

ENERGIA

Design for evolving
scenarios

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cacto



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Abstract

Cacto is a new food-storage product that exploits the natural process of evaporation to create the ideal environment for preserving fruit and vegetables. Cacto promotes a healthier diet aimed at respecting seasonality through the emancipation of food needs from the use of electricity. The product is thought for the rural populations of the Mediterranean basin in 2030 when, due to the rise in temperatures and more widespread dryness, energy poverty will become a primary issue.



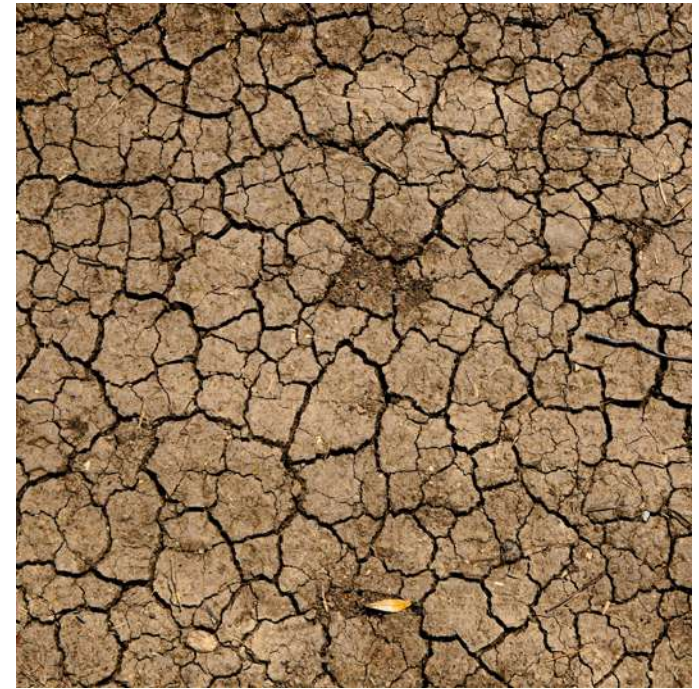
01

Scenario

In ten years, global warming will impact the Mediterranean basin, causing a rise in temperatures and even more widespread dryness. In this context, energy poverty will be more present in rural areas due to both a raising in energy prices and the presence of frequent blackouts due to the necessity of providing continuity of energy to large cities. Food preservation therefore becomes a relevant issue, with the need to find alternative low-tech solutions.

Climate Change

The climate change we are already experiencing will become increasingly significant in the future, leading to a disruption of the natural balance. As the concentration of greenhouse gases increases, the temperature will rise, leading to heat-related illnesses, making outdoor work untenable. Another consequence will be extreme weather events, such as storms and wildfires, which will cause damage, especially to the poorer part of the population. Desertification will advance, and water resources will become increasingly scarce in areas already suffering from water shortage. Among these, the Mediterranean basin will be one of the hardest hit areas by the crisis.



Why the Mediterranean Basin?

For our scenario, we have decided to focus on the Mediterranean basin, as it represents a geographical area that, although it presents differences in traditions and customs, shares a very similar climate, vegetation, and diet. Mediterranean climate is a temperate climate with dry summers; it has mild winters, little precipitation in the colder months, hot and sometimes completely dry summers and high insolation. During these periods, farmers use irrigation systems capable of exploiting both surface and groundwater to grow olives, vines, citrus fruits and cereals.

At the demographic level, in countries such as Italy, Spain, and Greece population growth will be guaranteed by the migratory balance, while in North Africa it will be a consequence of the natural balance.

Internal migratory movements will continue, with an increase in rural exodus and concentration in the largest population centers in smaller households. In addition to this, the age of the population is constantly increasing, leading to the allocation of an increasing portion of public funds to medical and care services.



Food and diet

Climate change will also impact the diet of the Mediterranean population which, although following a healthy and sustainable pattern, will need to be adapted to follow the new natural rhythms. The collection of food from pastoralist, hunting and fishing will decrease due to the reduction of the polar cap of the Arctic and Antarctic regiments. Furthermore, as well as heat stress, the reduction in water availability will negatively impact activities related to agriculture, grazing and animal husbandry. In this context, it will become necessary to switch to a diet based on cereals, vegetables and fruit, to be accompanied very occasionally by more protein-rich (and impactful) products such as meat and fish.

14.5% of the world's CO2 emissions are caused by the cattle industry. If it was a country, it would be the 3rd most polluting country after U.S.A and China.

Cattle industry



5.0 gigatonnes of CO2 produced in 2021

USA



5.1 gigatonnes of CO2 produced in 2021

China



11.5 gigatonnes of CO2 produced in 2021

Energy poverty

In rural areas energy poverty will be a major issue for several reasons: firstly, the scarcity of fossil materials will make it even more necessary to invest in alternative energy sources. However, the shift will be gradual, making it difficult to fully meet all population's needs. This will lead to more and more frequent blackouts, both planned and unplanned, which will primarily affect rural areas, as the continuity of power will have to be guaranteed to the most densely populated population centers. In addition to this, the poorer segments of the population will face increasingly unaffordable electricity bills, thus having to curb their usage and to let go some comforts.



People living in cities with more than one million inhabitants will use between 60–80% of the energy resources.

Concept development

In this scenario, we have identified an area of opportunity for intervention. Energy poverty in rural areas, coupled with the rethinking of a more sustainable diet, creates new design space for rethinking food preservation systems. This led us to a question:

“What if it was possible to create a product that, through a natural preservation method, could keep food fresh without changing its taste and nutritional values?”

Relative Humidity %	Ambient temperature					
	18.3	21.1	23.9	26.7	29.4	32.2
30	9.4	11.1	13.1	15.0	16.9	18.9
40	11.1	13.3	15.3	17.2	20.0	21.7
50	12.2	14.4	16.7	18.9	21.1	23.3
60	13.9	15.6	18.1	20.6	23.1	25.6

MITD-lab, “Evaporative Cooling Technologies for Improved Vegetable Storage in Mali”

<http://d-lab.mit.edu/resources/publications/evaporative-cooling-technologies-improved-vegetable-storage-mali>

Our research led us to the rediscovery of a natural technique used in ancient times to keep food fresh: the evaporative cooling chamber (ECC). This device functions according to a basic principle called “evaporative cooling,” where the evaporation of water from a surface removes heat, creating a cooling effect. The temperature of air is dropped significantly, allowing to decrease the inner temperature up to 15 °C. Evaporative cooling was used to improve vegetable storage shelf life by providing:

- A stable storage environment with low temperature and high humidity, which reduces the rate

of respiration, water loss and spoilage in most vegetables;

- Protection from animals and insects that contaminate and eat the vegetables.

Several key considerations are important for determining if an evaporative cooling device will provide effective cooling and storage. ECCs and clay pot coolers provide the most benefits when they are used in low humidity climates (less than 40% relative humidity), the temperature is relatively high (maximum daily temperature higher than 25 °C), water is easily accessible, and the device can be located in a shady and well-ventilated area.

In order to function, every cooling device needs four basic components:

 **Vase**

The exterior vase needs to be in terracotta or similar material, since its porous surface is key in allowing water to evaporate through its surface.

 **Inner container**

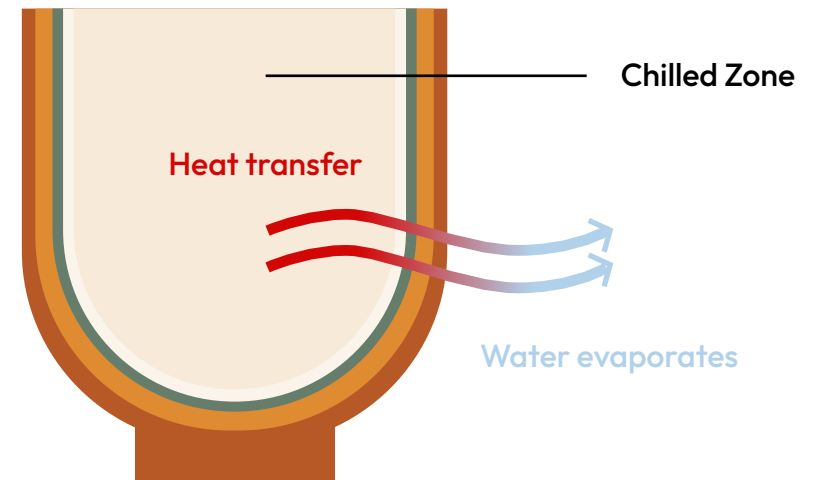
The container for the food can be made of any material that conducts heat. It is better for the container to be waterproof so that it is possible to use also non-drinkable water without risking contaminating the food.





 **Material to hold the liquid**

Sand is often used because it is inexpensive and it has a large surface area, but it's not the only option. The most important features are that it holds lots of water and provides surface area for evaporation.

 **Liquid**

Water is the most practical liquid to use for evaporation. It is readily available and it removes a large amount of heat per kilogram of evaporation as compared to other liquids.



-  Terracotta vase
-  Expanded clay
-  Water
-  Internal container

Today, with the technological advancement of the refrigerator, the technique has almost fallen into disuse. It is mainly used by indigenous people in Central Africa who do not have access to electricity to preserve their crops longer and healthier. They are often supported by NGOs that collaborate in providing technique and knowledge to make these devices. An example is MIT D-Lab, an NGO that works with people around the world to develop and advance collaborative approaches and practical solutions to global poverty challenges.



The discovery of this technique allowed us to add the missing piece to the puzzle. Hence, our concept was born: we intended to use the evaporative cooling device technique to create a natural refrigerator that allows rural populations in the Mediterranean basin to keep fruit and vegetables fresh while fitting in with the lifestyle, needs, and problems of the more developed part of the world.

02



Product

Cacto is a new food-storage product that uses the natural process of evaporation to create the ideal environment for preserving fruit and vegetables.

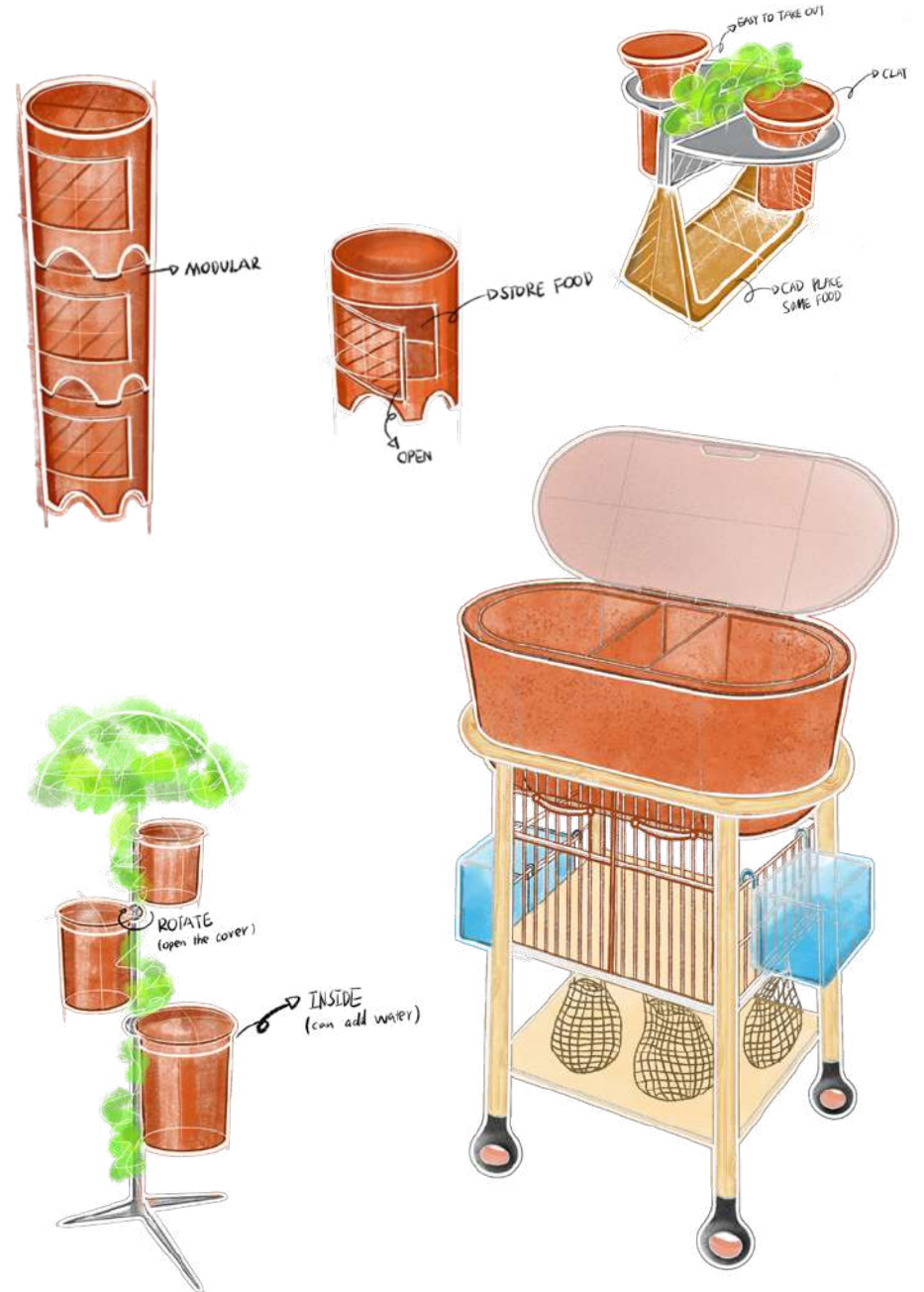
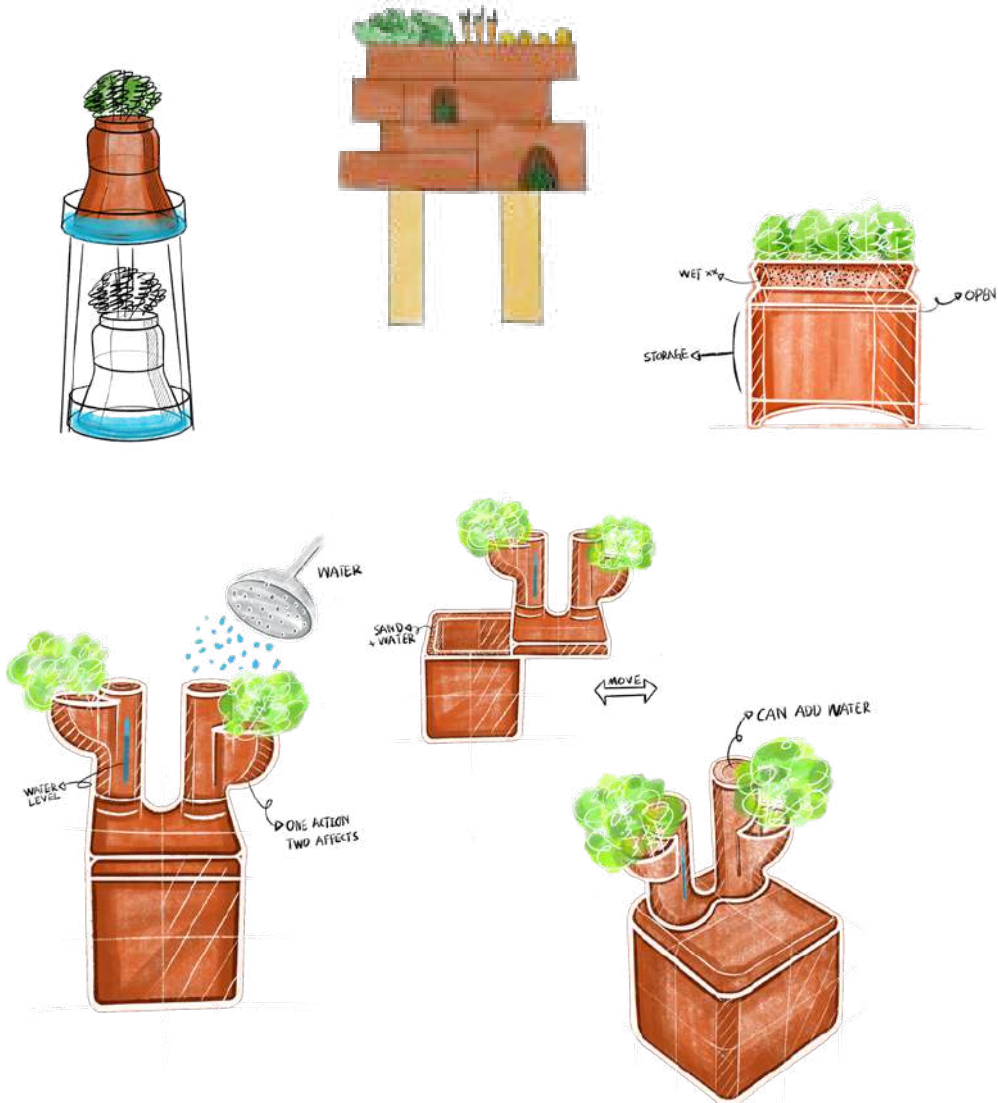
Cacto promotes a healthier diet aimed at respecting seasonality through the emancipation of food needs from the use of electricity, allowing users who live in energy poverty to lower their electricity consumption by giving up the use of the fridge.

Cacto is a new eco-way of preserving food. Thanks to the water evaporation process, it creates a cold environment inside the chamber, allowing to maintain fruit and vegetable fresh at the perfect temperature. The product, other than the cooling chamber, presents an additional basket on the bottom part and a grid where to attach the vases with the herbs.





Design process



Functioning

Terracotta cooler

The core part of the product is constituted by a double layered structure, divided into an external terracotta vase and an internal container. By adding water to the expanded clay that fills the spaces between the inner and outer structure, the process of evaporation will start, absorbing heat from the inner container and lowering the temperature of the inner chamber where fruits and vegetables are placed. At the same time, terracotta is a porous material with a large surface area, allowing water vapor to easily diffuse out with the heat.





Basket

The basket is underneath the fridge, in the lower part of the product, and it is fixed to the product's legs to ensure a stable stand.

The basket has many small round holes on both sides to increase air circulation and allow the user to hang the vases for the aromatic herbs. The height of the front of the basket has been lowered to allow the user to better see and access to the fruit and vegetables.



Herbs

The plant vase can be hung through the small round holes on either side of the basket. The user can choose the position and number of plant vases to be hung, creating in this way a personal combination of aromatic herbs that can be used, for example, to cook or perfume the room.

How to use Cacto

How to divide fruit and vegetables

Not all produce can be stored together because some fruits release ethylene, which can accelerate ripening or reduce the quality by promoting senescence, loss of green color, yellowing, change in texture and flavor, formation of necrotic areas on plant tissues, etc.

For this reason, we divided fruit and vegetables in 4 different categories based on their needs for better preservations:

Ethylene producers (like banana, apple, apricot, pear, rock melon, kiwi, avocado, tomato);

Vegetables that grow straight: Some vegetables grow up straight so storing them laying down make them spoil quickly (carrot, leek, scallion, celery...);

Non-ethylene producers: they stop producing ethylene once they have been picked from the tree (olive, grapes, cucumber, strawberry, raspberry, cherry, citrus fruits, asparagus, peas, legumes, pineapple).

Grown underground: this kind of fresh food is better if kept in a sealed bag in a dark space (onion, garlic, potato, etc).



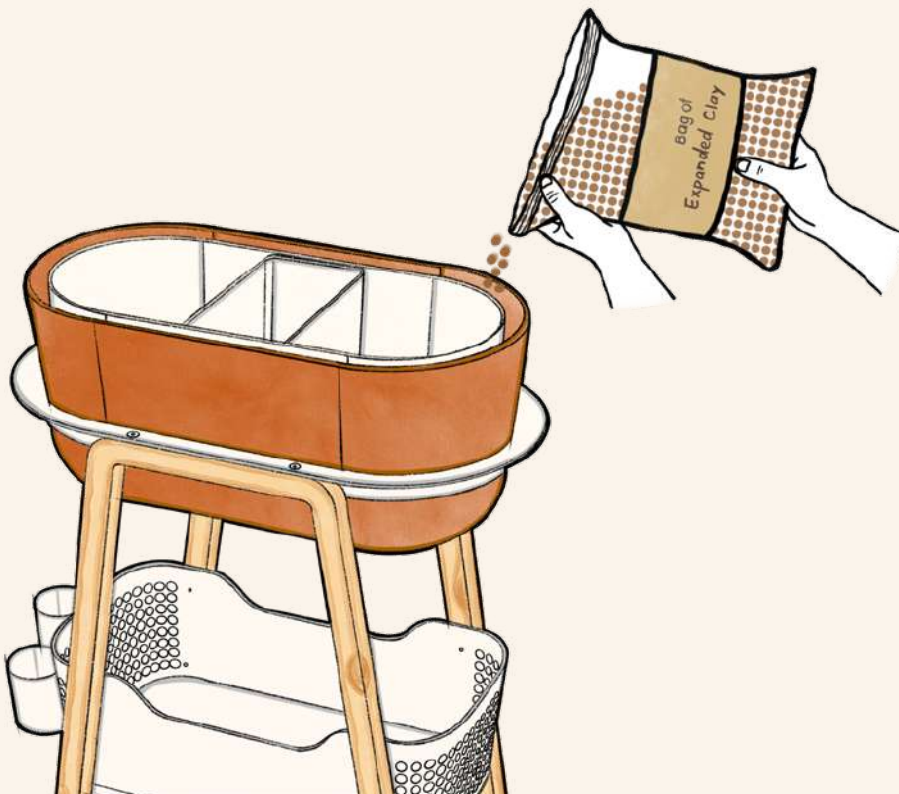


Expanded Clay

When assembling the product, the user fills the space between the external terracotta vase and the inner container with the expanded clay, and then adds some water to it. When the effectiveness of the expanded clay fades with prolonged use, the user should replace it with the new one.

Refill water

During the daily use of the product, the user regularly waters the expanded clay to allow the evaporative cooling process to run smoothly. The small plugs on the frame can be removed, so it is possible to pour water between the wall just using a funnel. In this way, the water will fill all the space by capillary action.



Maintenance


Users can do some action to better maintain the functionality of the product. Users can use a standard sponge to wipe and clean the inside and inner surface of the refrigerator. Just remember to be gentle when wiping or washing the surfaces in order to clean the pores on the outer surface.

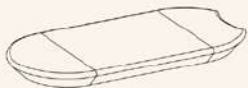
One cleaning cycle every three weeks is possible. If the cooling is not very strong, it means that the pores are clogged by a build-up of dirt or dust, which can be resolved by simply washing the refrigerator. The vases and other components, such as the basket, can be cleaned in the same manner to restore them to their original functionality.





Components and Materials




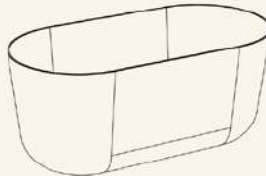
<p>1. Lid</p>	
<p>MATERIAL: PP plastic</p>	
<p>DIMENSIONS: 624x276x20mm</p>	
<p>MANUFACTURE: Injection mold</p>	<p>DESCRIPTION: The lid helps to keep the freshness inside the chamber and keep out insects from flying around the fruit and vegetable. It's completely removable and can be hanged in different ways to the product.</p>

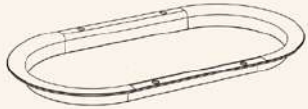
<p>2. Small plugs (x4)</p>	
<p>PP plastic</p>	
<p>DIMENSIONS: 40x20x3 mm</p>	
<p>MANUFACTURE: Injection molding</p>	<p>DESCRIPTION: The small plugs close the holes in the frame and are easily removable with the use of the nail.</p>


<h3>3. Frame</h3>	
<p>MATERIAL: PP plastic and silicon</p>	
<p>DIMENSIONS: 700x360x15 mm</p>	
<p>MANUFACTURE: Injection molding</p>	
<p>DESCRIPTION: The frame closes the space between the terracotta vase and inner chamber, making the watering accessible only by the small holes covered by the plugs. This enhances the efficiency of the evaporation process and hides the expanded clay from the user's view.</p>	

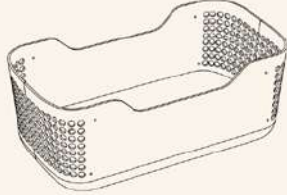
<h3>4. Sliding container</h3>	
<p>MATERIAL: Aluminium</p>	
<p>DIMENSIONS: 287x150x261 mm</p>	
<p>MANUFACTURE: Milling and deep drawing</p>	
<p>DESCRIPTION: The sliding container separated the inner chamber in three spaces, and while sliding, it can adapt the product to different needs of the user. Inside the container, the user can place their vertical vegetables.</p>	


<h3>5. Inner container</h3>	
<p>MATERIAL: Aluminium</p>	
<p>DIMENSIONS: 644x300x325 mm</p>	
<p>MANUFACTURE: Milling and deep drawing.</p>	
<p>DESCRIPTION: The inner container is where the user will place the food. We used aluminum because it's an excellent heat conductor and it is easy to clean, making it more hygienic for the food.</p>	

<h3>6. Terracotta vase</h3>	
<p>MATERIAL: Terracotta</p>	
<p>DIMENSIONS: 700x360x300</p>	
<p>MANUFACTURE: Moldin and firing</p>	
<p>DESCRIPTION: The vase is the main part of the product. Its porous surface allows the evaporation of water and so the functioning of the product. Its walls are slightly inclined with the same angulation of the ring: in this way it can be supported freestanding.</p>	

<p>7. Metal ring</p>	
<p>MATERIAL: Aluminium</p>	
<p>DIMENSIONS: 767x412x45 mm</p>	
<p>MANUFACTURE: Milling and drawing</p>	
<p>DESCRIPTION: The ring is the key component of the product. It gives stability to the structure and helps connect the legs. It supports the terracotta vase through gravity thanks to the slightly inclined inner side, that embraces the product without damaging it.</p>	

<p>8. Legs (x2)</p>	
<p>MATERIAL: Silver fir wood</p>	
<p>DIMENSIONS: 654x40x960 mm</p>	
<p>MANUFACTURE: Milling and gluing from three pieces (two sides and top)</p>	
<p>DESCRIPTION: The legs help to support the product, making it into a piece of furniture that can be placed inside the house. The inclination help to better distribute the weight and keep the fridge balanced. The legs are attached to the metal ring through two pair of screws.</p>	

<p>9. Basket</p>	
<p>MATERIAL: Aluminium</p>	
<p>DIMENSIONS: 650x330x250 mm</p>	
<p>MANUFACTURE: Laser cut and deep drawing.</p>	
<p>DESCRIPTION: The basket has a double function: it can be used to put the extra fruits and vegetables that can stay at ambient temperature and are more frequently used. Other than this it has a structural purpose in keeping the legs united avoiding the spreading and granting stability to the product.</p>	

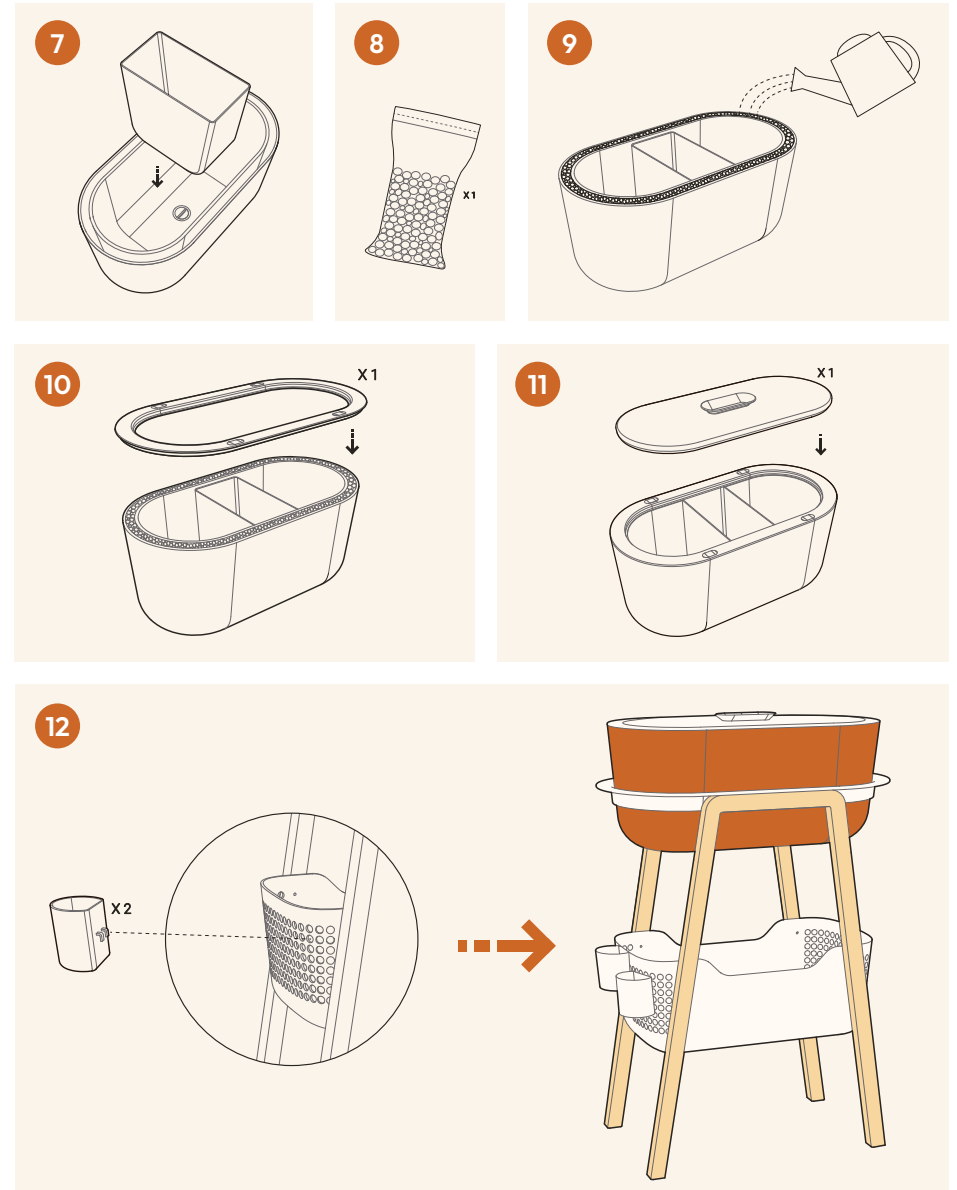
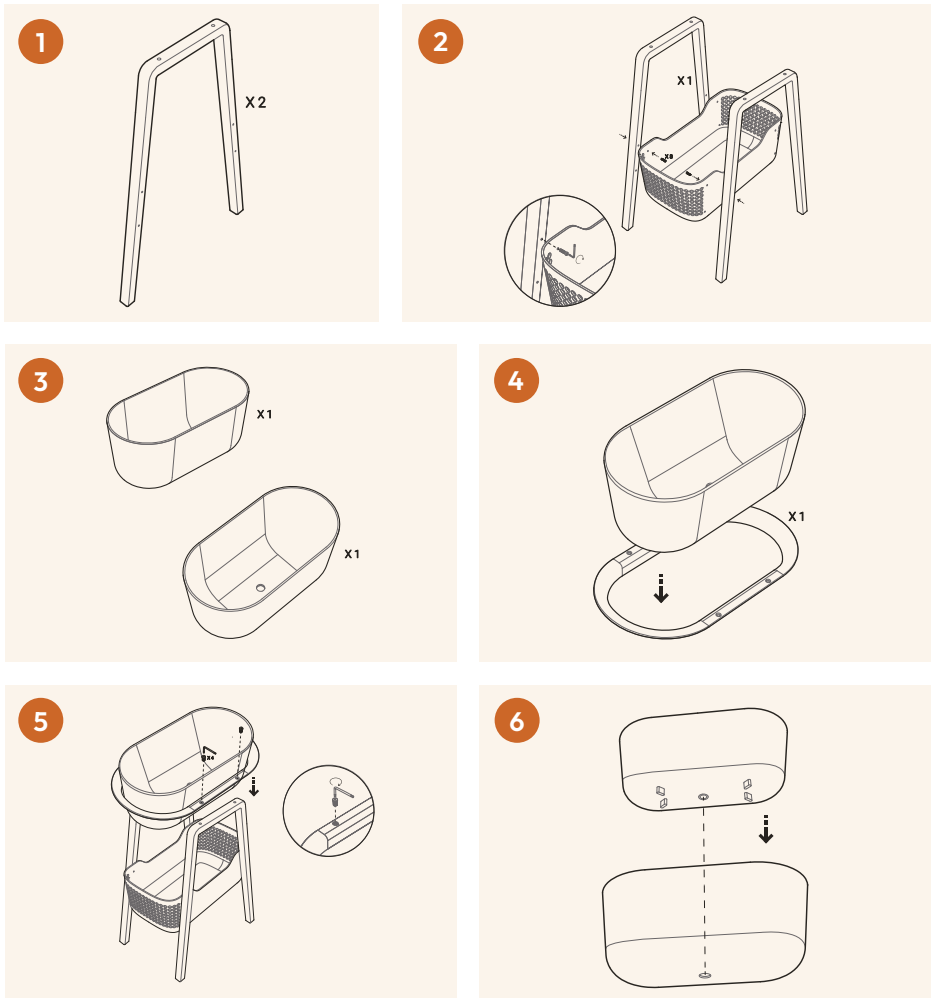
<p>10. Herbs vase</p>	
<p>MATERIAL: PP plastic</p>	
<p>DIMENSIONS: 85x90x100 mm</p>	
<p>MANUFACTURE: Injection molding</p>	
<p>DESCRIPTION: The vases can be attached to the basket's grid through the hooks placed on the back, making them adherent to the surface. The user can use them to grow herbs, and can move them, creating always new composition in the grid.</p>	

Customization

Customers can choose one of our three available style options for Cacto, or they can select any color from the brochure listed in the customization section of the website. As a result, consumers can personalize the product in accordance with their preferences, which is the first step toward customization that will bring them much closer to the product's desired appearance without compromising quality.



Assembling instructions



Packaging

The packaging we designed does not need glue, it works by interlocking folds so that the user, once the components of the product will be removed, can be able to fold it easily to keep it.

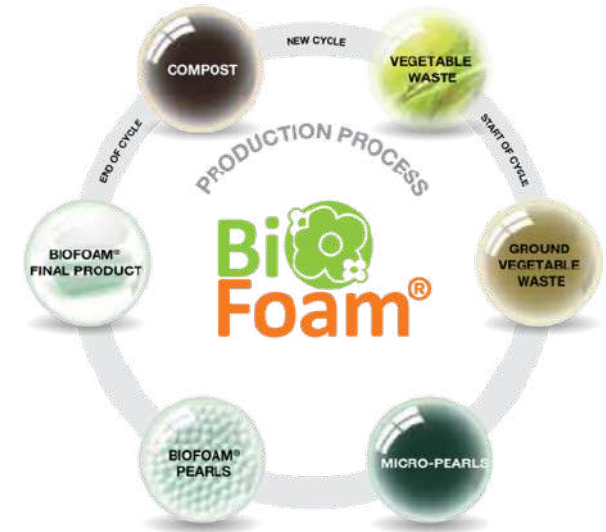
The external graphics present the essential information (i.e. the name of the product and its shape, a section where the functioning and purpose of Cacto are described and another where the values of our company are mentioned). Inside the packaging there is BioFoam, a completely biodegradable foam solution with properties similar to EPS to protect the product during transport.



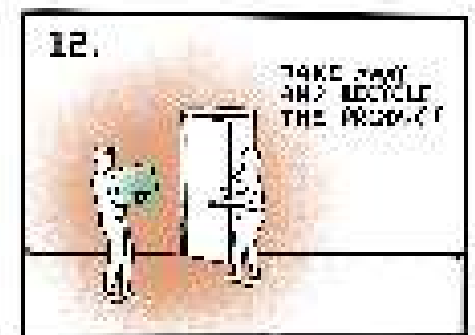
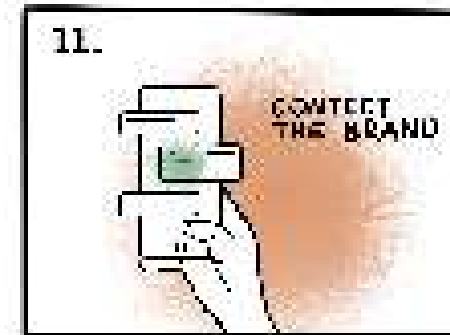
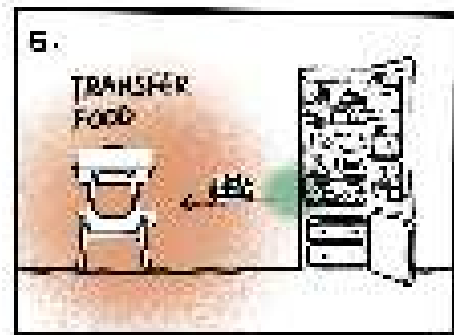
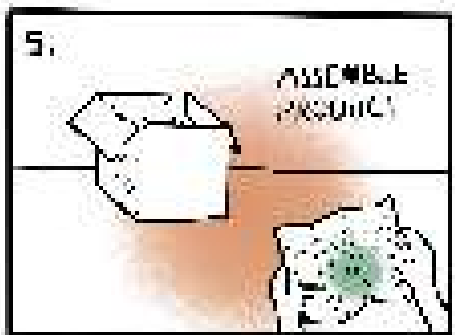
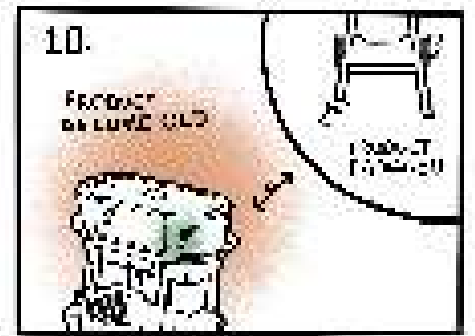
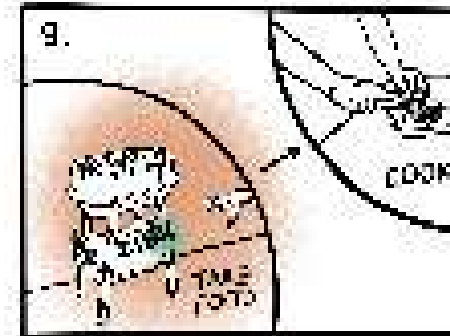
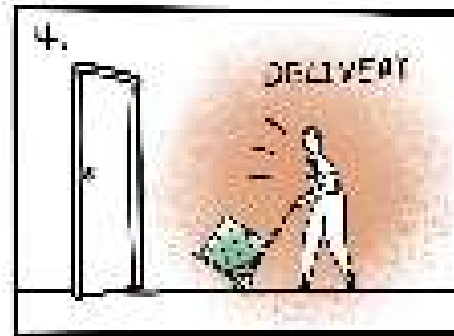
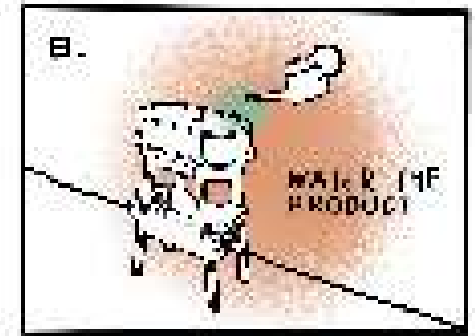
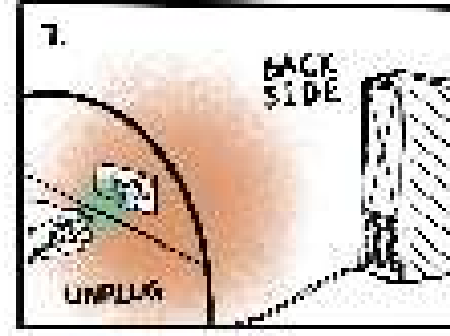
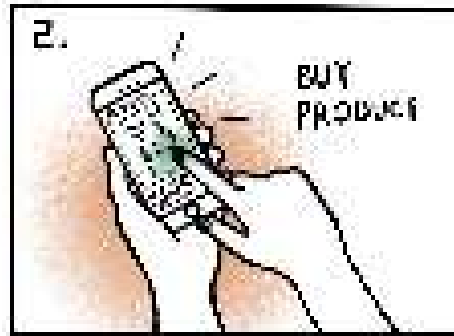


For packing the fragile components of our product like the terracotta vase we need a material that can absorb shocks, soft textured, insulator and semi-rigid. Expanded polystyrene (EPS) is frequently used because it has these properties, but it is a non-biodegradable material and hazardous to the nature. We decided to use Biofoam, a material similar in characteristics to EPS, with the distinction that EPS is created

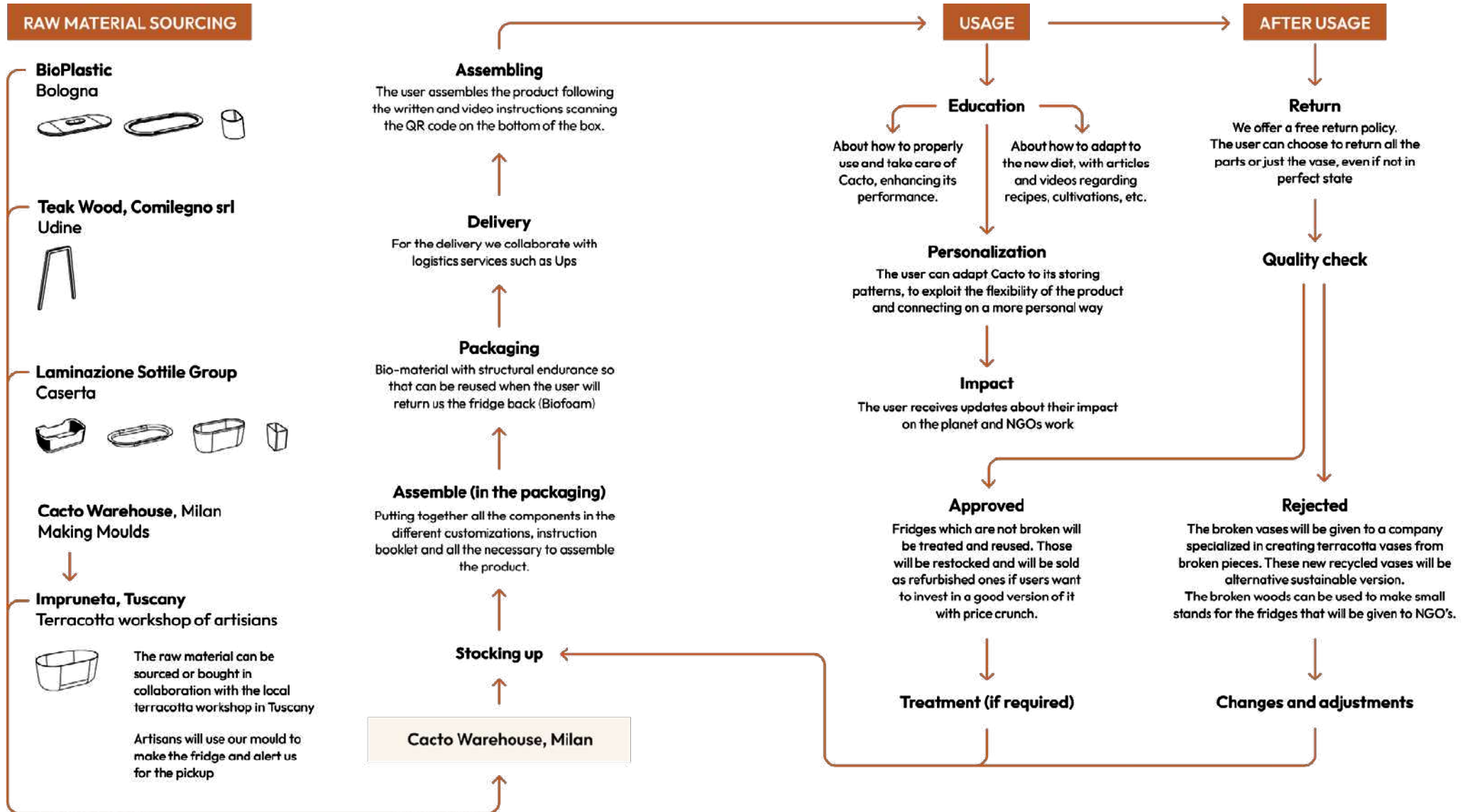
using polymers based on fossil-based resources (a finite resource), while Bio foam's raw material is made from biopolymers which are created from plant resources, an infinite resource. Synthesized foams can have a wide range of material features and characteristics. These make them appropriate for packing, insulation, and other uses because of their changeable nature.



Storyboard



Product Lifecycle



Cacto's impact



Diet

Having a plant-based and balanced diet can improve your health and reduce the production of CO2 of intensive farming.



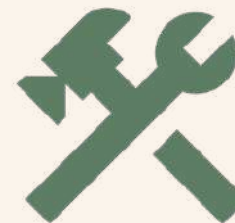
Logistics and production

All the materials are sourced in the Mediterranean basin, and we collaborate with companies that are sustainable according to the ESG ratings.



Energy saver

Cacto is thought to substitute the fridge, so the user can keep using only the refrigerator. In this way every product helps to save up to 700kWh per year.



Restoring

Other than create new products, in the Cacto's warehouse we are specialized in restoring old ones, reselling them as refurbished products at half price.

03



Service

From its creation until its disposal, the service of our product is carefully structured to maximize its worth. Every one of the components comes from the Mediterranean, ensuring its originality and eco-friendly nature. By working with NGOs such as the WFP (UN), we make sure that the product can be delivered freely also to those who cannot afford it and need it the most in the poor areas of North Africa. Customers will be informed of the extent of the influence their purchase has had on the planet as a whole.

Service overview

Our service is made of three main parts: the first regards the production of the components. All the materials are outsourced and worked in collaboration with local terracotta workshops and low-impact (according to ESG ratings) companies. This partnership enables us to promote and raise awareness of the green technology that is currently in demand, and it allows enough flexibility to grant the users the chance to personalize their product, changing colors and materials creating their own version of the product. Every one of our clients is a part of a larger vision to which they all contribute. With the purchase of each refrigerator, we save a portion of the profit to finance the production of alternative versions of Cacto that are given to NGOs like WFP that work

in providing food services to poor countries. In this way, the impact will be extended outside the action of saving energy, and it will regard improving the condition of life of poorer populations without access to clean energy. We are aware of the significant environmental threat posed by appliance waste, so we take steps to address it in the third major component of our service, using the circular economy system. After the fridge has been used, customers can return the unit, which is then upcycled to the greatest extent possible and subjected to the necessary processing before being sold as second-hand products to customers looking for a more affordable and dependable model.



Outsourcing and customization



Collaboration with NGOs

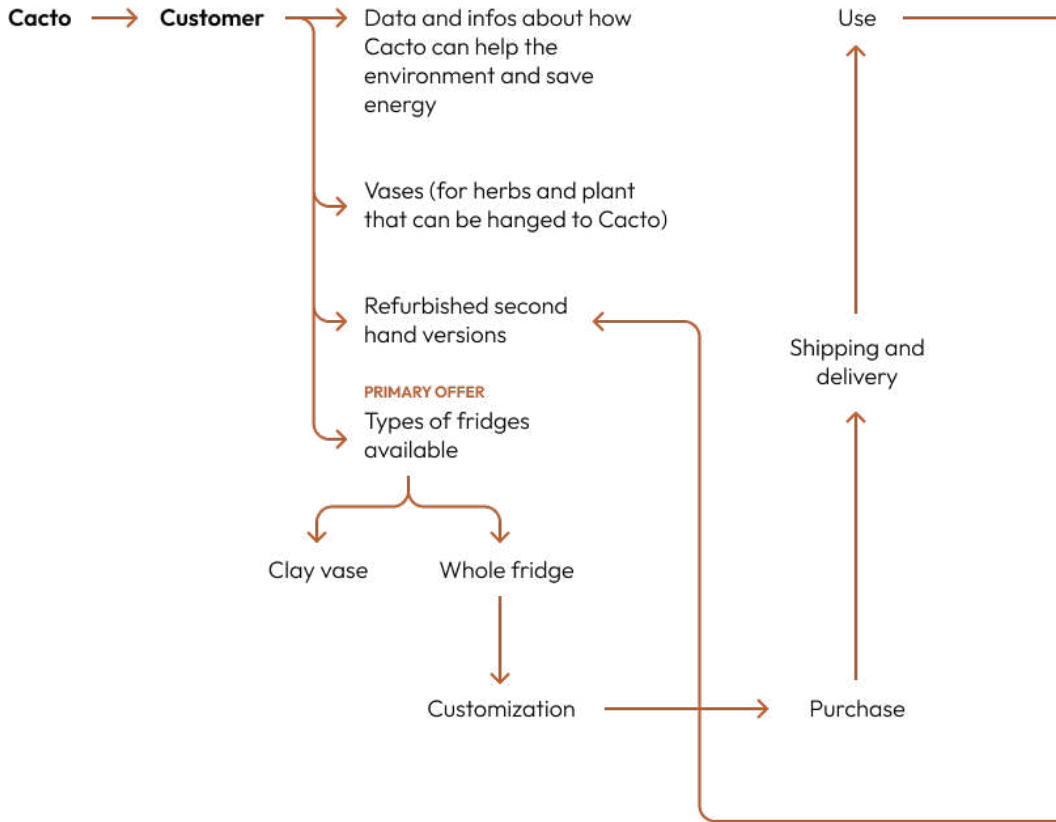


Circular economy system

Offering map

PRIMARY CUSTOMER

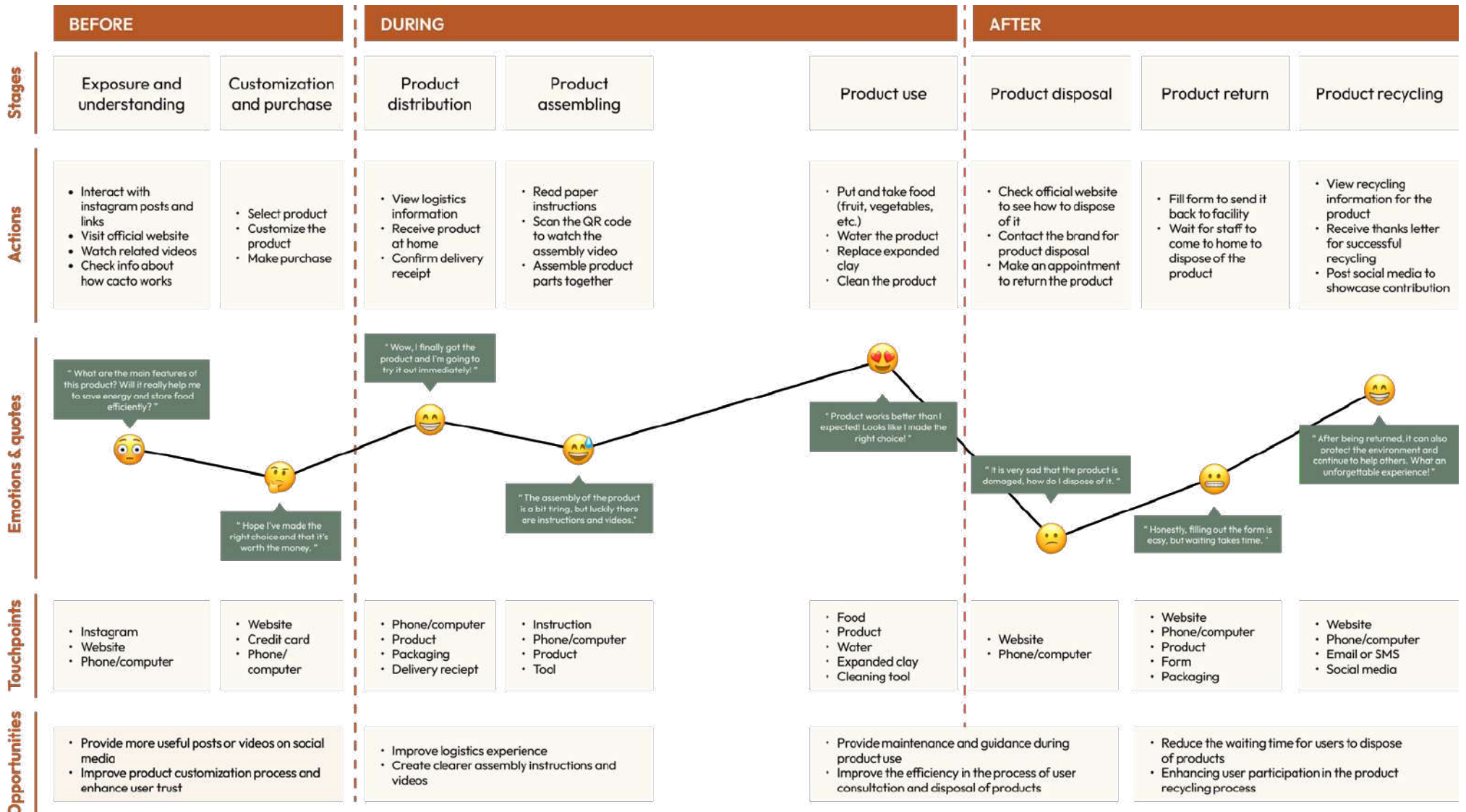
Customization and delivery



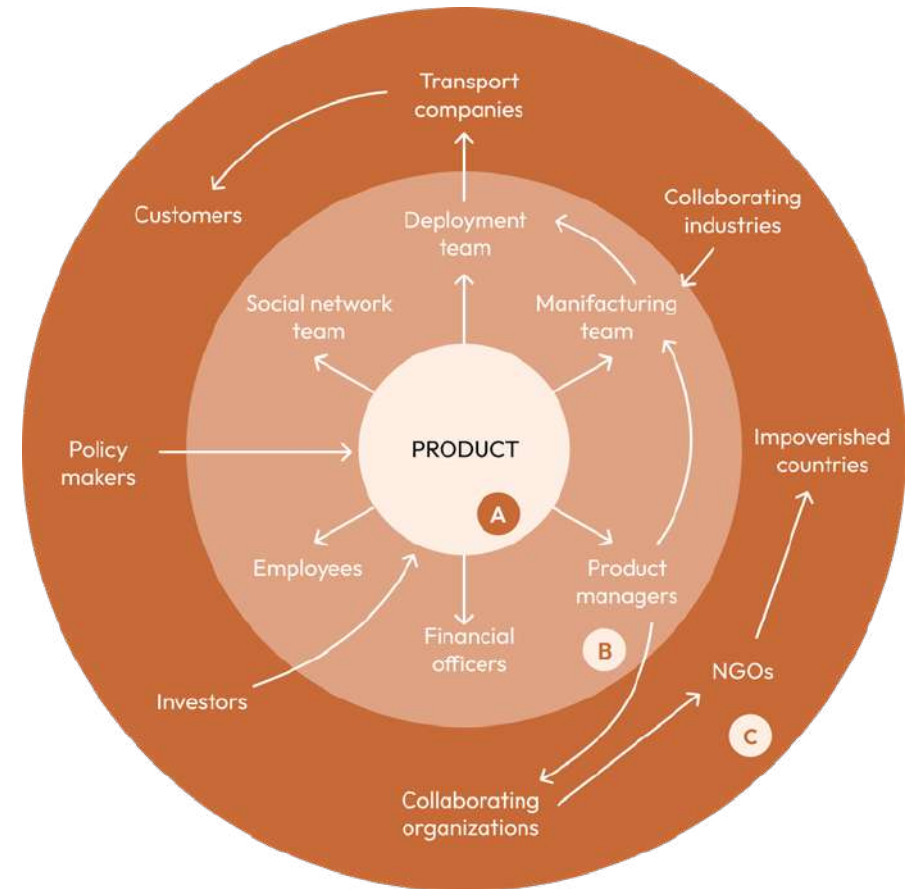
NGOs OFFER



User Journey



Stakeholder map



The stakeholders map is a visual representation of all the stakeholders involved in our service and in the making or use of our product. The map is divided in three circles that represent three different sectors of our service: the product, the internal stakeholders (people that work inside our company) and external stakeholders (people that work in collaboration with our company or offer a service to us, and customers that interact with our product).

The stakeholders are not isolated from each other, but are connected and work together to create our service.

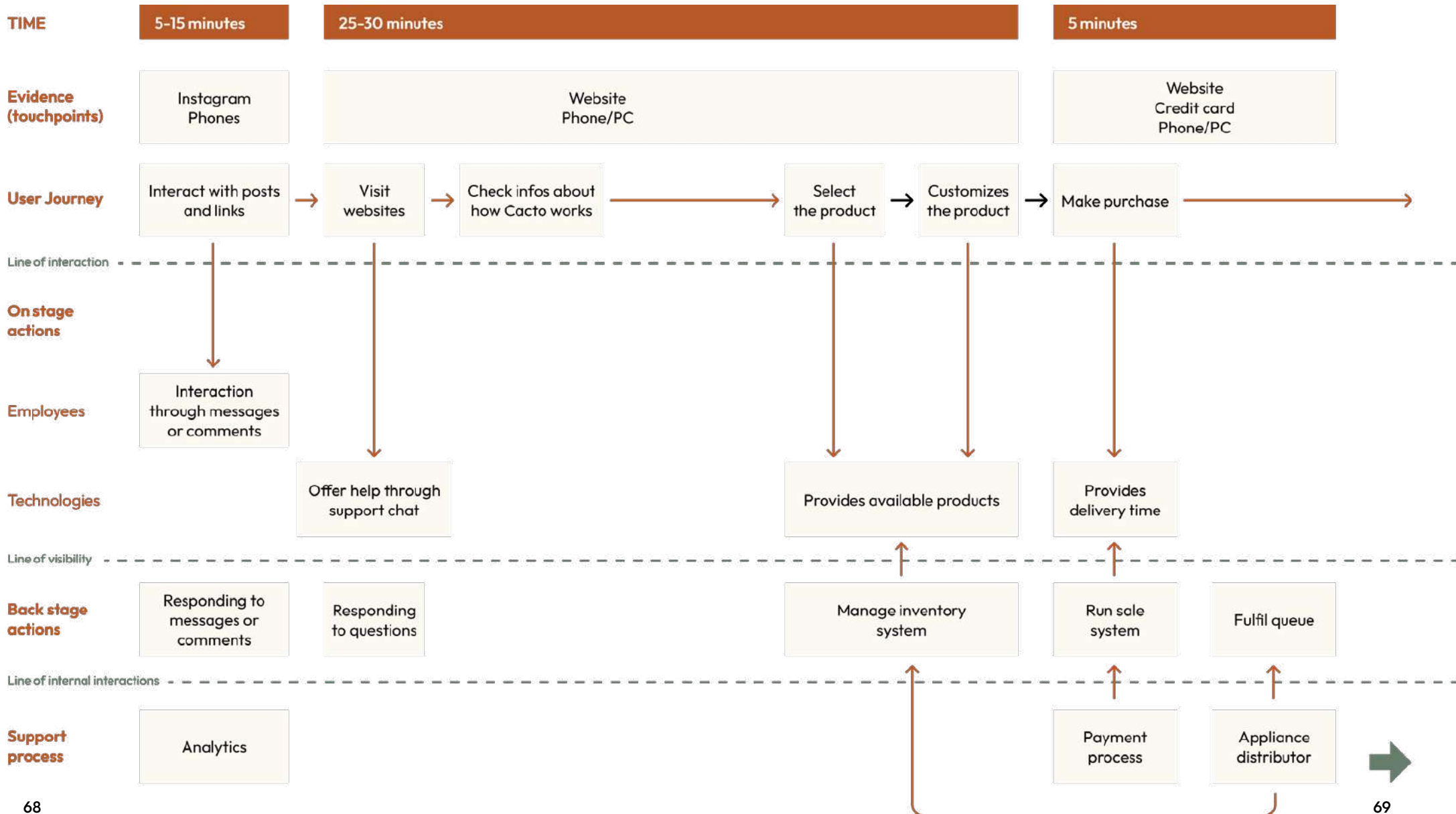
B) Internal stakeholder

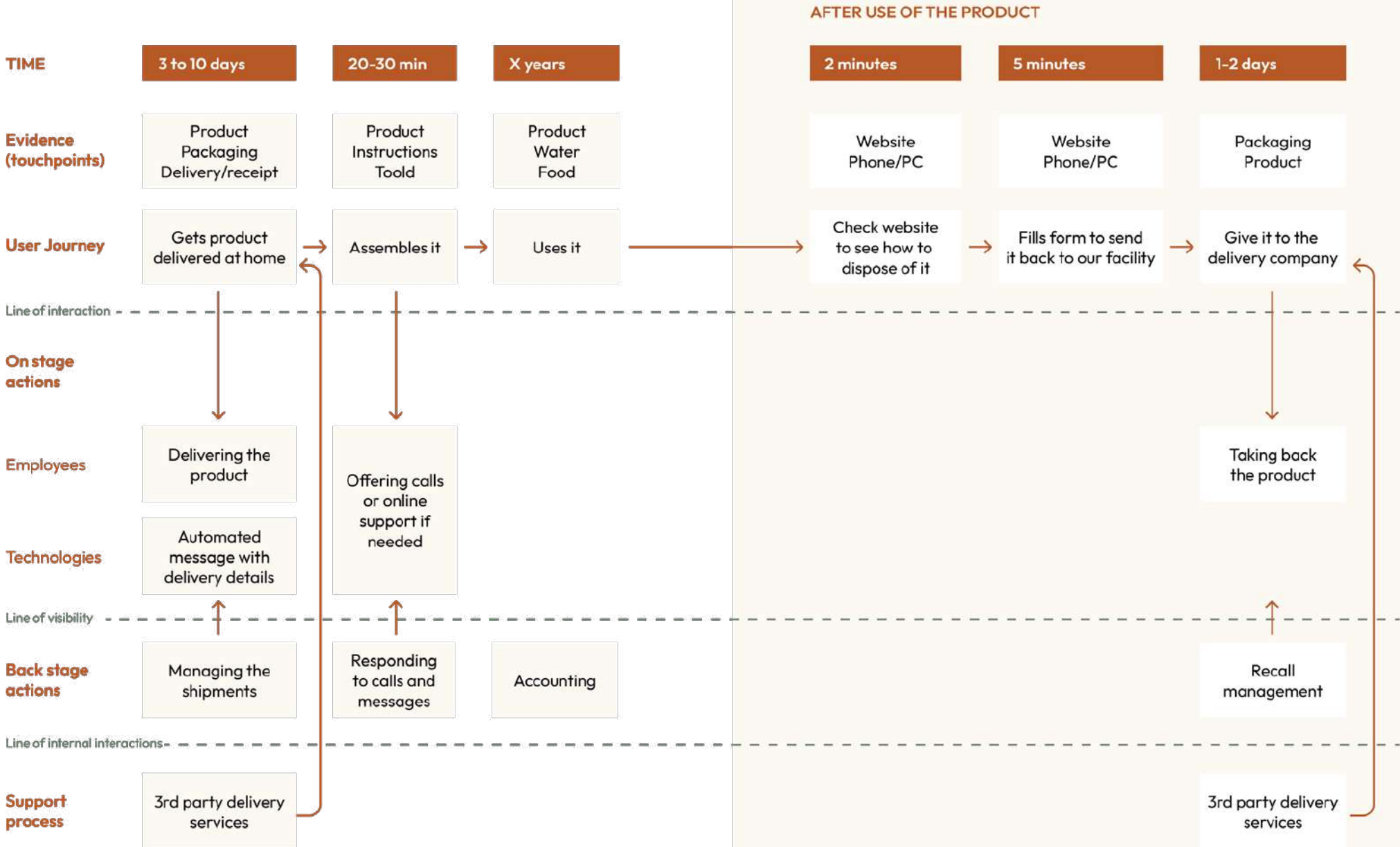
1. Employees
2. Product Managers
3. Financial Officers
4. Transport Company
5. Deployment Team
6. Manufacturing Team

C) External stakeholder

1. Policy Makers
2. Investors
3. Collaborating Organizations
4. NGOs
5. Impoverished People
6. Collaborating Industries
7. Transport Company
8. Customers

Service Blueprint





04



Brand

Cacto is a brand which aims to help people embrace a new and more sustainable way of living, synthesized in the brand's values, through the change of food consumption and diet. The communication of Cacto is, at the same time, straightforward and ironic, bold but minimal, developed both through physical and digital touchpoints.

Vision

We imagine a future in which people embrace a new way of living based on a re-acquired relationship with nature. Cacto is a product service system that helps and motivates people to adopt this way of living.

Mission

Cacto provides an alternative, energy free and sustainable solution to food storage that can help people suffering from energy poverty preserving their food longer thanks to the terracotta cooler and promotes a more sustainable diet based on fresh products.

This solution can be adopted for need or willing and, also, Cacto collaborates with NGOs to distribute this simple but effective preservation method in developing countries in which electricity isn't always accessible, helping also to reduce food waste.



Responsibility



Sustainability



Connection with nature



Circularity

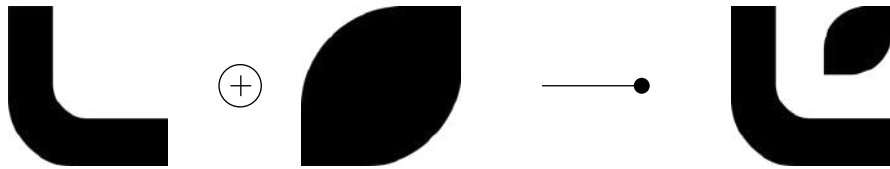
Why Cacto?

The naming Cacto borns as a modified version of the word cactus. Cactuses are plants known for their incredible ability to survive in a hot and dry environment like the desert, where water is very hard to find. For this reason, some plants have found different ways to reduce their water consumption and save it. Cactuses in particular, during rainy season, absorb more water than they need and store it in dedicated areas like leafs and roots for the drier seasons.



Logo

The design process behind the logo for Cacto was to find a clean and iconic symbol that could unify the distinctive shape of the terracotta cooler and a referral to the values of our brand.



Product shape

Leaf



Our claim

“Saving energy starts with food”

The claim is a clear and direct statement that addresses the main purpose of cacto. For saving energy, people have to take on the challenge proposed by cacto and try to change their food consumption patterns and food storage methods. The food industry is, in fact, one of the most energy consuming and polluting active industries in the world.

**Saving energy
starts with food**

Typography

The primary and only font used for the visual identity of Cacto is Outfit, a clean and modern sans-serif font characterized by highly rounded shapes. Outfit keeps great readability at smaller sizes and weights.

Outfit

Designed by On Brand Investments Pty Ltd, Rodrigo Fuenzalida

Aa

AaBbCcDdEeFfGgHhIiLlMmNn
OoPpQqRrSsTtUuVvWwXxYyZz
1 2 3 4 5 6 7 8 9 0 ! ?

Colour palette

The color palette used for Cacto is composed of 4 colors which aim to recall earthy and natural feelings of the product and brand.

#B65927 R:182 G:89 B:39	#DF8B31 R:182 G:139 B:49
#F7EAD9 R:247 G:234 B:217	#667D6B R:102 G:125 B:107

Saving energy
starts with food.

 cacto



Store food, save energy


The first campaign proposed for Cacto is strictly related to the core elements of the visual identity of the brand: the claim and the leaf, part of the logo. In this series of posters, the leaf of the logo is used as a clipping mask to contain food and so to recall the main purpose of Cacto: storing food. The typographic element is the real core of the campaign and, through the brand's claim, wants to communicate and to stimulate the viewer to join the community of Cacto, and start having a real impact.





Saving energy
starts with food


www.cacto.it

 cacto



Saving energy
starts with food


www.cacto.it

 cacto



Saving energy
starts with food

www.cacto.it

 cacto

This is not ...

“This is not ...” is, instead, a self-ironic and bolder campaign for Cacto, developed directly from our design process. While designing Cacto, in fact, the team made many ironic analogies between ours and existing products which were then translated into this advertising campaign. The “This is not ...” copies are the main graphic and meaningful elements of the posters, stating what the product is not and an action which links the two compared products. At the bottom of the artifacts, a QR Code links the physical touchpoint to the website, where people can delve into the product-service system.



cacto



This is not
a **bbq**

but it keeps your veggies tasty



cacto



This is not
a **cradle**

but it takes care of your food



cacto



This is not
a **vase**

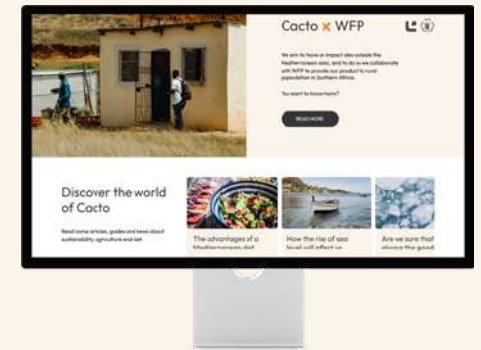
but you can water it



Website

The website has a home page that initially invites the user to explore the purchase section, where you can buy Cacto in its various versions and proceed with product customization. Another important function of the site is to inform customers about how Cacto works and, above all, its environmental benefits. To accomplish this, some screens show various data regarding, for example, the amount of energy and CO2 that Cacto saves. To inform buyers of the relationship between our company and the NGOs

dealing with the distribution of food in developing countries, it has been inserted a section called Cacto x WFP (UN World Food Program), where users can discover how this part of the service works and how the company can distribute the product for free to these communities. Lastly, a section called "The world of Cacto" presents the user with a series of articles regarding diet, climate change and nature to help him adapt to the new lifestyle faster and keeping hi inform about the planet's conditions.





Social media

With our social media campaign, we have three main goals: the first one is to keep our users informed about the impact they made and share this information to potential customers. The second one is to promote Cacto with photos of products and its perks, while the third one is to share broader information about the climate change and Mediterranean diet, engaging the user and keeping them informed about these topics.



Annexes













EVOLVING
for climate