Opener of water-gel container

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ANTONINO X
Opener of water-gel container

Advisor: Prof. Cristian Campagnaro
Candidate: LIU TONG
CHEN YUQUN
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01. THE SOURCE OF THE DESIGN
1.1 Introduction of Multiple Sclerosis & AISM Center

What is multiple sclerosis?

Multiple sclerosis (MS) is a demyelinating disease in which the insulating covers of nerve cells in the brain and spinal cord are damaged. This damage disrupts the ability of parts of the nervous system to communicate, resulting in a range of signs and symptoms, including physical, mental, and sometimes psychiatric problems. Specific symptoms can include double vision, blindness in one eye, muscle weakness, trouble with sensation, or trouble with coordination.

MS takes several forms, with new symptoms either occurring in isolated attacks (relapsing forms) or building up over time (progressive forms). Between attacks, symptoms may disappear completely; however, permanent neurological problems often remain, especially as the disease advances.

Fig. 1.1.1-In MS, the central nervous system is attacked, damaging the myelin covers of nerve cells.

While the cause is not clear, the underlying mechanism is thought to be either destruction by the immune system or failure of the myelin-producing cells. Proposed causes for this include genetics and environmental factors. MS is usually diagnosed based on the presenting signs and symptoms and the results of supporting medical tests. There is no known cure for multiple sclerosis. Treatments attempt to improve function after an attack and prevent new attacks. Medications used to treat MS, while modestly effective, can have side effects and be poorly tolerated. Physical therapy can help with people’s ability to function. The long-term outcome is difficult to predict, with good outcomes more often seen in women, those who develop the disease early in life, those with a relapsing course, and those who initially experienced few attacks. Life expectancy is on average 5 to 10 years lower than that of an unaffected population.

Fig. 1.1.2-Multiple Sclerosis: Understanding the Patient’s Information Navigation Journey
Multiple sclerosis is the most common immune-mediated disorder affecting the central nervous system. In 2015, about 2.3 million people were affected globally with rates varying widely in different regions and among different populations. That year about 18,900 people died from MS, up from 12,000 in 1990.

The disease usually begins between the ages of 20 and 50 and is twice as common in women as in men. MS was first described in 1868 by Jean-Martin Charcot. The name multiple sclerosis refers to the numerous scars (sclerae—better known as plaques or lesions) that develop on the white matter of the brain and spinal cord.

A number of new treatments and diagnostic methods are under development.
A person with MS can have almost any neurological symptom or sign, with autonomic, visual, motor, and sensory problems being the most common. The specific symptoms are determined by the locations of the lesions within the nervous system, and may include loss of sensitivity or changes in sensation such as tingling, pins and needles or numbness, muscle weakness, blurred vision, very pronounced reflexes, muscle spasms, or difficulty in moving; difficulties with coordination and balance (ataxia); problems with speech or swallowing, visual problems (nystagmus, optic neuritis or double vision), feeling tired, acute or chronic pain, and bladder and bowel difficulties, among others.

Difficulties thinking and emotion—due to exposure to higher than usual temperatures, and Lhermitte’s sign, an electrical sensation that runs down the back when bending the neck, are particularly characteristic of MS. The main measure of disability and severity is the expanded disability status scale (EDSS), with other measures such as the multiple sclerosis functional composite being increasingly used in research.

These are the social, psychological, and job-related problems of life with MS.
• If MS makes it hard for you to walk or drive, you may not be able to do your job well.
• Because it’s tough to get around and hard to talk to people about what life with a chronic disease is like, you may not be as social as you once were.
• You could get depressed. It’s a byproduct of the changes MS makes in your brain and in your life.
The condition begins in 85% of cases as a clinically isolated syndrome (CIS) over a number of days with 45% having motor or sensory problems, 20% having optic neuritis, and 10% having symptoms related to brainstem dysfunction, while the remaining 25% have more than one of the previous difficulties. The course of symptoms occurs in two main patterns initially: either as episodes of sudden worsening that last a few days to months (called relapses, exacerbations, bouts, attacks, or flare-ups) followed by improvement (85% of cases) or as a gradual worsening over time without periods of recovery (10–15% of cases). A combination of these two patterns may also occur or people may start in a relapsing and remitting course that then becomes progressive later on. Relapses are usually not predictable, occurring without warning. Exacerbations rarely occur more frequently than twice per year. Some relapses, however, are preceded by common triggers and they occur more frequently during spring and summer. Similarly, viral infections such as the common cold, influenza, or gastroenteritis increase their risk. Stress may also trigger an attack. Women with MS who become pregnant experience fewer relapses; however, during the first months after delivery the risk increases. Overall, pregnancy does not seem to influence long-term disability. Many events have been found not to affect relapse rates including vaccination, breast feeding, physical trauma, and Uhthoff’s phenomenon.
The Italian Multiple Sclerosis Society (AISM) is the only organization in Italy that addresses every aspect of multiple sclerosis (MS), through advocating for the rights of people with MS and providing services and through orienting, promoting, and financing scientific research.

MS is among the most common major diseases of the central nervous system. It is chronic, unpredictable, progressive and can lead to serious disability. MS is diagnosed in young adulthood, typically between 20 and 40 years of age and women are diagnosed nearly three times as often as men. The type and severity of symptoms as well as the disease course varies from one person to another. In Italy there is a person diagnosed with MS every 3 hours.
AISM was founded in 1968 with the objective of advocating for the rights of people with MS, and over time has become the principle resource not only for people with MS, but for families, healthcare professionals and anyone involved in the fight against this disease.
AISM places great importance on the RIGHTS of people with MS in order to assure their full inclusion in society. Through a continual dialogue with key stakeholders, including government representatives and legislators, AISM invests in a tangible advocacy plan that promotes programs and actions to improve the political, social and healthcare landscapes. The plan directly focuses on bettering legislation in order to improve the quality of life of people with MS and those with other illnesses and disabilities.

A commitment to providing information, increasing awareness and improving knowledge about MS is based on a continual dialogue with people living with the disease in order to understand their needs and expectations. This dialogue contributes to intensifying the MS Movement and has had not only an impact on the MS community, but on society as well.

Today the MS community, through collective action coordinated by AISM, is capable of drawing increasing attention to this complex disease that represents a social and health crisis for the country. The challenges of MS can be faced and overcome together. This is possible thanks to all of the women and men, young people, activists, volunteers, members, scientists, donors, healthcare professionals and every other stakeholder who has chosen to be by our side.

The priceless amount of effort, time, expertise and commitment given every day are the ingredients that make the MS Movement great.
Multiple sclerosis (MS) is a demyelinating disease in which the insulating covers of nerve cells in the brain and spinal cord are damaged. This damage disrupts the ability of parts of the nervous system to communicate, resulting in a range of signs and symptoms, including physical, mental, and sometimes psychiatric problems.

Specific symptoms can include double vision, blindness in one eye, muscle weakness, trouble with sensation, or trouble with coordination.

MS takes several forms, with new symptoms either occurring in isolated attacks (relapsing forms) or building up over time (progressive forms). Between attacks, symptoms may disappear completely; however, permanent neurological problems often remain, especially as the disease advances.

The provincial section of Turin is located in the territories for more than twenty years. Numerous volunteers have been historical thanks to whom AISM have achieved or obtained results in the Turin area. Results that have led to one of the largest centers in Italy. The AISM Center “Il Fortino” of Turin goes to implement a widespread network of services that the Italian Multiple Sclerosis Association provides throughout the Italian territory to improve the quality of life of people with MS.
1.2 The process of the workshop

Politecnico di torino & AISM center workshop

The workshops of polito provide an opportunity to address practical and extemporary design experiences. The main features of a workshop are the limited duration (one week) and the presence, as tutors, of professionals from atypical sectors that are close to the design area. Active participation, sharing of ideas and the collective experimentation of new solutions in a short amount of time make the workshop an essential educational experience for young designers. The collaboration with internationally renowned companies is also a professional opportunity for students to confront themselves with the world of work.

Master’s workshops face the issues of social design, starting from users’ needs, behaviours and cultural approaches, and the context they live in. Within the workshop, students will look for solutions to improve the quality of life of the people involved. They will experiment new ways and tools to provide answers to the analysed social challenges.

“DESIGN FOR EACH ONE” & AISM

A creative and experiential “journey” through the world of motor disability. From the construction of the report to the conception (and co-construction) of assistive products, the path provides workshop experiences in a group with the aim of satisfying concrete needs and facilitating daily gestures.
2017 workshop in AISM center

01Day  **Relationship Creation**
Learn about multiple sclerosis and the AISM Center
Observing the living conditions of patients in the center and discovering the difficulties in their lives

02Day  **Difficulty Analysis**
Find out more about their needs through activities and communication with patients, find difficulties, and come up with ideas

03Day  **Co-construction/Co-design**
Establish a design concept and production plans, discuss and collaborate in small groups, and prepare materials

04Day  **Prototype Construction**
Make product models with materials and tools and let patients have a trial with final model

05Day  **Workshop Presentation**
Design user:
Antonio Cataldi

Design reasons:
Because of the special diet, Antonio needs someone to help to tear the food-gel container lid and eat.

Design goal:
Design a tool to help Antonio open the lid of the food-gel independently.
The initial idea of our workshop design is to create an effortless and easy-to-open water-gel opener based on Antonio’s condition. The circular cutting method of the traditional bottle opener is not suitable for muscleless users, so we use the method of pressing to cut water-gel container lid.

Place the sawteeth inside the opener, which is safe to use and can be easily cut out lid with the weight of the hand.

The water-gel opener has a small above and big below shape, and the lower circular opening is larger than the container diameter for positioning and the opener can be placed around the container.

The upper circular cover has the same diameter as the container lid, and is easy to use when going down by hand pressure, the top bracelet can put your hand into the gap between it and the round cover, making it easier to take.
The time of the workshop is limited. We used the pvc board, Velcro, glue gun and other tools to complete the water-gel opener in one and a half days.

In the later experiments, the model also achieved the expected effect, with positioning and cutting function.

Regarding the size of the model, its overall height is shorter than the height of the container, which is convenient for the hand to apply downward pressure, and the height of the sawteeth is shorter than the distance between the water surface and the lid, so that the serrated sawteeth touch water can be avoided, and the circular lid on the opener is the same size with container lid.
02. THE TRANFORMATION PROCESS
2.1 Evolution process

2.2 Improved display
2.1 Evolution process

Project scope

Development of the concepts produced by the “Design for each one” workshop. To provide an inclusive and participatory design for people with limited mobility.

By:
Cristina Navone, Animation Cooperative Valdocco Onlus
Cristian Campagnaro, Department of Architecture and Design, Polytechnic University of Turin

Tutor:
Enrico Giunta, Animation Cooperative Valdocco Onlus
Andrea Vairo, Animation Cooperative Valdocco Onlus
Guidelines

Socket
The object must take into account the reduced capacity of the user and the further and progressive reduction over time.

Position
The geometries must prevent slippage or incorrect positioning during the support of the container on the container. With the consequent failure to open the can.

Cut
The aid must accurately drill the protective film of the gel water container, preventing any material falling into the container.

Affordance
The use of the aid must be immediately comprehensible to the user.

Concept

Creation of an object capable of facilitating the opening action of the containers of gel water, for the periodic hydration of the person suffering from dysphagia.
The aim of the aid is to restore self-sufficiency in an action that the user with motor disability performs numerous times in the course of his day.
ANTONINO: design development

Model 1
July

Model 2
November

Model 3
December

Model 4
January

Model 5
March

Evolution process
2.2 Improved display

Hole
Easy to take antonino by hand.

Sawteeth
Perfect cutting the lid of water-gel container.

Feet
Help people locate in use and place antonino.

Hanging hole
Hanging holes make it easy to fix people’s hands with antonino with straps.
TAKE IT

LOCATION

BRING IT

PLACE IT

CUT THE LID

Improved display
A NEW PLAN
3.1 Analysis of existing results

3.2 Our design positioning and Market research

3.3 The meaning of our design
3.1 Analysis of existing results

Model 1

Disadvantages
- Difficult to hold
- Difficult to positioning (easy to crush)
- High material costs
- Sawtooth not durable
- Hook shape difficult to print
- Low body visibility

Advantages
- Good body stability

Disadvantages
- Shape can’t reach the need to reduce costs
- Difficult to positioning (Sawtooth and inner wall too close)
- Hook shape difficult to print

Advantages
- Perfect sawtooth penetration

Model 2

Disadvantages
- Difficult to positioning
- Hook shape difficult to print

Advantages
- Increased visibility at the top

Model 3

Disadvantages
- Not simple enough grip and positioning system
- Sawtooth isn’t sharp enough
- Hook shape difficult to print
- Body shape isn’t simple enough

Advantages
- Good body size

Model 4

Disadvantages
- Printing defects affect disengagement
- Poor stability

Advantages
- Increased visibility at the top
STRENGTHS

1. Light weight material, portable
2. Simple use (press)
3. From tearing to cutting, reduce the need for force
4. Help patients to improve their self-worth

OPPORTUNITIES

1. Basically no similar product on the market
2. Applicable for almost all people who lack strength (patient/elderly)
3. Reduce price of production material

WEAKNESSES

1. Only suitable for single-size containers
2. Can only cut, need another tool to open the lid
3. Cleaning (not easy to dry)

THREATS

1. Manufacturing price is too high (Hard to be accepted by people)
2. Food safety (Different foods have different requirements for contact materials)
3.2 Our design positioning and Market research

Market research
The collection of different sizes of yogurt containers on the market to replace the different sizes of food gel containers that patients consume. Their main feature is that they are made of plastic containers and lids made of plastic or tin foil. In general, a normal person needs to tear the lid away from a corner before eating.

Fig. 3.2.1—Different sizes of yogurt on the market

Through the collection, most of the yogurt container lids on the market can be roughly divided into three sizes: small, medium and large. The three yogurt brands represented by YOMO, FRUTTOSI and FAGE are respectively.

Our design positioning

Why choose circular cutting?

- Cutting round objects, the same perimeter, the largest circular cutting area.
- The height of the food can is not important because the food container can withstand the pressure of cutting.
# 3 types of traditional cutting can openers

<table>
<thead>
<tr>
<th>Names</th>
<th>Instructions</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lever-type can opener</td>
<td>1. Place the blade of the can opener on the edge of the lid and press firmly</td>
<td>Low price</td>
<td>Easy to cut hands</td>
</tr>
<tr>
<td></td>
<td>2. Keep the blade down as parallel as possible to contact the edge of the can</td>
<td></td>
<td>To complicated steps</td>
</tr>
<tr>
<td></td>
<td>3. Push the blade down and gently open another hole.</td>
<td>Easy to carry</td>
<td>Need a lot of strength</td>
</tr>
<tr>
<td></td>
<td>4. Align the groove on the can opener with the raised thin edge on the edge of the can</td>
<td></td>
<td>Not easy to cut a complete circle</td>
</tr>
<tr>
<td></td>
<td>5. Cutting up and down, ring propulsion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotating wheel opener</td>
<td>1. Place the can opener on top of the can. Depending on the can opener, some need to clamp the teeth on the underside of the can and clamp the teeth on the outside and inside of the can.</td>
<td>Fair price</td>
<td>Slowly opening speed</td>
</tr>
<tr>
<td></td>
<td>2. Make sure the can opener and the can end are tight before twisting the handle.</td>
<td>Simple use steps</td>
<td>Need strength to make a circular cut</td>
</tr>
<tr>
<td></td>
<td>3. Twist the handle and turn around</td>
<td>Safe use method</td>
<td></td>
</tr>
<tr>
<td>Electric opener</td>
<td>1. Lift the flaps of the can opener and place the jar underneath.</td>
<td>The easiest use steps</td>
<td>High price</td>
</tr>
<tr>
<td></td>
<td>2. The can will rotate and be cut open. Some can openers may require you to hold the can.</td>
<td>Safe use method</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. The magnet will hold the cut metal can v lid and lift it up.</td>
<td>Quickly to cut a complete circle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Remove the cover.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What do a traditional cutting can opener need users to do?

- Need to aim well at the outer circle of the food container lid.
- The cutting action requires a certain amount of effort (some openers use the principle of leverage)
- Most need to use other items or open the lid by hand.

The existing cutting can openers on the market are designed for normal people with certain operational ability. They can easily make positioning, circular cutting and other actions, and have certain strength, which can be quickly opened.

For parts of patients who with multiple sclerosis, it is necessary to minimize the use of force in the opening operation and shorten the time required to complete the movement.
Functional analysis of Antonino's body and sawteeth

1. Only suitable for single-size containers?

- BODY
  - 1. Assist in correct positioning
  - 2. Ensure the visibility of the operation
  - Can change the size of outer crown

2. Can only do cut, need another tool to open the lid

- SAWTEETH
  - Cut the lid and grab the container
  - Can change the size of sawtooth
    - Spiral sawtooth ring
    - complex circular sawtooth

Change the shape of the sawtooth, and after cutting, grab the ANTONIO with upward force.
**ANTONINO**

opener of the water-gel container

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**About the user**

Who is the target user?

Patients or elderly persons who usually consumes food gels, has insufficient strength or has operational difficulties

What is the use of this product for them?

Can independently open the lid of the food container before eating.

According to this

What does this product mean for users?

- Satisfied with independent operation
- Cultivate operational capabilities
- Increase the affirmation of themselves
- Improve confidence in life

---

**About the product**

How many components does ‘ANTONINO’ have?

2

- Body
- Sawteeth

What are the goal functions of the product?

- Suitable for multi-size food gel containers
- Can be used to cut container lids
- Can remove the lid
04.
OUR DESIGN
4.1 Design analysis and creativity
4.2 Desktop production
4.3 Product material and color
4.4 Sketch and rendering
4.5 Model test
How does “ANTONINO” work?

First step: Take it

Second step: Location

Third step: Cut the lid

Fourth step: Open the lid with a spoon

Fifth step: Keep clean and place it

Components and functions:

- **UPPER SHELL, SHAPED, PERFORATED**
  - Allow three different crawl modes

- **INTERNAL CIRCULAR SAWTOOTH**
  - Cut the lid

- **OUTER CROWN**
  - 1. Correct positioning of guide aids on cans
    - 2. Guaranteed visual control of operation

Design analysis and creativity
1. Different sizes food-gel container
   (Different heights, different sizes of caliber, different widths of edges)
2. Low manufacturing costs
3. Environmental protection materials
4. Can open the lid in use

- Heating
- Destructive structure
- Do not destroy the structure
- Circular cutting
- Spiral cutting
- Vertical extrusion
- Rotary cutting
- Determine the center point (compass)
- Determine the arc

- Emotional resonance
- Ergonomics
- Increase friction (Reduce the use of force)
- Material
- Sustainable
- Environmental protection materials

- Greater force (lever principle)
- Small size.
  Light weight.
  Simple shape
- Greater force (lever principle)

- Emotional expression
- Material
How does “ANTONINO” work?

First step: Take it

Second step: Location

Third step: Cut and bring the lid

Fourth step: Keep clean and place it

Components and functions:
- Easy to take it
- Easy to location
- Bring the lid
- Cut different sizes of lids
- Keep clean
- Easy to place

Design analysis and creativity:
- Ergonomics
- Increase friction (Reduce the use of force)
- Simple shape
- Hook
- Replaceable sawtooth
- Material
- Small size, Light weight, Simple shape

Material M

Connection section

Sawteeth

Antonino
There are 3 ways to take ANTONINO. HOOP UP is the most difficult to produce and not easy to use, so we think it is unnecessary to use it. SHAPE OF BODY FOR TAKE IT and HOLES THAT CAN BE TAKEN are easier to understand, easier to use and reduce weight and material. For the part TAKE IT, the most important thing is easy to understand and easy to use, so that two ways we can keep them.
People have five senses and use visual and touch to achieve positioning, which are the most suitable methods for our target population. Visual positioning is the simplest, most effective, and most important positioning method. BODY POSITION is a method of assisting positioning. Now that BODY POSITION is difficult to make, it is easy to damage the sawtooth when it is used, so we need to simplify or eliminate BODY POSITION.
The original circular sawtooth has already achieved the cutting effect well, but there are also problems of easy damage and production difficulties, if you need to cut the lid of different sizes, rotary cutting must be the best.
Hole in the ANTONINO so that it can hang on the hook (like many kitchen utensils), it is easier to make it dry and save space. Use the feet to place it, Feet are difficult to produce, waste a lot of material, but it is easy to use, we need to improve it.
ANTONINO

TAKE IT

Shape of body for take it

- **ADVANTAGE**
  - 1. Provide more ways to take it
  - 2. Provide a way to take it and easy to understand

- **WEAKNESS**
  - 1. Increased volume and weight
  - 2. People with small hands or small hand strength cannot use it easily

Holes that can be taken

- **ADVANTAGE**
  - 1. Give more people more suitable choices for take it
  - 2. Reduced weight and reduced material use

- **WEAKNESS**
  - 1. It's hard to understand how to use it and find directions

CUT AND BRING THE LID

- Circular sawtooth

- **ADVANTAGE**
  - 1. Cutting is convenient and fast

- **WEAKNESS**
  - 1. Sawtooth production is difficult
  - 2. Sawtooth is easily damaged

- **ADVANTAGE**
  - 1. Osculum type
  - 2. Setscrew
  - 3. Hook
  - 4. Fork

- **WEAKNESS**
  - Bring the lid

ANTONINO MY CHOICE

I DO NOT CHOOSE IT

MY CHOICE

THERE IS A QUESTION THAT NEEDS MODIFICATION
1. Holes that can be taken and hanging hole we can mix them, one holes with two functions.

2. If we need body localization and feet, can we mix them become a simple structure.

3. The effective use of sawtooth is very important. Designing the specific shape of the sawtooth and achieving the function of separating the lid from the can will be our next thinking.

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**Vision positioning**

<table>
<thead>
<tr>
<th>ADVANTAGE</th>
<th>WEAKNESS</th>
</tr>
</thead>
</table>
| 1. Reduce costs and save material  
2. Easy to use it | 1. May affect structural strength |

**Body position (Touch position)**

<table>
<thead>
<tr>
<th>ADVANTAGE</th>
<th>WEAKNESS</th>
</tr>
</thead>
</table>
| 1. Easier to position  
2. Solved the placement problem | 1. Easy to damage sawtooth when use it  
2. Low visibility  
3. Use a lot of material |

---

**PLACE IT**

**Feet (As the support)**

<table>
<thead>
<tr>
<th>ADVANTAGE</th>
<th>WEAKNESS</th>
</tr>
</thead>
</table>
| 1. Easy to place  
2. Placed very stable | 1. Difficult to manufacture  
2. Use more materials |

**Punching, hanging**

<table>
<thead>
<tr>
<th>ADVANTAGE</th>
<th>WEAKNESS</th>
</tr>
</thead>
</table>
| 1. Save material  
2. Easy to manufacture  
3. Easy to fully ventilated | 1. Need a hook  
2. May affect structural strength |
4.2 Desktop production

What is desktop production?

Desktop molding tools such as 3D printers are equivalent to digital cameras and music editing tools, and anyone can use them to create one-off products for their own use.

The advantages of mass production are repetitive manufacturing and standardization, while 3D printing is beneficial for personalization and customization. One of the big wins in the digital manufacturing era is that we can choose between mass production and customization without paying expensive hand-made costs. Both have now become viable automated manufacturing methods.
We can imagine something, draw it on a computer, and a machine can make it real. We can push a button and an object will appear (eventually). As Arthur C. Clarke put it, “any sufficiently advanced technology is indistinguishable from magic.” This is getting close.

1) 3-D printer.

A 3-D printer and the paper printer you’ve probably already got on your desktop play similar roles. The traditional laser (or inkjet) printer is a 2-D printer: it takes pixels on a screen and turns them into dots of ink or toner on a 2-D medium, usually paper. A 3-D printer, however, takes “geometries” onscreen (3-D objects that are created with the same sort of tools that Hollywood uses to make CG movies) and turns them into objects that you can pick up and use.

Some 3-D printers extrude molten plastic in layers to make these objects, while others use a laser to harden layers of liquid or powder resin so the product emerges from a bath of the raw material. Yet others can make objects out of any material from glass, steel, and bronze to gold, titanium, or even cake frosting. You can print a flute or you can print a meal.

2) CNC machine

While a 3-D printer uses an “additive” technology to make things (it builds them up layer by layer) a CNC ("computer numerical control") router or mill can take the same file and make similar products with a “subtractive” technology, which is a fancy way of saying that it uses a drill bit to cut a product out of a block of plastic, wood or metal. There are countless other specialty CNC machines: CNC quilters and embroidery machines, CNC sign and vinyl cutters (for silk-screening), and CNC paper and fabric cutters for crafters, to name a few.

You can even print human organs out of living cells, by squirting a fluid with suspended stem cells onto a support matrix, much as your inkjet printer squirts ink onto paper.
Many CAD programs can break a 3-D object into 2-D parts so they can be fabricated with a laser cutter, and then neatly slotted together like one of those plywood dinosaur kits.

Some CNC machines are the size of a large table and are designed to make furniture out of wood (industrial CNC machines can be as big as a warehouse and can carve out objects as big as an airplane fuselage).

3) Laser Cutter

One of the most popular of the new desktop tools is the laser cutter, which is mostly a 2-D device. It uses a powerful laser to cut a precise pattern of any complexity into sheets of whatever material you feed it, from plastics and woods to thin metal.

4) 3-D Scanner

This device, which can be as small as a breadbox, allows you to do “reality capture.” Rather than having to draw an object from scratch, you can put an existing object in the scanner. It then uses lasers or other light sources and a camera to image the object from all sides, and then turns it into a 3-D image made up of tens or hundreds of thousands of polygons, just like a videogame character or CG movie set. The software can simplify it and let you modify any part you want. A common first experiment is to scan your head, then exaggerate your features and 3-D print a bobble-head of yourself.
Why choose the 3D printing?

**Cost reduction**
The 3D printing process allows the creation of parts and/or tools through additive manufacturing at rates much lower than traditional machining.

**Increased efficiency**
3D printing allows ideas to develop faster than ever. Being able to 3D print a concept the same day it was designed shrinks a development process from what might have been days to a matter of hours, helping users stay one step ahead of the competition.

**Prototyping**
A conceptual picture of the product is better than the description since it is worth 1,000 words, but with 3D Printing, a model speaks 1,000 pictures, so, getting to hold the tangible product-to-be, in hand, clears all lines of communication. There is no ambiguity when holding the exact, or at least a very close, representation of the product.

**Product development**
Being able to test ideas quickly and discover what doesn’t work accelerates discovery leading to an ideal solution. 3D printing allows a product developer to make breakthroughs at early stages that are relatively inexpensive.

**Innovation**
With standard mass-production, all parts come off the assembly line or out of the mold the same. With 3D printing, one can personalize, customize and tweak a part to uniquely fit their needs, which allows for custom fits in every aspect.
4.3 Product material and color

MATERIAL NAME: NYLON (PA)
PRICE: 15€/KG
DIAMETER: 1.75mm/3.00mm±0.05mm
PRINTING TEMPERATURE: 250-280°C
COLOUR: WHITE, BLACK, TRANSPARENT
MATERIAL CHARACTERISTICS:
HIGH ELASTICITY, HIGH TOUGHNESS, HIGH PURITY, HIGH STRENGTH.
(Elevata elasticità, elevata tenacità, elevata purezza, elevata resistenza)

MATERIAL NAME: PC
PRICE: 13€/KG
DIAMETER: 1.75mm/3.00mm±0.05mm
PRINTING TEMPERATURE: 250-280°C
COLOUR: WHITE, BLACK, TRANSPARENT...
MATERIAL CHARACTERISTICS:
HIGH TEMPERATURE RESISTANCE, UV RESISTANCE, GOOD LIGHT TRANSMISSION, HIGH GLOSS, HIGH HARDNESS.
(Resistenza alle alte temperature, resistenza ai raggi UV, buona trasmissione della luce, alta brillantezza, elevata durezza)
MATERIAL NAME: P-GLASS (Composites of PC and PETG)
PRICE: 21€/KG
DIAMETER: 1.75mm/3.00mm±0.05mm
PRINTING TEMPERATURE: 200-220°C
COLOUR: TRANSPARENT
MATERIAL CHARACTERISTICS:
HIGH TRANSPARENCY, GOOD RIGIDITY, GOOD TOUGHNESS, OPTICAL PROPERTIES OVER GLASS.

(Elevata trasparenza, buona rigidità, buona tenacità, proprietà ottiche sul vetro)

MATERIAL NAME: PETG
PRICE: 15.5€/KG
DIAMETER: 1.75mm/3.00mm±0.05mm
PRINTING TEMPERATURE: 250-280°C
COLOUR: WHITE, BLACK, TRANSPARENT...
MATERIAL CHARACTERISTICS:
HIGH TEMPERATURE RESISTANCE, GOOD GLOSS, GOOD LIGHT TRANSMISSION, GOOD TOUGHNESS.

(Resistenza alle alte temperature, buona lucentezza, buona trasmissione della luce, buona tenacità)
MATERIAL NAME: Photosensitive resin/Resina fotosensibile (liquid)

PRICE: 0.78€/g (Material and Processing)

COLOUR: WHITE, TRANSPARENT, TRANSLUCENT

MATERIAL CHARACTERISTICS:

High transparency, good light transmission, smooth surface, high precision.

(Elevata trasparenza, buona trasmissione della luce, superficie liscia, alta precisione)

OTHER MATERIALS: PLA and ABS Poor visibility, TPU Hardness difference. These materials do not meet the needs of our design.

Fig.4.3.5

Fig.4.3.6
MATERIAL NAME: PLA

Fig.4.3.7
MATERIAL NAME: ABS

Fig.4.3.8
MATERIAL NAME: TPU
Why we choose resin?

Resin
In polymer chemistry and materials science, resin is a solid or highly viscous substance of plant or synthetic origin that is typically convertible into polymers.

Conclusion
1. White resin is very cheap, can be used as a sawtooth.
2. Photosensitive resin has a transparent material to facilitate positioning.
3. Resin extracted from plants, can be used to make fake teeth, in line with food safety.
4. Photosensitive resin has high transparency, good light transmission, smooth surface, high precision.
4.4 Sketch and rendering

- Both suitable for left or right hand to hold.
- Suitable for users with small hands.
- Use right hand.
- Use left hand.
- Smaller hands’ size.
- Three size sawteeth target.
- Hook shape in order to hook out the lid.
- More fit to the fingers’ shape to grip the opener.
- Spiral sawtooth.
- Small
  - Medium
  - Large

- Three size sawtooth target.
Time: April
Model: 1st

Rendering

- White
- Plastic material
- Body + sawteeth cost 35€
Dimensions

Proportion: 1.5 : 1

Top View

95mm
55mm
75mm

Front View

35mm

Left View
Time

<table>
<thead>
<tr>
<th></th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1st</td>
<td>2nd</td>
</tr>
</tbody>
</table>

Rendering

- Transparent
- Resin material
- Body + saw teeth
- Cost 33€

- Easy to handle
- Reduce blocking
- Transparent material

- Tilted sawtooth
- Rotary cutting

- Less material
- Better visibility
**Dimensions**

- **Top View**: 105mm
- **Front View**: 30mm
- **Bottom View**:
  - Proportion: 1.5 : 1
Time

<table>
<thead>
<tr>
<th></th>
<th>April</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
</tr>
</tbody>
</table>

Rendering

- Transparent

- Resin material

- Body + sawtheeth
cost 31€

Easy to handle

- Transparent material

- Rotary cutting

- Bring out lid

- Less material

- Better visibility

- Hanging hole
<table>
<thead>
<tr>
<th>Time</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td>4th</td>
</tr>
</tbody>
</table>

**Rendering**

- Transparent
- Resin material
- Body + sawtheeth
  - cost 28.5€

- Easy to handle
- Reduce blocking
- Transparent material
- Rotary cutting
- Bring out lid
- Less material
- Better visibility
- Hanging hole
Dimensions

Proportion: 1.5 : 1
Model

1st

April

2nd

May

3rd

June

4th

July

5th

August

Rendering

- Transparent
- Resin material

Body + sawtheeth
cost 27€
Dimensions

Proportion: 1.5 : 1

Time
April  May  June  July  August
Model  1st  2nd  3rd  4th  5th

105mm
Top View

30mm
Front View

Bottom View

Left View

Sketch and rendering
**Model**

<table>
<thead>
<tr>
<th>Time</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td>4th</td>
<td>5th</td>
<td>6th</td>
</tr>
</tbody>
</table>

**Antonino** has one main body and four optional combination parts.

1. **Main Body**
   - **Front**: 110mm
   - **Top**: 55mm
   - **Right**: 15mm
   - **5mm**: 18mm

2. **Bring Lid Part**
   - **Front**: 25mm
   - **Right**: 5mm

**Proportion**: 1.5 : 1

**Proportion**: 3 : 1

Sketch and rendering
### Model 1

**Sketch and Rendering**

#### Cut Lid Part (Small)
- **Size:** 55mm x 16mm x 16mm
- **Dimensions:**
  - Top: 65mm
  - Front: 16mm
  - Right: 16mm

#### Cut Lid Part (Medium)
- **Size:** 55mm x 16mm x 16mm
- **Dimensions:**
  - Top: 65mm
  - Front: 16mm
  - Right: 16mm

#### Cut Lid Part (Big)
- **Size:** 55mm x 16mm x 16mm
- **Dimensions:**
  - Top: 75mm
  - Front: 16mm
  - Right: 16mm

---

### Time Table

<table>
<thead>
<tr>
<th>Time</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
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</thead>
<tbody>
<tr>
<td>Model</td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td>4th</td>
<td>5th</td>
<td>6th</td>
</tr>
</tbody>
</table>
Proportion: 1.5 : 1
TOTAL PRICE : 27.5€
THE PRICE OF PRODUCING A HUNDRED IS 15€

Proportion: 3 : 1

MATERIAL: PHOTOSENSITIVE RESIN (TRANSAPARENT)
PRICE: THE PRICE OF PRODUCING ONE IS 25€
THE PRICE OF PRODUCING FIFTY IS 18€
THE PRICE OF PRODUCING A HUNDRED IS 12.5€
**Proportion:** 3 : 1

**BRING LID PART**

- **MATERIAL:** PLASTIC
- **PRICE:** THE PRICE OF PRODUCING ONE IS 0.5€

**SAWTEETH (SMALL)**

- **MATERIAL:** PHOTOSENSITIVE RESIN (WHITE)
- **PRICE:** THE PRICE OF PRODUCING ONE IS 2€

**SAWTEETH (MEDIUM)**

- **MATERIAL:** PHOTOSENSITIVE RESIN (WHITE)
- **PRICE:** THE PRICE OF PRODUCING ONE IS 2€

**SAWTEETH (BIG)**

- **MATERIAL:** PHOTOSENSITIVE RESIN (WHITE)
- **PRICE:** THE PRICE OF PRODUCING ONE IS 2€
4.5 Model test
**MODEL 1**

**OPERATION**
Difficult positioning
Sawtooth cutting effort
Does not work well for different sizes of water-gel
Modify the sawtooth and body

**MATERIAL**
Can reduce material usage
Save 3D printing costs

**COMPONENTS**
Sawtooth: Sawtooth requires stronger penetration and controls the spacing of the serrations
Body: Make the subject easier to grip

**GEOMETRIES**
Control the distance between the sawteeth
Make the shape easier to grip
Need to be easy to place.

**AFFORDANCE**
Make the shape easier to understand how to use, so that the sawteeth can work easily.

**MODEL 2**

**OPERATION**
Difficult positioning
Sawtooth can work but the length is not enough to easily cut the lid
Water-gel does not work perfectly for different sizes

**MATERIAL**
Can reduce material usage
Save 3D printing costs

**COMPONENTS**
Sawtooth: Sawtooth can penetrate the lid, need to make penetration easier
Body: Increase visibility and be understandable how to use

**GEOMETRIES**
Easy to place
Need to increase the visibility and select different sizes of sawteeth and assemble them as needed

**AFFORDANCE**
Increase visibility
Easy to understand how to use it
Designed as a removable sawtooth to meet different needs
MODEL 3

OPERATION
Sawtooth perfectly cuts the lid
Easy to pick it up with left or right hands. For people with small hands or weak hands, need to improve the hole need bring the lid

MATERIAL
Less material use
Try transparent materials for easy positioning

COMPONENTS
Sawtooth: Sawtooth perfectly cuts the lid
Body: Improve visibility, can be placed very well, can easily understand how to use. Need to further improve visibility, making it easier to locate

GEOMETRIES
Improve the connection between the serrations
The main body to make the overall shape more sleek

AFFORDANCE
Further improve visibility and make the overall style consistent

MODEL 4

OPERATION
Easy to pick it up
Easy to cut the lid
Can bring the lid
Easy to place it

MATERIAL
Less material use
Transparent material makes positioning easy

COMPONENTS
Sawtooth: Sawtooth perfectly cuts the lid
Different sizes of sawtooth can be selected for different needs
Body: The body is suitable for different hands to get it

GEOMETRIES
Very good visibility
Easy to take it

AFFORDANCE
The hook for bring the lid must be simple
<table>
<thead>
<tr>
<th>MODEL 5</th>
<th>MODEL 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPERATION</strong></td>
<td><strong>OPERATION</strong></td>
</tr>
<tr>
<td>Easy to pick it up</td>
<td>Easy to pick it up</td>
</tr>
<tr>
<td>Easy to cut the lid</td>
<td>Not very easy to cut the lid</td>
</tr>
<tr>
<td>Difficult to take it off smoothly</td>
<td>Different sizes of sawteeth are installed tightly</td>
</tr>
<tr>
<td>Easy to place it</td>
<td>Easy to place it</td>
</tr>
<tr>
<td><strong>MATERIAL</strong></td>
<td><strong>MATERIAL</strong></td>
</tr>
<tr>
<td>Less material use</td>
<td>Less material use</td>
</tr>
<tr>
<td>Transparent material makes positioning easy</td>
<td>Transparent material makes positioning easy</td>
</tr>
<tr>
<td><strong>COMPONENTS</strong></td>
<td><strong>COMPONENTS</strong></td>
</tr>
<tr>
<td>Sawtooth:Sawtooth perfectly cuts the lid</td>
<td>Sawtooth:Sawtooth cutting is not smooth</td>
</tr>
<tr>
<td>Different sizes of sawteeth are not tight enough to install</td>
<td>Different sizes of sawtooth can be selected for different needs</td>
</tr>
<tr>
<td>Body:The body is suitable for different hands to get it</td>
<td>Body:The body is suitable for different hands to get it</td>
</tr>
<tr>
<td><strong>GEOMETRIES</strong></td>
<td><strong>GEOMETRIES</strong></td>
</tr>
<tr>
<td>Very good visibility</td>
<td>Very good visibility</td>
</tr>
<tr>
<td>Easy to take it</td>
<td>Easy to take it</td>
</tr>
<tr>
<td><strong>AFFORDANCE</strong></td>
<td><strong>AFFORDANCE</strong></td>
</tr>
<tr>
<td>Need to modify the size of the hook to open the lid</td>
<td>Hook shape can pull out the lid</td>
</tr>
</tbody>
</table>
5.1 Engineering drawing
5.2 The composition of Antonino
5.3 Antonino’s use steps
Name: Three views of body part of Antonino X
Units: mm
Proportion: 1:1
Material: Photosensitive resin (transparent)
Name: Three views of sawtooth part of Antonino X
Units: mm
Proportion: 1:1
Material: Photosensitive resin (white)
Size: Small
Name: Three views of sawtooth part of Antonino X
Units: mm
Proportion: 1:1
Material: Photosensitive resin (white)
Size: Medium

Top view

Front view

Left view
Name: Three views of sawtooth part of Antonino X
Units: mm
Proportion: 1:1
Material: Photosensitive resin (white)
Size: Large

Top view

Front view

Left view
Name: Three views of hook of Antonino X
Units: mm
Proportion: 5:1
Material: Photosensitive resin (white)
The composition of Antonino X

Name: Antonino X
Proportion: 1:1

Material is photosensitive resin (white)
Body part of Antonino X

This hole is easier for the weak hand to take it.

The shape is easy to take Antonino X for both right and left hands.

This shape is for connecting the body and the sawtooth.

The feet for place Antonino.

The shape is easy to take Antonino for both right and left hands.

Name: Body part of Antonino X
Proportion: 1:1
Material: Photosensitive resin (transparent)
Sawteeth part of Antonino X

**Name**: Body part of Antonino Plus  
**Proportion**: 1:1  
**Material**: Photosensitive resin (white)

**A1**: After the sawtooth cuts the lid, the notch makes the lid not fall off.  
**A2**: Connection sawtooth and hook.  
**A3**: Different sized serrations can cut different sizes lids.
Sawteeth part of Antonino X

- Front of sawteeth part
- Back of sawteeth part

- Hook for bringing the lid.
- The hole for sawtooth and body connection.

The composition of Antonino X
**The hook of Antonino X**

**Name**: The hook of Antonino Plus

**Proportion**: 1:1

**Material**: Photosensitive resin (white)

1. The hook passes through the lid
2. The hook bring the lid

- **D1**: The spacing is gradually reduced, and the friction between lid and hook is increased.
- **D2**: Take hook through the lid.
- **D3**: Hook the lid when bring the lid.
Sawtooth and body connection

F1

F2
F1 and F2:

F1 is the convex part on the body.
F2 is the concave part on the sawteeth.
F1 and F2 imitate the connection mode of Lego, fixed by static friction and connected.

Sawtooth and body connection
How to use Antonino X?

FIRST STEP

SECOND STEP

THIRD STEP

FOURTH STEP

TAKE IT!

use left hand ↔ use right hand
Antonino X's use steps

First step

Second step

Third step

Fourth step

Take it!

Weak hand or small hand use
1. Convenient for people with left or right hands
2. Convenient for people with weak or small hands
3. Ergonomic design
4. Easy to understand how to use
Antonino X’s use steps

First step: The feet of Antonino X will help us locate without deviation from the center.

Second step: Transparent materials will help us easily position with the eyes.

Third step: The feet of Antonino X will help us locate without deviation from the center.

Fourth step: Transparent materials will help us easily position with the eyes.

Positioning!
FIRST STEP
SECOND STEP
THIRD STEP
FOURTH STEP

CUT AND BRING THE LID!

1. Take it drown
2. Cut the lid
Antonino X’s use steps

1. Take it drown
2. Cut the lid
3. Take out

Easy to cut the lid and bring it!
PLACE IT!

The feet of Antonino X help you easy to place, and air dry after cleaning, there will be no dust, make sure to use it next time.
How to replace the sawtooth part?

Use the thumb to push the sawteeth part from the back of Antonino X.
Before combination

Antonino X’s use steps

87
After combination

After that, after pushing the sawteeth part, you can replace the other sawteeth parts you need. We have three different sizes of serrations for most food containers on the market.
Suitable for hand-held shape design, so Antonio can easily pick it up!

Reasonable sawtooth size makes Antonio easy to cut the lid.

Hook helps Antonio X easy to bring the lid.
When Antonio uses Antonino X!

Transparent material helps Antonio X to positioning well with the eye.

The feet help Antonio X easy to place it.
Production price of ANTONINO X

TOTAL PRICE: 21 €
The price of producing a hundred is 13 €/each
(contains three sawteeth and one body)

Shipping price: 10 €/kg

MATERIAL:
PHOTOSENSITIVE RESIN (TRANSPARENT)

PRICE:
The price of producing one is 15 €
The price of producing fifty is 12 €/each
The price of producing a hundred is 10 €/each

MATERIAL:
PHOTOSENSITIVE RESIN (WHITE)

PRICE:
The price of producing each one is 2 €
The price of producing fifty is 1 €/each
06. ACTUAL USE OF ANTONINO X
TAKE IT

Use the shape of the body of the opener to grasp the arc on the edge of the body that fits the shape of the hand. The bottle opener is light enough to allow the user to take it securely.

CUT AND BRING THE LID

Perfectly cut the lid with the pressure of both hands and ensure that the sawteeth do not touch the horizontal lines inside the container. The hook at the center of the opener is perfectly pierced and hooked up, and the lid is lifted while lifting the hand.
The transparent body material gives the opener maximum visibility and clearly shows the positioning between the sawteeth and the lid.

The three legs of the opener are used to support the body and steadily placed on the table.
The research work provided is very clear and hides many of the expertise on user requirements, health care issues, printing and production of 3D models. Multidisciplinary efforts have come to an end, and it involves a lot of “doing and redoing” parts, because each solution must be proven by practice, and practicality and flexibility have always been the key words of the entire project, which makes the product in the factory. Easy to implement, quick to assemble on site and well integrated in the actual use of rehabilitation centers.

Our new design is based on the product design done by VALDOCCO ONLUS ANIMATION after the Politecnico di torino’s workshop project “Design for each one” in March 2017, it can be clearly divided the product features that have been achieved and the product functional goals that have not been achieved, and in the long run, what we need is a product that can be used in factory production and sales.

First of all, from the structure of the product, the external conditions of the original product have reached the basic operational requirements, and is applicable to the operational ability of the target user.
It can be divided into grasping, visual, squeezing, cutting, and placing these main functions, we must continue to strengthen these functions, to enlarge the function, which requires new attempts and practices.

Secondly, in order to expand the scope of application, considering the size of the multi-size hydrogel or yoghurt containers on the market (they all have the same tear-off lid), it is necessary to collect data on common container sizes on the market and integrate them. Adjusting the diameter of the serrations, the expansion of the target population is also part of the population, including all those who lack strength and basic operational difficulties.

Finally, because the original product operation process needs to add the action of taking the cover, this is also a design difficulty. We must design the parts of the product on the principle that the materials are as uniform as possible and no multiple materials are produced to achieve this goal.

From the perspective of the materials used in the production, the technology of 3D printing using liquid resin realizes the ultimate goal of the transparent model, and if the mass production is required in the future, the production cost of the liquid resin will be greatly reduced.

In order to provide a better explanation of product design to different stakeholders (companies) and show them how to actually implement the idea, a sketch of a possible business model was developed, which can be found in this book.

As mentioned in the previous section of this book, all people with power loss and basic operational difficulties, whether elderly, children or patients, are end users of the product, and we aim to adapt to the needs of users, improve their operational ability and enhance their sense of self-worth. Provide flexible solutions to meet the needs of the rapid development of accessories. In addition, in order to provide the greatest level of flexibility possible, it is recommended to use a desktop factory machine to reinforce the design and creation of the product.
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Master’s degree in Systemic Design
Department of Architecture and Design
Graduated in December 2018
Master Thesis

ANTONINO X

Opener of water-gel container