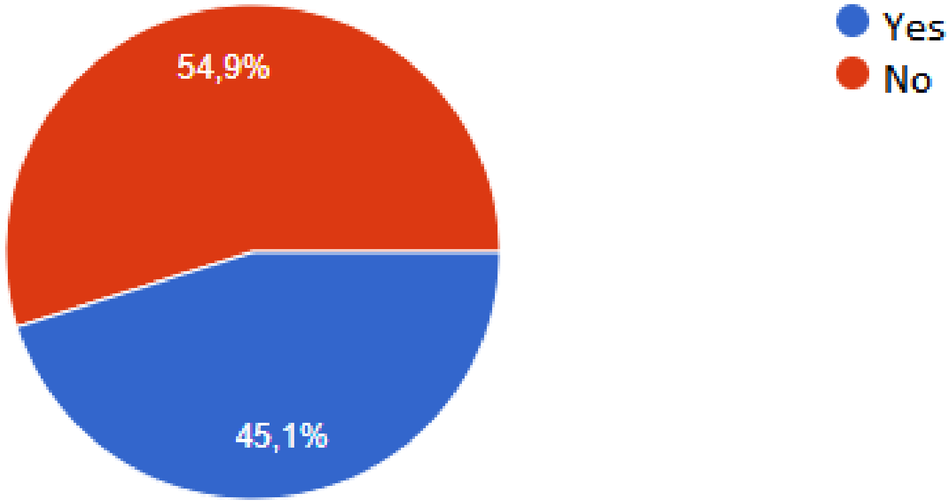
ONLINE SURVEY

MAIN QUESTIONS

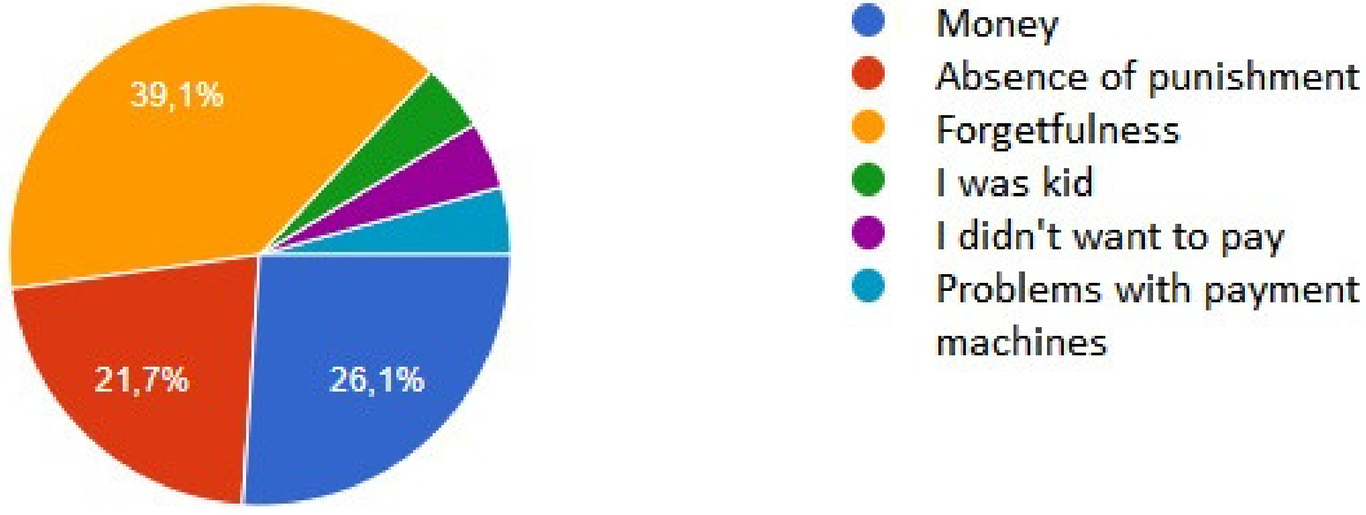
To complement our field observations, we did an online survey. In that survey we tried to understand better the reasons why people don't pay.

It was interesting to see that most people in a hurry to catch the metro forgot to validate, and this made us think that adding signals, increasing the number of machines and validators could help reduce the number of intruders.

Have you ever used the subway without paying a Ticket?



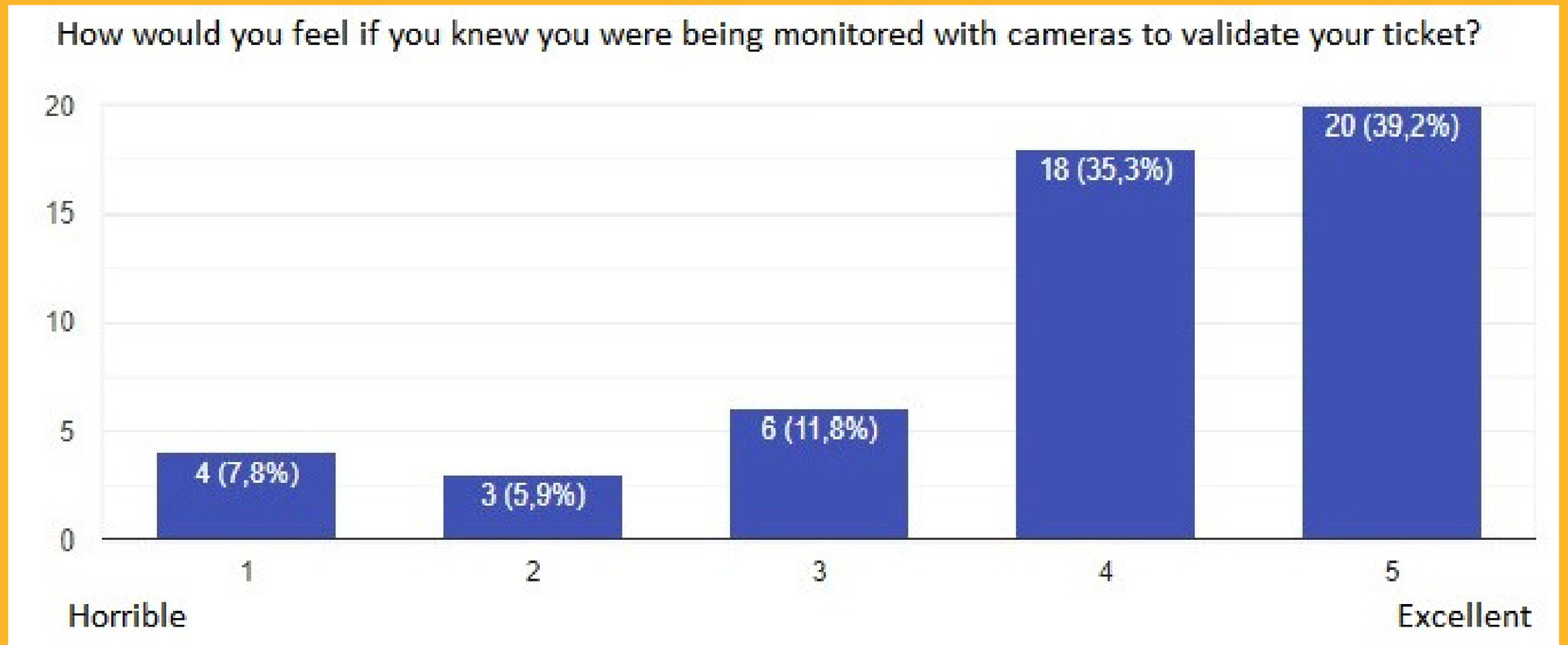
What was the reason for not validating your ticket?



ONLINE SURVEY

MAIN QUESTIONS

Before making the survey we started to think in possible solutions.It was an early stage of the project but we wanted to take advantage of this opportunity to take some feedback from the user about our solution idea.
We didn't have a concrete idea but we knew that the solution could be monitoring the users with cameras.

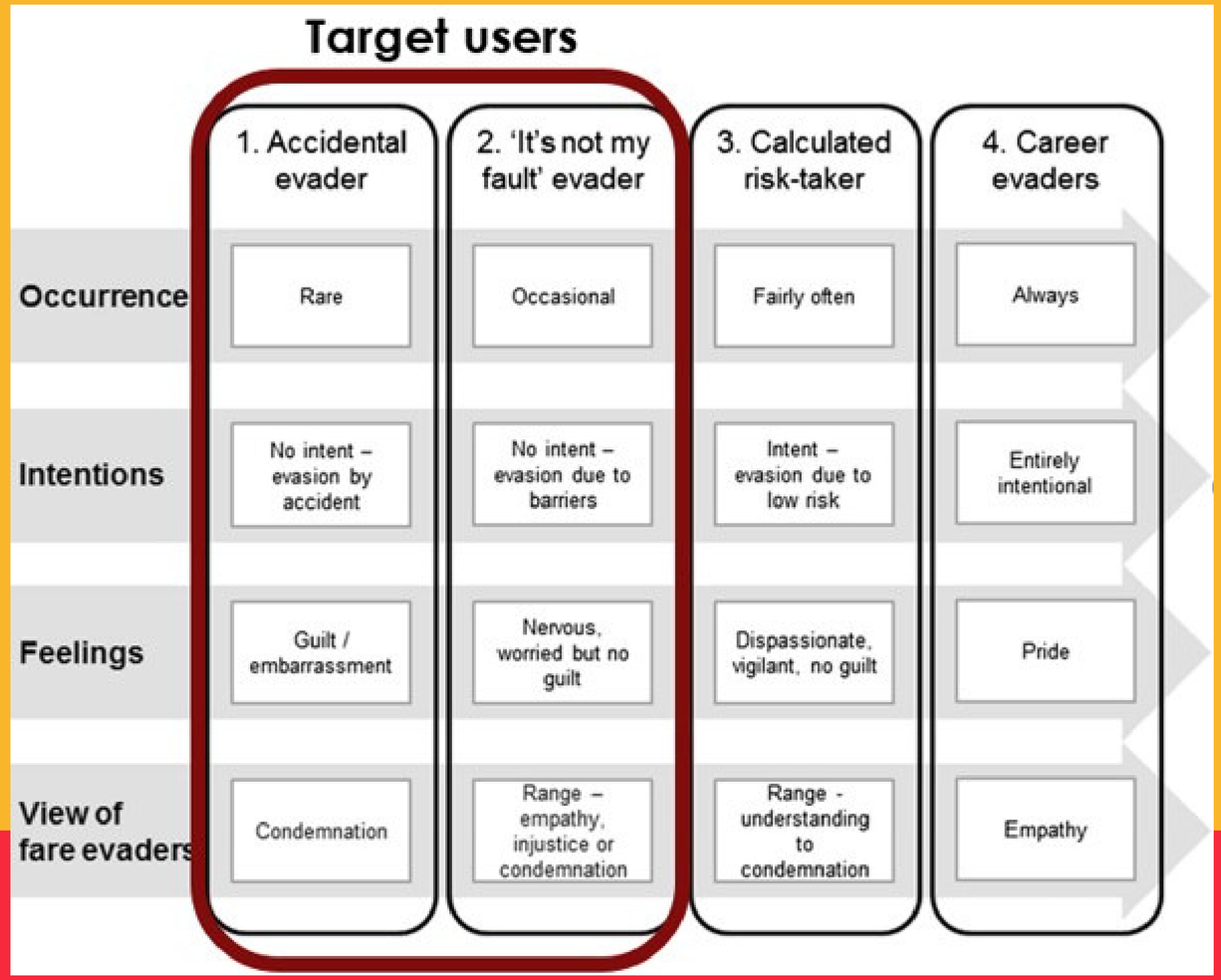


FINAL RESULTS

TARGET USERS

With our online survey we understood the customers better. We also realised that the most of users do not mind being monitored with cameras while validating their ticket.

We also saw that there's a relevant number of people that do not validate their ticket because they forget to do it. So we decided to focus on them mainly.



DEVELOPMENT

The development of this project was made in 5 steps.
In the end of each step (exception made with low functionality prototype) we made user's tests with the goal of testing and improve our solution.

Gathering data around mental models is a critical step for getting feedback (since we always consider feedback useful) from the users. Our solution evolved from the initial concept until we reached the final prototype, the fully functional prototype

INITIAL CONCEPT

LOW-FIDELITY PROTOTYPE

LOW FUNCTIONALITY PROTOTYPE

FUNCTIONAL PROTOTYPE

FULLY FUNCTIONAL PROTOTYPE

PROTOTYPE 0

INITIAL CONCEPT

Our initial approach started with using sensors on tickets that can be validated through sensors on doors.
Sensors used in tickets should be similar to the ones used in running races.
If someone didn’t pay their ticket the system raises a warning alarm and the person can purchase the ticket inside the train.
For those who get the ticket, they will get a discount after some validations.

USER'S TESTS

On this step we made an online questionnaire and field observations.

From the questionnaire, we understood that the users are ok about having cameras monitoring them to check the validation of tickets.
Most of the users wanted the possibility of an app to buy the ticket.

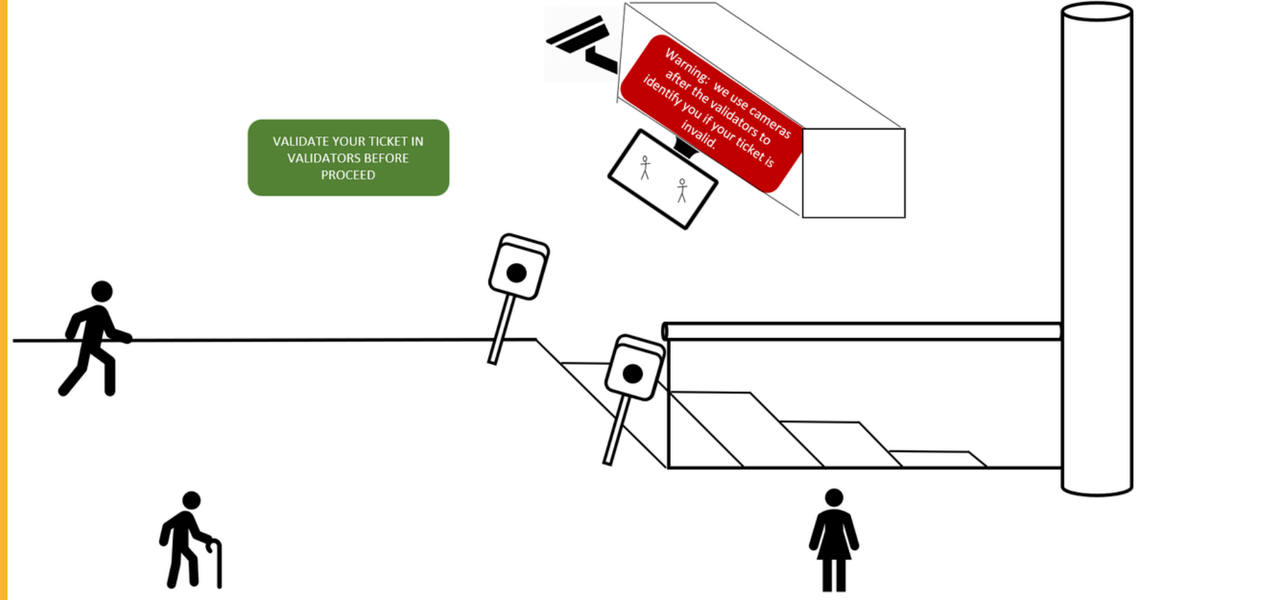
From field observation:

- Most of the people observed are < 30 years old
- Interaction with the tickets' machines seem to cause some difficulties, mainly to those that appear to be tourists
- Those who apparently don't pay are < 30 years old

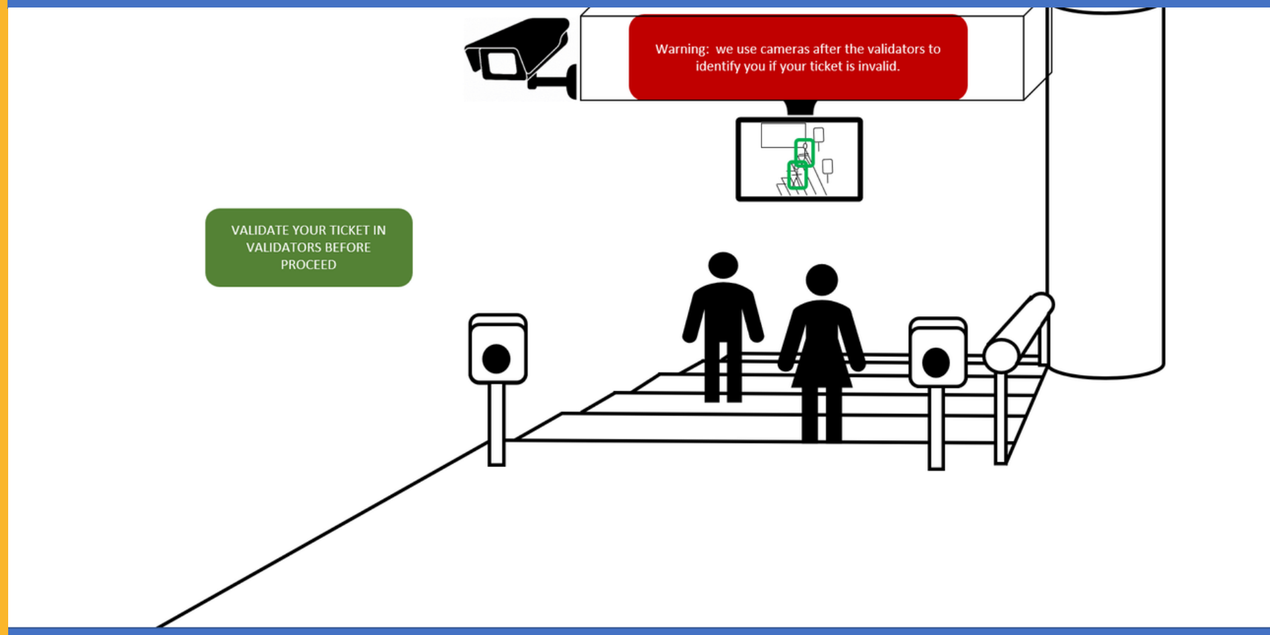
PROTOTYPE 1

LOW-FIDELITY PROTOTYPE

The low fidelity prototype design process was initiated by the understanding of how to connect our idea, using thermal cameras, with the solution of Porto metro where 20% of people that use the metro don’t pay their ticket.

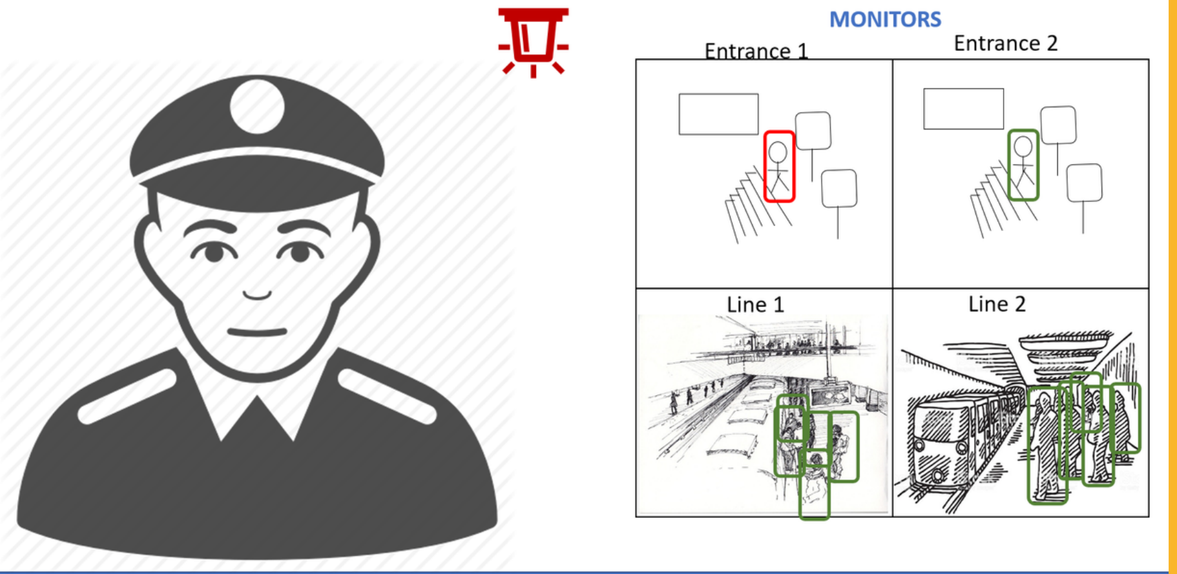


Meanwhile, in a Metro of Porto station ...



The thermal camera detects the customers and two green boxes around the customers are shown in the display

The thermal detects the customer and a red box is shown around him.



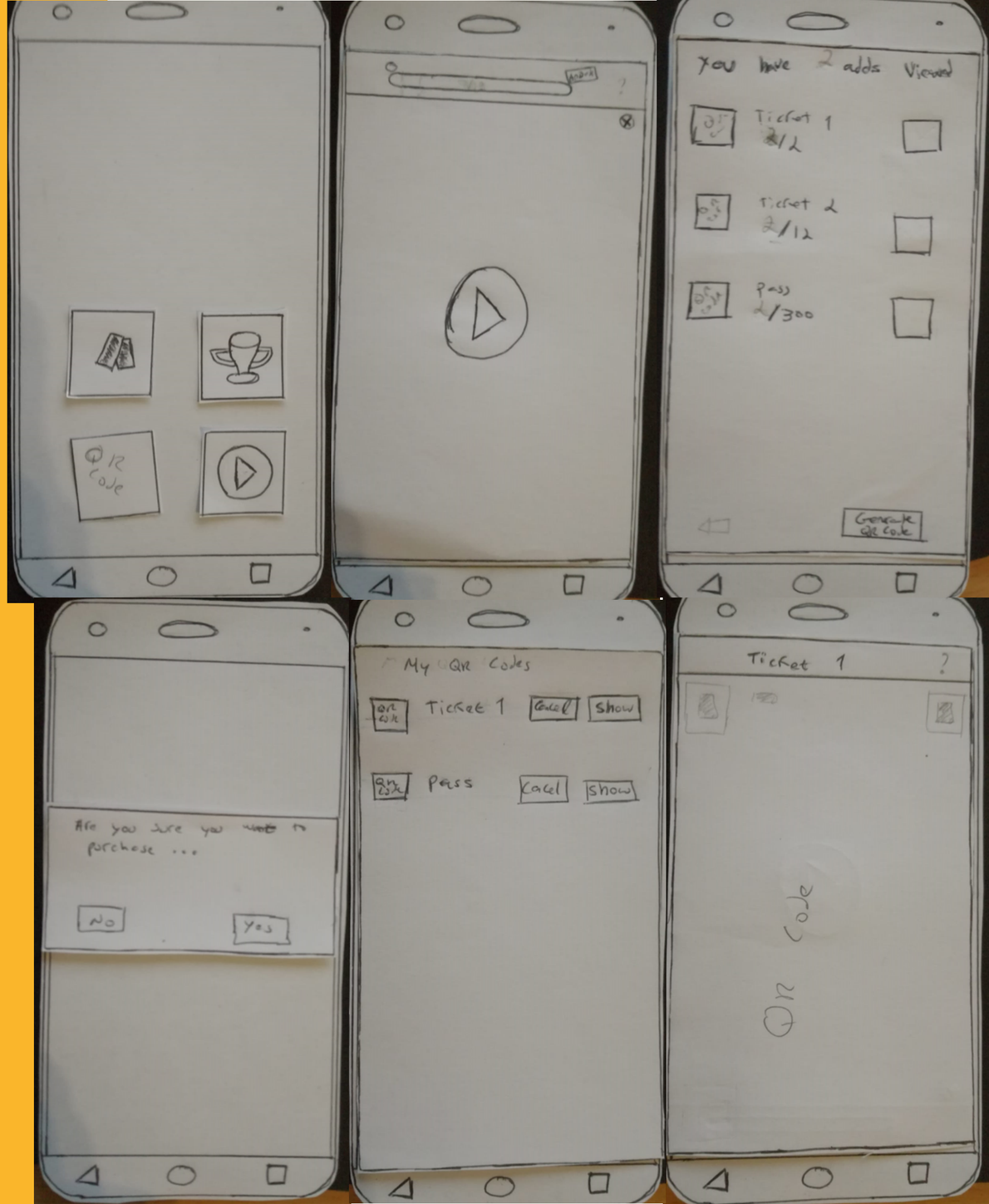
The Officer sees the person that didn't validate the ticket

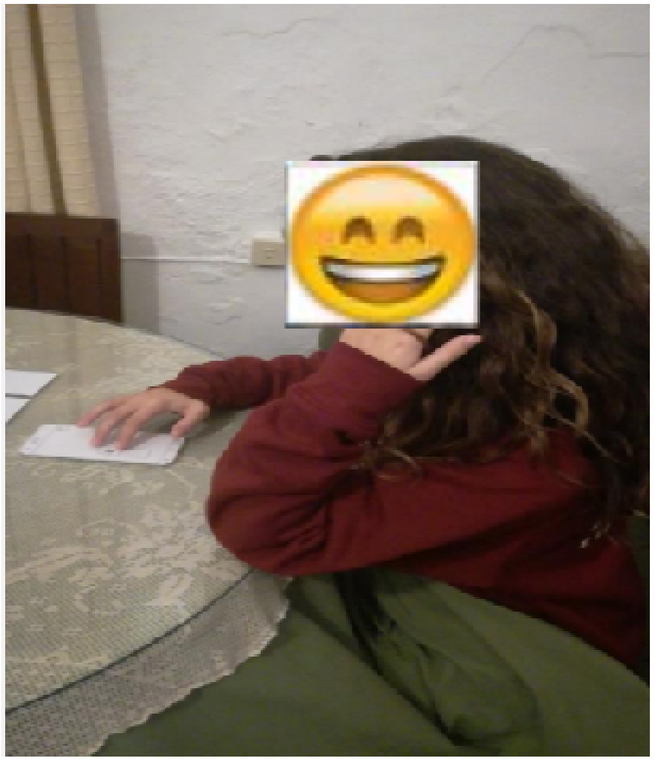
The use of thermal cameras would be for the users to be able to see themselves in a screen set after the validators with a green or red box around them depending on their valid or invalid ticket.

In case the system detects a user without a valid ticket, it would inform the metro employees that could take responsibility on the user.

Additionally we wanted to implement an app where people could watch a certain number of commercials to get free tickets.

These tickets came out as QR-CODES on the app and could be switched to real tickets in the ticket machines of metro, which would encourage users to ride the metro with a valid ticket.





USER'S TESTS

For the first test with users we used the uncovering mental model technique on the storyboard and think aloud technique on the app sketch.

On the storyboard we asked users to explain every visual that they were looking at and asked a couple of questions in order to collect early user feedback.

On the app sketch we gave the user the task to try on the app and they said what they were thinking in order to detect design errors.

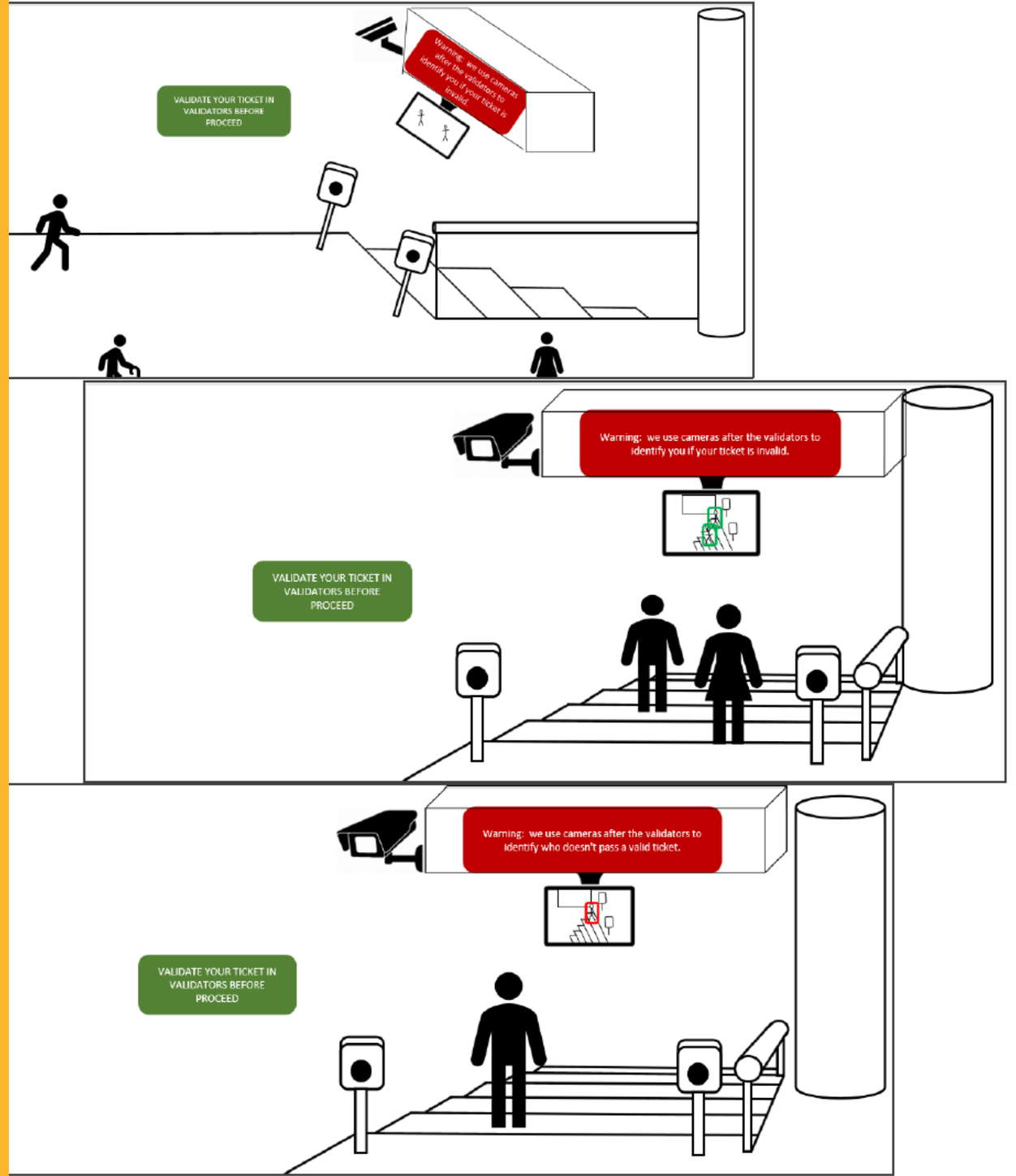
USER'S TESTS

After the tests we could understand the following:

Users who tested our prototype noticed that the solution of using a supervisor to take the responsibility on the users that didn't pay would not work so well specially in the rush hours.

Users also couldn't understand how the QR-CODE system would work and how it would connect the ticket to the user.

On the app we needed to improve the design of both the screen to select what ticket the user wants and the QR-CODE screen.

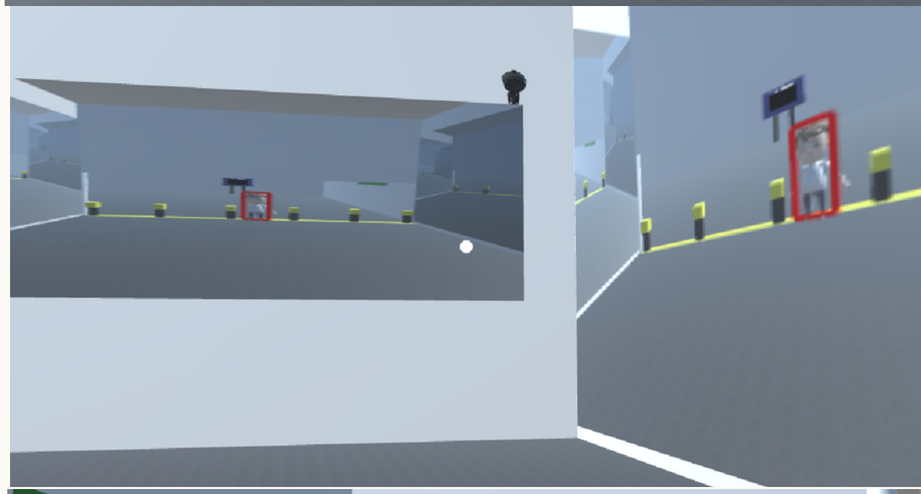


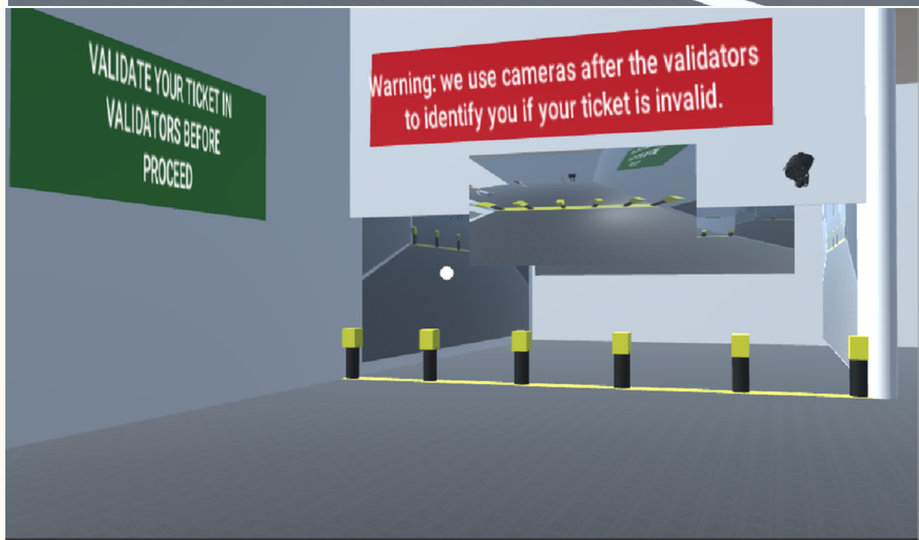
PROTOTYPE 2

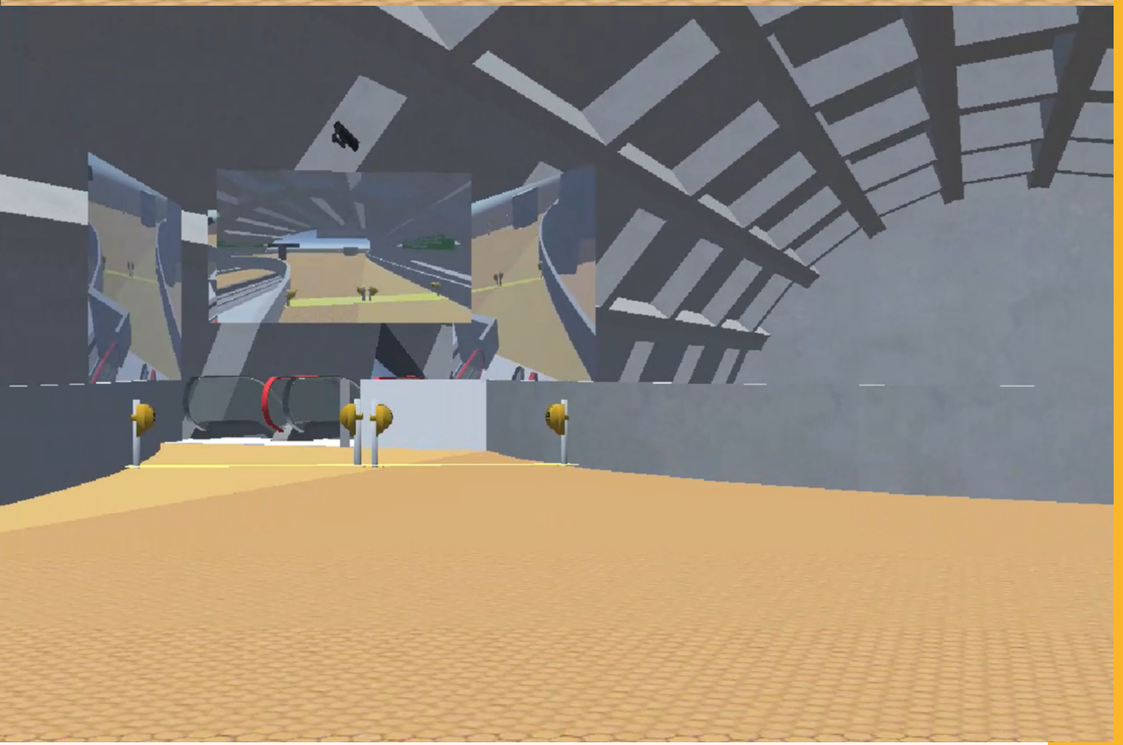
LOW FUNCTIONALITY PROTOTYPE

The low functionality prototype results from the information obtained from users in the previous prototype and is a sketch made in virtual reality of our final prototype.

We also decided to give up on the app idea to be able to meet the deadline and just focus on the thermal cameras part.







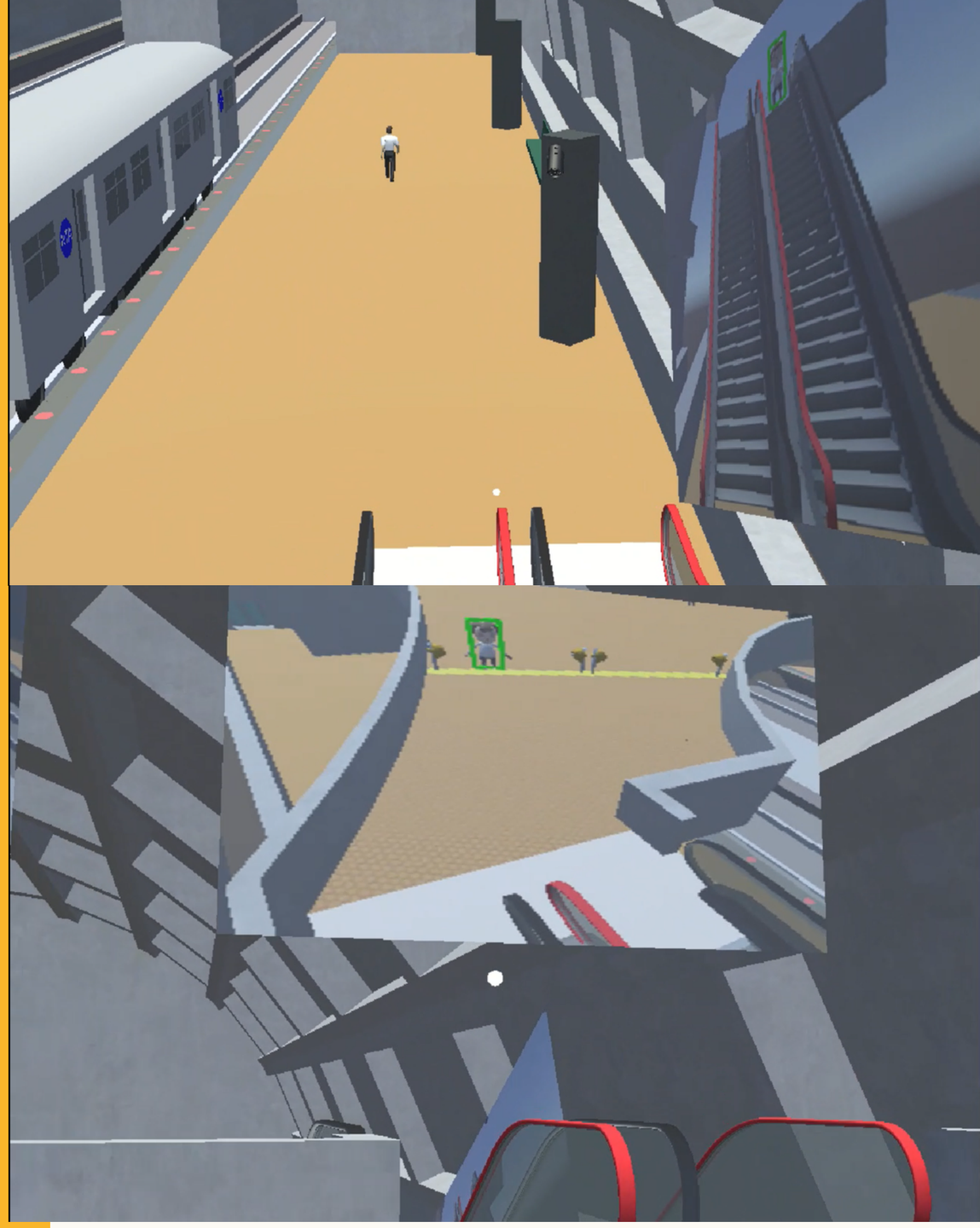
PROTOTYPE 3

FUNCTIONAL PROTOTYPE

At this point, we implemented the storyboards with the corrections required to meet the layout goal in virtual reality.

For this step of the project we defined the following critical tasks implemented on our virtual reality prototype:

- Use monitors in the Metro station next to the validation zone displaying the customers and their validation status
- Simulate the interaction with the Metro validation system



USER'S TESTS

We tested the prototype with users using the Think Aloud Technique where we gave them the following task:

- "Try to catch the metro and tell us everything you do while using this prototype"

During the tests we tried to understand if the colored boxes were noticed and if the user understood what it was ment for.

Was also very important to understand user's difficulties in order to correct the design of this prototype.

USER'S TESTS

Design implications obtained from the results:

- Change the screens (position and size)
- Try different styles of customer validation status on the screen
- Put more info at the station (Signs, destination indications)

PROTOTYPE 4

FULLY FUNCTIONAL PROTOTYPE

At the final step we added a shame factor to persuade people from travelling without a valid ticket.
Added more signs, changed screens and created other users using the station where some had bought a ticket, others didn't.

USER'S TESTS

We made a quantitative study with the help of the think-aloud technique.

We tried to understand how many users could identify the correct number of screens used on validation system at the station, also how many users could identify who has a valid or invalid ticket and how many people realize each of these actions.

USER'S TESTS

IMPLICATIONS FOR FURTHER REFINEMENTS

Improvements for our solution:

- Add alternatives to beep sound when people don't validate their tickets
- Remove monitors that aren't being seen

Improvements for our prototype:

- Users around the metro should be different it order to make the distinguish easier from each other
- Add people entering and exiting the station all the time
- Easily reset scene

CONCLUSION

Thinking and building a technological solution to a real-world challenge following a set of well structures phases, with consecutive development of prototypes and respective user tests, and with the real notion of the Metro of Porto customers' needs makes this solution much more robust and credible, either to the ones that developed it or to the ones that will acquire or use it.

The fact that the Metro of Porto is in a different city, made us find different and sometimes more creative ways of accomplishing the challenges throughout the development of this solution, either by having to find transportation systems with similar access constraints or by having to find user tests questions that would also apply to the Metro of Porto.

The solution described in this document has a big probability of reducing the high number of non-paying customers of the Metro of Porto mainly due to the shame factor associated with the display of the validation status of the customers that could be visible to anyone around.

The choice of a solution that don't change the way how actual Metro of Porto customers use their system is a very good way of facilitating its integration in the real system, because it doesn't require any adaptation of those who correctly use the system.

Annex

Online Survey

Users answer from prototype 1

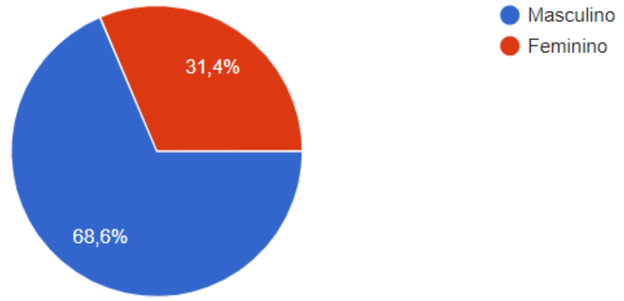
Users answer from prototype 3

Users answer from prototype 4

Somos um grupo de alunos do Instituto Superior Técnico e estamos a desenvolver um projeto alusivo ao desenvolvimento de um sistema sem barreiras para o metro. O Questionário demora em média 5 minutos para ser preenchido, sendo totalmente anónimo. Agradecemos desde já a sua colaboração.

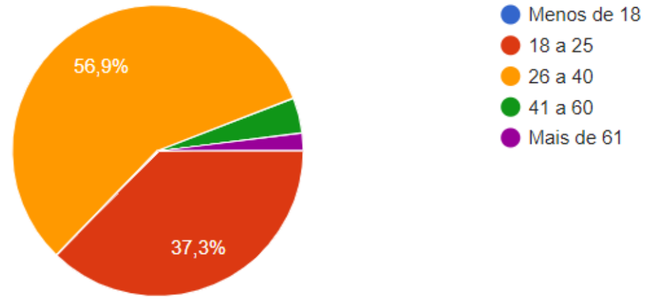
Sexo

51 respostas



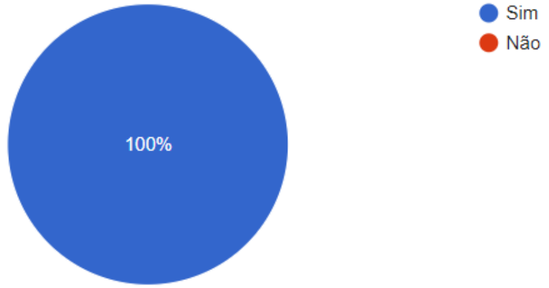
Idade

51 respostas



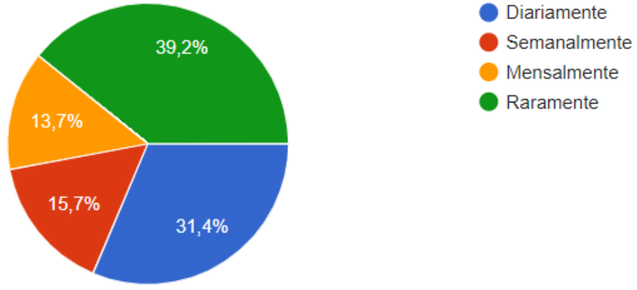
Alguma vez utilizou o serviço do Metro ?

51 respostas



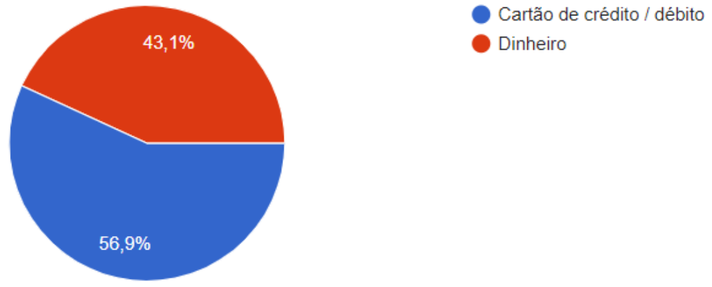
Com que frequência utiliza o metro ?

51 respostas



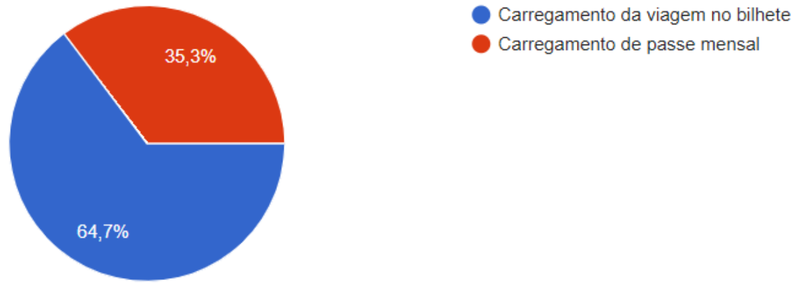
Qual a opção de pagamento que costuma utilizar no serviço do metro ?

51 respostas



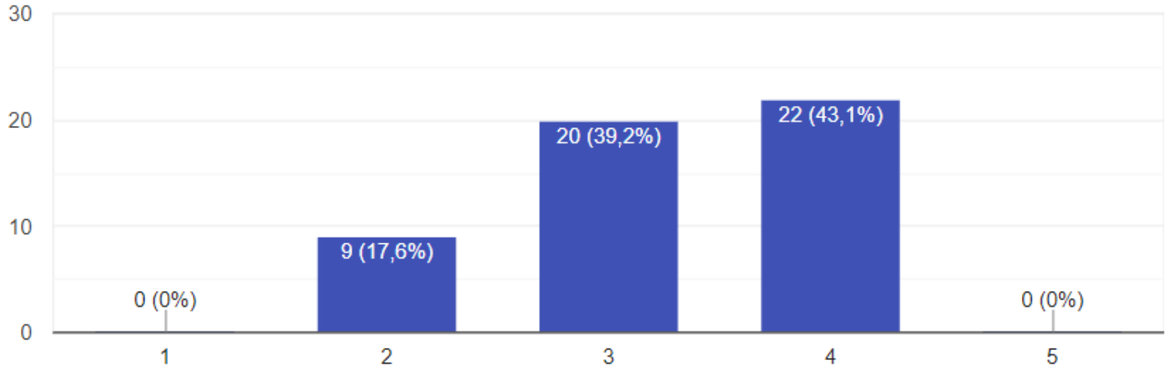
Que tipo de viagem costuma adquirir ?

51 respostas



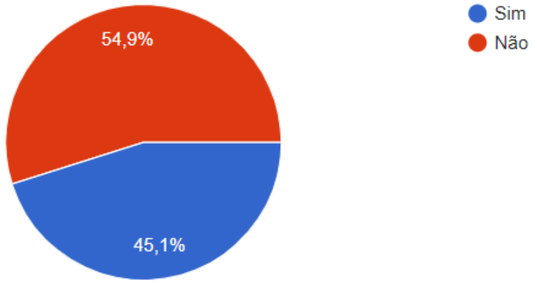
Qual é o seu grau de satisfação com o serviço do metro?

51 respostas



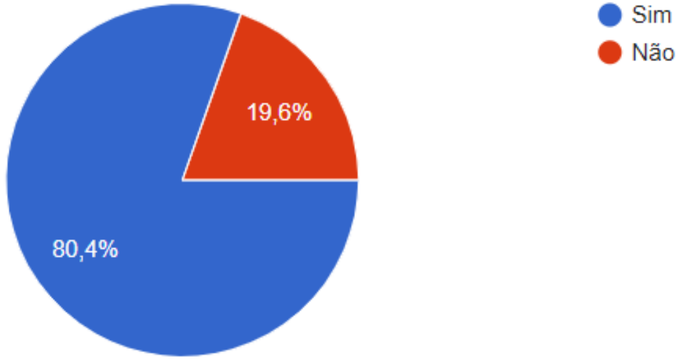
Alguma vez utilizou o metro sem pagar Bilhete ?

51 respostas



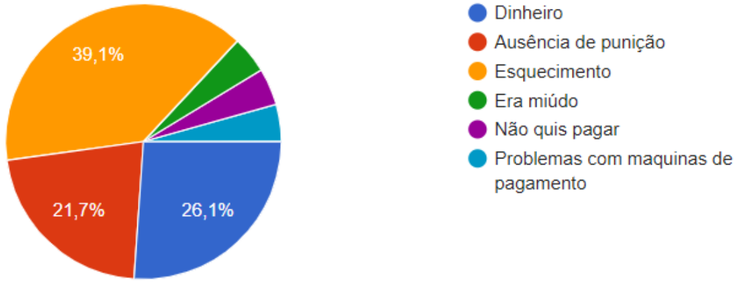
Gostaria de ver o metro sem cancelas físicas ?

51 respostas



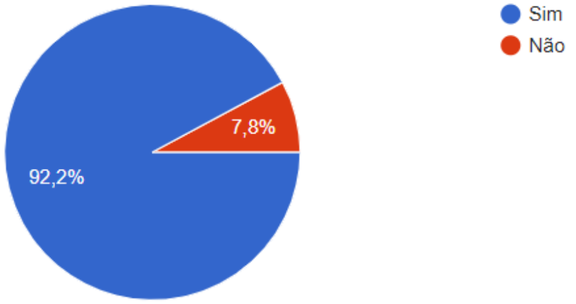
Qual o motivo ?

23 respostas



Continuaria a pagar o seu bilhete/passe se deixasse de haver barreiras físicas no metro ?

51 respostas



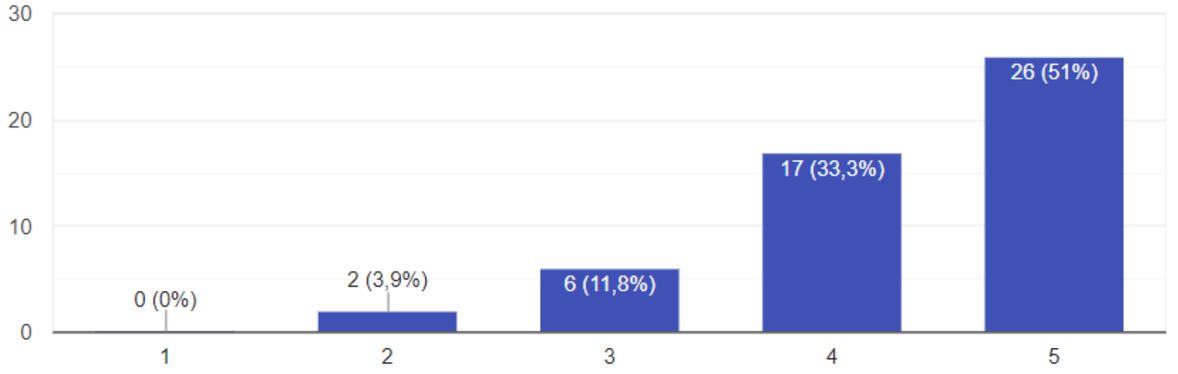
Qual o motivo ?

3 respostas

SE não há cancelas, não posso validar
Mais rápido
O serviço não é gratuito pelo motivo que tem grandes custos para ser mantido. Se queremos que o serviço melhore a pior ideia seria retirar os custos e faze-lo gratuito

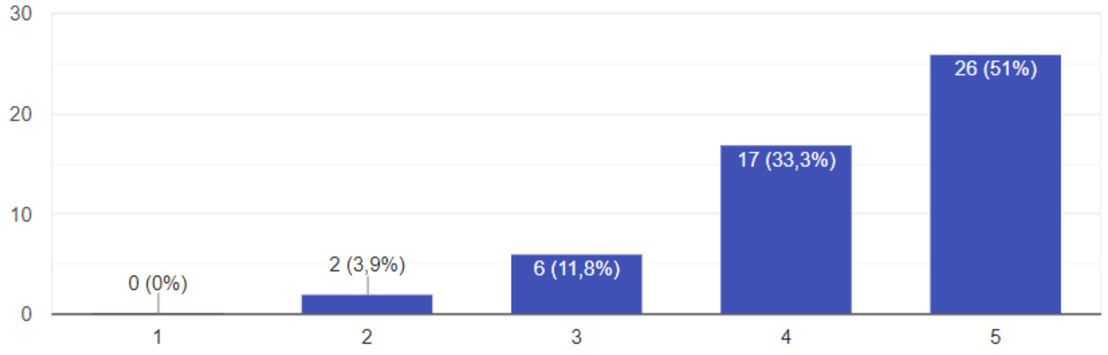
Qual é o seu grau de satisfação relativamente a uma possível aquisição do bilhete através do smartphone?

51 respostas



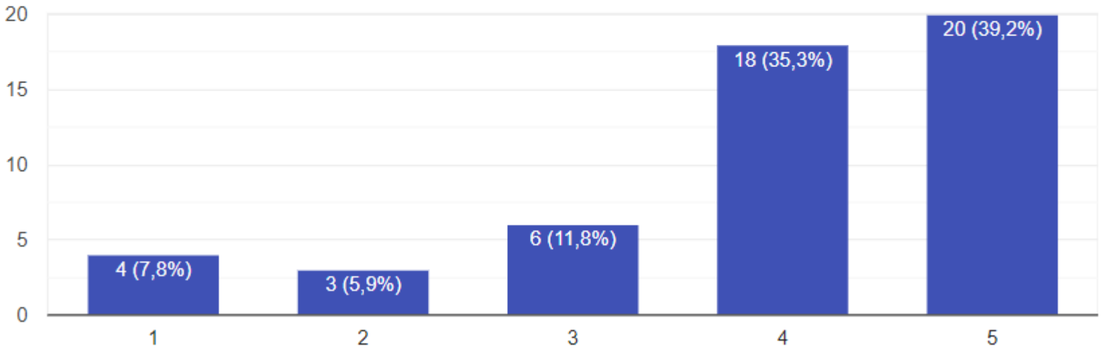
Qual é o seu grau de satisfação relativamente a uma possível aquisição do bilhete através do smartphone?

51 respostas

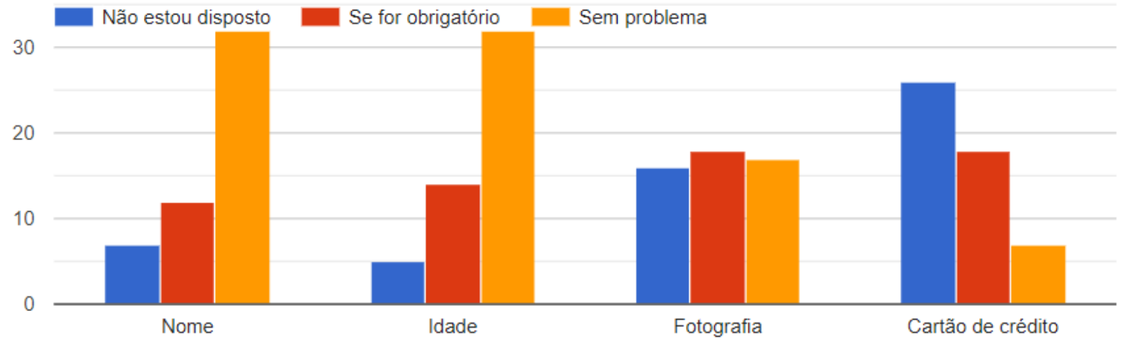


Como se sentiria se soubesse que estava a ser monitorizado com câmaras para validar o seu bilhete ?

51 respostas

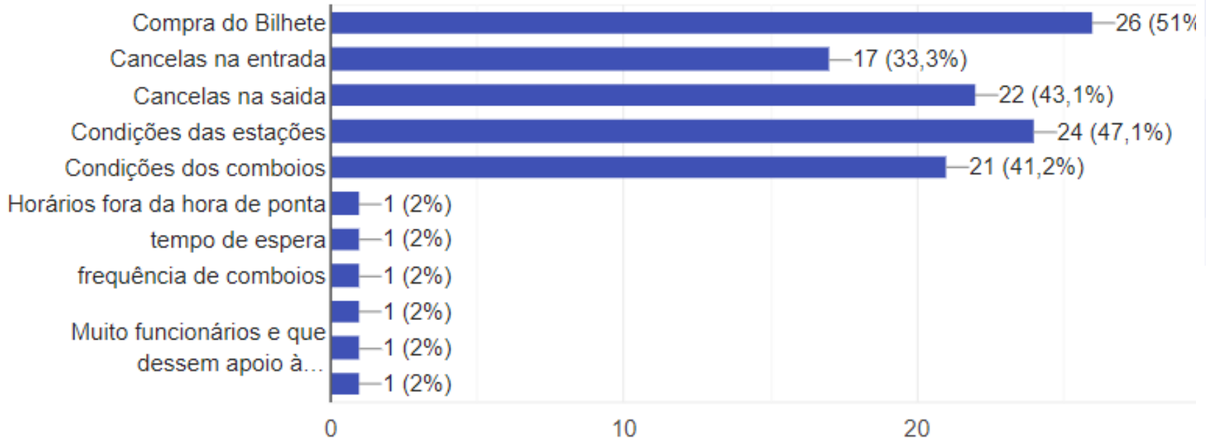


Relativamente aos seguintes dados, qual a sua disponibilidade para os fornecer ao serviço interno do metro para que o seu bilhete/passe seja validado?



Entre o entrar e sair do metro, que parte da experiência da viagem alteraria/melhorava ? (Seleccione todas as respostas que se aplicam)

51 respostas



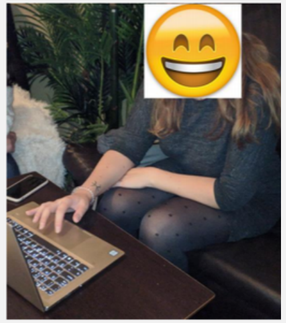
Tem alguma sugestão para a implementação de um sistema do metro sem barreiras ?

14 respostas

Não tenho sugestões
Sensores nas estações, como nas lojas de roupa.
Perfeito
Não
Não aprovo porque o metro tem muitas gaps em termos de segurança e qualidade de serviços
Não
Demora na compra de bilhetes, compra por smartphone seria ótimo.
Aplicação com bar code
Não querias mais nada
Tags rfid ativas
Barreiras, mas com bilhete virtual (QR Code); pulseira (ou algo do género) com sensor tipo via verde com câmaras a registarem quem passa sem pulseira válida
na
Sistema de check point duplo para validar quem entra e sequencialmente quem adquiriu bilhete. Compra de viagens ou passe virtual através de app que permita fazer gestão de conta e histórico de viagens e com a possibilidade de gerar QR Code que seria utilizado no 2o checkpoint para validar título de viagem.
Numa primeira fase seria mais viável eliminar apenas a barreira de saída.

Users answer from prototype 1

USER 1: DIANA
AGE: 26



- **Can you describe what you see in every visual?**
- Yes, easily.

- **Is there any task that you can't perform?**
- None. It's well-thought and easy to decipher. I would only need to understand better how the QR-CODE works.

- **What did you like the most?**
- The idea of the screen after the validators, it's also a second confirmation of the validation of the ticket.

- **What do you think is the best way to get a ticket, cash or QR-CODE?**
- QR-CODE.

- **What tasks need to be redesigned?**
- What if the security man cannot reach the person with the square red light while he is climbing down the stairs just before arriving to the station? Is it easy to find his square red light in the middle of the crowd down in the metro station?

- **Are there any problems using the system?**
- The security guards reaching on time to the people with the square red light, before they enter the metro. Also, if they can identify the person when they arrive next to her, since there is no red light without the screens, in real life.
- Can the thermal cameras show people as they are, or sense only the heat of the body, not recognizing the faces making it difficult for the security guards to identify people's faces?

- **Is this design useful for users, making them always pay the ticket?**
- Yes, it makes an impact on people's consciousness.

- **Other Observations:**
- It would avoid lines in the ticket machines, the QR-CODE idea.

USER 2: NATÁLIA
AGE: 22

- **Can you describe what you see in every visual?**
- No. What is the QR-CODE? Is the green light the one that detects people on the validator? Does the screen show real people or is it in black and white?

- **Is there any task that you can't perform?**
- Yes. How does the QR-CODE task work? Where can you get it from? How is your ticket card connected to the QR-CODE?

- **What did you like the most?**
- It makes an impact on people's conscience that they are being watched.

- **What do you think is the best way to get a ticket, cash or QR-CODE?**
- I would rather validate my ticket using the QR-CODE than the ticket card.

- **What tasks need to be redesigned?**
- Use validators with QR-CODE only. Only by arriving to the metro station and having the ticket already paid, makes this process easier.

- **Are there any problems using the system?**
- In the rush hours, the system would have to be very good to detect everyone. The system would have to make sure that everybody would pay the fine.

- **Is this design useful for users, making them always pay the ticket?**
- By having a new system detecting everything to make sure everyone pays, I would go back and pay my ticket.

- **Other Observations:**
- Change tickets for commercial adds is a good idea. If you really want to use the system and have no possibilities how, you won't mind watching commercial adds.

USER 3: ALEXANDRE
AGE: 30

- **Can you describe what you see in every visual?**
- Yes, the stories are very self-explanatory.

- **Is there any task that you can't perform?**
- No.

- **What did you like the most?**
- The possibility of getting tickets through the APP.

- **What do you think is the best way to get a ticket, cash or QR-CODE?**
- With the QR-CODE using the APP.

- **What tasks need to be redesigned?**
- The first control area shouldn't be so close to the validators in order to give enough time to those more careless to notice that they forgot to validate the ticket.
- But, on the contrary, it shouldn't be so far that could avoid immediate action by Metro officers.

- **Are there any problems using the system?**
- The system might fail if there's a lot of people passing without validating.

- **Is this design useful for users, making them always pay the ticket?**
- This design will keep the same efficiency for those who already use the system correctly and will probably influence those who may try to cheat it, making them go back and get a valid ticket.

USER 4: FREDERICO
AGE: 31

- **Can you describe what you see in every visual?**
- Yes, it's not difficult.

- **Is there any task that you can't perform?**
- No.

- **What did you like the most?**
- The detection of the invalid users with the thermal cameras.

- **What do you think is the best way to get a ticket, cash or QR-CODE?**
- QR-CODE is more interesting, but both should be kept. I think that the possibility to pay using a debit/credit card is missing.

- **What tasks need to be redesigned?**
- Put signals indicating that the Metro officers are close by.

- **Are there any problems using the system?**
- Imagine there's a problem with the detection because the thermal cameras are not working as expected and a valid user appears red in the monitor?

- **Is this design useful for users, making them always pay the ticket?**
- Yes, because of the shame factor when detected.

- **Other Observations:**
- If the person doesn't see the monitor, how he/she will know he/she is an invalid user? Maybe adding a light signal next to the validators.

USER 5: BEATRIZ
AGE: 22

- **Frequency of use of the Metro?**
- Every day.

- **The user reached the goal?**
- Yes.

- **What was the main problem?**
- The screen to select what ticket she wanted.

- **Will you use our app to exchange tickets for commercial ads?**
- Depends on how many ads we need to see to receive a monthly pass.

USER 6: VASCO
AGE: 18

- **Frequency of use of the Metro?**
- Rarely.

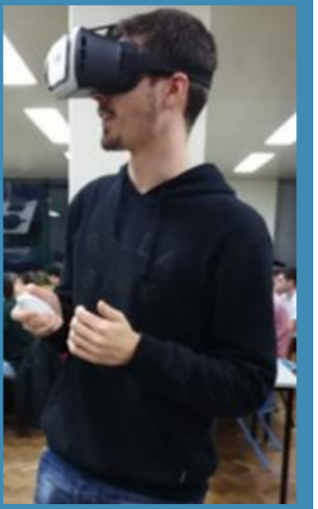
- **The user reached the goal?**
- Yes.

- **What was the main problem?**
- Did not realize that the button for QR-CODE was to see the QR-CODEs that he already had. He thought it was to scan a QR-CODE.

- **Will you use our app to exchange tickets for commercial ads?**
- Yes, because he only uses the subway a few days a year and so he will travel free without having to see many ads.

Users answer from prototype 3

User 1:



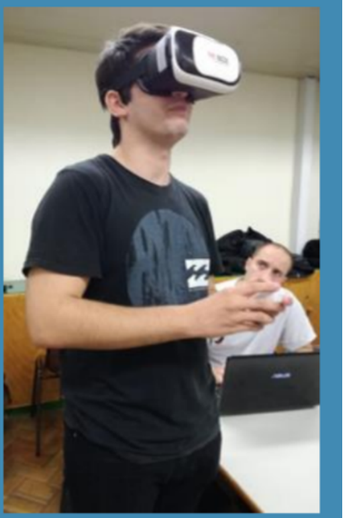
Went straight to the ticket machines

Read the warnings

User went downstairs and didn't say anything

He didn't notice what was on the screens or the screens themselves.

User 2:

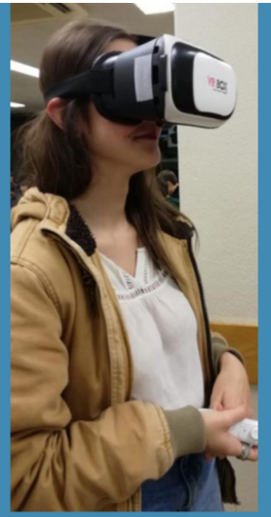


User tested first the environment and only after that went in the right direction.

He picked up the ticket and found that it had the same

He passed the validation zone and verified that he was identified by cameras with a green box around him and asked if this would indicate if it was valid.

User 3:



Asked if she needed to buy a ticket

Many difficulties to buy the ticket

She does not realize where she is, very confused. Missing indications.

Didn't notice the monitors.

It was only after turning back that she noticed the monitors and the warnings.

Only after a few indications the user noticed that it was green and that meant a valid user.

User 4:

When he saw the "red stairs", he decided to go back and go on the other side.

He identified himself in the monitors.

He noticed the red box and didn't associate with non-validation of the system.

He came back to buy the ticket and had some difficulties in doing so.

He only noticed that he had a ticket after we told him.

When he returned to the validation zone he noticed that it was green.

User 5:

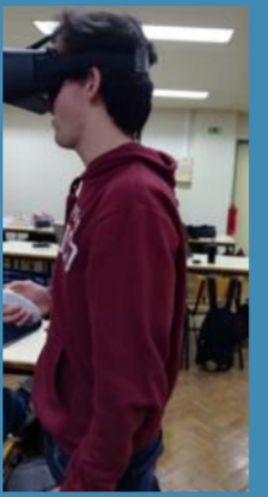
Went to the ticket machines to buy the ticket.

The yellow line looked green(He said he was a little colorblind).

Asked for validators and how he would validate his ticket.

Didn't identify the monitors.

If the screens were more visible he might be able to find them.



Users answer from prototype 4

Pre-Questionnaire						Task 1	Task 2	
Gender	Age	How often do you use the metro?(Everyday,Weekly,Monthly,	How often do you validate your ticket?	Have you already used VR?	How would you feel if you knew you were being monitored with cameras to make sure you validate your ticket? (Fine, Ok, Bad)		How many screens can you identify? (10 - 100%)	Can you identify who has a valid or invalid ticket? How many people from each? (4 green, 2 red) - 100%
Female	26	Weekly	Everytime	Yes	Fine	Went to the machine to buy the ticket. Asked what was the noise heard. Noticed the screens and understood that this noise was coming from a user with a red box.	10	3 green, 1 red
Male	26	Monthly	Everytime	Yes	Ok	Went straight to the validation zone. Asked what was the noise heard. Went downstairs and noticed the screens and the users	10	1 green, 2 red
Male	25	Everyday	Everytime	Yes	Ok	Went to the machine to buy the ticket. Asked what was the noise heard. Noticed the screens and the users	10	1 green, 1 red
Female	31	Everyday	Everytime	No	Ok	Asked if she needed to buy the ticket. Asked what was the noise heard. Noticed the screens and the users	8	3 green, 2 red
Male	21	Everyday	Everytime	Yes	Ok	Went to the machine to buy the ticket. Noticed the screens and the users	8	3 green, 2 red
Male	21	Weekly	Everytime	No	Ok	Went straight to the validation zone and noticed the screens. Went back to buy the ticket and went downstairs successfully. Noticed the screens and the users	5	4 green, 2 red
Male	20	Everyday	Everytime	No	Fine	Went straight to the validation zone. Noticed the screens and turned back to buy the ticket. Noticed the users.	8	3 green, 2 red
Female	29	Everyday	Everytime	No	Fine	Asked where she could buy the ticket. went to the machine to buy the ticket. Noticed the screens and the users. Finally went downstairs.	8	3 green, 2 red
Female	27	Everyday	Everytime	No	Ok	Went to the machine to buy the ticket. Asked what was the noise heard. Noticed the screens and the users	10	3 green, 1 red
Male	24	Monthly	Everytime	No	Fine	Went to the machine to buy the ticket. Noticed the screens and the users	10	3 green, 1 red
Male	26	Rarely	Everytime	Yes	Ok	Went to the machine to buy the ticket. Noticed the screens and stopped for a while to watch people on validation zone. Went downstairs.	10	4 green, 1 red
Male	26	Rarely	Everytime	No	Ok	Went to the machine to buy the ticket and asked what was the noise heard. Went to validation zone and understood it came from the users with a red box.	10	4 green, 2 red
Female	20	Weekly	Everytime	No	Bad	Went straight to the ticket machines. Went downstairs and noticed the screens around him and the users with valid/invalid ticket	10	2 green, 1 red
Male	26	Everyday	Everytime	Yes	Ok	Went to the ticket machines. Asked what was the noise heard. Went downstairs and noticed the screens and the users	10	2 green, 2 red
Female	20	Weekly	Everytime	No	Ok	Went straight to the validation zone. Noticed the alarm and understood what happened. Went back to buy the ticket. Went downstairs and noticed the screens and the users	10	3 green, 2 red

Our links

Our GitHub Repository

https://github.com/Toscan0/CCU-G11

Our website

http://web.tecnico.ulisboa.pt/~ist181633/