Master in Industrial Engineering

Master's final project

DESIGN AND VALIDATION OF A BUSINESS MODEL REGARDING AN ENVIRONMENTAL IMPACT ANALYZING APPLICATION WHO CAN HELP USERS MAKE BUYING CHOICES IN THEIR DAY TO DAY LIFE.

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Madrid
June 2020

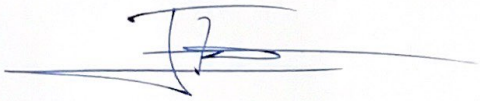
Declaro, bajo mi responsabilidad, que el Proyecto presentado con el título "Design and validation of a business model based on an environmental impact app who can help users make buying choices" en la ETS de Ingeniería - ICAI de la Universidad Pontificia Comillas en el curso académico 2020/2021 es de mi autoría, original e inédito y no ha sido presentado con anterioridad a otros efectos. El Proyecto no es plagio de otro, ni total ni parcialmente y la información que ha sido tomada de otros documentos está debidamente referenciada.

Fdo.: Kermene Emma Fecha: 25/ 05/ 2021

Autorizada la entrega del proyecto

EL DIRECTOR DEL PROYECTO

Fdo.: Javier Fuentes Ibañez Fecha: 25/ 05/ 2021



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Autor: Kermene, Emma
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ABSTRACT OF THE PROJECT

Introduction

Food production is responsible for one quarter of the world's greenhouse gas emissions[1]. The choice of their food consumption is part of everyone's day-to-day life and is grandly impacting the global greenhouse gas emissions. In the store, the customer is facing a lack of information about the carbon footprint of the products they are buying, and to know it have to do an effort of researching and browsing on the internet. In this way, it is crucial to give to anyone the keys to easily choose their own consumption knowing and according to the impact it has on the climate. Thus, this application project will focus on the food products as it can possibly touch everyone on a daily basis, but can be widen to other categories of products later on. For now, the consumers can assess their global carbon footprint through websites that take into account general habits and aspects of their life such as the housing, the diet, the mean of transport... The consumers can also do researches about the carbon footprint of food products in freely available data tables, but this takes time.

What will be the project? The project will be a **carbon impact analyzing application that shows the carbon footprint of any generic food product**. For who will it be? It will be for average consumers who want to know the impact of their food consumption on the climate. Why this project is relevant right now? It is answering to the rising consciousness about the climate cause, and give consumers a tool to help them make buying choices.

The objectives of this project are to **create a viable business model canvas** and to **iterate it through interviews** with potential customers. They are also to **find usable carbon footprint data** about food products, and finally to do a **mock-up of the application** that can give a proper idea of what it should look like and how it should function.

[1] https://ourworldindata.org/food-ghg-emissions

Methodology

The development of the business model canvas to become viable is done with the Lean Start-Up methodology. This methodology is based on the "Agile" concept, and can be applied to develop new products, services or businesses. This is based on a simple iteration of three steps, which are repeated as many times as necessary: build, measure, learn. In the building phase something new is created, it could be a part of the business model canvas, a function in the mock-up of the application, a specification about the functioning of the application... This new feature is then tested through the measuring phase with an experiment, mainly interviews with potential customer. During this phase some feedback is collected, and during the learning phase it is processed to lead to a modification of the current business model canvas or mock-up. This modification is then implemented in the next building phase, and the whole cycle is repeated.

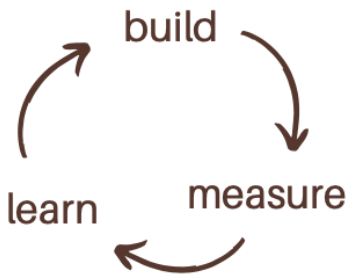

Figure 1: Lean Start-Up cycle

Results

In this project, two rounds of interviews have been ran with 21 potential customers from different ages and backgrounds, leading to various modifications of the business model canvas and the mock-up, leaving them more fitted to the actual market and needs of the customers. This has been done following the phases of the Lean Start-Up cycle. Thus, the business model canvas has been firstly set and then iteratively tested and modified to become viable.

A proper source of data has been found, being a public database gathering the environmental impact of about 2500 generic food products commonly used. This is a wide enough data set where every customer could find their usual food products and discover their carbon footprint.

A mock-up of the application have been created with the three main pages of the application so the potential customers could well understand its functioning and give their feedback about its appearance during interviews. This mock-up have been modified according to the feedback received, following the Lean Start-Up cycle.

An economic viability study have been run for the next five years to understand how the cash flows are evolving, and to understand when the application could become profitable. This study balances the revenues streams with the cost structure.

Conclusion

This thesis project is building the foundations of a business model for an environmental impact analyzing application, through the iterations of the Lean Start-Up methodology. The business model canvas is evolving through the rounds of interviews to become operational but could at any time be tested and modified with another experiment to adapt more to the market. The report is organized chronologically with all the steps and iterations of the Lean Start-Up methodology applied to this project.

RESUMEN DEL PROYECTO

La producción de alimentos es responsable de una cuarta parte de las emisiones mundiales de gases de efecto invernadero. La elección de su consumo de alimentos forma parte del día a día de todos y tiene un gran impacto en las emisiones mundiales de gases de efecto invernadero. En la tienda, el cliente se enfrenta a la falta de información sobre la huella de carbono de los productos que compra, y para conocerla tiene que hacer un esfuerzo de investigación y navegación en internet. De este modo, es crucial dar a cualquier persona las claves para elegir fácilmente su propio consumo conociendo y en función del impacto que tiene sobre el clima. Así, este proyecto de aplicación se centrará en los productos alimentarios, ya que posiblemente puede tocar a todo el mundo en su día a día, pero puede ampliarse a otras categorías de productos más adelante. Por ahora, los consumidores pueden evaluar su huella de carbono global a través de páginas web que tienen en cuenta los hábitos generales y aspectos de su vida como la vivienda, la dieta, el medio de transporte... Los consumidores también pueden investigar sobre la huella de carbono de los productos alimentarios en tablas de datos de libre acceso, pero esto lleva tiempo.

¿Cuál será el proyecto? El proyecto será una aplicación de análisis del impacto del carbono que muestra la huella de carbono de cualquier producto alimentario

genérico. ¿Para quién será? Será para consumidores medios que quieran conocer el impacto de su consumo de alimentos en el clima. ¿Por qué es relevante este proyecto en este momento? Es una respuesta a la creciente concienciación sobre la causa del clima, y proporciona a los consumidores una herramienta que les ayuda a tomar decisiones de compra.

Los objetivos de este proyecto son crear un lienzo de modelo de negocio viable e iterarlo mediante entrevistas con clientes potenciales. También son encontrar datos utilizables sobre la huella de carbono de los productos alimentarios y, por último, hacer una maqueta de la aplicación que pueda dar una idea adecuada de cómo debe ser y cómo debe funcionar.

El desarrollo del lienzo del modelo de negocio para hacerlo viable se realiza con la metodología Lean Start-Up. Esta metodología se basa en el concepto "Agile", y puede aplicarse para desarrollar nuevos productos, servicios o negocios. Se basa en una simple iteración de tres pasos, que se repiten tantas veces como sea necesario: construir, medir, aprender. En la fase de construcción se crea algo nuevo, que puede ser una parte del lienzo del modelo de negocio, una función en la maqueta de la aplicación, una especificación sobre el funcionamiento de la aplicación... Esta nueva característica se pone a prueba a través de la fase de medición con un experimento, principalmente entrevistas con el cliente potencial. Durante esta fase se recogen algunos comentarios, y durante la fase de aprendizaje se procesan para dar lugar a una modificación del lienzo o maqueta del modelo de negocio actual. Esta modificación se implementa en la siguiente fase de construcción, y todo el ciclo se repite.

En este proyecto se han realizado dos rondas de entrevistas con 21 clientes potenciales de diferentes edades y procedencias, lo que ha llevado a diversas modificaciones del lienzo del modelo de negocio y de la maqueta, dejándolos más ajustados al mercado real y a las necesidades de los clientes. Esto se ha hecho siguiendo las fases del ciclo Lean Start-Up. Así, el lienzo del modelo de negocio se ha establecido en primer lugar y luego se ha probado y modificado de forma iterativa para que sea viable.

Se ha encontrado una fuente de datos adecuada, que es una base de datos pública que recoge el impacto medioambiental de unos 2.500 productos alimentarios genéricos de uso habitual. Se trata de un conjunto de datos lo suficientemente amplio como para que cada cliente pueda encontrar sus productos alimentarios habituales y descubrir su huella de carbono.

Se ha creado una maqueta de la aplicación con las tres páginas principales de la misma para que los clientes potenciales pudieran entender bien su funcionamiento y dar su opinión sobre su aspecto durante las entrevistas. Esta maqueta se ha modificado en función del feedback recibido, siguiendo el ciclo Lean Start-Up.

Se ha realizado un estudio de viabilidad económica para los próximos cinco años con el fin de conocer la evolución de los flujos de caja y saber cuándo podría ser rentable la aplicación. Este estudio equilibra los flujos de ingresos con la estructura de costes.

Este proyecto de tesis está construyendo las bases de un modelo de negocio para una aplicación de análisis de impacto ambiental, a través de las iteraciones de la metodología Lean Start-Up. El lienzo del modelo de negocio está evolucionando a través de las rondas de entrevistas para llegar a ser operativo, pero en cualquier momento podría ser probado y modificado con otro experimento para adaptarse más al mercado. El informe está organizado cronológicamente con todos los pasos e iteraciones de la metodología Lean Start-Up aplicada a este proyecto.

Acknowledgements

I would like to thank Javier Fuentes Ibañez for his guidance through the whole project and his useful pieces of advice and knowledge about the Lean Start-up methodology. I would also like to thank Jaime de Rábago Marín for his useful feedback about the project intermediary presentations and content. Lastly, I want to thank all of the interviewees for their time, they brought various precious point of views about the project that helped the business model to evolve and adapt better to the market.

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Chapter 1

Introduction

1.1 Problem statement

Buying one kilo of beef is equivalent to driving 100 kilometers by car, both releasing 27 equivalent kilos of CO2 in the atmosphere[1]. Information about the impact of our consumption on the climate and especially about its **carbon footprint** are hard to find and understand and this is true in many sectors, from streaming websites to food items, including clothes and automotive market.

There is a huge different in carbon footprint impact of food product that can not be seen or understood just by looking at them. For example in a mere burger all of the ingredients are more or less in the same weight proportion, making the whole burger a simple food item that people do not detail by its composition. However when taking a closer look at each of the ingredient carbon impact the beef steak clearly stands apart, representing 91,5% of the whole burger footprint. The figure 1.1 shows in a visual way this paradox.

This type of information is hard to find as it is hard to calculate. Back to the beef example, counting its carbon footprint has to be done for the food it ingests, the transformation of the meat, the storage and the transportation to the food market. Moreover, the production impact has to be balanced with the edible proportion of the beef and a moisture loss factor to render the proper production impact. This represents a lot of information to find, analyse and process. However the ISO 14067 norm [ISO18] was created in 2018 to regulate the carbon footprint calculation and communication of food items.

In this context, how can someone reduce its personal impact on climate without fully knowing it?

[1]Figures from the Environmental Working Group's Meat Eater's Guide and the EPA's Guide to Passenger Vehicle Emissions.

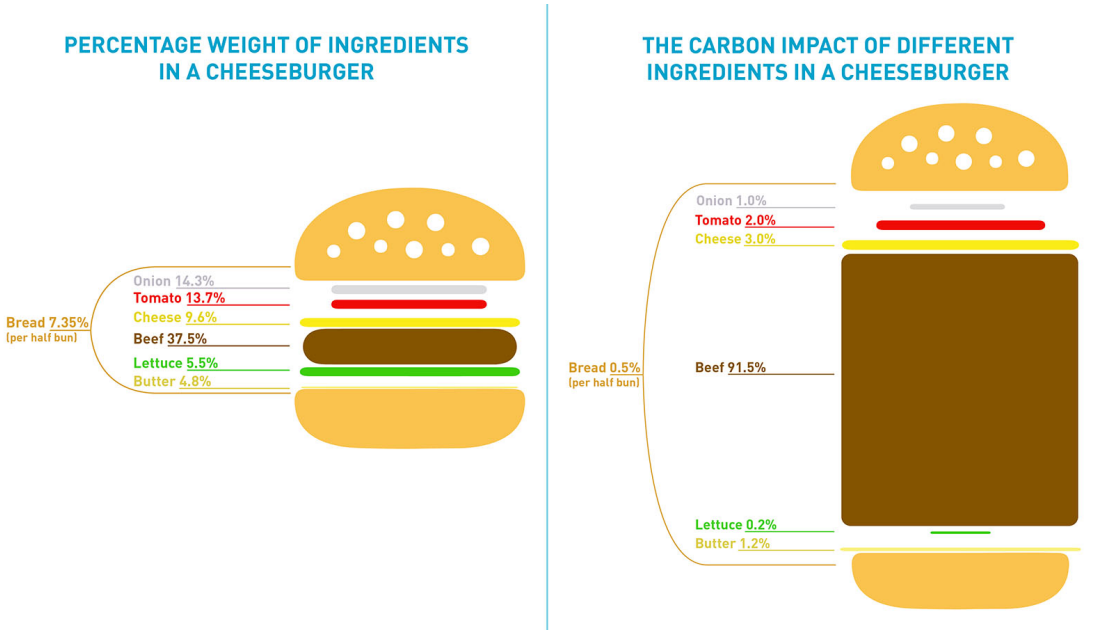


Figure 1.1: Burger weight composition and carbon impact

It exists several websites allowing you to calculate your own global carbon footprint, analysing your consumption, housing and habits. The most famous website of this type is *Ecological Footprint Calculator*[2], showing the user how many planets Earth we would need if everyone on Earth had the same consumption habits. This is a great and visual option for people to assess their global impact on the atmosphere, it even proposes some options and ideas to reduce it. However it does not go into details of personal consumption and is not allowing people to adjust finely what they are buying and consuming in order to reduce their impact.

Some **databases** are also free to use, counting the carbon footprint of many items, particularly food items. This is a great option for people willing to dig in data to know more about their impact and to compare the carbon footprint of different products they are used to buy, but not everyone is ready for doing researches on their own nor have to time for it.

Plenty of data is available freely on the web for the ones who are ready to do researches but only a minority of people are actually using it. Which is missing for general public is a way to obtain easily concrete and visual information about what they are buying and consuming.

However there are plenty of ways for people to diminish their daily carbon footprint as it is distributed in various fields, from electronic devices to food con-

[2]https://www.footprintcalculator.org

sumption, including transportation and hot water supply. This is detailed in the figure 1.2.

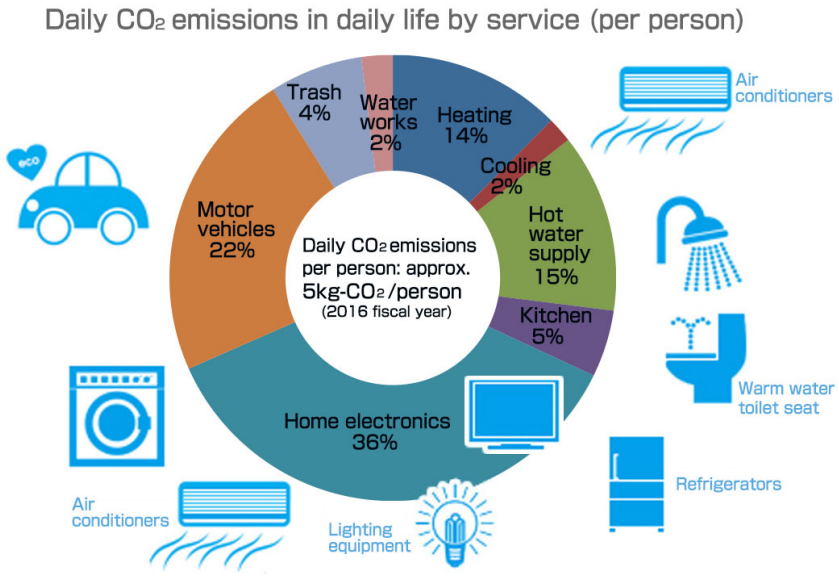


Figure 1.2: Average daily carbon footprint

1.2 Methodology: Lean Startup

The methodology used to develop a business model in this project is the **Lean Startup** methodology.

General vision

Lean Startup is the most successful adaptive tool for control of the innovation used in products of services launch in various industries. A large spectrum of companies who were launched with this methodology exists to affirm that: Telefónica in telecommunication, Repsol in the energy sector, Mercadona in retail of BBVA in the bank sector are all very prosperous companies nowadays.

Lean Startup is a scheme following the *Agile* principles and value for innovative products, services or businesse launches. These principles are based on a validated knowledge, scientific experimentation and market iterations and can be summed up as **Build, Measure, Learn**.

Three fundamental principles

The methodology is based on the three following mainstays:

Business Design According to this methodology, every idea (in my case, the carbon footprint counting application) should be developed with the business model logic. This logic permits to figure out as early as possible if the idea brings value to the clients and to the company. In this way different tools are exploited like Business Model Canvas or Alexander Osterwalder's Value Proposition Canvas.

Customer Development Steve Blank and Bob Dorf validation process named Customer Development allows us to figure out the business model. Its four phases permits to conduct experiments with different focus: the problem-solution focus (Customer Discovery), the market-product focus (Customer Validation), the growth motor focus (Customer Creation) and the business model focus (Company Building).

Agile Product Development The product or service development process follows the Agile principles, using Scrum and Kanban frameworks. In this frameworks a list of hypothesis (Product Backlog) about the business model are validated through cycle iterative experiments named sprints. The sprints are aiming to find new clues, validated knowledge and make up pivots according to the objective facts found out.

Chapter 2

Initial business model

2.1 Previous steps to build the business model canvas

2.1.1 Context of the problem

As seen in the figure 2.1, the food production greenhouse gas emissions adds up to 26% of the global footprint, and everyone is consuming food products twice or thrice a day. The food production and consumption problem is then a global problem impacting everyone, but people are not as educated and informed about this as they should be in order to be able to participate in the solving of this issue. From this recognition I understood the importance of informing and communicating about this to the largest number of people.

2.1.2 Finding the problem

In this first part the actors of the lack of information about carbon footprint problem are identified and one specific problem is targeted to develop its solution. The frame here is the **impact on ecology of goods consumption** and the actors are: the consumers, the producers, the states and their government.

In this frame, the governments are mainly dealing with norms and regulations about carbon footprint. The producers are worried about their cost of production, the norms of the governments and the opinion of their customers. The consumers' problems are about the prices and the brands of their products, and the impact on the planet of their consumption. All of these problems are brainstormed in the figure 2.2.

The problematic that this business model will address and that seems to affect the more persons is: **"How can the consumer choose a product knowing**

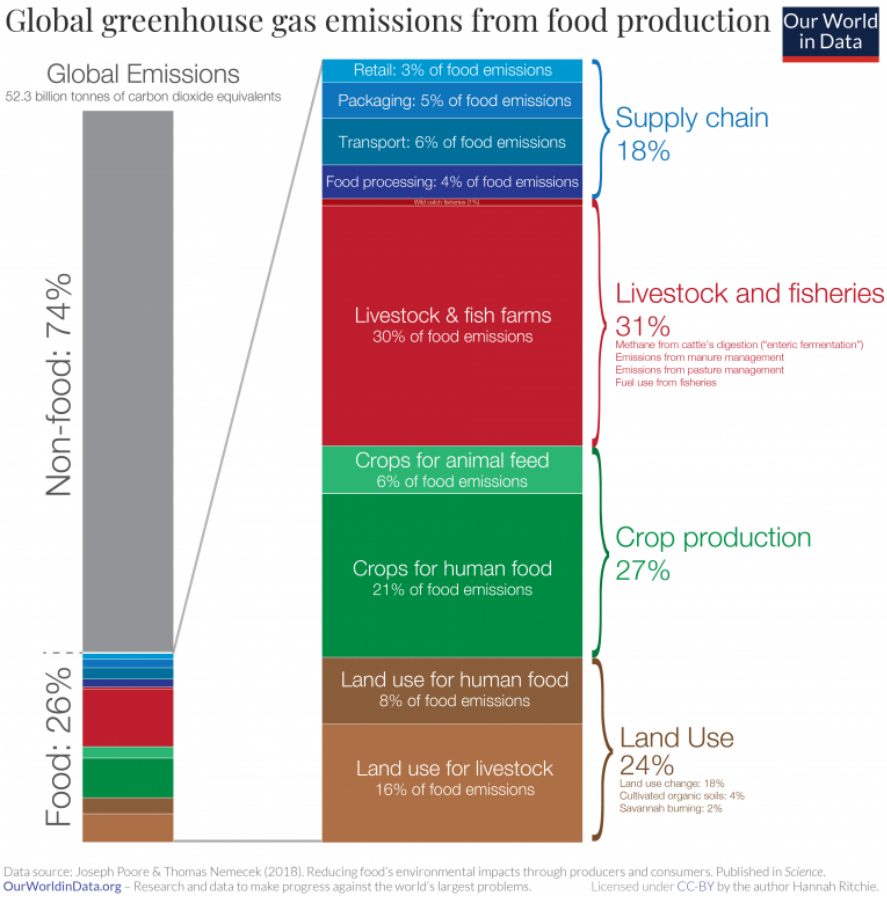


Figure 2.1: Impact of food production in the global carbon footprint

their carbon footprint?". This problem is to be evaluated in the empathy map in order to understand what think and feel an average customer and how this problematic affects them.

2.1.3 Empathy map

With the empathy map the entrepreneur tries to get into the shoes of their customers in order to understand them. How do they think and feel? What do they hear and see? What do they say and do? What are their pains and frustrations, and what are their needs and expectations?

The typical customer for this business idea could be Alix, who is a student of 25 years old and lives alone. They want to reduce their personal impact on climate and feel that everyone needs to take part but think that it is difficult to know the exact impact of each product they buy. They hear that brands are doing a lot of green

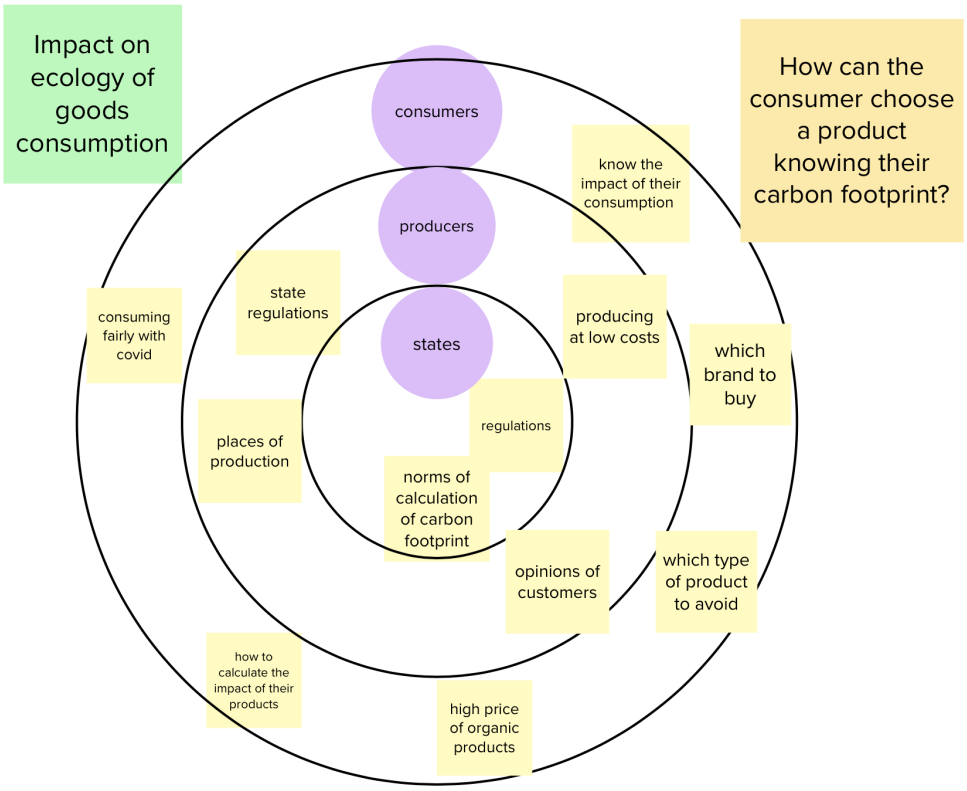


Figure 2.2: Finding the problem

washing and that no one is agreeing on products impact on climate depending on which criteria we take. They also know that organic products are more expensive than regular ones. They see a lot of green packaging that catches their eyes, a lot of information written on packaging but no clear information about carbon footprint. They say it is important to measure its own impact and talk about it with friends and family. Their frustrations are about the few information displayed on the products and the fear that the footprints are not relevantly calculated. In the other hand, they want to have a tool to calculate carbon footprint in order to be able to choose knowingly the products they consume. This information is gathered in the figure 2.3.

The typical customer information can then be summed up in the client presentation sheet shown in the figure 2.4.

2.1.4 Elaboration of ideas

The ideation tool helps promoting the generation of potential ideas and solutions for the selected problem which is "How can the consumer choose a product know-

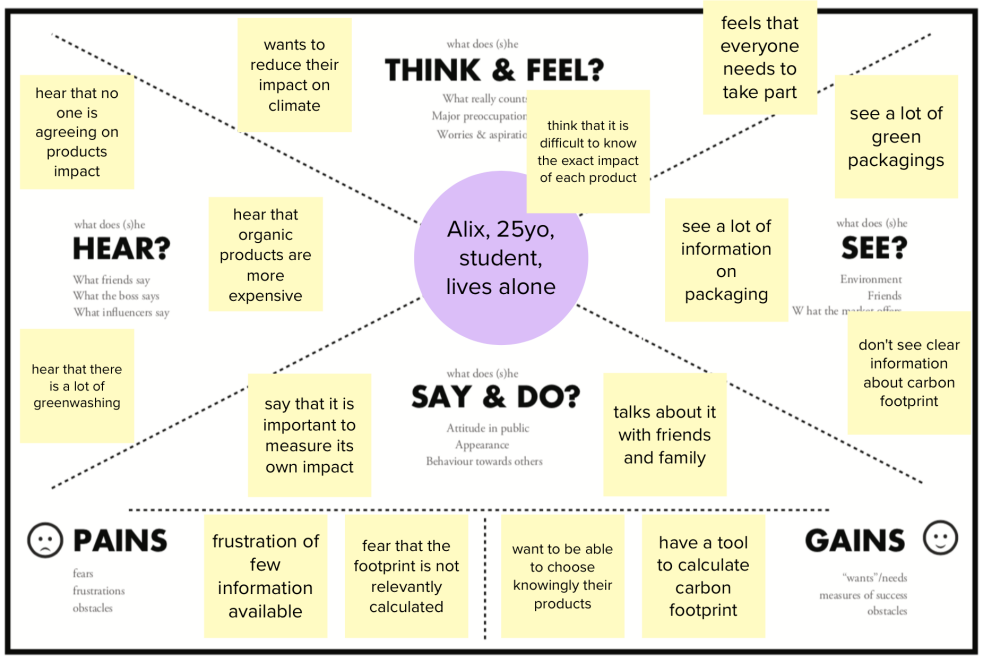


Figure 2.3: Empathy map

ing their carbon footprint?". This includes the problem, things we like and are good at it and technological trends in order to create ideas. These steps and ideas are shown in the figure 2.5. The things we master as entrepreneurs are: communicating, developing applications, searching for data, calculate carbon footprint and explain things clearly. The technological trends which can help in the solution of this problem are: mobile applications, cloud computing, optimization models, big data and database and research engines. When combining the know-how and the technological trends the ideas that come up are: creating an application to sum up the information, stock the data on the cloud, rank products by their carbon footprint, explain how the carbon footprint is calculated and the possibility to search for a specific product or a category of products.

The idea that emerges from this is to create a **mobile application that ranks products in a category by their carbon footprint**. This idea is to be developed in a first business model canvas.

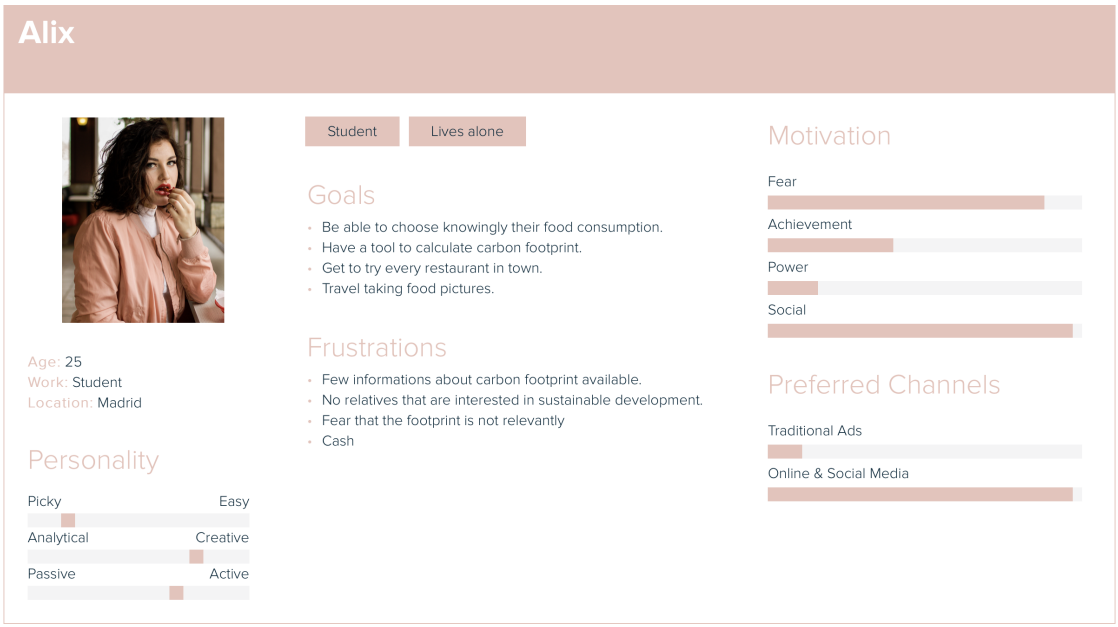


Figure 2.4: Alix customer information sheet

2.2 Initial business model canvas

2.2.1 Business model

To answer to the current problematic situation where very few people know the carbon impact of what they are buying and consuming, especially when it comes to food, the business idea is **an application which displays the carbon footprint of many food products in a simple and understandable way**.The first business model canvas elaborated is shown in the figure 2.6 with a package of assumptions that are validated or dismissed during future iterations of the Lean Start-Up methodology.

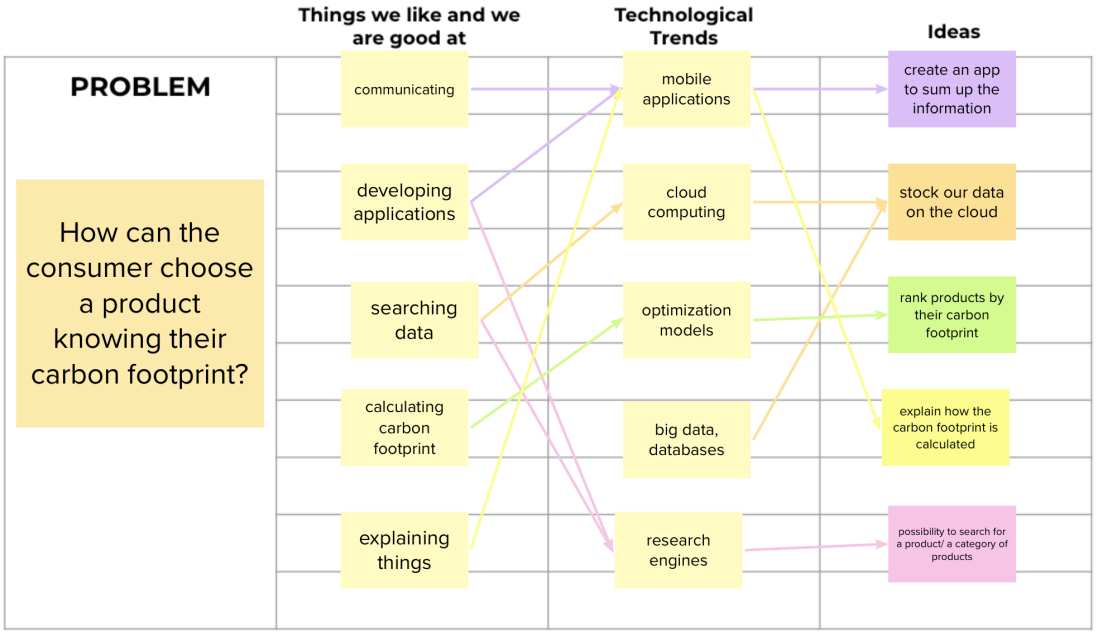


Figure 2.5: Elaboration of ideas

Value Proposition

The application displays the carbon footprint data of many food products in a visual way so the final user can easily understand it. The application presents many categories and subcategories of products that are easy to access and research. The products in a particular category can be ranked and filtered depending on their carbon footprint. In the application there is also a comments part for users to give their feedback or read the others' one.

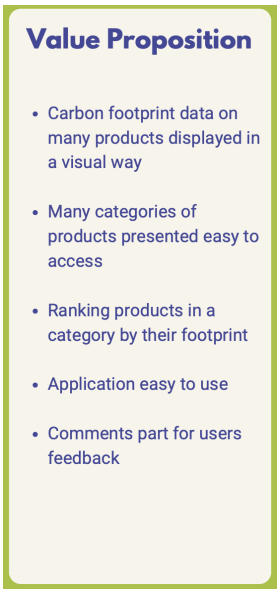


Figure 2.7: Value proposition

Figure 2.6: First business model canvas

Customers Segments

The customers targeted with this application are people who want to adapt their personal consumption to their beliefs about the current climate crisis. They are young people open to the use of mobile applications and acting for the climate. They are people who want more transparency on what they are buying. Finally they are people taking part in climate oriented associations or who are making donations to the climate cause.

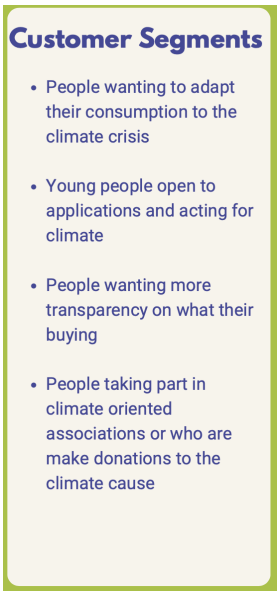


Figure 2.8: Customer segments

To understand better who are the potential customers and early adopters of this application there is the following tool. The early adopters are people wanting

to know the carbon footprint of their consumption, who know that they don't have this information and are currently trying to find a solution. These people need to act fast for the climate cause, need updates on the carbon footprint information and reliable or official information.
The early majority would be people aware that they don't know their own carbon footprint but not actively seeking a solution. These people want to have information about the products they are buying but don't want to spend time looking for this information.
The late majority of customers are people aware of the problem but satisfied with the amount of information they have, and the laggards are people not interested in knowing the carbon footprint of their consumption, not interested in the climate question.

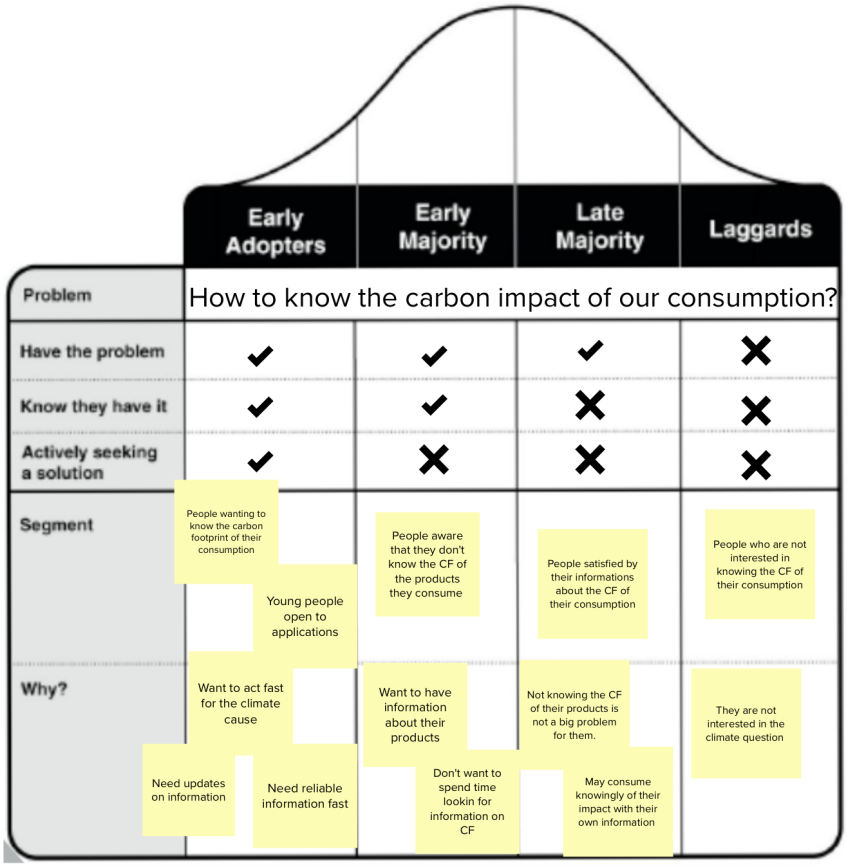


Figure 2.9: Early Adopters tool

Customer Relationship and Channels

The customers can be reached through app stores like the Apple Store or the Play Store, through social media used by young people such as Instagram, Twitter or TikTok, through the website of the application and finally through climate oriented associations where the customers targeted take place.

A powerful marketing campaign about the carbon impact of food can reach out new customers by raising their awareness and pointing out their need to understand the carbon footprint of their own consumption. The customers will be reached out through a newsletter, through notifications, a blog by digital ways and some events can be organised in universities too.

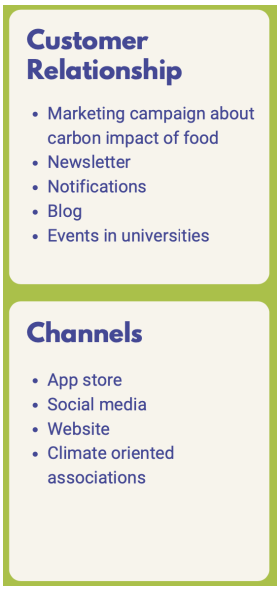


Figure 2.10: Customer relationship and channels

Key Activities and Key Resources

The main activities of this business are the development of the application, the documenting and researches about carbon footprint calculation norms and data, the creation of a database to store this data and the communication about the application.

The resources available are the developers team, official data sets about the carbon footprint of many products and a cloud space for the database.

Figure 2.11: Key activities and resources

Key Partners

The key partners are the government who wants to promote local consuming and thus national economy, universities to benefit from their incubators and to propose internships to their students, carbon footprint experts and data providers, climate oriented associations and investment banks financing start-ups in their projects.

Figure 2.12: Key Partners

Cost Structure and Revenue Streams

The costs of the business are mainly the wages for developers and communication employees, but also the subscription price for the cloud database. The revenues are advertisements on the application, a premium offer for special features like an analysis of the carbon footprint of the user global consumption based on the products they searched for, and a fee for brands to pay in order to be more visible in the app (without changing their carbon footprint data).

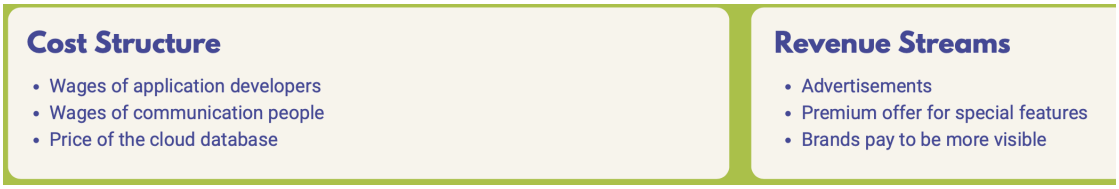


Figure 2.13: Costs and revenues structure

2.2.2 Value Proposition Canvas

As an echo to the empathy map and knowing now the business model canvas of the application, the value proposition canvas helps to understand if the value

proposition of the application answers well to the pains and gains of the typical customer.

The gains for the user is that they can find all of the carbon footprint information they need in one place, and know well the carbon impact of their consumption. The application relieves the pains of the consumer as they don't have to look all over the internet to find the information they need and easing them the task of comparing two products between them. It is a time saving application for the user. The previous research work of the customer to monitor their consumption, find carbon footprint data and compare two products between them is now replaced by the application.

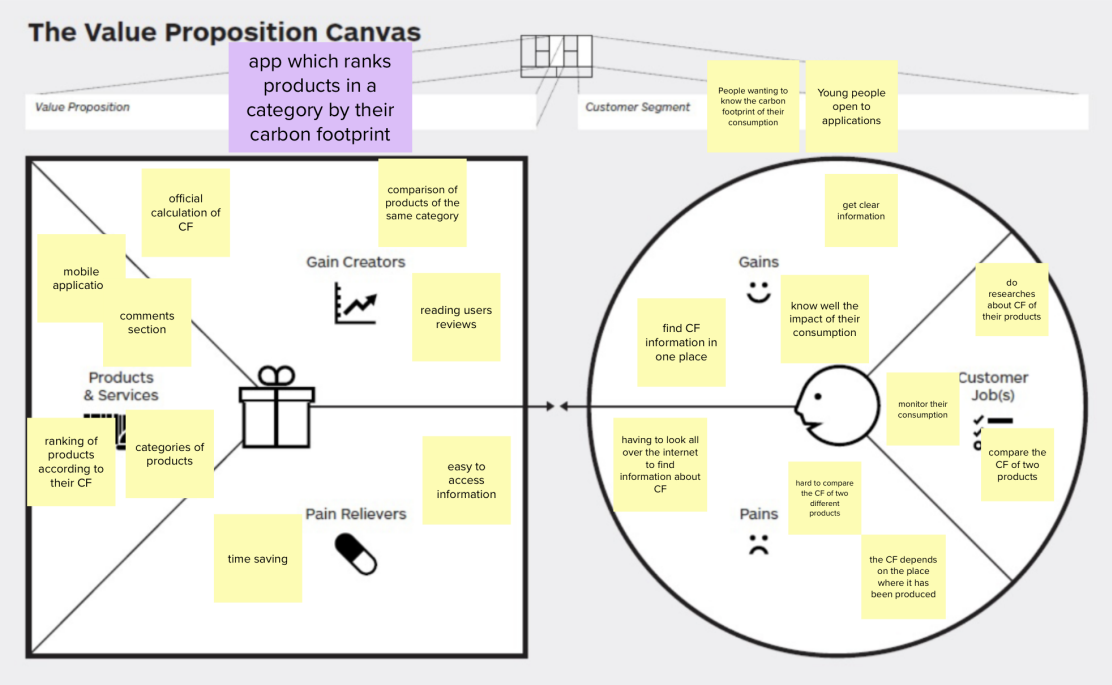


Figure 2.14: Value proposition canvas

2.3 Data sources

The carbon footprint data used in the application has to be of very good quality, either official data or from a scientific study in order for the users to be able to rely on it to measure their own consumption. It exists several scientific papers explaining the impact and the carbon emissions of food products, but these papers are framed in a country or a set of countries and is not relevant for users living

abroad from this country. However, in the article *Reducing food's environmental impacts through producers and consumers* [JPO18] the two scientists base the carbon footprint data on 570 studies complying standardized methodology, gathering data that covers around 38,700 commercially viable farms around **119 countries in the world**. The data available gather the greenhouse gas emissions of **40 categories of food products** expressed in equivalent kilogram of CO2 emitted per kilogram of product. This allows to compare two products between themselves, and the variety of countries present in the studies make it possible to have a great average of emissions for each product. Nonetheless, 40 categories of products are somehow limiting for individuals to understand in detail their personal consumption as they cannot make a difference between two chocolate biscuits for example.

Figure 2.15: Agribalyse program

Figure 2.16: ADEME and INRAE

It exists a study financed by the French Agency for Ecological Transition ADEME and the french National Research Institute for Agriculture INRAE which is called **Agribalyse** [DUP21] and is framed by the ISO 14044 norm. Such as the previous article [JPO18], the Agribalyse study gather data about the carbon impact of food product during all their life cycle, from the production part to the recycling or trashing part including the transportation, the packaging, etc... Unlike the previous article, this study examines more detailed products categories which makes a database of **2480** small and detailed **categories of products**. In the figure 2.17 there is the distribution of the generic products in the different categories. For example in the milk and dairy products there are 221 different products. This data sets is much more useful for individuals to monitor closely the carbon footprint of their own consumption by having so many different generic products. This is the data set that is going to be used for displaying in the application.

Categories	Number of products in the database
Meats, eggs & fishes	637
Fruit & vegetables	423
Cereals and starchy products	375
Milk and dairy products	221
Processes meals	284
Fat and oils	56
Drinks	219
Sweets and desserts	55
Ice creams	25
Sauces and condiments	169
Baby food	33

Figure 2.17: Number of products by category in the Agrilabyse database

2.4 Life Cycle Analysis methodology

The Agribalyse program establishes environmental data on food products commonly consumed following the Life Cycle Analysis (LCA) methodology. LCA is a methodology for assessing environmental impacts associated with all the stages of the life-cycle of a commercial product, process, or service. Here **all the steps of each food product life-part are studied**, from the agriculture to the final consumption, including the transformation, the packaging, the transportation and the distribution. The carbon footprint of each of the steps is calculated in order to obtain a global one. The LCA methodology is well known and used at the international scale by the scientific community, private actors and political powers. It is defined and framed by the ISO 14044 norm. It is recommended particularly because it is the only environmental evaluation standardized, multi-criteria methodology which is applicable to all of the economic fields. All of the stages of the life-cycle studied in the LCA are depicted in the figure 2.18.

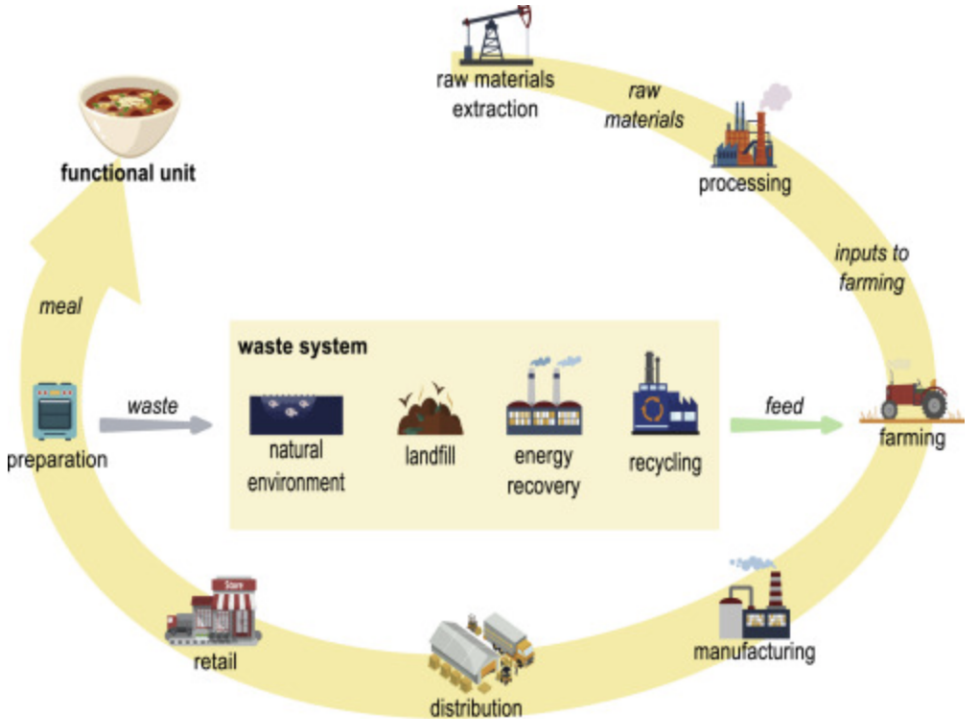


Figure 2.18: Stages of the life-cycle studied in the LCA

2.5 Carbon footprint calculation

The carbon footprint calculation of each product present in the application will then be taken from the open Agribalyse database to be displayed visually in the application. The database content is available in a complete Excel file which allows to research one of the 2480 products in particular by its category and subcategory and gives its carbon footprint in **kilogram of carbon dioxide equivalent per kilogram of product**. This unit is universally used to speak about climate change due to greenhouse gas emissions. All greenhouse gas (GHG) emissions are converted into CO2 equivalents to be compared. Each greenhouse gas has a different global warming potential (GWP) and persists for a different length of time in the atmosphere.The three main greenhouse gases are the carbon dioxide (CO2), methane (CH4) representing 84 times the GWP of the CO2 (which means that releasing 1 kg of CH4 into the atmosphere is about equivalent to releasing 84 kg of CO2) and nitrous oxide (N2O) representing 298 times the GWP of the CO2. There are other greenhouse gas but there are much less present in the human activities. However, the GWP of each gas has to be weighted with their proper lifetime in the atmosphere that can be longer of shorter than the CO2. All of this

data is gathered and explain in the [WAY20] website.

This measurement unit allows to **compare different GHG emissions** in the way they participate to climate change, and to **add up** different emissions between them. For example this is useful to add up the GHG emissions of all of the stages of the life-cycle of a product.

Chapter 3

Users interviews and first iteration on business model canvas

3.1 Hypothesis to validate or dismiss

For the first business model canvas to work well there are several hypothesis about the potential customers' habits and issues to validate or dismiss. An hypothesis is a clear assumption about one particular aspect of the potential customer habits, appreciations of the product, needs or fears and it should be written beginning by "I think that", the "I" being the person creating this start-up. The hypothesis should first be brainstormed and then mapped according to their **uncertainty** and their **risk**. Their uncertainty shows how less we are sure about this statement or not and their risk shows how much their veracity could endanger our start-up or not. In the case of this application the hypothesis are mapped on the figure 3.1.

In these axis the most important hypothesis to verify first are the ones in the upper right part, which are both uncertain and risky. In the case of this start-up, the three most important hypothesis to verify are:

- I think I will find my customers through their implication on the climate cause (associations, donations...).
- I think people who want to reduce their carbon impact are not willing to pay for a premium version as they are already making an effort by monitoring their consumption.
- I think the 3 most important problems my customers are facing are finding the information, knowing what carbon footprint means, having the information presented in a visual way.

To these principal hypothesis can be added:

- I think the first customers to be interested are young people as they care more about climate and are used to applications.
- I think people wanting to reduce their carbon impact don't have enough clear information to do it rightly.
- I think my customer will have interest in my product because it offers clear, visual and uniform information in the same place.
- I think the size of my customer segment can expand much over time.

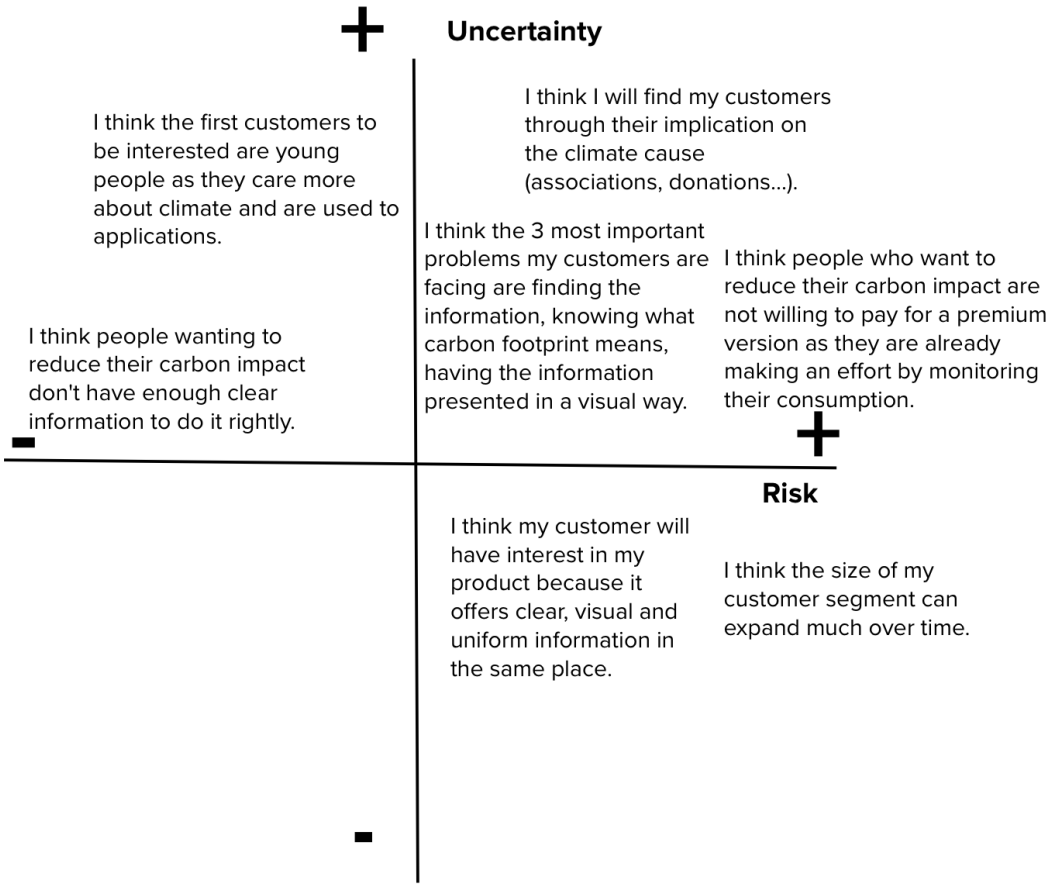


Figure 3.1: Hypothesis of the first business model canvas

3.2 Interviews and results

3.2.1 Interviews

These hypothesis are to be validated with **potential customers** during interviews in order to have an external point of view about people's consumption habits and about the product. During this first round of interviews the questions were oriented towards the users problems and habits more than toward the product itself.

The questions are first trying to understand the interviewee situation and context about their age, donations and consumption habits for example. The questions asked to the interviewees were the following:

- Do you consider yourself concerned about the climate cause? Can you rate it on a 1 to 10 scale?
- How old are you?
- Do you take part in any climate-oriented association?
- Do you donate to any cause? If yes, to which cause? If it financial, how much do you donate per year approximately?
- Are you adapting your personal food consumption to your climate-related convictions?
- Are you eating more food that release less greenhouse gases during their lifetime?
- Do you find clear information about the carbon footprint of food items? Where?
- What would you say that are the three main problems preventing you from eating in a cleaner way?
- What is the importance of these problems from 1 to 10?
- If you are struggling to fin information about the impact of some products, it is preventing you from consuming in a cleaner way?

Questions at first were very precise in order to map the situation and context of each interviewee, then became more open to let them voice their concerns and motivations freely without influencing them. **16 people** were interviewed, from various background and with different age categories and all of their data is collected in an Excel file.

3.2.2 Results

These interviewees resulted in very different opinions and habits, which I was expecting or not and were very instructive. The different answers are to be compared with the hypothesis previously stated to validate or invalidate them. Five main conclusions can be taken after reading all of the interviewees answers, displayed in the figure 3.2, which are:

- The **implication about climate** of potential customers is way more **limited** than in my hypothesis, which is a thing to change in the following business model canvas.
- The **lack of information** about carbon footprint is quoted as a main problem by interviewees **less often** than in my hypothesis.
- **Young people are actually concerned about the climate** as stated in my hypothesis.
- There is **no clear information** about carbon footprint available easily, as stated in my hypothesis.
- Knowing more **carbon footprint data is useful** for the majority of the interviewees, as stated in my hypothesis.

These conclusions linked to the previous hypothesis are useful to understand the strengths and weaknesses of the actual business model canvas and to modify adequately some parts to reduce as much as possible the weaknesses.

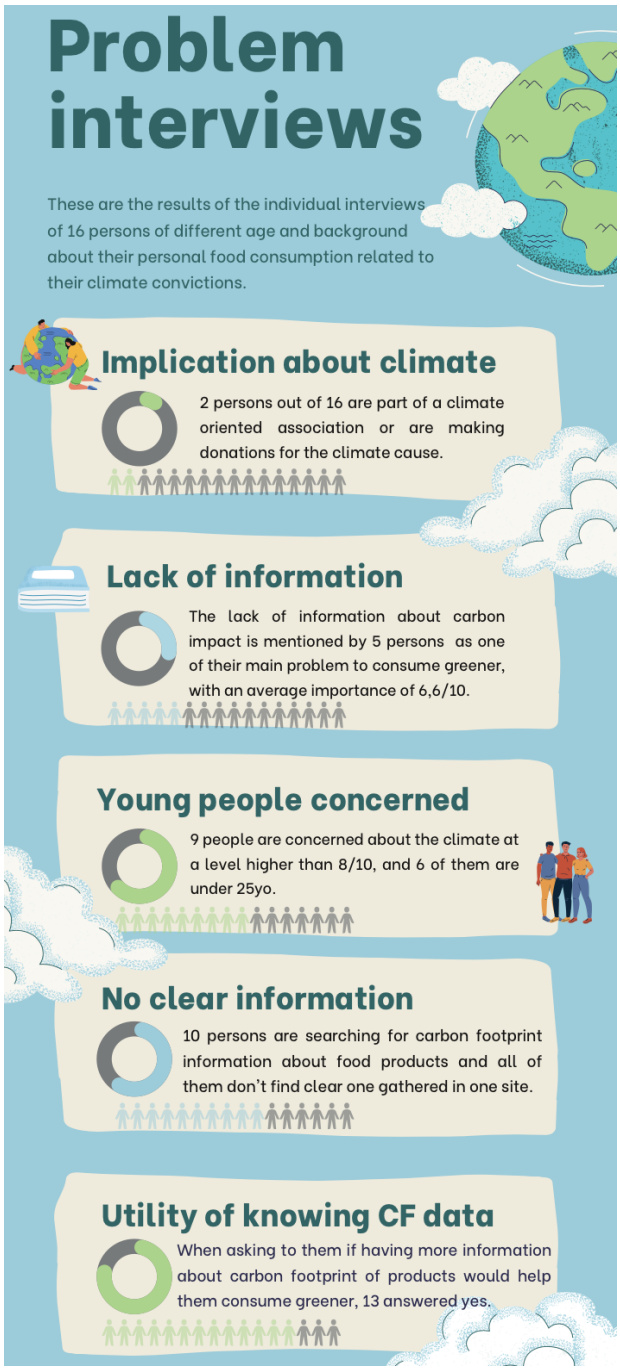


Figure 3.2: Main conclusions of the interviews

3.3 Business model canvas modified

The sections about customer segments, channels and value propositions are the one to be modified after this first round of interviews with potential customers. There are things that were present in the business model canvas that were dismissed, added or validated after taking the five main conclusions previously.

Figure 3.3: First business model canvas modified

Value proposition

The core of the value proposition, which is the carbon footprint data on many products displayed in a visual way is validated thanks to the second, fourth and fifth conclusions taken previously. This is something that can be useful to several people, in the 13/16 proportions in these interviews.

Customers Segments and channels

After the first conclusion about the implication about climate of the interviewees the people taking part in climate oriented associations or who make donations to the climate cause are dismissed as they do not represent a large enough part of the potential customers. Accordingly the channel of climate oriented associations is dismissed too. People wanting more transparency and people wanting to adapt their consumption to the climate change are validated as it is an important and growing part of the potential customers. Moreover, young people are validated too in the customer segments thanks to the third conclusion taken previously. Finally after the fifth conclusion another customer segment is added, representing the majority of the potential customers: people that are needing clear information about carbon footprint to consume greener.

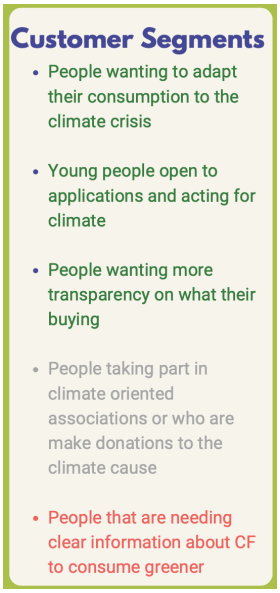


Figure 3.4: Customer segments

Chapter 4

Product specifications and mock-up

4.1 Specifications

After having a deeper understanding of the potential customers' needs, it is possible to imagine and detail the application specifications.

4.1.1 User stories

To understand well the functionalities needed in the application the clients needs should be formulated and summed up in the form of user stories, much used in the Agile project management of software. The user stories are written simply with the template: **"As [persona], I want to [action or enablement], so that [overall benefit]"**. This is told by the user's perspective and done in two practical steps: the action or enablement is something wished by the user in order to have an overall benefit stated just after. None of these two things are technical ones, they are just actions and consequences wished by the user, explained with simple terms. The users stories for this application are narrated as Alix, the typical potential customer for this business, presented in the client information sheet in figure 2.4. The user stories are the following:

1. As Alix, I want to have a comparative tool to compare different products' carbon footprint, so that I can be able to choose knowingly between two products.

2. As Alix, I want to get the detailed carbon footprint of many food products that I consume regularly, so that I can understand the most polluting life parts of these products.

3. As Alix, I want to get proposed meals or food product that emit less without having to search for them manually, so that I can make a quick choice concerning my next meal.

4. As Alix, I want to navigate through the data very easily, so that I don't loose my time trying to make a great action for the climate.

5. As Alix, I want the data that I am looking at to be from a reliable source, so that I can trust it and rely on it without making additional researches.

4.1.2 Specifications

The users stories help to create concrete specifications for the application that answer to these needs. Moreover it is simple to verify if the functionalities created respond to these user stories by checking in the application if the user story is well respected. First, the application will be distributed in **three sections: the category view, the lists view and the product view**. This will allow the user to compare products of the same category easily, to have suggestions or to understand in detail the carbon footprint of one product. The specifications are then the following ones, corresponding to one or several user stories:

1. (User story n°1) Display the carbon footprint of each product present on the application in a simple way and visible either from the product view or from a list view.

2. (User story n°2) In the product view, explicit the percentage of the carbon footprint of a product in each of its six life-cycle parts: agriculture, transformation, packaging, transportation, distribution and consumption.

3. (User story n°3) In the lists view, propose various lists gathering products with similar carbon footprint and category, for example a list of processed meals with the lowest carbon footprint.

4. (User story n°4) Display the information and the views in a visual way, with an clean design.

5. (User story n°5) Take all the data from the Agribalyse database.

4.2 Mock-Up

With all of these specifications detailed previously it is possible to create various mock-ups of the application, which are screens of what the application should look

like forward. This is part of the Minimum Viable Product (MVP) to show to potential customers in the second round of interviews. The three mock-up views are shown in the figures 4.1, 4.2 and 4.3.

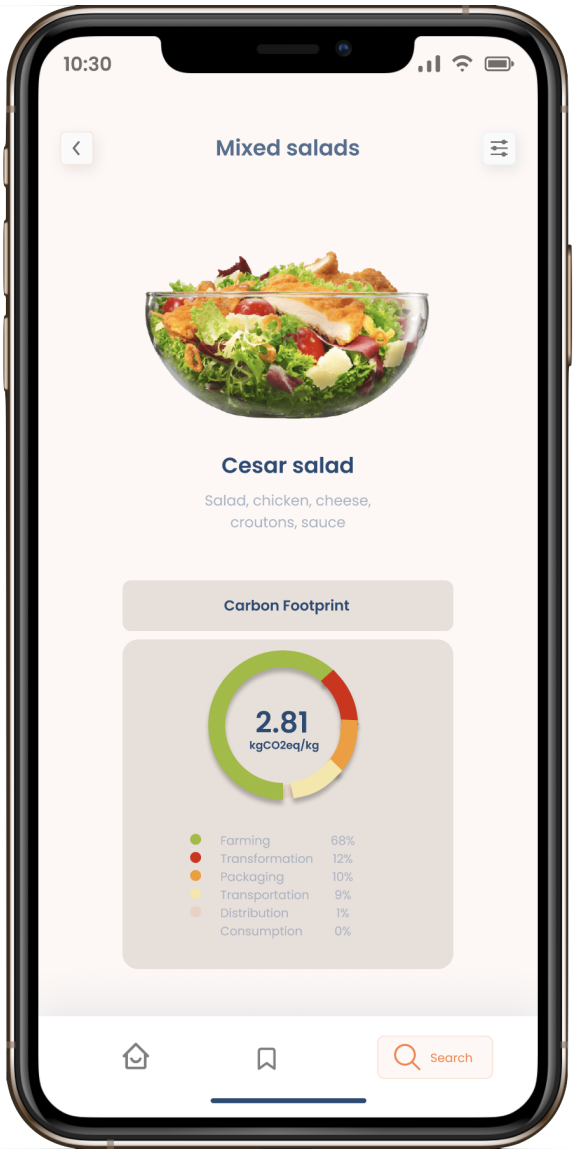


Figure 4.1: Product view

The product view displays an image of the product, with a short lists of the principal ingredients and below that its global carbon footprint, detailed in percentages of each of its life-cycle parts. In this view the user can search for a product in particular directly in a search bar that appears when clicking on the "Search" button.

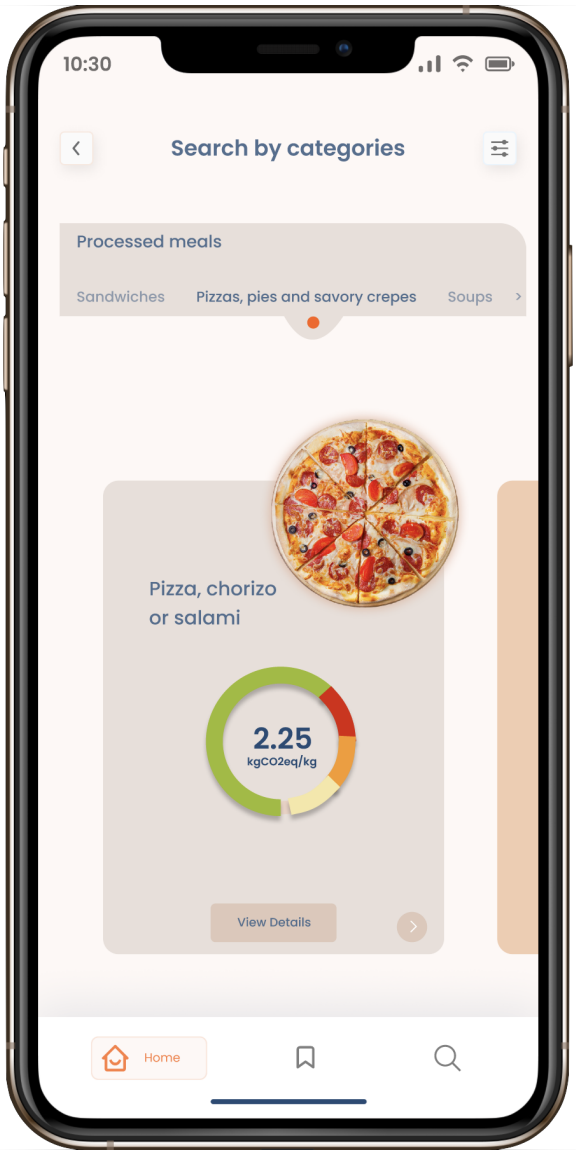


Figure 4.2: Categories view

The categories view displays a tool which allows to browse the products by categories and subcategories. For example in the figure 4.2, the category chosen is "Processed meals" and among the subcategories displayed right below the one chosen is "Pizzas, pies and savory crepes". In this subcategory the user can browse through the products by swiping left or right. When they want to see more about a product, they just have to click on the "View Details" button to arrive on the product view.

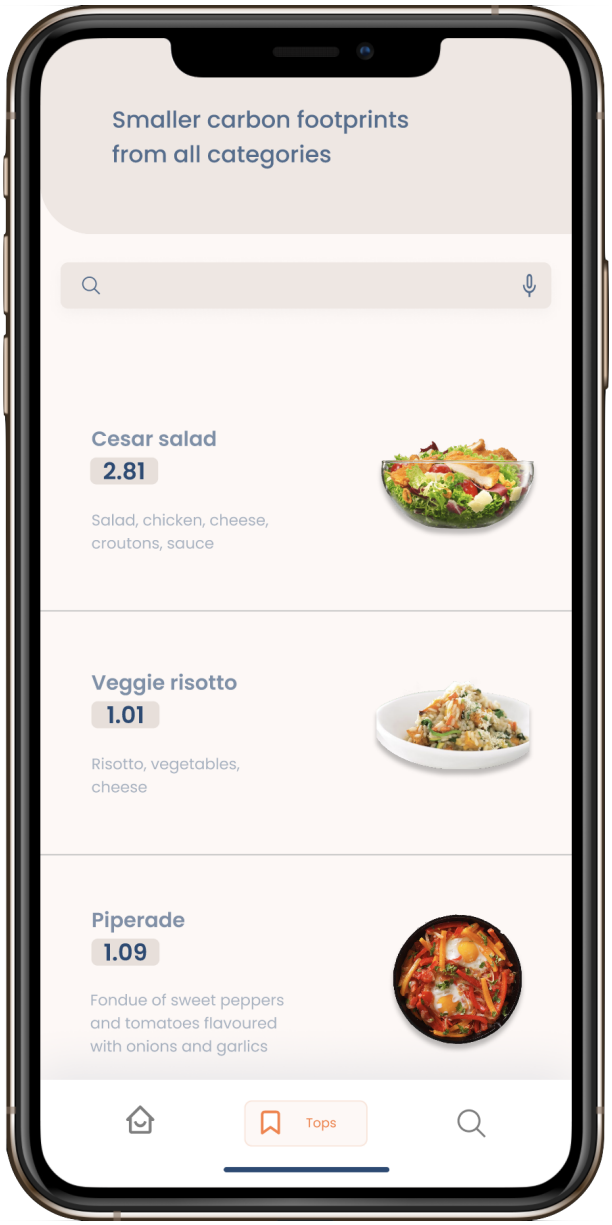


Figure 4.3: Tops view

The tops view or lists view displays various list of similar products that the user can click on. In the figure 4.3, the user is in the list called "Smaller carbon footprint from all categories" and he can scroll down to see all the product presented or click on a product to arrive on the product view. Moreover, to switch from one view to another the user should click on one of the three symbols on the bottom of the screen, from left to right: categories view, tops view and search or product view. All of the data shown in the mock-up is real and is coming from the Agribalyse

database, as it will be in the application.

4.3 Brand image

4.3.1 Name

The brand should have a striking name which is easy to remember and understandable even if only heard at the radio or in a conversation without seeing it. In fact, the words in the brand name should be clear and not have homonyms. The aim of this application is to count the carbon emissions of the food products we consume, and thus simply the brand name could be **Counting Carbon**. This describes simply the function of the application and is easy to remember for the potential customers. Moreover, the initials **CC** are the same and very visual.

4.3.2 Logo and colors

The colors of the application mock-up are chosen to be neutral and inspire tranquility, for the customer experience to be as enjoyable and pleasant as possible. As this application is displaying information about carbon footprint and climate change I didn't want it to generate additional anxiety to the customer, as some of them told me in the interviews that they already have a feeling of urgency about the climate situation. Moreover, I decided to avoid the green colors too much associated to the nature and the climate cause to favour more neutral and earth colors such as light beige, camel or brown. The logo of the brand is thus using the same colors as the user interface of the application: **light beige and brown**. These colors are representing the brand and constituting its identity so they should be present on the landing page of the application and on the downloading page of the application on the AppStore and GooglePlay. The logo in itself should remember the nature in a subtle way, it then represents few leaves superposing on one and other, delimited by a circle. This is a sober design supposed to not overload the logo.

Figure 4.4: Logo

4.4 Example of carbon footprint of two complete meals

In order to understand how the application could help a customer to make choices in their food consumption, there is an example of a comparison between the carbon footprint of two complete meals. The first menu is composed of salmon carpaccio with a marinade, Bourguignon beef and pineapple bites in its juice. The second one is composed of a homemade potatoes salad, vegetarian risotto and a fruit charlotte. The comparison is made with the database meant to be used in the application. The hypotheses taken to simplify is that the starter is about 100g per person, the first course is about 400g and the dessert about 100g.

The first menu emits $(5,1 \times \frac{1}{10}) \times (28,21 \times \frac{4}{10}) \times (1,52 \times \frac{1}{10}) = 11,95 kgCO2eq$. The second menu emits $(4,1 \times \frac{1}{10}) \times (1,01 \times \frac{4}{10}) \times (2,33 \times \frac{1}{10}) = 1,047 kgCO2eq$. The first one emits **ten times more** than the second one, which is vegetarian. This information should easily give information to the customer and let them make an informed decision about which menu they are going to order.

Figure 4.5: Two menus

Chapter 5

MVP validation interviews and second iteration on business model canvas

5.1 Interviews and results

5.1.1 Interviews

This second round of interviews is aiming to validate or invalidate the previous specifications and mock-up of the product with potential users. The interviews were divided in **three parts: the presentation of the first interviews two main conclusions, the presentation of the application and the interviewee feedback**. Thirteen persons were interviewed, some that were firstly interviewed in the habits part and some others that were not, and that were not aware of the product specifications. The questions asked to the interviewees in the feedback part were the following:

- Would you download the application? Would you prefer it to be included in another existing application? Does it bother you to download a lot of applications?
- Would you mind seeing advertisement on the app?
- Would you pay for a premium version with special features? Offline mode, access to your entire history of products, analyse of your consumption based on your history...
- Are there other functionalities/ data you would like to see on the app?

- How would you rate the interface user of the app on a scale from one to ten? Would you change something for it to be easier and more appealing to use?

5.1.2 Results

These interviews resulted in very different opinions and ideas, which I was expecting or not and were very instructive. Five main conclusions can be taken after reading all of the interviewees answers, displayed in the figure 5.1, which are:

- 11 out of 13 persons would **download the application**, and 6 of them would not prefer it to be included in another application.
- 11 persons wouldn't mind seeing **advertisements** on the application, however 4 of them would not accept pop-up type ads which bother too much the user experience.
- 6 persons are willing to put some money in order to have a **premium version** with no ads and special features, depending on the price.
- The two main ideas proposed by a third of the interviewees are the **total carbon footprint of a recipe** or a shopping list, and a **relative grade** by subcategory.
- The average grade for the **User Interface** was 8/10, and the main ideas were a small i for **additional information** about the carbon footprint and a **color code** to illustrate the relative scale carbon impact.

These conclusions are useful to understand the strengths and weaknesses of the actual business model canvas and to modify adequately some parts to reduce as much as possible the weaknesses.

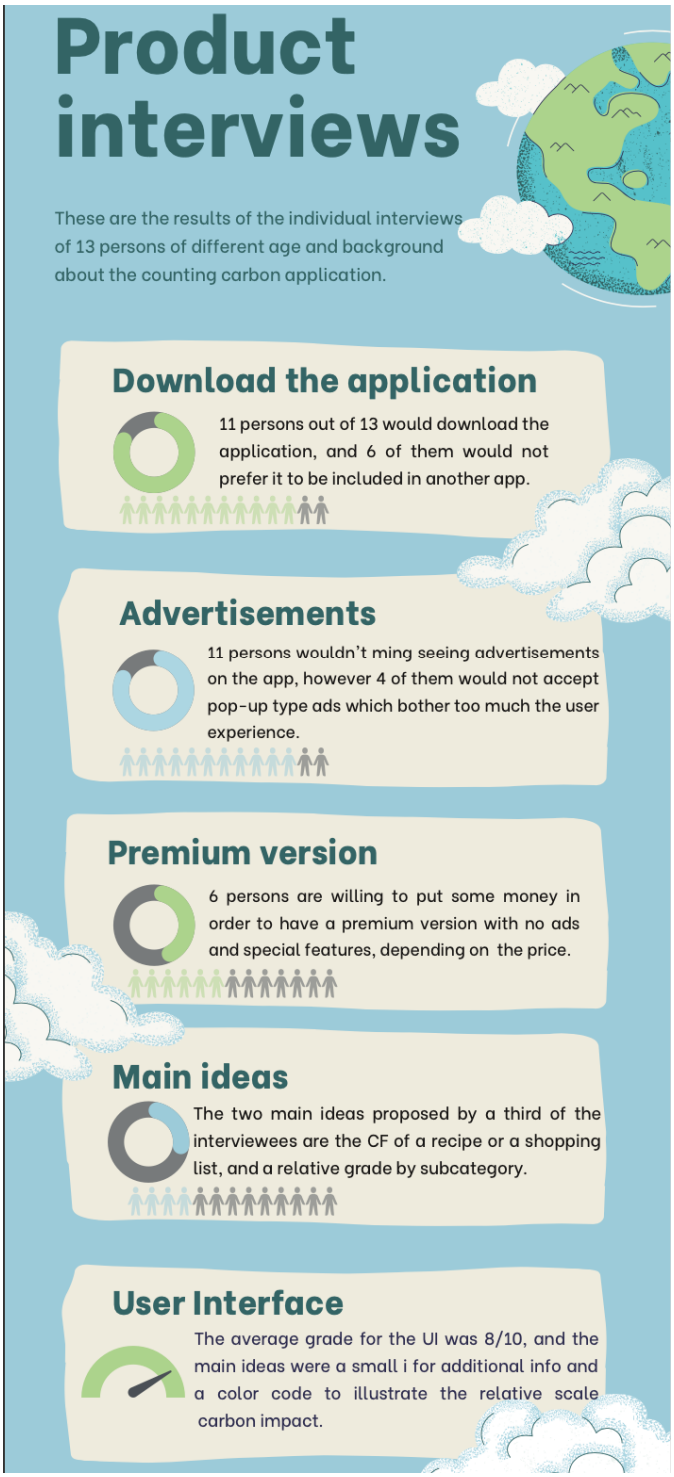


Figure 5.1: Main conclusions of the interviews

5.2 Business model canvas modified

The sections about revenue streams and value proposition are the one to be modified after this second round of interviews with potential customers. There are things that were present in the business model canvas that were dismissed, added or validated after taking the five main conclusions previously.

Figure 5.2: Business Model Canvas modified

Value Proposition

After the interviews and their feedback part and ideas part about data and functionalities, a feature of the value proposition was dismissed by lack of interest: the comments part for feedback users. This part was useless as the products presented here are generic and not from a particular brand. Thus, users feedback could apply for this product in one brand but not in another brand, and not be relevant for the other users.
The four first points, being carbon footprint data of many products displayed in a visual way, many categories of products presented and easy to access, ranking products in a category by their footprint, and an application easy to use were validated by the potential users and kept in the value proposition.
Finally, five of the proposition of the interviewees were selected and added to the list of other features. These features are relevant because they were said multiple times by different people, showing a real need of customers.

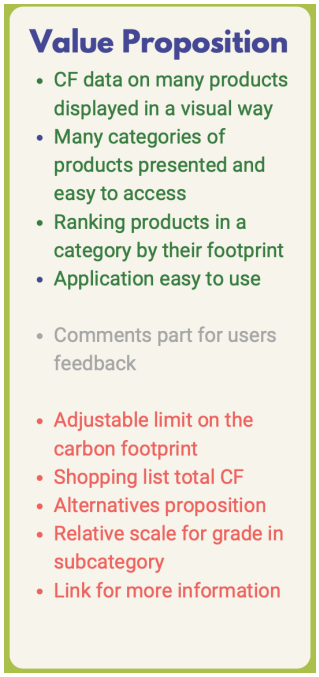


Figure 5.3: Value Proposition

The features added were the following:

- **Adjustable limit on the carbon footprint**. Users will be able to set a limit of carbon footprint to not overpass among the products they are looking, in order to not waste time by looking at products that emit too much according to their standards.

- **Shopping list or recipe total carbon footprint**. Users will be able to create a list of products they plan to buy during their next shopping session and the app will add all of the carbon footprints in order to indicate the global one. Users would be able to do this also for a recipe.

- **Alternative propositions**. When a product has a too big footprint, the application will propose an alternative product from the same category.

- **Relative scale for grade in subcategory**. As a global grade would not be relevant, in comparing a dessert with a beverage for example, the application will provide grades based on a relative scale of the carbon footprint of the

products from the same subcategory. This will help users compare similar products between them and make some choices.

- **Link for additional information**. In the product view there will be a small i with a link for vulgarized information about carbon footprint and LCA for users wanting to understand in a deeper way what they are looking at. The information will not be directly in the product view to not overload the user interface.

Revenue streams

The hypothesis that brands could pay to be more visible is dismissed as the users should not be influenced over which product to buy in another way than the pure carbon footprint. However, 85% of the interviewees are open to see advertisements on the application and 46% of them are willing to take a premium membership. These two hypothesis are then validated. However, to respect the brand impartiality, if the revenue streams coming from the premium memberships appear to be sufficient in the economic viability there will no be advertisements on the application, and if there are they will be of banner type and not pop-up type to bother as little as possible the user experience.

5.3 Economic study

5.3.1 Size of the market

As the database Agribalyse is reporting about food products consumed in France, the launch of the application will be made in **France** at first, and the market studied is France. The Total Addressable Market (TAM) is all of the people with a smartphone in France, being 77% of the total population in 2019, which is 67M people, according to the French National Institute of Statistics and Economic Studies (INSEE). Indeed, the **TAM** is **52M people** big.

The Serviceable Addressable Market (SAM) represents which part of the TAM is served by the application. As seen in the first round of interviews, young people are more inclined to act for the climate, for example by downloading this application and changing their consumption habits. The hypothesis taken is thus that the **20-59 years old** are the one targeted by this business. They represent 33M people in France and if we consider that 77% of them own a smartphone, the **SAM** would be **26M people**.

The Serviceable Obtainable Market (SOM) represents the share of the SAM that can be captured by the business. To evaluate the SOM through a five years

plan, two percentages have to be estimated: the **percentage** of the SAM **aware of the existence of the application** (reached through marketing campaigns and by word of mouth), and the percentage of them who are **willing to download** the application. The prediction of the evolution of the size of the customer base is shown in the figure 5.4. The number of customers is growing at a slow pace at first and then increasing more rapidly from the third year where huge marketing efforts will be done. The percentage of premium customers will vary from 0% the first year to stabilize around 10% in the fourth year. The SOM will tend to stabilize around 4M users in five years.

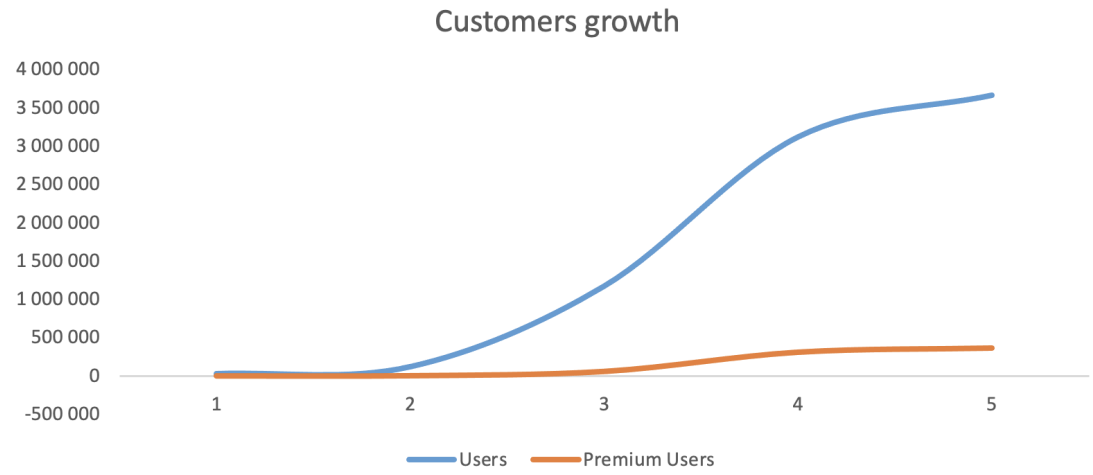


Figure 5.4: Predictive evolution of the customer base in a five years plan

5.3.2 Costs and Revenues structure

Costs

The costs are divided into two parts: the costs of **setting up the application** at first and the **recurring costs**. The costs of setting up the application are 20k€ for the development of the application, and 2k€ for the landing page of this application which explains its functioning. The total setting up costs are 22k€.

The recurring costs are divided into the costs of **maintaining the application**, the **wages** of the employees and the **marketing** costs. The costs of maintaining the application are the cloud database subscription of about 15€ per month (for example with Google Cloud), the price of the domain of about 15€ per year, the hosting web of about 15€ per month, the hosting back-end for the application of about 50€ per month, the Google Play subscription of 25€ per year

and the Apple Store subscription of 200€ per year. The total costs of maintaining the application are 1,2k€ per year.

The wages are depending on the number of employees. In the first year there will be only two developers to create the proper application. They will be then joined in the second year by two persons responsible of the marketing, and one person responsible of the help-desk. The wages are calculated with the average wage of each job in France, and adding the employer charges. In the fifth year, there would be five persons in the marketing department, ten developers and three persons in the help-desk.

The marketing costs are zero the first year when the application is being developed and are truly augmenting (about 50000€ at first) in the following years in order to obtain the previous predictive growth in the number of customers.

Revenues

The revenues come mainly from the premium subscriptions. In the product interviews, 1 person out of 2 is willing to pay a price to participate in the financing of the application and to have special features. The special features are an offline mode, the access to the entire history of products and the analyse of the consumption based on the history.

The cost of the premium subscription is 10€ per year, and a possibility to donate 10€ more per year for people really interested in financing this application. Based on the 5/10 ratio of people willing to pay in the interviews and by security, the hypothesis taken is that the number of premium will rise slowly from 0% the first year to stabilize at 10% the fourth and fifth year. Moreover in the revenue part the 10€ additional that can be donated will not be taken into account and will be a plus for the finances. With these assumptions, the revenue stream should look like what is shown in the figure 5.5 in the first years.

As the premium membership appear to be sufficient, there will not be advertisements in the application for both additional reasons: the application has to be impartial and the customer not influenced by any brand, and the products present on the application are generic and not branded, so brands presence is not relevant in the application.

As seen in the figure 5.5, the grey line representing the net income of the start-up begins to be positive at the beginning of the third year, this is where the start-up begin to be profitable.

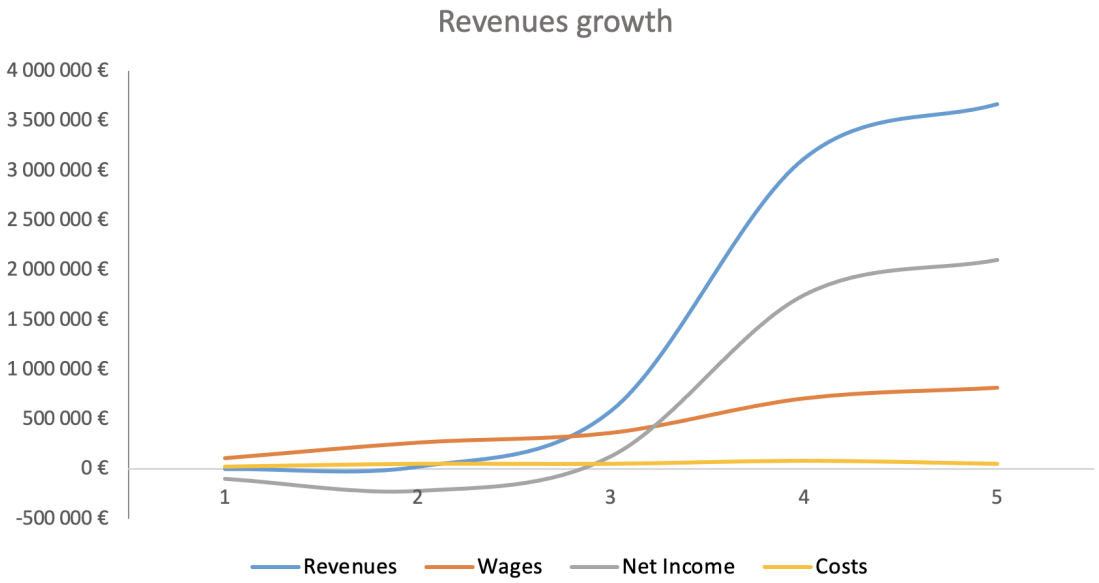


Figure 5.5: Predictive evolution of the revenues in a five years plan

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenues	0 €	23 400 €	585 000 €	3 120 000 €	3 666 000 €
Costs	130 216 €	315 164 €	412 976 €	790 016 €	867 032 €
EBITDA	(130 216 €)	(291 764 €)	172 024 €	2 329 984 €	2 798 968 €

Figure 5.6: Revenues, costs and EBITDA table

5.4 Industry analysis

To understand better the accuracy of the left part of the business model -the **Key Partners** part- an industry analysis should be run.

5.4.1 Competitors

The main competitor in the French market is **Yuka**. This is also an application which allows the customer to scan some food product in order to understand their impact on their health. The application displays information about macro and micro nutrients, risky additives, nano-particles, levels of sugar, fiber, protein, salt... This is their main functionality, and it does not compete against the Count-

ing Carbon application, however in February 2021 they launched their "Eco-score" which evaluates the impact of the product scanned on the environment. It gives a grade between A and E to the customer following several criteria, including the carbon footprint. However as the functionality was launched recently it lack of data about the majority of products and for the moment in the Eco-score part their is written "Unknown Eco-score". Yuka is waiting for both customers and brands to voluntarily fill up ecological data about the products so they can display the Eco-score. This is the main disadvantage of their business model. Their main advantage would be their customer base already consequent with about 16M users in late 2020.

Nonetheless, the fact that Yuka launched an environmental functionality just a few months ago reveals that their is a **real market** and a consequent customer segment of people wanting to reduce their environmental impact knowingly through an application. The customer segment targeted by Counting Carbon is more or less overlapping Yuka's one, however all of the carbon footprint data in Counting Carbon application is available right away and does not need any customer-based or brand-based participation to be completed. The customer segment targeted by Counting Carbon is thus more focused on people who want to know their impact right away and not wait for the database to be completed.

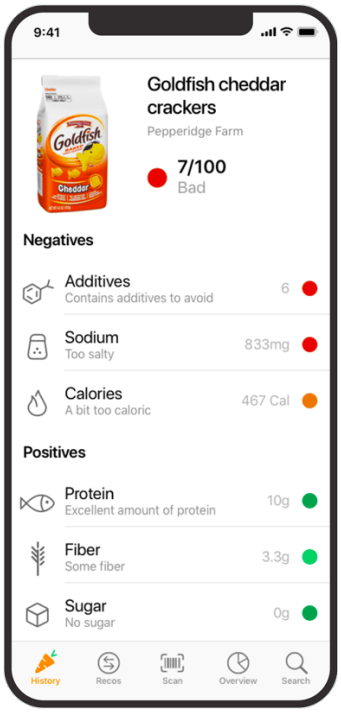


Figure 5.7: Yuka application

Yuka is the only player similar to Counting Carbon but there are **indirect players** to take into account, such as **websites to calculate your global carbon footprint** according to your consumption habits. This type of websites exists and is always free to use for the user, however they only provide generic information and can not help much the users to make choices about their food consumption. They are more driven to the living conditions such as the choice of heater in the house, the choice of transportation mode... Their main competitive advantage are that they are free of charge and do not represent a big time investment for the users as they are done in a few minutes. However, their competitive disadvantages are their lack of details and precision: they only take into account the global diet of the user and not the different food items they consume in a daily basis. These websites are more targeting the customer segment of people wanting just a glimpse of their impact on the climate out of curiosity but don't want to invest their time investigating it. This customer segment seems quite important, however Counting Carbon is not targeting it as they would not be ready to pay a premium subscription as they already don't want to invest their time in knowing their carbon footprint.

Other indirect players are the **freely available datasets** about the carbon footprint emissions of food products. These are free to use but need users to be aware of the signification of the carbon footprint values and unity, and they need them to be willing to dig into this database to find what they want. This is very complete data but not easy to grasp and understand for people who don't know much about carbon footprint. So these datasets are targeting a customer segment of more acquainted persons, which is smaller than the customer segment targeted by Counting Carbon.

5.4.2 New entrants

Yuka could be considered as a new entrant as their environmental functionality is just released, but they already have a well built customer base. No other new entrants are known for the moment, but some start-ups like Counting Carbon could be preparing to enter the market. The barriers these new entrants have to overcome are principally finding a customer base which is not redundant with another direct or indirect player, and finding a reliable database that customers can trust and rely on to make their own decisions. This is done by Counting Carbon with the Agribalyse database.

Moreover, the fact that Yuka is already rooted for a few years result in the fact that people are sensitized to the close analysis of their consumption and to not trust the packaging of the products. This makes the market easier to enter for other players such as Counting Carbon.

5.4.3 Substitute products and services

The websites allowing to calculate the global footprint and the freely available databases could be considered as substitutes as much as indirect competitors. Other substitutes could be the researches people make on their own about the carbon footprint impact of the meat consumption for example, or about substitutes to meat. These are time-consuming researches and mostly done by people who are already interested and invested in the climate cause, so this does not really overlap on the Counting Carbon targeted customer segment.

The switching costs between using an application and beginning to do their own researches are quite high not financially but in terms of comfort and time management. Indeed, the application is designed to save time to the user and to be a pleasant experience, so switching from that to digging into the web to find some precise information is costly. However the value proposition of the application has to be sufficient for the users for them to not want to go doing their own researches, and this is what the several interviews rounds are about: find a satisfactory value proposition for the potential customers.

5.4.4 Stakeholders

The stakeholders who might influence the Counting Carbon business model are the **government** who could decide to impose an environmental score on the packaging of all food products in the same way it was imposed a nutritional score. If this score was to be imposed the application would loose its interest to the customers, and would only be useful when the customer is not near some products he wants to know their impact. This is a powerful stakeholder and a meaningful risk but the slowness of the government decisions and the lobbying of many brands to hide their huge impact on the environmental should lower the risk of it happening in the next months and even years. This could be interesting to get the approval from the french government to gain credibility. This partnership possibility is written in the key partners part of the business model canvas.

Other stakeholders that might influence the business model are the **brands of food products**. If some brands are willing to cooperate and give the information about the emissions of all of the life steps of their food products the application could become more complete and attract more customers. This could be a win-win situation as the brands who are proud of their production chain could be showcased in the application and gain more customers while the application could become more complete and with verified and reliable information and attract also more customers.

Other stakeholders are the **environmental NGOs and associations** that could support or not the application. As they have a lot of influence over the

people interested in the climate cause and the number of these people is constantly growing, these stakeholders could really have an impact on the customer segment of the application. This could be interesting to form a partnership with one of these associations to gain credibility and to grow the customers base. This partnership possibility is written in the key partners part of the business model canvas.

Other possible stakeholders are the **universities**, which provide key educational elements to the future buyers generation. Some formations about climate change stakes and levers are emerging in these universities, so if these formations talked about new tools to monitor their consumption and consume greener to the students, such as the Counting Carbon application this would mean a gain of customers and credibility. Moreover the network effect in the universities is really present and the students could talk about the application to their mates and family. As for the NGOs, this could be interesting to form a partnership with some universities. This partnership possibility is written in the key partners part of the business model canvas.

5.4.5 Suppliers and others Value Chain Actors

The whole application depends on the **carbon footprint databases** available, so **providers** of such databases are **key players** in the value chain. However as mentioned before, such databases are very present on the web and even if some of them are not complete, the Counting Carbon team could work to assemble several of these databases in order to obtain a large, reliable one to use in the application. To avoid a lack of data in the application, it could be interesting to form a neutral partnership with a supplier of such database, as mentioned in the business model canvas. In the case of the Agribalyse database, the partnership could be with the ADEME which is almost equivalent to making a partnership with the French State.

Chapter 6

Conclusion and actualized business model canvas

The actual business model canvas for the application is then the following one, actualized according to the two rounds of interviews of potential customers and the brand colors. Its components were validated by different potential customers so it seems appealing for them. However if another round of interviews about a more developed MVP was to be done, surely the business model would change somehow as it is never a final business model but more an actual one which is always evolving.

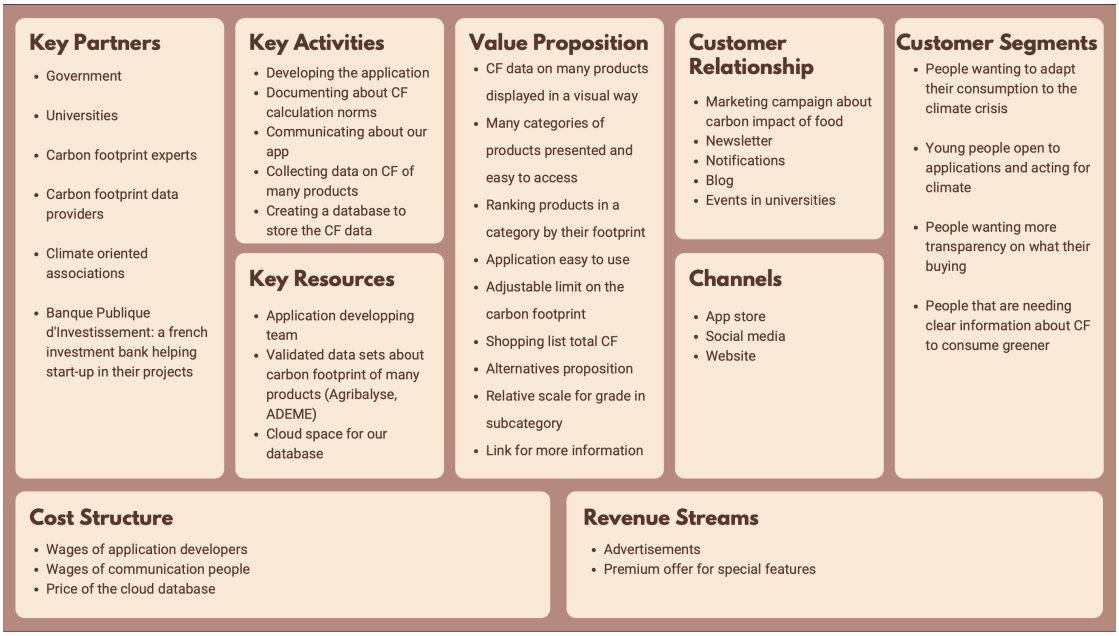


Figure 6.1: Actual business model canvas

The aim of this project as its title mention was to design and validate a business model canvas. The design of the business model is done as there is an actualized canvas, and the validation process -which should last way more than the duration of a TFM- is started with some experiments which are the interviews rounds, the economic study, the MVP creation and first validation. This project is the starting point for the validation process explained in the Lean Start-up method. To continue this project this would mean continuing the validation process and thus the experiments. The next steps for this entrepreneurship project are for example to develop a more viable MVP in order to present it to potential customers during interviews and collect their feedback, to create a landing page for the customers, to create a first viable version that can be put on the digital store... It can also be a customers capture experiment: if the hypothesis is to find some customers on the social networks an experiment could be run by sharing a link to the landing page on a social network such as Twitter and counting the number of clicks on this link for example. These a lines of reflection about potential experiments that could be run to continue the validation part of this project, but there could be plenty of others and it depends grandly on the reaction of potential users during these experiments.

Appendix A

Alignment with Sustainable Development Goals

This project works in alignment with the United Nations Sustainable Development Goals, and particularly the 3rd, the 12th, the 13th and the 17th, highlighted in the figure A.1.

Figure A.1: Sustainable Development Goals addressed

The first goal addressed by the application is the number **12: Responsible consumption and production**. This SDG is about promoting sustainable lifestyles while ensuring sustainable consumption and production patterns. The Counting Carbon application will allow people to understand more their consumption to adapt it to their sustainability goal. While gaining users, the application will encourage people to consume in a more responsible way and will put the sustainability of production into a spotlight. Moreover, the network effect of the users of the application will hopefully encourage discussions about how the food consumption has an impact on the climate and which alternatives to polluting products exist. Indeed, the aim is that industries and companies see that the mentalities are actively evolving and the low carbon impact of their product is what now attract consumers and tend to rethink and modify their agriculture methods and their production and transportation lines.

Moreover, this application project is truly aligned with the goal **13: Climate action**. This axis is about taking urgent action to combat climate change and its impacts. During this project elaboration the two rounds of potential customers allowed me to measure the relative implication about climate of people, and to make them think about it while talking to them about this application concept. These briefings were an occasion for the interviewees to maybe take themselves some steps to reduce their impact or act for the climate. I believe that people need to be acquainted with something to feel concerned and then maybe act in this way. These interviews were a step toward their acquaintance. During the application life, its role will be to inform and lighten the decisions of the customers, being a driver to their climate awareness. In this way, the application is aligned with the climate change goal.

Furthermore, this project goes in the sens of the goal **3: Good wealth and well-being** more distantly than the previous ones. In fact, if the consumers and the producers each one in their way reduce their global carbon footprint, the air pollution will diminish and have a positive impact on everyone's health. There will be less breathing diseases, a good impact on the skin too and some other positive effects that are not directly related to the lungs or the skin. This is taking part in the virtuous circle of the reduction of air pollution. More remotely, the oceans are also absorbing a lot of the CO2 released in the atmosphere and this is killing and causing disease among oceanic forms of life, such as fish for example. Reducing the amount of CO2 in the atmosphere will enhance the quality of the food we fish and thus the citizens global health.

Lastly, this project is aligned with the goal **17: Partnerships for the goals** more distantly than the previous ones too. This goals aims to strengthen the means of implementation and revitalize the global partnership for sustainable development. In this way, if the application establishes some partnerships with

environmental NGOs, publishers of carbon footprint databases or universities it takes part in the global effort to sustainable development, by connecting the final users to some scientific data and organisations or associations.

Appendix B

Habits interviews, results

Concerned about the climate	Age	Association	Donations	Adapting personal food consumption to climate	If yes, wich actions	Eating food that release less greenhouse gas	If yes, wich actions	Find clear information	1st problem	rating	2nd problem	rating	3rd problem	rating	lack of info is a problem?	rate of the interview
6	<25	no	no	yes	• reducing meat • seasonal vegetables	no		no	habits	6	price	5	desire to change	2	not a principal one	24
8	<25	no	no	yes	• reducing meat • consume locally (France)	yes	• seasonal vegetables • consume locally	no, word of mouth, pity no "nutriscore" for CO2	price	7	lack of info about carbon impact	3			yes	26
8	<25	no	no	yes	• reducing meat • seasonal vegetables	yes	• avoid red meat • prefers to consume locally	no but don't search	taste not replaceable	5	price	5	living with others, has to adapt	3	no but it could ease its way to consuming greener	30
6	<25	no	no	yes	• reducing meat • tries to consume organic • tries to consume locally	yes	• tries to consume locally	no, more info about water consumption	taste not replaceable	8	habits	6	protein intakes less diverse, harder to find	3	no but it could ease its way to consuming greener	29
10	<25	no	no	yes	• vegetarian • seasonal vegetables • consume locally • no plastic packaging	yes	• vegetarian • seasonal vegetables • consume locally • no plastic packaging	no info on packaging, looks on the internet, many articles, no info gathered	price	9	living with others, has to adapt	6	easiness of buying in a supermarket	3	yes	32
6	<25	no	no	no		no		no	easiness of buying in a supermarket	5	taste not replaceable	4			no	21
8	<60	no	no	yes	• consume organic • seasonal vegetables • consume locally	no		no precise info, only general ideas	lack of info about carbon impact	8	easiness of buying in a supermarket	8	conservation of organic food harder	6	yes	29
6	<25	no	no	yes	• reduce plastic packaging • tries to buy organic	yes	• reduce plastic packaging	no (don't search, don't find)	price	6	no direct visible consequences of not consuming organic	5	taste not replaceable	4	no but it could ease its way to consuming greener	23
8	<25	no	no	yes	• reducing meat • seasonal vegetables • few transformed products (no cans...) • less products that comes from very far	yes	• less products that come from very far	no place to find info, read them when they appear in articles/ social media	not owning a garden	7	far from a clean source of food (family)	4	no info about cooperatives or farms near her home	3	no but it could ease its way to consuming greener	33
7	<40	no	no	yes	• consume locally • tries to consume organic • seasonal vegetables	yes	• reduce plastic packaging	no clear info	lack of info about carbon impact	9	habits	6			yes	32
4	<25	no	no	yes	• reducing meat • eggs from open air chicken	no		no (don't search, don't find), pity no "nutriscore" for CO2	taste not replaceable (likes meat)	7	protein intakes less diverse, harder to find	6	price	4	no but it could ease its way to consuming greener	25
10	<40	no	yes, think tank	yes	• reducing meat • consume locally • seasonal • organic • few transformed products	yes	• less red meat • consume locally	no clear info, miss carbon footprint in Yuka	availability of good products	8	lack of info about carbon impact	7	price	4	yes	29
8	<40	no	no	yes	• 95% seasonal • consume locally	yes	• consume local meat • eat french fruits and vegetables (90%)	no (don't search, look for the origin)	not everything is produced locally	5	over packaging	3	taste not replaceable	1	if people were more informed they would care more	30
10	<25	Neighbourhood AMAP	no	yes	• AMAP (consume locally) • vegetables, eggs, chicken organic • support local agriculture • reducing meat • few transformes products	yes	• les meat • consume locally	no (don't search)	no bulk store nearby	8	not owning a garden	3			can be useful to make some choices or reveal some info we are not aware of	32
5	<25	no	no	yes	• support local and ethical production • no nutella	yes	• local	no (don't search)	price	8	lack of info about carbon impact	6	easiness of buying in a supermarket	3	yes	23
8	<25	no	greenpeace	yes	• less beef • les meat • organic • not too much plastic • local (France)	yes	• less beef • les meat • organic • not too much plastic • local (France)	no (don't search)	price	8	taste not replaceable	3	living with others, has to adapt	3	no but it could ease its way to consuming greener	23

Appendix C

Product interviews, results

Download	Prefer included with other app	Ads	Ads type	Pay for special features	Ideas data	Ideas functionalities	UI rate	Ideas UI
yes	yes	ok		no			8	
yes	yes	ok		yes (but depends on the price)	• health and nutrition data	• social network (sharing, liking) • shopping list: total CF	7	• other part for health data
yes	yes	ok		yes (but depends on the price)		• propose an alternative • link with data explanation or vulgarized data	7	
yes	yes	no		yes	• give a grade (more visual)	• propose an alternative • relative scale for a grade in the subcategory • barcode scan	8	• CF format in bars
yes	no	depends	• banner ok • pop up not ok	no	• recipes • where to buy each product or ingredient	• share a product (flatmates)	8	• more visible menu
yes	no	depends	• less frequent ads • pop up not ok	no	• map with average origin of products	• locate producers/ farmers nearby	8	• history more visible
yes	yes	depends	• banner ok • pop up not ok	no	• macro/micro nutriments • average price per product		8	• small i for more information
no	yes	ok		no	• macro/micro nutriments		9	• change the view of the products
no	no	no		yes	• health and nutrition data	• relative scale for a grade in subcategory	8	
yes	yes	ok		yes (but depends on the price)		• put a customized limit on the carbon footprint • rank or filter by CF	9	
yes	no	ok	• pop-up not ok	yes		• customize the product (organic, place of production...) • design menus to see their CF • analyse patterns of consumption and monetize it • sell the application to restaurants or companies when your reputation is on point	9	show smth dynamic (Figma or Genially)
yes	no	ok		no	• water quantity used • waste quantity	• shopping list/recipe: total CF	8	bigger category place
yes	no	ok		no		•relative scale for a grade in subcategory	8	color code to compare impacts

Appendix D

Economic studies

		Year 1	Year 2	Year 3	Year 4	Year 5
	Revenues	0 €	23 400 €	585 000 €	3 120 000 €	3 666 000 €
	Wages	107 016 €	263 964 €	361 776 €	708 816 €	815 832 €
	Costs	23 200 €	51 200 €	51 200 €	81 200 €	51 200 €
	EBITDA	(130 216 €)	(291 764 €)	172 024 €	2 329 984 €	2 798 968 €
	DA					
	EBIT	(130 216 €)	(291 764 €)	172 024 €	2 329 984 €	2 798 968 €
	Interests	0 €	0 €	0 €	0 €	0 €
	Taxes	(32 554 €)	(72 941 €)	43 006 €	582 496 €	699 742 €
	Earnings	(97 662 €)	(218 823 €)	129 018 €	1 747 488 €	2 099 226 €
	Revenues bruts	0 €	23 400 €	585 000 €	3 120 000 €	3 666 000 €
(M users)	**TAM**	52	52	52	52	52
(M users)	**SAM**	26	26	26	26	26
	% aware of the app	1%	3%	15%	30%	30%
	% who download	10%	15%	30%	40%	47%
(Users)	**SOM**	26 000	117 000	1 170 000	3 120 000	3 666 000
	% of premium	0%	2%	5%	10%	10%
	premium users	0	2340	58500	312000	366600
	price of premium	10 €	10 €	10 €	10 €	10 €
	Setting up costs	22 000 €				
	Recurring costs					
	Cloud database	180 €	180 €	180 €	180 €	180 €
	Domain	15 €	15 €	15 €	15 €	15 €
	Hosting web	180 €	180 €	180 €	180 €	180 €
	Hosting back-end app	600 €	600 €	600 €	600 €	600 €
	Google Play	25 €	25 €	25 €	25 €	25 €
	Apple Store	200 €	200 €	200 €	200 €	200 €
		1 200 €	1 200 €	1 200 €	1 200 €	1 200 €
	Marketing costs	0 €	50 000 €	50 000 €	80 000 €	50 000 €

	France	(brut)
Marketing person	22 724,00 €	
Developer	37 682,00 €	
Helpdesk	31 200,00 €	
	1 893,67 €	
	3 140,17 €	
	2 600,00 €	
	29568	
	53508	
	44304	

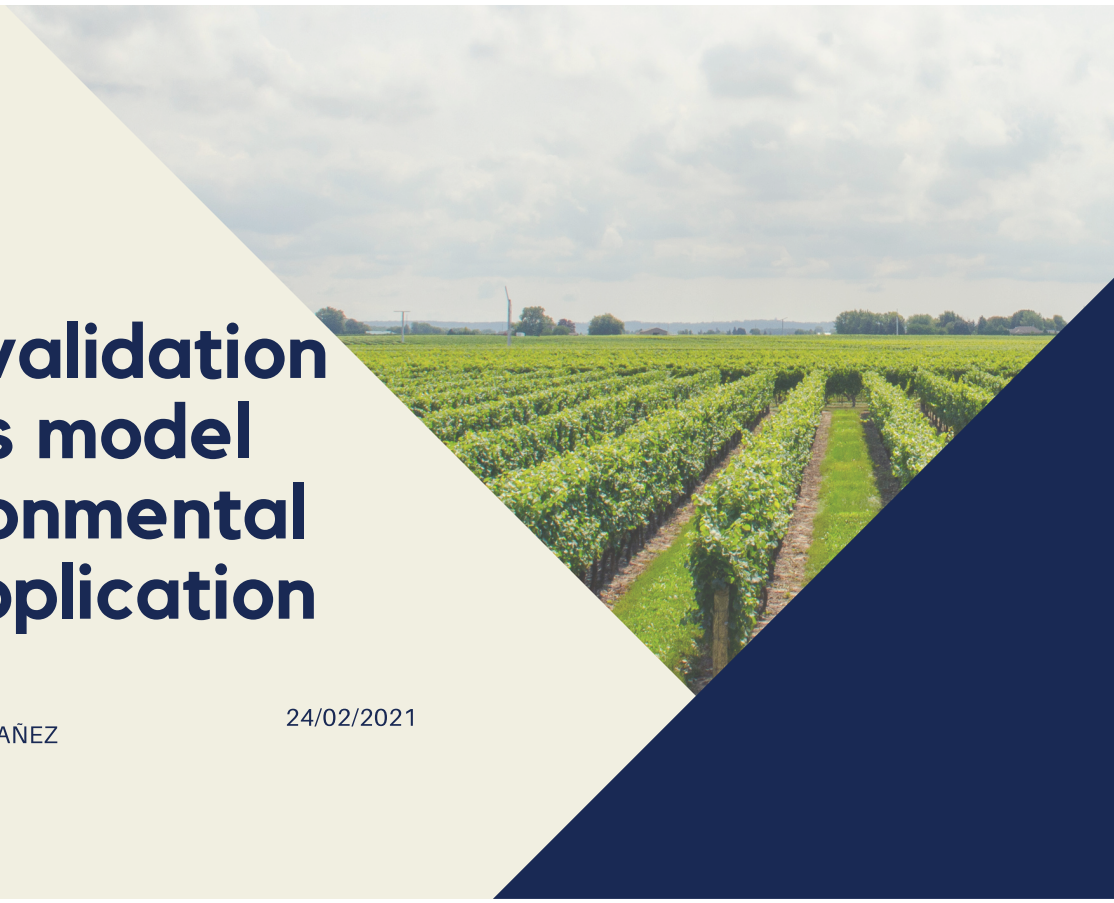
https://www.pmejob.fr/blog-emploi-et-pme/combien-coute-un-salarie.html#simulateur

Job	**Marketing person**	**Developer**	**Helpdesk**	**Total wages**
Average wages	22 724,00 €	37 682,00 €	31 200,00 €	
Wages paid by the company	29 568,00 €	53 508,00 €	44 304,00 €	
Year 1	0	2	0	107 016,00 €
Year 2	2	3	1	263 964,00 €
Year 3	2	4	2	361 776,00 €
Year 4	5	8	3	708 816,00 €
Year 5	5	10	3	815 832,00 €

Appendix E

First intermediate presentation

Design and validation of a business model for an environmental analyzing application



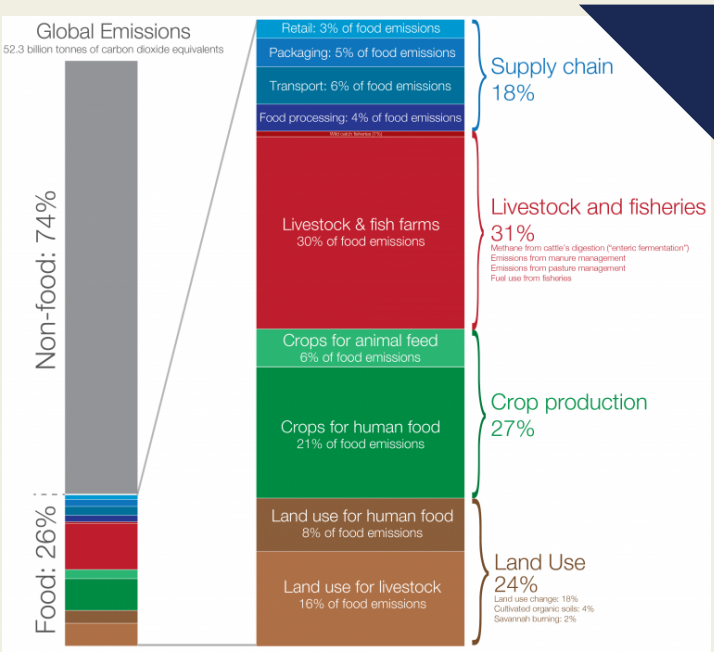
Emma KERMENE
Director: Javier FUENTES IBAÑEZ

24/02/2021

Content

Introduction

Food production is responsible for one-quarter of the world's greenhouse gas emissions.



Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. Science, 360(6392), 987-992.

Consumers key problems

LACK OF INFORMATION

In the store, it is difficult to asses the impact of a product on the climate as it is not clearly written on the packaging.

CARBON FOOTPRINT DEFINITION

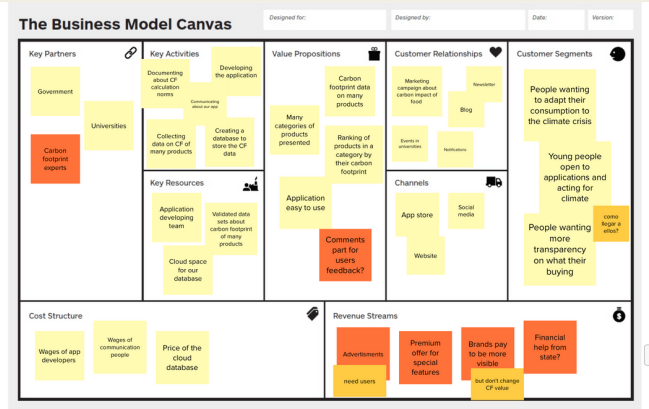
What is or not included in the carbon footprint of a product? Its production, but also transportation and storage?

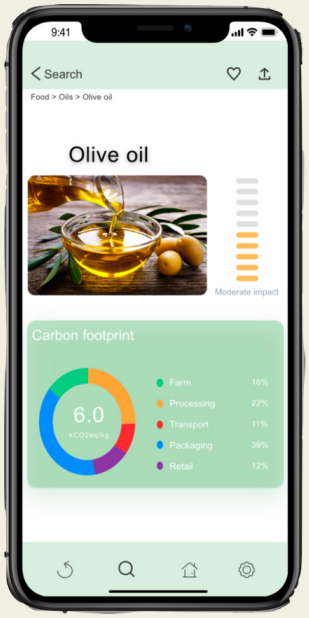
LACK OF VISUAL EXPLANATION

No website or application is gathering all the carbon footprint information in a visual and easily understandable way.

Application

Displays the carbon footprint of food products based on data from a 2018 scientifical analysis.





Objectives

1. CREATE A BUSINESS MODEL CANVA

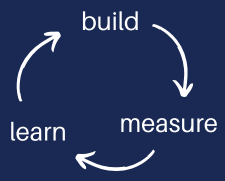
2. ITERATE THE BM THROUGH INTERVIEWS

3. FIND CARBON FOOTPRINT DATA

4. DO A MOCK-UP OF THE APPLICATION

Lean start-up methodology

Based on the "Agile" concept, applied to new products, services or businesses.



BUSINESS DESIGN Business model canva

CUSTOMER DEVELOPMENT Customer discovery and validation

PRODUCT DEVELOPMENT Sprints functioning

Application mock-up development methodology

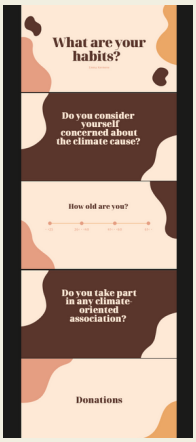
CARBON FOOTPRINT Norms and datasets

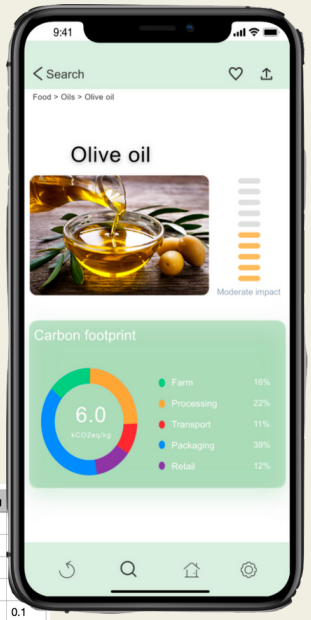
APPLICATION MOCK-UP Specifications and mock-up

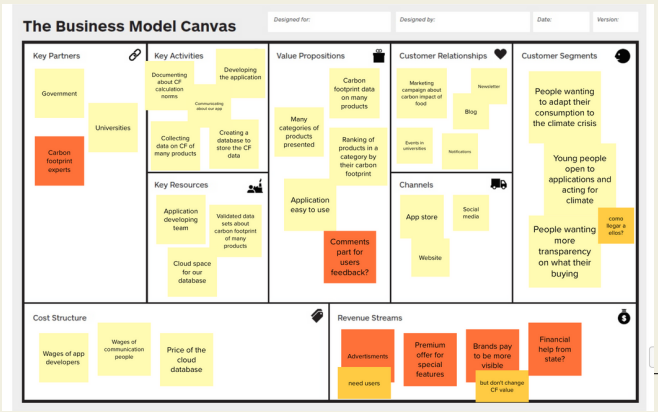
CODING OF A PATH Concrete show of the application functioning

Results

Name	Concerned about the climate	Age	Association	Donations	Adapting personal food consumption to climate	If yes, wich actions	Eating food that release less greenhouse gas	If yes, wich actions	Find clear information	1st problem	rating	2nd problem	rating	3rd problem	rating	lack of info is a problem?	rate of the interview
Lola	6	<25	no	no	no		no		no	easiness of buying in a supermarket	5	taste not replaceable	4			no	21
Nadine & Vincent	8	<60	no	no	yes	• consume organic • seasonal vegetables • consume locally	no		no precise info, only general ideas	lack of info about carbon impact	8	easiness of buying in a supermarket	8	conservation of organic food harder	6	yes	29
Hugo	6	<25	no	no	yes	• reduce plastic packaging • tries to buy organic	yes	• reduce plastic packaging	no (don't search, don't find)	price	6	no direct visible consequences of not consuming organic	5	taste not replaceable	4	no but it could ease its way to consuming greener	23
Elina	8	<25	no	no	yes	• reducing meat • seasonal vegetables • few transformed products (no cans...) • less products that comes from very far	yes	• less products that come from very far	no place to find info, read them when they appear in articles/ social media	not owning a garden	7	far from a clean source of food (family)	4	no info about cooperatives or farms near her home	3	no but it could ease its way to consuming greener	33
Julien	7	<40	no	no	yes	• consume locally • tries to consume organic • seasonal vegetables	yes	• reduce plastic packaging	no clear info	lack of info about carbon impact	9	habits	6			yes	32
PA	4	<25	no	no	yes	• reducing meat • eggs from open air chicken	no		no (don't search, don't find), pby no "nutrizone" for CO2	taste not replaceable (likes meat)	7	protein intakes less diverse, harder to find	6	price	4	no but it could ease its way to consuming greener	25







Food product	Land use change	Animal Feed	Farm	Processing	Transport	Packging	
Wheat & Rye (Bread)	0.1	0.0	0.8	0.2	0.1	0.1	
Maize (Meal)	0.3	0.0	0.5	0.1	0.1	0.1	
Barley (Beer)	0.0	0.0	0.2	0.1	0.0	0.5	
Oatmeal	0.0	0.0	1.4	0.0	0.1	0.1	
Rice	0.0	0.0	3.6	0.1	0.1	0.1	0.1
Potatoes	0.0	0.0	0.2	0.0	0.1	0.0	0.0
Cassava	0.6	0.0	0.2	0.0	0.1	0.0	0.0
Cane Sugar	1.2	0.0	0.5	0.0	0.8	0.1	0.0
Beet Sugar	0.0	0.0	0.5	0.2	0.6	0.1	0.0
Other Pulses	0.0	0.0	1.1	0.0	0.1	0.4	0.0
Peas	0.0	0.0	0.7	0.0	0.1	0.0	0.0
Nuts	-2.1	0.0	2.1	0.0	0.1	0.1	0.0
Groundnuts	0.4	0.0	1.4	0.4	0.1	0.1	0.0
Soymilk	0.2	0.0	0.1	0.2	0.1	0.1	0.3

What remains to do?

1. FINISH APPLICATION SPECIFICATIONS AND MOCK-UP

2. RUN THE PRODUCT INTERVIEWS WITH USERS

3. CODE A PATH OF THE APPLICATION

4. VALIDATE THE PRODUCT WITH USERS

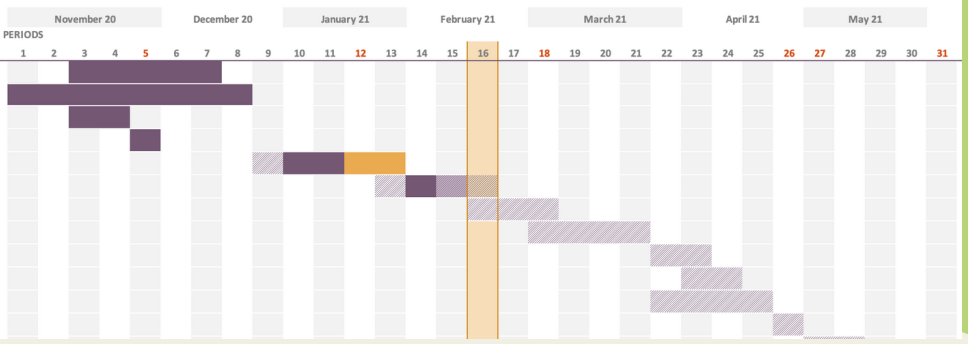
Gantt realisation

GANTT

Period Highlight: 16

Plan | Actual | % Complete | Actual (beyond plan) | % Complete (beyond plan)

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Sprint 0: First canva and hipothesis	3	5	3	5	100%
Researches on Lean Startup	1	8	1	8	100%
Redact anexo B	3	2	3	2	100%
Anexo B	5	1	5	1	100%
Sprint 1: Interviews with users	9	3	10	4	100%
Sprint 2: MVP specification and mockup	13	3	14	3	60%
Sprint 3: MVP validation with users	16	3			
Sprint 4: MVP coding of a path	18	4			
Sprint 5: MVP validation with users	22	2			
Redact SDG annex	23	2			
Report	22	4			
Complete draft version	26	1			



Appendix F

Second intermediate presentation

Design and validation of a business model for an environmental analyzing application

Emma KERMENE
Director: Javier FUENTES IBAÑEZ

21/04/2021

Content

Introduction

What?	A carbon impact analyzing application that shows the carbon footprint of any generic product.
For who?	Average consumers who want to know the impact of their food consumption on the climate.
Why?	Answer to the rising consciousness about the climate cause, and give consumers a tool to help them make buying choices.

Objectives and Methodology

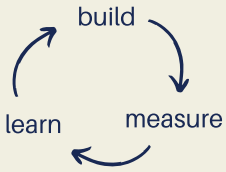
1. **CREATE A BUSINESS MODEL CANVA**

2. **ITERATE THE BM THROUGH INTERVIEWS**

3. **FIND CARBON FOOTPRINT DATA**

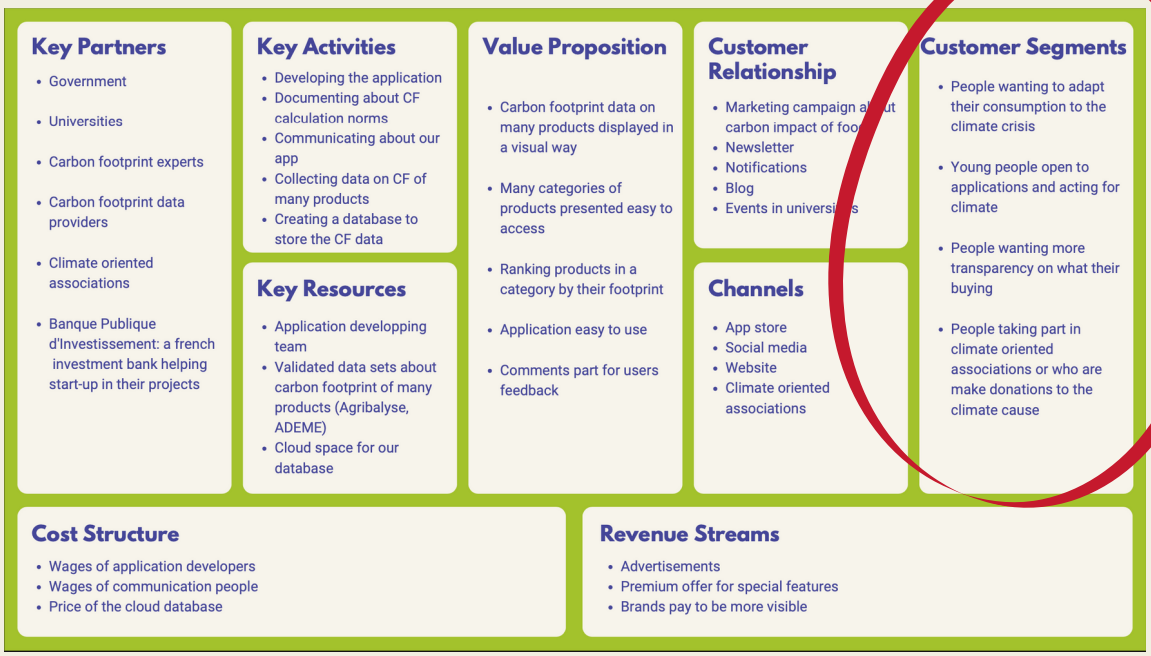
4. **DO A MOCK-UP OF THE APPLICATION**

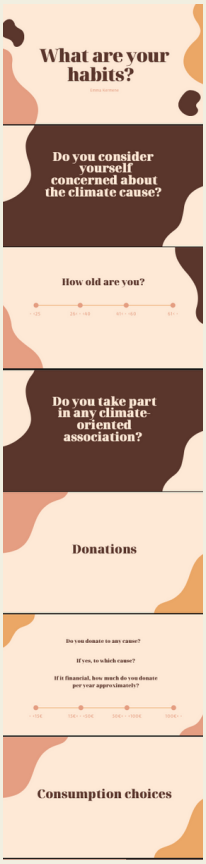
LEAN START-UP METHODOLOGY



Initial Business Model Canvas

Initial Business Model Canvas





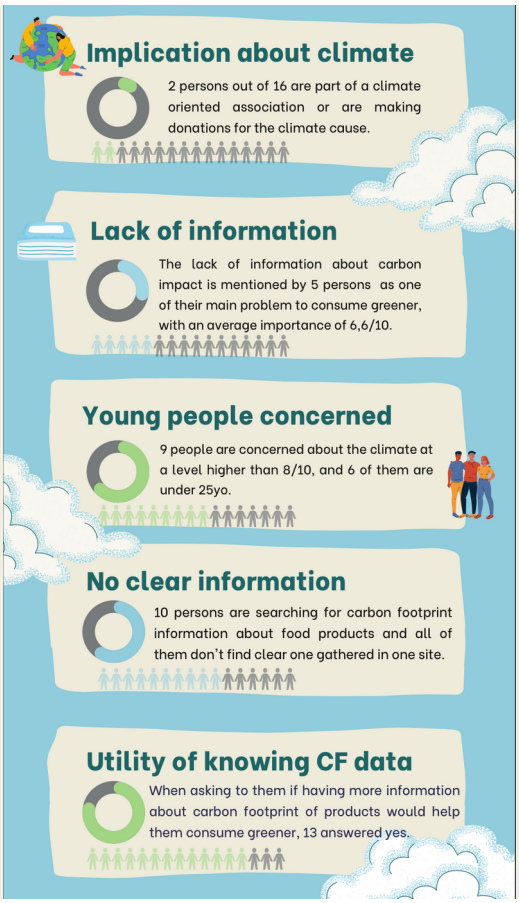
Users Interviews

Understand the potential customers' habits

Validate or not hypothesis about the customers segements

16 interviewees from different age and background

Five main conclusions



Business Model Canvas modified

Data source

A collective program

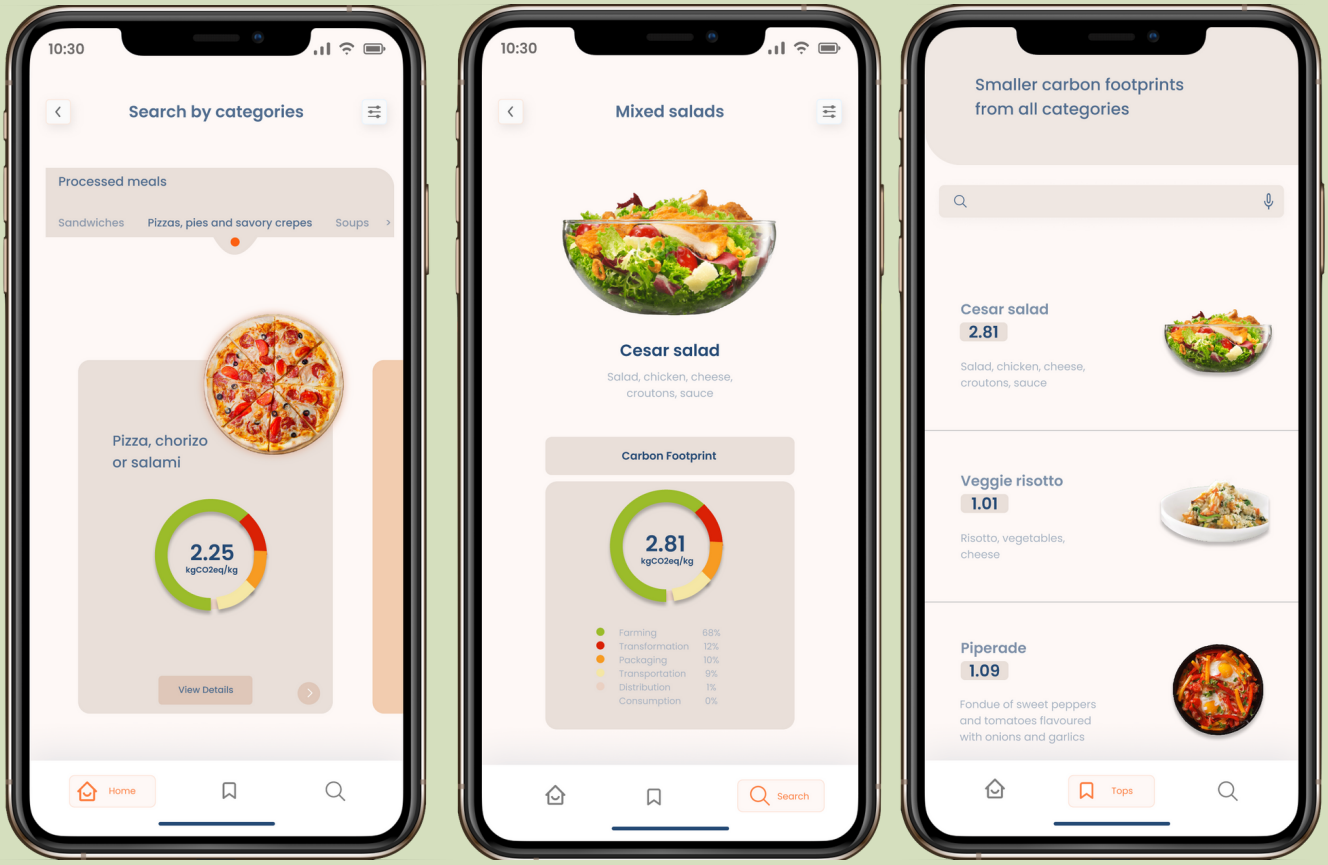
Existing since 2013 and aiming to provide tools to meet the environmental challenge in food sectors, piloted by the ADEME.

Resulting in a database

A public database of environmental impact of 2480 detailed categories of food products commonly consumed in France.

Categories	Number of products in the database
Meats, eggs & fishes	637
Fruit & vegetables	423
Cereals and starchy products	375
Milk and dairy products	221
Processes meals	284
Fat and oils	56
Drinks	219
Sweets and desserts	55
Ice creams	25
Sauces and condiments	169
Baby food	33

Mock -up


10:30
Search by categories
Processed meals
Sandwiches
Pizzas, pies and savory crepes
Soups
Pizza, chorizo or salami
2.25
kgCO2eq/kg
View Details
Home
10:30
Mixed salads
Cesar salad
Salad, chicken, cheese, croutons, sauce
Carbon Footprint
2.81
kgCO2eq/kg
Farming 68%
Transformation 12%
Packaging 10%
Transportation 9%
Distribution 1%
Consumption 0%
Search
Smaller carbon footprints from all categories
Cesar salad
2.81
Salad, chicken, cheese, croutons, sauce
Veggie risotto
1.01
Risotto, vegetables, cheese
Piperade
1.09
Fondue of sweet peppers and tomatoes flavoured with onions and garlics
Tops

Users Interviews (second round)

Get the potential customers' feedback of the product

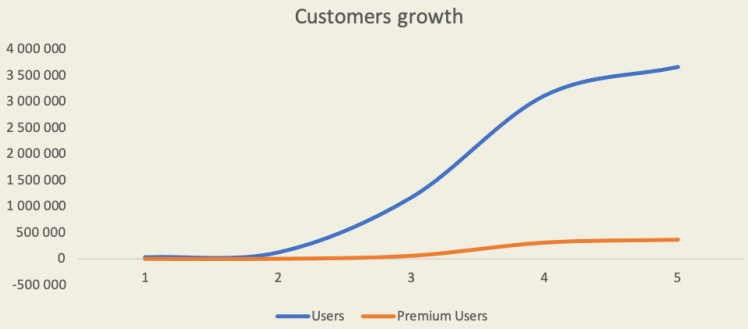
Validate or not hypothesis about the value proposition and revenue stream

13 interviewees from different age and background

Revenues stream

Premium subscriptions

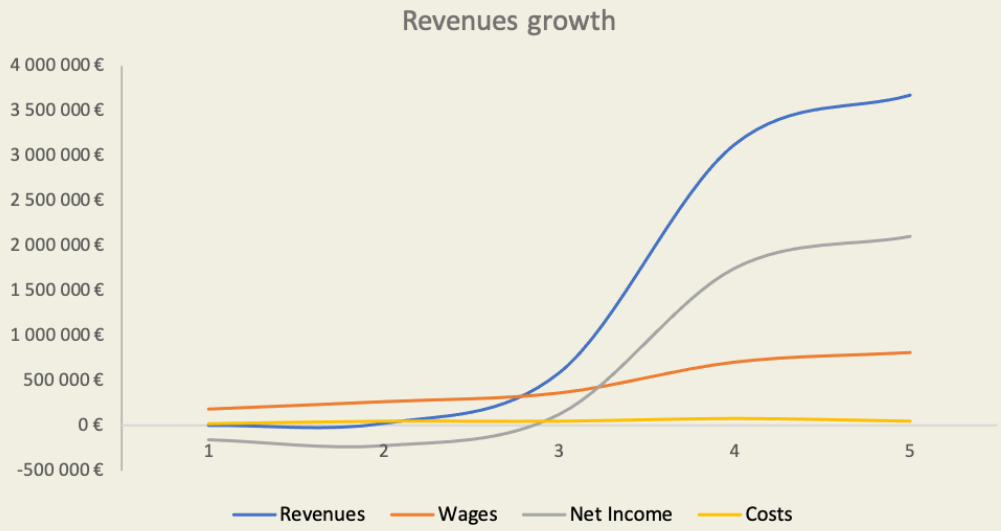
Advertisements ?



Costs Structure

Setting up costs	Application	20k€
	Webpage	2k€
		22k€
Recurring costs	Cloud database	15€/month
	Domain	15€/year
	Hosting web	15€/month
	Hosting back-end	50€/month
	Google Play	25€/year
	Apple Store	200€/year
		1,2k€/year
	Marketing costs	50-80k€/year
	Wages	180-800k€/year

Net Income


Revenues growth
4 000 000 €
3 500 000 €
3 000 000 €
2 500 000 €
2 000 000 €
1 500 000 €
1 000 000 €
500 000 €
0 €
-500 000 €
1
2
3
4
5
Revenues
Wages
Net Income
Costs

What remains to do?

1. FINISH TO RUN THE PRODUCT INTERVIEWS WITH USERS
2. UPDATE THE BUSINESS MODEL CANVAS 
3. FINISH TO REDACT THE REPORT 

Thank you!

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