



## Mobile Education Platform

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## 1 The problem we are working on

### 1.1 Context

In 2018 the world's second largest dumpsite located in Brazil, closed. The Estrutural dumpsite (Lixão da Estrutural) in Brasilia was up to the closure, a workplace for about 1200 people who made their livelihood by scavenging the trash for goods and recyclable materials [Cruvinel et al.,2019, Purchase, 2018]. These people, referred to as waste pickers, had the opportunity to transfer to new recycling centres established by the Brazilian government when the dumpsite closed. The new recycling centre also known as Solid Waste Recovery Installation (SWRI) would improve the waste pickers working conditions in several ways. At SWRI, the waste pickers were obligated to wear personal protection equipment and their ergonomic working conditions were improved [Purchase,

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2018]. Health issues, quality of life and the removal of illegal activities were the main reasons for closing the dumpsite. According to Purchase [2018] Serviço de Limpeza Urbana do Distrito Federal (SLU) had registered 47 accidents from 2009 to 2017. These accidents range from burns to more serious cases, such as a truck overturning on waste pickers and deaths [Purchase, 2018]. Another reason for closing the dumpsites is to improve the environment and health conditions of the general population. In the report “A Roadmap for Closing Waste Dumpsites” by the International Solid Waste Association (ISWA), the Estrutural dumpsite is highlighted, as one of the world’s largest and most threatening to human health. Thereby, the closing of the dumpsite contributes to the implementation of the UN Sustainable Development Goals (SDG) [ISWA, 2017]. However, most if not all waste pickers, have resentment towards the SWRI, caused by the reduced earnings.

**Mateus Halbe:** So, to ask another question. What is the verdict, do you prefer to work here or in the dump?

**Waste picker:** Dumping ground.

**Waste picker:** Dumping ground.

**Waste picker:** Dump site with certainty.

**Maria:** Here everyone is for the dump site

**Mateus Halbe:** Is this serious or are you all joking?

**Waste picker:** Seriously! There, I worked three days and I already supported the entire month

- Quotes from [Britze and Nielsen, 2019, p. 95]

The purpose of the Mobile Education project is to achieve an understanding of how an education platform can be designed for the waste pickers in Brasilia, Brazil. The goal is to develop the first steps towards designing a prototype that will support the waste pickers to learn how to manage their personal finances.

## 1.2 The joint work

### 1.2.1 The Group

The project was developed by seven students, three from Denmark and four from Brazil:

| Denmark               |                        |          |
|-----------------------|------------------------|----------|
| Name                  | Field of study         | Semester |
| Anja B. Mejer         | Engineering Psychology | 6th      |
| Emma B. Mortensen     | Engineering Psychology | 6th      |
| Ina V. B. Rasmussen   | Engineering Psychology | 6th      |
| Brazil                |                        |          |
| Name                  | Field of study         | Semester |
| Yasmin R. Kalume      | Production Engineering | 11th     |
| Isabel B. Alves       | Production Engineering | 4th      |
| Julia S. Brito        | Production Engineering | 5th      |
| Bianca M. de Oliveira | Production Engineering | 11th     |

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The group was able to gain knowledge and create a co-operation agreement in Hamburg. It was agreed that the Danes would travel to Brazil in the beginning of May to collect data for the prototype. The collaboration continued online, however due to the COVID-19 the waste pickers were also in quarantine, which made it impossible for the Brazilians to get in contact with them. In addition, the Danes was not able to travel to Brazil in order to conduct field work as initially planned.



### 1.2.2 Cooperation agreement

In connection with the seminar in Hamburg we made together a Cooperation agreement, which contains the following subjects:

- Online meetings (how often, what tools do we use, what time and date)
- What tools to use for communication
- How often do we keep each other updated
- How much can each group provide for the project ( how much time can be spent on the project, is it a course or a bigger report that each group need to deliver at home)
- Milestones
- How is the schedules for the participants and how much time does information of a task be given in advance
- Contact information

### 1.2.3 Risk management

The snippet below, is a small part of the risk management that was done in collaboration.

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| Risk   | Impact | Probability | Result | Strategy      | Preventive action  | Response action  |
|--|--------|-------------|--------|---------------|--|--|
| The waste pickers not being engaged and interested on participating.   | 4      | 5           | 20     | Reduce        | Explain to them that they can save time going to classes and spend more time with their family or work and still get the same benefits | Compensates them for their work and help   |
| SLU not being interested with our project and not seeing a purpose on it                                       | 4      | 1           | 4      | Avoid         | Give a good pitch  | Try to find another case   |
| The Relationship experiment will not be ready in time  | 3      | 1           | 3      | Avoid         | Stick to schedule  | Fix it as soon as possible   |
| We find out that there is a bug or mistake in the experiment setup, after we have started the data collecting. | 3      | 3           | 9      | Reduce        | Test the code or program   | If we have not done many tests we can start over, but if we have done many tests and have no more time, we have to evaluate whether we can use the data. |
| The last experiment will not be ready in time  | 3      | 2           | 6      | Reduce        | Stick to schedule  | Fix it as soon as possible   |
| Lack of data for the analysis  | 5      | 2           | 10     | Reduce/Accept | Try to find as much data as possible   | Do our own research  |

Here the team members listed all sorts of risks/problems that could occur during the project. Afterwards the Risk was assessed in order to evaluate how big of an impact it would have on the project if it happened. The “Preventive action” was an agreement on how to prevent the risk of happening and the “Response action” is how the group should handle the risk if it occurred. That way all team members have agreed on how to handle different situations.

### 1.2.4 Value Proposition Canvas

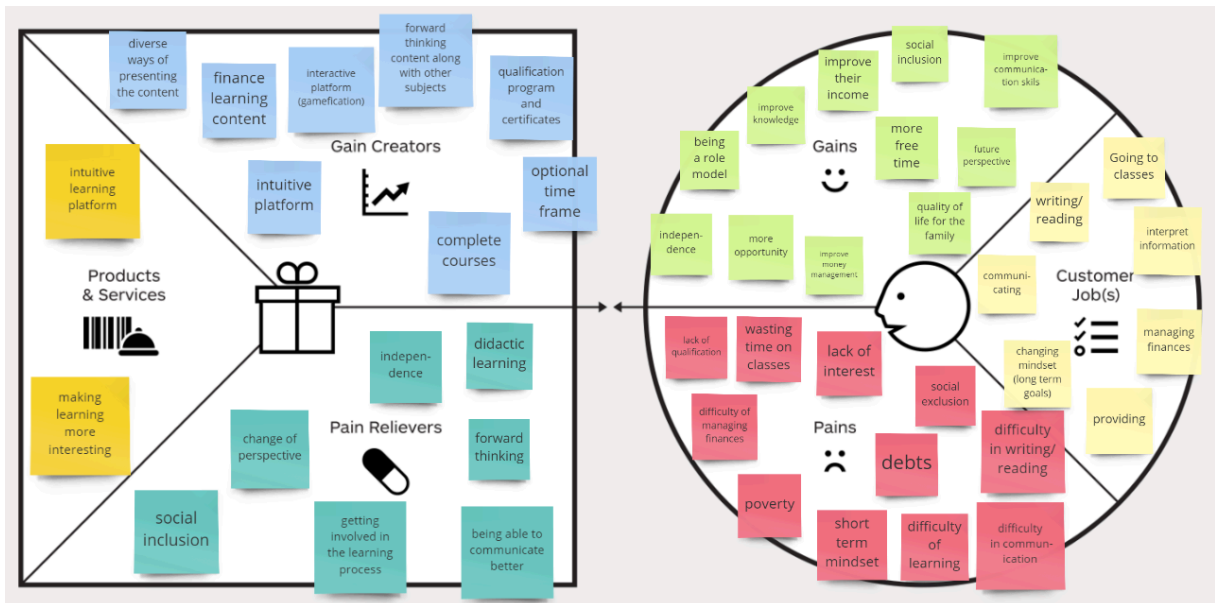
The team was presented with the context of the waste pickers affiliated with SLU and decided to use a tool called Value Proposition Canvas to analyse in more depth the values and needs of our customer. As the team has wanted to have a better understanding of the waste pickers’ needs and their perception of value, we have defined that the waste pickers are our customer.

The Value Proposition Canvas is a tool that helps ensure that all the products are developed around the customer's values and needs. By analysing the customer jobs pains and gains, the team was able to understand the profile of the customer and also build a better value proposition.

As the team met in person on EPIC 2020, the filling of the Value Proposition Canvas was done by hypothesis survey and, as they could, our mentors guided the team's way to ensure that the hypothesis were consistent with reality, considering that we were not able to validate until we were able to meet with the focus group.

The tool is divided in two main parts, the customer’s profile and the value proposition. The customer’s profile is composed by the jobs, pains and gains and the value proposition is divided by the description of the project, the pain relievers and gain creators.

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Understanding the value proposition, the team to elaborate the hypothesis to validate about the waste pickers, considering that the team had an overview about the waste pickers' reality. The hypothesis raised were segmented by the gaps that the team filled on the canvas.

The waste pickers have low to none access to basic education, so they have difficulties on reading and writing and also managing their finances. Before the dumpside was closed, they profited everyday, as they sold the input gathered during that day. As the wasteside was closed, the garbage selection was regularized as a job and cooperatives were founded to provide the waste pickers a better work environment and guarantee that the workers were not underaged.

The waste pickers are provided with a capacitation program, elaborated by the SLU's team together with the cooperatives, that focuses on equipping them with the basic knowledge that helps them get a better quality of life.

Although, the effectiveness of this capacitation program was questioned because the requirement for them to get this training is their attendance and also the value of this program was not perceived by the waste pickers.

Then, the hypothesis were designed based on the information that we had on the waste pickers.

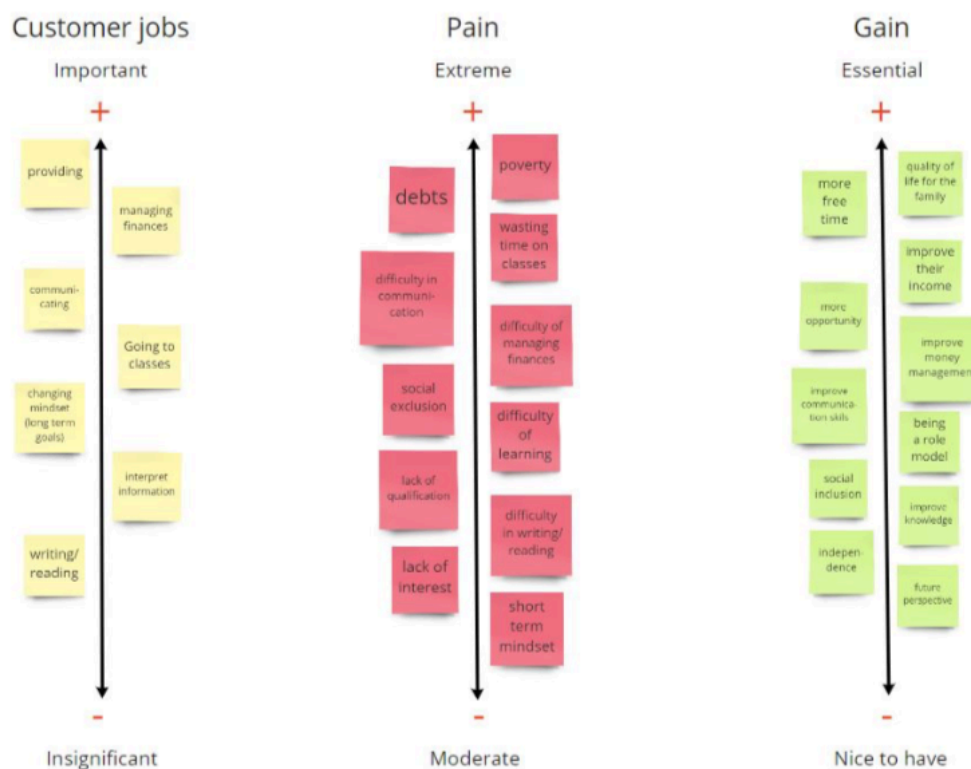
- We believe the waste pickers are not able to read and write properly, so they have difficulties on communicating, so they suffer from social exclusion.
- We believe the waste pickers have trouble with interpreting information
- We believe the waste pickers struggle with managing their finances, so many of them suffer from poverty and may be in debt
- We believe that the waste pickers have difficulty on learning
- We believe that the waste pickers have a lack of interest on learning, so they find that the time spent on classes are a waste of time, considering that their income is directly proportional to the time they spend working

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- We believe that the waste pickers want to have more spare time
- We believe that the waste pickers want to increase their income, be role models and provide more quality of life to their families
- We believe that the waste pickers want more time to spend with their families
- We believe the waste pickers' have a short term mindset, so they don't have future perspectives and the long term goals' mindset has to be developed

After the hypothesis survey, the team prioritized the customer's jobs, pains and gains based on the aspects that would affect more or less on their perspective. This part of the construction of the canvas is significant to put the customer's needs in perspective and solve their problem the most efficient way possible.

The image below is a representation of the way the team ranked the aspects based on people's basic needs and how the aspects would be considered important and significant.



The product, its pain relievers and gain creators were constructed acknowledging the customer's perspective, so the team idealized an intuitive learn platform that makes learning more interesting for the waste pickers.

Considering the reasoning of the canvas, the team raised hypothesis about how the platform would provide capacitation and certificates and also help the waste pickers learn in a more dynamic way.

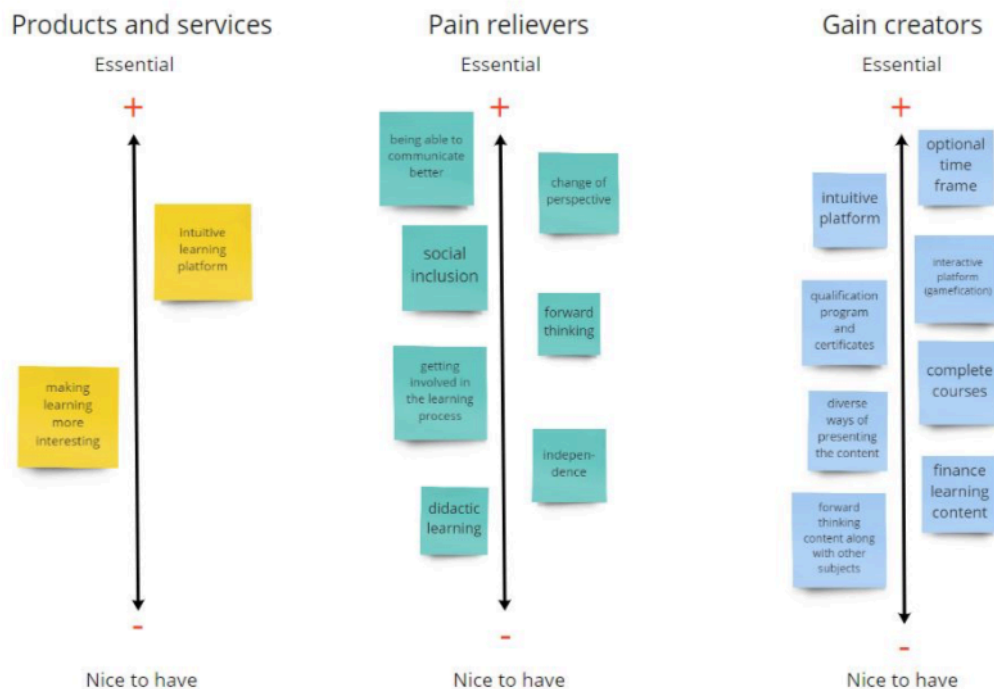
The hypothesis of value proposition were constructed based on the customer's profile.

- We believe the platform would provide a more dynamic and attractive way of learning, making them more involved in the process of learning

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- We believe the knowledge that the waste pickers would be able to acquire would help them conquer more independency and social inclusion
- We believe the platform would improve the waste pickers' ability to communicate
- We believe the platform would improve the waste pickers' money management
- We believe the knowledge acquired would help the waste pickers develop a forward thinking mindset

As it was done on the customer's profile, the value proposition part of the canvas was analysed and prioritized based on humans' basic needs and how the prioritization would be made by our customer. The image below is a visual representation of the perspective about the aspects that are essential and nice to have based on the customer's reality.



The project is a continuation of a previous project that happened one year before in which was presented to the team the difficulties faced by SLU and the cooperatives to engage the waste pickers in their own capacitation program and also make it more efficient.

Based on the considerations and also analysis that the previous project's team made immersing on the waste pickers' reality, the team came to the conclusion that addressing the financial education theme to a platform that helps the waste pickers improve their learning process and also is a more dynamic way of learning would help our customer solve their most important problem: managing their finances.

The choice was made considering that if the platform was made with the intention on solving the customer's problem in a more efficient way, focusing on a more specific subject would present more value to the waste pickers and provide them capacitation on a subject that is directly linked to their most afflicting pain.

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### 1.4 Approached

The project developed a report by the Danes and an article by the Brazilians.

#### 1.4.1 Approached in the report by the Danes

Five expert interviews have been conducted by email. The five experts were a part of the EPIC seminar in Hamburg, Germany. The reason using these people are that they have worked with the waste pickers or have a connection to the previous project created by Britze and Nielsen [2019]:

- Tatiana Marins Caiado is a production engineer and has been working with recycling and circular economy towards sustainable production-consumption.
- Mateus Halbe Torres is a student and Business Consultant.
- Giullia do Couto Machado is a student at a public health college and an SLU intern.
- Daniel Arias Martijena is a production engineer student at the University of Brasília and currently work as an intern for the SLU.
- Jens Myrup Pedersen is an associate Professor at Aalborg University.

The goal of the project by the danes is to develop the first steps towards a prototype that supports the waste pickers in managing their personal finances. In this development process, waste pickers as a target group are first examined through a user research. This is done to create an understanding of the waste pickers and their needs. This results in the user requirements that the app aims to accommodate:

- The product should provide learning material about finance management that can be used directly in the waste pickers everyday lives.
- The app should create flexibility for the waste pickers, so the waste pickers can prioritise their time to support their families.
- The app and courses should meet the waste pickers abilities and therefore it should be possible for the waste pickers to operate the app and learn even though they are illiterate.
- Mental arithmetic should not be necessary to learn personal finance management.

Secondly, an approach to motivate the waste pickers could be by implementing active learning, as used in the study by Head [2014]. Further, active learning correlates with the informal framework, which is the learning method the illiterate and functional illiterate use. The experience with the previous learning material shows the waste pickers' motivation to attend and participate in the courses provided by SLU, in general is low. Therefore an analogy is developed in collaboration with the group in Brazil. .

Thirdly, a prototype is developed. When designing and developing an app to the waste pickers, it's important to take into account that some are illiterate and functional illiterate. Therefore, it is considered to use inductive reasoning and focus on the visual learning

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channel. However, alternative methods of communication, such as audio is investigated as well. Due to the period of this project and the limitations on graphic design skills, only a prototype of the application is created. As this project focuses on the prototype, only features and content is investigated. The long term use of the Mobile Education Platform require a more refined high-fidelity prototype before conducting such tests. Therefore, this is for a future project. Thus, the experiment in the project focus on investigating which areas of the prototype needs to be changed in future projects. Thereby, the following problem statement is examined throughout the project:

Which elements should be a part of the design of the prototype to help the Brazilian waste pickers learn how to manage their personal finances?

Unfortunately, due to COVID-19 it was not possible to perform the experiment with the target group. Therefore, it was chosen to conduct the experiment online with Danes and Brazilians. When using other participants than the target group, the data can only be used to understand the functionality of the prototype, and correct overall mistakes, but it isn't possible to give an estimation of the target group's perception. Therefore, some of the conclusions are that the prototype might not be valid, when testing on the target group. This is due to the participants of the experiment are literate and are from a wealthy social class, and therefore their way of thinking and handling finances, can be very different from the waste pickers. In conclusion, this project by the Danes created the foundation for developing an interface for a personal finance prototype to the waste pickers in Brasilia, Brazil. However, it is necessary to conduct experiments with the waste pickers in order to conclude if these aspects are a valid representation of the target group.

### 1.4.2 Approached in the report by Brazil

The Brazilians had an approach more related to the validation of the necessity of the app. A bibliometric research was conducted in the platforms Web of Science, Scopus and Google Scholar in order to better understand the state of art. The main keywords used were: "Personal finance education" AND "Low income", "User experience" AND "Financial management" and "User experience" AND illiterate. These words were chosen with a view to understand how personal finance education is usually approached, how is the user experience in case of people with lower education levels and how to combine both finance management education and mobile learning.

In addition to that, since we were not able to meet the waste pickers in person, we created a survey that the main objective was to validate some hypotheses that we had about the waste pickers profile. The survey was also based in the article "PALMA: Usability Testing of an Application for Adult Literacy in Brazil" by Maciel [2013]. The participants of the research were all workers from the SLU cooperative. We created an online questionnaire with 14 questions that could help us learn more about the way the waste pickers interact with technology and their main issues during this interaction. We also asked about their interaction with mobile learning and their main reason why not to enjoy it.

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### 1.4.3 Different aspects taken into account

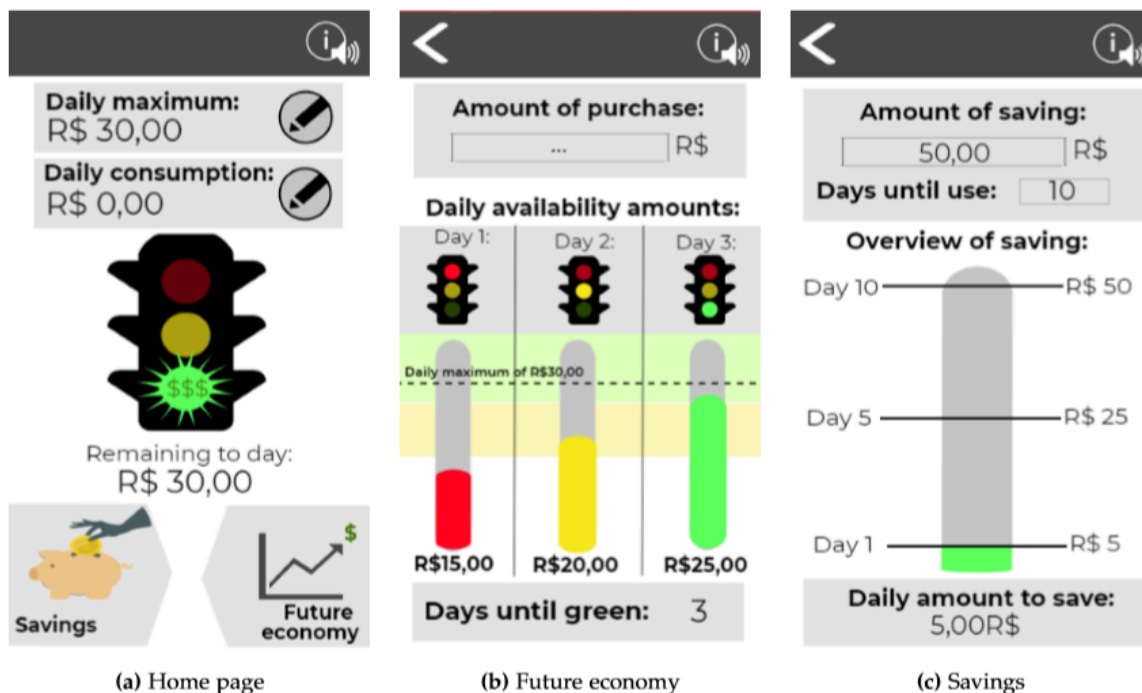
- Different guidelines from the two universities and therefore it was agreed upon from the beginning that the two teams would not necessarily put an equally amount of time in the project

### 1.5 The final result


The Danes created a report on 112 pages regarding an app for the waste pickers. The report was handed in 26.05.2020. The report was a part of their bachelor project, but without the collaboration with Brazil, it could not have been done.

The Brazilians also wrote a report with focus on the literature research and validation of the necessity of the App. The report will be delivered in the end of June, when the Brazilian semester finishes.


The below pictures ( a - f ) is the prototype developed during the project.




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(d) Daily consumption



(e) Daily maximum



(f) Add with pictures of money

## 2 Reflection and evaluation

### 2.1 How did we structure the group work

| Milestones  | DeadLine   | Responsible  |
|---|------------|--|
| Data analysis of the forms to analyse the problem | 13th March | <b>Brazilians:</b> If new data is needed, it will be collected, researched, analysed and translated.<br><b>Danes:</b> doing analysis of data for report. If new data is to be collected, we need to help make material for it.   |
| Relationship experiment with the mix and match    | 3th April  | <b>Brazilians:</b> get the tasks from Denmark around 30th March and latest on 3th April and make test with the waste pickers witch have to be done by april 10.<br><b>Danes:</b> Create a task for the waste pickers, they can perform and send it to Brazil. Latest finished by 3th April, but preferably before. |

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|  |                   |  |
|--|-------------------|--|
| Prototype and small test with the app  | 29th April        | <b>Brazilians:</b> doing continuous testing with the mockup in Brazil.<br><b>Danes:</b> When data is processed from the relationship experiment, feedback is given about icons for the mockup.   |
| Experiment in Brasilia   | 4th to 8th of May | <b>Brazilians:</b> schedule and arrange the meetings necessary to the experiment, previously talk to the people on SLU about the purpose of the project in order to get as much help as possible.<br><b>Danes:</b> hopefully able to go to Brazil. Sends information about trials before we hop on the plane.  |
| Denish Report finish   | 27th May          | <b>Brazilians:</b> if you have the time / desire you can help to read and give feedback for report, it may be possible but not necessary.<br><b>Danes:</b> making the report separately.   |
| Research about the different ways to engage the waste pickers to use the app | June 1st          | <b>Brazilians:</b> research the state of art of methodologies about engaging people and analyse how it can help the group considering the context of the waste pickers, collect material in google docs. Updating process. Search available data and translate for the danish group.<br><b>Everybody:</b> Collect material on Google Docs and update it right away and, at the end, make a combined report |
| Presentation of the project to teachers from Netherlands                     | 9th Jun           | <b>Brazilians:</b> organizing the presentation   |
| Brazilian Report finish  | 1st July          | <b>Brazilians:</b> making the report   |
| Presentation of the project in Brazil SDG                                    | 27th - 31th July  | <b>Brazilians:</b> organizing the presentation<br><b>Danes:</b> participant  |



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### 2.1.1 Online meetings

Meetings are made twice a month over Hangouts. The date and time of each meeting are scheduled at the previous meeting.

It is required to have an agenda before the meeting, so the different topics will be discussed. There will be a template for every meeting.

### 2.1.2 Reports in Slack

Every friday there is going to be a report following the template below:

This week I have work on:

I'm done with:

Next week I have to:

I need help with:

I haven't done, but I was supposed to:

When making a report on slack, the first person makes a post with [weekly report for week XX] and reports are made in the thread.

## 2.2 How did we overcome COVID-19

During the entire project the bi-weekly meeting continued which ensured a good communication and cooperation between the Danes and Brazilians.

Due to COVID-19 the project became more theoretical than firstly intended.

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## 2.3 Recommendations for next years EPIC

We would recommend that every group would create a cooperation agreement and a risk management at the EPIC seminar. By doing so, future problems can be avoided and, if problems should occur, everyone in the group have agreed upon the way of handling obstacles.

A Cooperation agreement can contain the following subjects:

- Online meetings (how often, what tools do we use, what time and date)
- What tools to use for communication
- How often do we keep each other updated
- How much can each group provide for the project (how much time can be spent on the project, is it a course or a bigger report that each group need to deliver at home)
- Milestones

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- How is the schedules for the participants and how much time does information of a task be given in advance
- Contact information
- In some case a punishment could be agreed upon if one or more teammates does not comply with the previous agreed terms of the corporation. This could be e.g. that the person buys a beer for the other teammates.

## 2.4 What we learnt from EPIC

We learnt how a cooperation with another country could be like, where we contributed with different knowledge. We have learnt about each other's culture and the different lives realities that each one lives. In addition, we have gained knowledge about how to communicate, make plans and schedules between many people. Further it has been great to make new friends.

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