Recyclove

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1. Executive summary

The Olympics is a huge event that attracts thousands of spectators and athletes. With such a boost on the number of people in the city, waste management and trash collection can become a challenge. In order to handle with such issue, we see recycling as a potential and profitable solution for the city of Paris.

Recycling programs cost less than collecting and incinerating waste, not only to mention the benefits for the environment [7]. For this reason, we are proposing Recyclove: a rewarding system for citizens and visitors to gain points for every item they recycle. This would be possible by using sensors on trash bins connected to mobile devices.

Later on, the users can exchange these points to special prizes during the Olympics, discounts in partner business and reduction of prices on transportation fees. Our idea comes as a full service package to the city government: we will design, produce and install the sensors in the bins. We will also offer regular maintenance, updates on the app for the citizens and data for the city planners.

Our strategy is to start small, targeting in 2018 the neighbourhoods and surroundings of Paris, so that in 2024 we will be ready to work closely with the Olympics organizers. By engaging the people in the recycling process, we want to help the organizers to save money and the environment. We believe that our solution can bring value to both citizens and governors, at the same time it contributes to a more sustainable future.

2. Problem and solution

Paris is one of the candidates to host the Olympics in 2024. We were presented with the challenge named “Call for innovation to enhance Paris’ candidacy SMART PARIS 2024, proposed by the Committee for Paris Candidacy 2024. They are challenging innovators to find ways of capitalizing on this event, to make the city smarter and to

leave a positive legacy. The case provider highlighted the issues of minimizing the ecological footprint, improving the energy efficiency and increasing the accessibility and atmosphere within the city. To add to this list another very concerning issue is the amount of trash that will be produced during the Olympics will be even bigger than what it currently is.

User's Need/Problem

The high volume of waste produced in the cities has always been a huge problem. In 2012, the total waste generated by 28 countries in Europe was more than 2 514 million tones [ref], a number that is predicted to continue increasing on the next years. Such quantity is worrying because the predominant way to handle this waste is not very eco-friendly. Incineration and littering in landfills lead to air and water pollution, at the same time, the disposition of garbage in improper places bring many diseases to the population.

Therefore, the need for recycling becomes evident, especially in an event like the Olympics in which the amount of waste produced is even higher. Some of the advantages of recycling are saving energy, preserving resources, creation of new jobs, reducing the emissions of unhealthy carbon gas, as well as decreasing the need for landfills. Even though the benefits for the environment are very clear, many people still lack the motivation to actually separate their waste and recycle it.

Solution proposed

Recyclove, our business idea, comes from the need to give citizens more incentives to recycle and to help them to separate the trash. We propose the installation and maintenance of smart trash bins around the city, topping it up with a gamification system to award points to the users. People would be able to later on use the points to exchange for tickets and discounts vouchers. Although such solution requires an initial investment by city government, in long term they can save a lot more.

Role and Impact of the solution

The creation of more sustainable and eco-friendly solutions are of crucial importance for the future of big cities, because the current models proved to be impracticable to sustain in the next years. The benefits of our solution can have a many positive impacts on the environment. To cite some of them: the reduction of energy to produce new materials, the decrease on air and water pollution and the conservation of natural resources.

Additionally, with so many issues with handling the increasing amount of trash, city administrators can win a lot by adopting recycling programs. First of all, the cost to produce recycled materials is less than to extract it from raw forms. Also, with more items being recycled, decreasing costs with waste collection, the need for incineration and landfills is reduced. Lastly, the recycling process creates new business and skilled jobs. In summary it is economically attractive to governments and cities to adopt our solution.

Finally, the value for the citizens comes with the possibility of being rewarded and recognized for the effort. Many people do not feel motivated enough to put in extra time to recycle, therefore our idea would be a great incentive for that. With the use of smart bins, there is also a warning of when the trash was not correctly separated, which can help users to learn it. All in all, the citizens would just need to take their trash out as they normally do and they would gain points to be exchanged later.

Innovation

There are similar solutions in the market already. Recyclebank [ref] for instance, also offers rewards for its user. However, our differential is on what can be purchased with the points. Many users complain that they can only buy magazines with Recyclebank, whilst with our product, they would be able to get exclusive seats on Olympics games, discounts in partner business and reduction of prices on touristic attractions or parking fees.

Another similar solution is Bigbelly [4]. They produce smart trash bins that notify the municipality when the bin is full by using Wi-Fi, as well as compressing trash in smaller blocks. Their focus is not on creating a more positive experience of the user and they do not have an award system attached to it. Our idea, Recyclove, is simpler than that, as we only use sensors to verify the weight and the type of material is being recycled, so that people can be awarded correctly. Also, we provide cheaper cost than BigBelly.

Finally, the sensor itself is an innovation. Even though there are sensors to warn the waste collectors that the bins are full [6], our sensors will come with technology to recognize what type of trash was deposited and if it corresponds to correct one. In addition, we are providing data to the government from these sensors, which is also a feature that can be improved and might differ from the existing solutions.

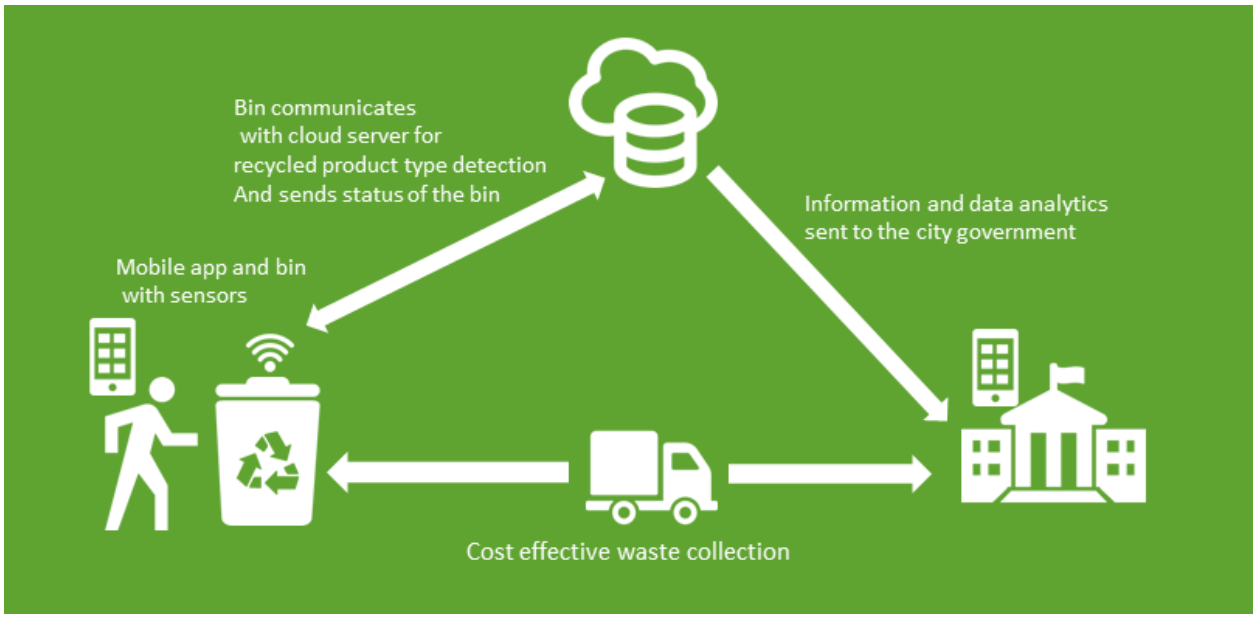


Figure 1: System architecture of the proposed venture product

3. Business modelling and planning

3.1 Business modelling

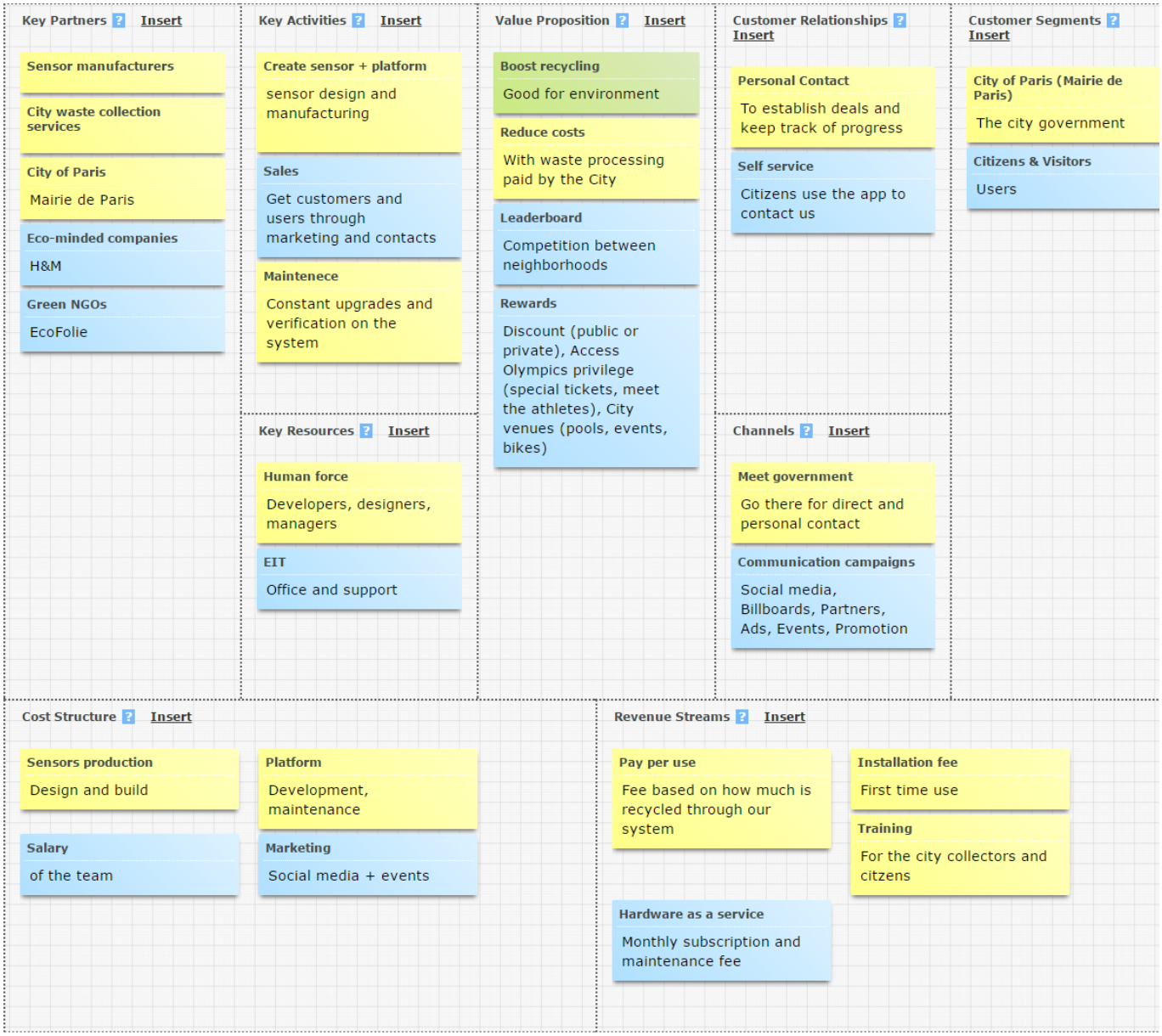


Figure 2: Business Model Canvas

In this session we will describe the business model behind our idea. Figure 2 shows the business model canvas [5] of the proposed venture which is a short and concise explanation of our business model. Each session of the canvas will be detailed in the following pages.

Value proposition

As described in the previous session, we are targeting both citizens and governors. For the government, the main value gained is money saved by the increase of recycling rates. The proposed system will motivate the citizens in order to increase the amount of waste being recycled. As a consequence, the waste management cost will be reduced. Also, with the help of notification about the waste level, governments can optimize the waste collection. The transportation cost for carrying waste from bin will be reduced and they can take better decision based on data analytics**.**

For the citizens, the main value comes from gamification. Whenever citizens recycle through our system they get virtual points on their mobile app and compete in a leaderboard. They will also get discounts on the products from our partners, on tickets for public transport, on access to public touristic spots. We also plan to reward the top recyclers during Olympic event with exclusive seats for the games on Paris Olympic 2024.

Industry value chain

In terms of technology development, we are proposing to buy basic sensors i.e. audio sensor, NFC tag, Wi-Fi shield, camera and Arduino so that we can send the design of our product to the manufacturers. What we get from them is the final smart bin sensor. We will sell this sensor to the municipality.

The municipality then gets increased recycling, reduction of cost of waste management, notification service and data analytics. We expect that will pay us in monthly fees as payment for our service and maintenance. They will also pay an initial fee for initial installation of the sensors.
Besides, our partners will get promotion of their products, as well a boost on their company image given that they supporting recycling initiatives, thus concerned about environment pollution. On the other hand, they will give us access to rewards (i.e. giving discount on some beverage or discount on tickets to touristic attractions), so that we can forward it to the users.

The users will be using the bins equipped with sensors produced by us. They will get points on their mobile app. Using these points will give them access to rewards and

recognition on the leaderboard. There will be special prizes during the Olympics too. Overall, the citizens will have cleaner, happier and healthier urban life. Fig 3 illustrates the entire value network.

Market segments

We are selling our service to the city government, but our users are also the citizens who will make use of the bins to recycle. We are solving a pain from the governments that spend high amount of money handling the waste, as well as we are giving the citizens an extra motivation to recycle.

We provide our service to the city government. We install and maintain the sensors in the recycle bins of the municipality who buys our service. The citizens and visitors to the city will be using the smart bins equipped with sensors provided by us. The citizens will be using the mobile app to track their points and rewards. Business organizations can partner with us, specially the beverage companies as they produce a great amount of bottles and cans, so their costs can also be reduced if recycling is increased.

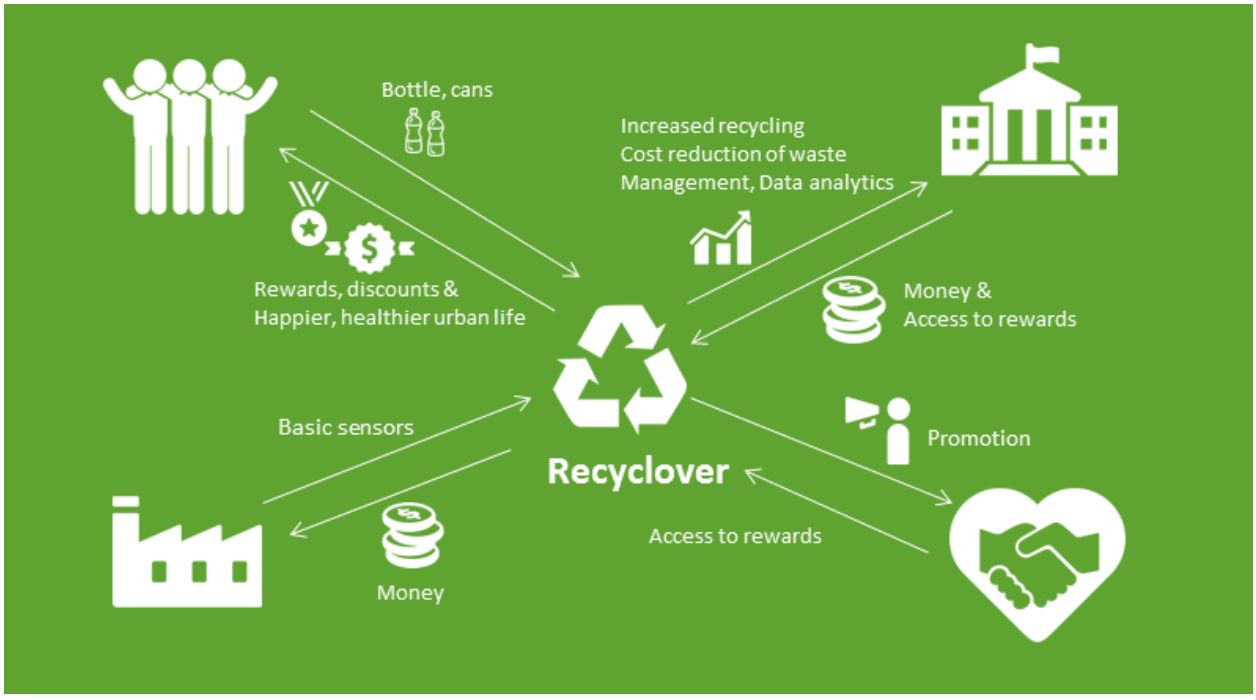


Fig 3: Value network of proposed venture

Competition

There are lot of competitors in this market. But we do not consider the bin producers as our direct competitors unless they provide some smart bin features in their product. We consider BigBelly, Recyclebank and SmartBin are our biggest competitors, even though there are others [10]. BigBelly [4] produces bins with Wi-Fi connectivity and sensors to measure the level of waste in the bins. These bins also have compaction mechanism which increases the effective capacity of the bin almost by five times. Recyclebank provides points to its users as reward for recycling. Smartbin provides remote fill level monitoring and data analytics. The Figure 4 shows a comparison between them.

Benefit/competitive advantage of the product or service

Recyclove, our solution, motivates the citizen to recycle more through gamification. This is a competitive advantage because the other solutions were not successful on that. Citizens get points for recycling and a leaderboard is maintained to encourage people. Highest points holder in a month will get extra rewards and recognition. The extra advantage comes with the partnership with the Olympics, which will boost our marketing and make us better known.

Also, we do not produce the bins, rather we focus on developing the sensors and installing them in the ordinary bins. This should make our product more appealing to the municipality as it can be installed almost without making any change in existing system. Only the sensors will be installed in the existing bins. This also reduces the primary installation cost for smart bins. We sell our hardware as a service which makes its installation cheaper and its maintenance a constant source of revenue.

Values	BigBelly	Recyclebank	SmartBin	Recyclove
Gamification	✗	✓	✗	✓
Notify when full	✓	✗	✓	✓
Sort out trash	✗	✗	✗	✓
Installation cost	$ 3500	N/A	N/A	€ 3.5
Hardware as a service	✗	✗	✗	✓

Figure 4: Comparing with the competitors

Market potential

The target customer for our solution are city municipalities, but the end user are the citizens and visitors of the equipped cities. The benefits of acquiring our system for cities is to have a higher number of citizens recycling waste. Given that our main source of revenue comes from a fee on the amount of waste, in order to estimate a total revenue, we need calculate the number of users and the average waste. For those reasons the market potential is based on the urban populations in the targeted city.

In Europe the urban population represent 75% of the total population so more than 547 million people [2]. The average amount of municipal waste (produce by households and sometime small businesses and public institutions) is 475kg per inhabitants per year [1]. Of the total produced waste 44% is already being treated through recycling or composting and we estimate that this number could be raised to 75%. If we combine those number with our current pricing of 0,007cents/kg of waste recycled, we obtain a total addressable market of 1 558 950 000 euros. This can be said to be our market potential.

Ethics and sustainability

There is more than strictly financial gain to this venture, by encouraging citizens to recycle more we are addressing one of the most important ecological challenge of our time [3]. A society that recycle more gain on every level by having less energy being consumed, reducing the need for raw material and creating jobs. Furthermore, by having the citizens sort themselves their waste and then reward them we are creating a culture of recycling. They are taking responsibility for recycling their waste, and thus pave the way to a recycling education that is key for long term change.

3.2 Business planning

This session presents our plans and estimations for the future of Recyclove.

Go to market

Before releasing our product to the market we need to conduct research on the use of our product. One way to do so would be to partner with several small cities (15 to 20 000 inhabitants, Orsay for instance) and develop the product hand in hand to make

sure that it suits municipalities. This will at same time secure some cities in which we will launch our product first.

In order to have a solution ready, we have to design and patent our sensor and find manufacturers. The production will be handled by a contracted manufacturer able to keep the costs of productions low.

Besides the hardware, the software has to be developed. This means creating the mobile application the users will use as well as the platform provided to the city and to the waste collection services to organize a smart waste management, so that they can access the data collected by the sensors.

Once this development phase is completed, we expect a launch in at least one of the partnering cities at the last quarter of 2017. This would be followed by launch in similar sized cities in the next quarters.

We will then try to reach a bigger agglomeration, supposing that we managed to have successful cases in the several cities we launched before. In those bigger cities our strategy is to first reached some neighbourhood or suburbs as a test and then expand to the all city.One of those city could be Nantes as is has proven to have a strong environmental policy by being named European Green Capital in 2013.

Then, in 2024 we would be ready to launch in Paris and make a partnership with the Olympics. The reason why we plan to start small is to avoid having to deal with a huge amount of waste in our first trial, at the same time we want to have more experience so that we can provide a better service.

IPR aspects

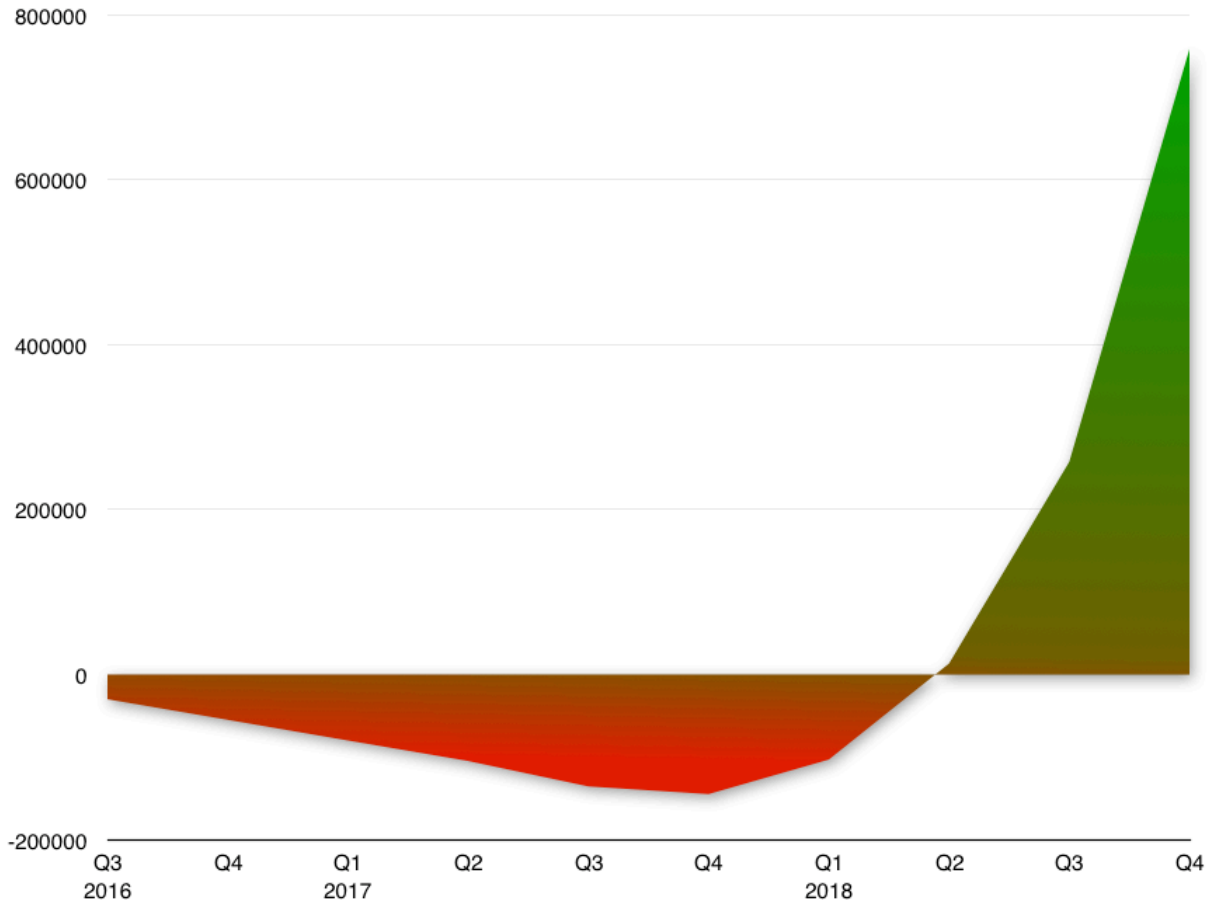
In order to protect our market and investment in R&D we are going to apply a utility patent to our waste detector sensor. This sensor will bring innovation by detecting both how full is the bin, which already exist in competitor's sensor, and the detection of the type of waste being put into the bin. This invention is of course useful, to our gamified solution and beyond, and is non obvious. By fulfilling the three NUN criteria our patent application should be successful. As for the software part of our product, patenting it doesn't bring a high value so we do not plan to do it.

Financial forecast

We are planning on starting the product development and the research in the third quarter of this year (2016). In the first year, we will be focused on the design of the sensors, buying the materials, sending it to the manufactures. In addition, we need to invest on getting the patents and paying legal costs. Until the third quarter of 2017, when we plan to start our operations, we also have to pay our salaries and costs for the company. All this will create a negative balance in our cash flow but it is just on the initial phase.

As soon as we start operating, in the last quarter of 2017, our cash flow will turn into positive. Next to the revenue there will still be some operational costs such as maintenance, installation, and production of sensors, however these services will be charged to our customers. The sales and marketing costs will rise a bit as well but that will not make big difference in the cash flow.

Our first customers will be small cities or neighbourhoods in Paris. We aim to start expanding more and more as the time goes by, starting from 2018. By the end of the second quarter of 2018, according to our estimations, we can reach the 0 in the cash flow, and by the end of that year we intend to reach approximately 2 million people. According to our research, we can say we will have 1 million users already what creates this high profit, what u can see on the diagram.



Return of the proposed business

As the government is our main source of investment, they are the ones that will see most of the direct benefits from our business. Given that Recyclove encourage people to recycle more, the list below shows how this practice can create return to the cities:

- Successful recycling programs cost less to operate than waste collection, landfilling and incineration.
- The creation of new jobs to handle the recycling process. For every employee collecting recyclables, there are 26 employees hired for processing the materials and manufacturing them into new products.
- Recycling creates four jobs for every one job created in the waste management and disposal industries.

Moreover, there are many benefits for the environment as well, as cited in [8],[9]. This is crucial for the future of the big cities. The return to the sustainability of the city can include:

- It decreases the need for raw material, as every ton of paper recycled saves 17 trees.
- It saves energy, given that the energy saved by recycling one glass bottle is enough to light a light bulb for four hours.
- It reduces ten major categories of air pollutants and eight major categories of water pollutants.

Risk assessment

The biggest risk for our business is a low number of adopters. If we do not have enough citizens to use our system, the city government might not get the return he is expecting. Therefore, we need to get as many users as possible, otherwise, we are risking to lose the profit on the installation of new sensors and the partner's trust.

Another risk is if we fail to design and build good sensors for the bins. As we are not aware of how such technology might work, we have to take extra care when using the investment money on it. We plan to invest on prototyping before we manufacture a large amount of sensors.

Besides, there is the risk of not making deals with many partners. It is possible that they are not willing to collaborate on our terms or they might not see the potential of our idea. To tackle it, we need to highlight the positive outcomes they can benefit with. Before even starting to produce sensors we need to be sure that we have good discounts to provide as rewards to the users.

Finally, we plan to manage the risks by starting small and expand carefully. We want to have some profit before moving to bigger cities and neighbourhoods. In this way we have more control of our activities and the improvements we need to do. It is also easier to pivot the idea if not much money have been sent on manufacturing sensors and marketing campaigns. We see the launch in a small area as a great chance to test our business before scaling it up.

Strategy of Funding

We are asking for €170 000 as initial seed investment, which will cover our costs until we create enough revenue. The funds will go to the development of the sensors, to our salaries and to the marketing campaigns. As soon as we launch in a small city or a

neighbourhood, we will receive the payment of the installation and maintenance fee from the city government. We are aiming to get some funds from the partners as well, but this will be used to cover the costs after the launch of the product.

4. Business development process

Our business idea was created for the “Call for innovation to enhance Paris’ candidacy SMART PARIS 2024”. The first step we took was understanding the problem thoroughly. We read the case, we saw the examples on the website and we discussed with other classmates. We wanted to be sure we were not interpreting it wrong. We came to the conclusion that the most valuable solution for such challenge would be smart and eco-friendly services, given the issues highlighted by the case provider. It was only after this clear inspection that we began the process of eliciting ideas.

Before thinking about any specific solution, we listed many eventual problems a city can go through whilst hosting the Olympics game. Some of them were: security, construction of Olympic Village, reception of tourists, transportation time, energy efficiency, environmental protection and accessibility. Each of us had different solutions for these different problems and we wrote them down in stickers so that the other team members could understand them too. After a brief discussion of each of them, we voted for the ones we thought were more interesting.

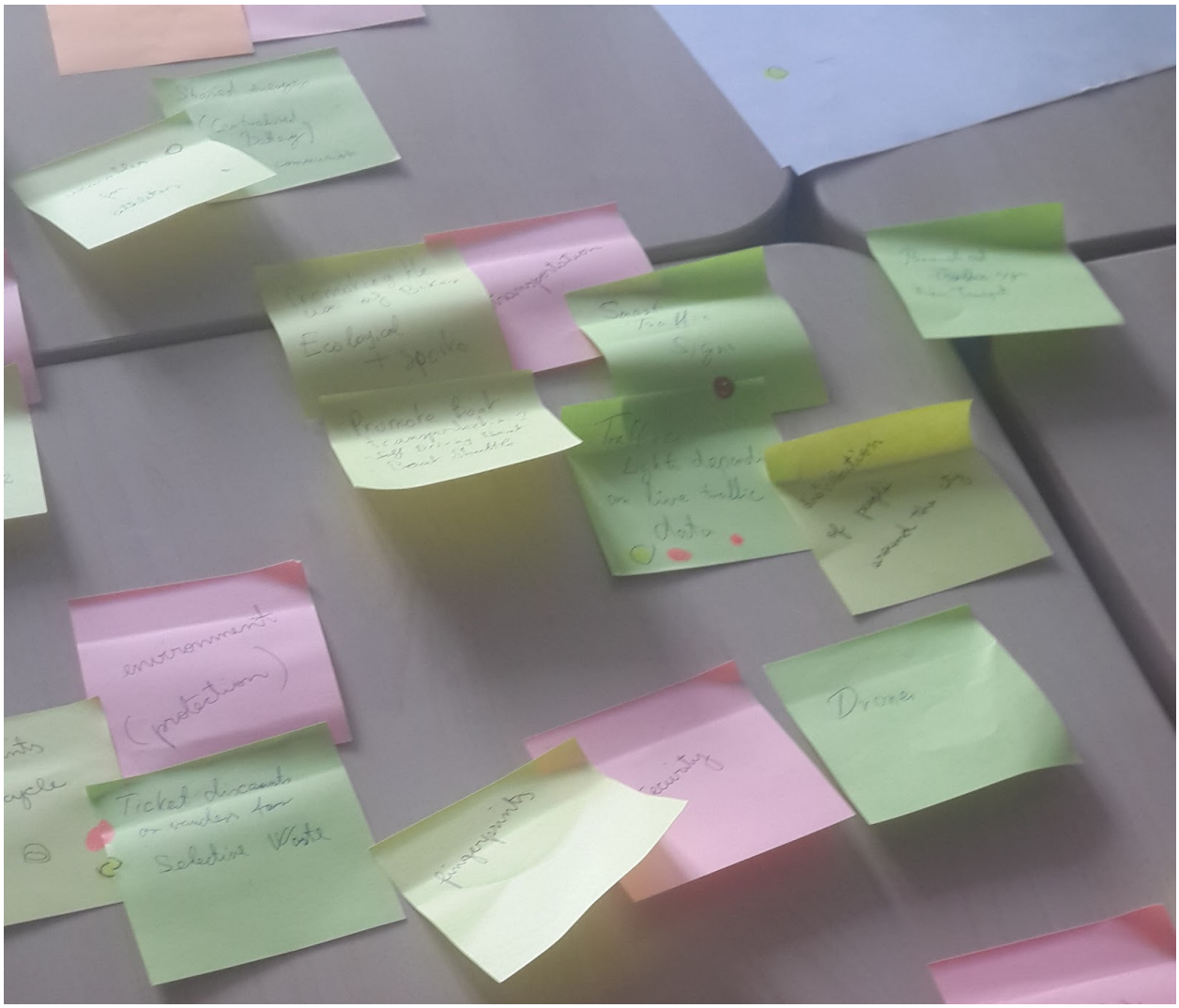


Figure 6: Brainstorming

The three most voted ideas were taken to the whiteboard so that we could discuss them further. After an intense discussion, we realized that our ideas were not compatible to our skills. One of them was about sharing the extra energy produced in the city between all citizens, by storing it in central batteries. We decided that we should focus on a simpler but efficient solution that we could reach by our current technical knowledge. So we ended up with a previous idea we brainstormed, related to gamification and recycling.

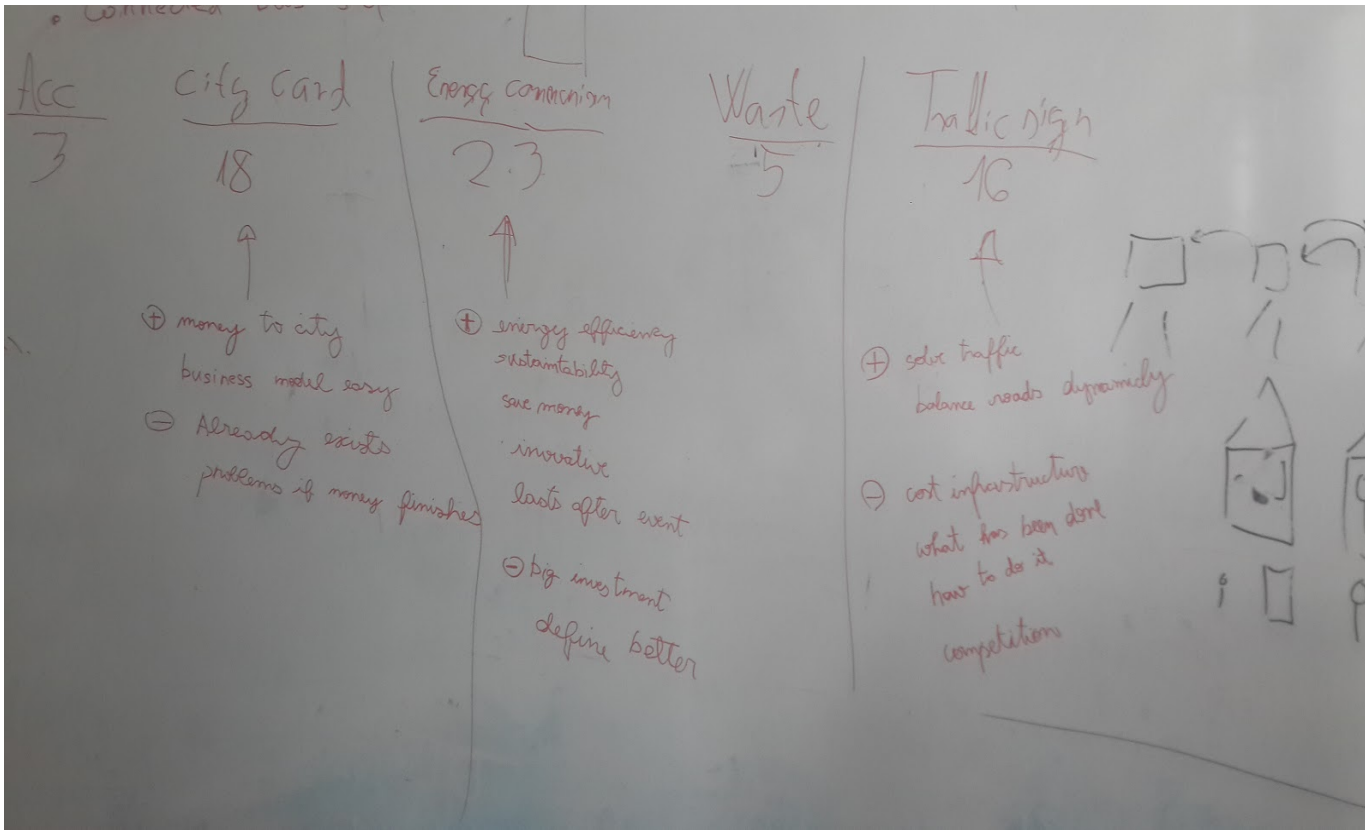


Figure 7: Voting for an idea

We researched a lot about existing solutions in the market and how they were making profit. It is important to understand what the competition is so that we can highlight our advantages. We also went deep on the existing technical possibilities of smart bins, because they are the foundation of our idea and we needed to be aware of what the market has been proposing till now.

Our findings led us to make use of business model canvas to conduct the group discussion and decide the details about each of the blocks. The first pitch we created was based on what we envisioned so far. We decided to not go much deeper in finance and costs, as we were not sure about the reaction of the specialists, but we wanted to show in a very clear way what the value was.

Recyclove turned out to be well received, as we received positive feedbacks after the presentation. However, we decided to pivot our idea to use even simpler technical devices. Our colleagues gave us some suggestions concerning the gamification elements. Adding to this, we also researched better about costs and technical details. We divided the work for the next presentation between all team members in order to present a more complete pitch.

This division of activities and tasks was based on the knowledge and experiences of the group members. Each of us was responsible for developing one of the activities below. The tasks involved research and analysis of data. Afterwards the team members shared the findings with the others, in order to receive the feedback and optimize the work.

These were some of the tasks to be completed for before the second pitch:

- To estimate the amount of waste produced in Europe
- To determine the cost for recycling
- To see the current market scenario
- To find and trace the competitors, their function and products
- To count/find the number of trash bins used in the city
- To find out the current garbage collection mechanisms
- To estimate the costs of construction, installation, function and maintenance of the sensors
- To discuss and analysis about the methods of running the project
- To estimate the operational costs such as project administration, implementation and company registration, etc.

During the process, we received guidance from the specialists. They listened to what we were working on and were very honest. Some of them did not agree with our idea of building the sensors ourselves, whilst others believed it was the best way to keep the product to ourselves and provide just the service to the governors. For this particular disagreement that we faced, we discussed as a group until all of us were convinced that owning the technology for the sensor was the best idea for now.

Another decision we had to take was concerning the partners we wanted to make deals with. Some of use argued that it should be shops or any retail business, but others pointed out that beverage companies would be the most interested in having the bottles back. In the ned, we decided to keep both ideas, because it is for the users to have more options on what to spend their points with.

On the last days we had to focus on creating the slides for the pitch. We also had to think about the story we wanted to tell. We divided the parts based on the tasks we had been working on the last week, so that we were familiar with it, but in the end we made many adjustments to put the presentation in a standard style. We learned that for the next time, it might be better if only one or two people are responsible for the slides, since the styles vary a lot between team members.

Finally, we discussed about the next steps to continue this project. We believe that for this idea to be successful we need substantial financial supports which as mentioned, we estimated to be about €170 000. We would need to get contacts for meeting with city governors in small cities and neighbourhoods in France. In addition, we need to go deeper on research the design of the sensors and the mobile applications. Also, detailed descriptions of the business plans also need to be done. After all, we will still need to make efforts to engage the citizens on adopting Recyclove. It is not an easy path, but we believe our solution has the potential to bring a more sustainable future for Paris and for the world.

5. Evaluation

Overall, this project was a good opportunity for me to practice teamwork skills. We had very different working styles and opinions about the project. However, we were driven to build something that we would be proud of presenting. I have learned that a pitch is not built overnight and that the bigger the effort we put, the better the result would be in the final day. I wish I had learned more about the financial forecast and how to calculate costs, but this was not my role for this project.

The process was divided in two phases. Before the first pitch, we spend most of the time brainstorming and discussing ideas. We pitched our initial thoughts and we collected a lot of feedback. Afterwards, we did some intense work, specially on the finance and strategy part. We divided very clear tasks so that each of us knew what to work with. The roles were naturally defined, given the preferences of the members.

Clement was the designer, he was working on the logo art and on the user journey. Balzs was responsible for the financial forecast and for creating a visualization. Sakel elicited the sensor costs and did an extensive research on the competitors. Ghasem was elaborating the go-to-market strategy. We all worked on the slides together.

I (Giovanna) was managing the process, so that we could have a high quality deliverable in the end. I suggested prioritizing certain things and I was constantly bringing up feasibility issues of our ideas. I think my contribution to the team was this practical side of me when I am making decisions. I wanted us to create a good product and to show it in a clear way to the audience. I also encouraged them to go deeper on

the data so that our pitch could have more details. I have learned a lot about the current market for projects for recycling in this project.

In terms of content, there were many ideas based on mobility and urban issues that I was not aware of. It made me see the city through a different perspective. Also, I have learned how to create a timeline plan, a go-to-market strategy and a full business report. Regarding my own competences, it took me some time to understand how the technology for the sensors worked, but my team members were better at it than me. As I said before, it was good to be part of the team.

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