UNIVERSITAT POLITÈCNICA DE VALÈNCIA

Escuela Técnica Superior de Ingeniería del Diseño

SUSTAINABLE PACKAGING DESIGN INNOVATION

TRABAJO FINAL (MOVILIDAD) DEL
Grado en Ingeniería en Diseño Industrial y Desarrollo de Productos

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TUTORES :
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CURSO ACADÉMICO: 2020/2021

Contents

Minor Packaging Design & Innovation

Minor Sustainable Packaging Design & Innovation

SUMMARY

This work has been carried out in the Erasmus program (European Project Semester) in The Hague (The Netherlands) and is divided into two projects.

The first was realized in the subject "Packaging Design Innovation" and its objective is the realization of a carton packaging that will be presented to the competition of the European association PRO CARTON. In this context, the design of a take-away food package, specifically Mexican tacos, has been made. The project is divided into four phases: analysis, ideation, concept and final presentation; and throughout the work the development of each of them is explained.

The second project is developed in the context of the subject "Sustainable Packaging Design Innovation". It focuses on the creation of a product that helps prevent food waste. The phases in which the project is divided are analysis, ideation, concept and final presentation.

Minor Packaging Design & Innovation

Teachers :
Wander Colenbrander
Gerard de Koning

The first minor consists of a group work which is a proposal for the Procarton contest.

The individual work consists of 4 assignments proposed by the teachers.

Pro Carton final presentation :

The Pro Carton Young Designers Award is now one of Europe’s leading annual young talent competitions for packaging design. It also plays a pioneering role in promoting sustainability as it focuses exclusively on cartonboard design.

The group work of this minor consisted of creating a proposal to participate in the contest.

"Taco2Go" is the name of the proposal that I sent to the contest together with my group. It is a take-away food container for tacos whose compact format makes it easy to transport for both users and deliverers.

The design is modular, giving the possibility of making larger or smaller outer boxes for different amounts of food. The assembly of the packaging is simple, similar to a take-away pizza box, so the restaurant workers themselves can assemble it and save space during transport.

In the next pages there is the final presentation of the Pro Carton project.

Group 6

Alicia Sanchez, Raj Vaidya, Thijs Seelen

Analysis

Context

The Pro Carton Young Designers award is a packaging design contest based in Europe, with the goal of promoting sustainability by strictly focusing on cartonboard. Designers can choose to compete in four categories: food & drink, save the planet, think outside the box, and "all other".

Problem Definition

The Pro Carton Young Designers award needs novel, impressive, and sustainable concepts for packaging withcardboard within one of four presupposed categories. The concept should be fully fleshed out (consider users,marketing, finances etc.), and should avoid adding features that do not add to the impressiveness or sustainability without good reason.

Stakeholder Analysis

Pro Carton

Needs: A sustainable design for packaging using carton or cartonboard along with accompanying documents.

Retail companies

Needs: Designs for packaging which are sustainable, "theft proof", protect the user from harm, and protect the product from microbes (if applicable).

Potential user

Needs: Packaging that facilitates transport without causing damage to the product. The packaging should beeasy to unpack at the location the user needs to unpack it (keeping availability of tools in mind). The content of the packaging should remain isolated from external microbes and forces (if applicable). Sustainability would be a bonus to the users, however it is not paramount to the success of the packaging.

Competitor Analysis

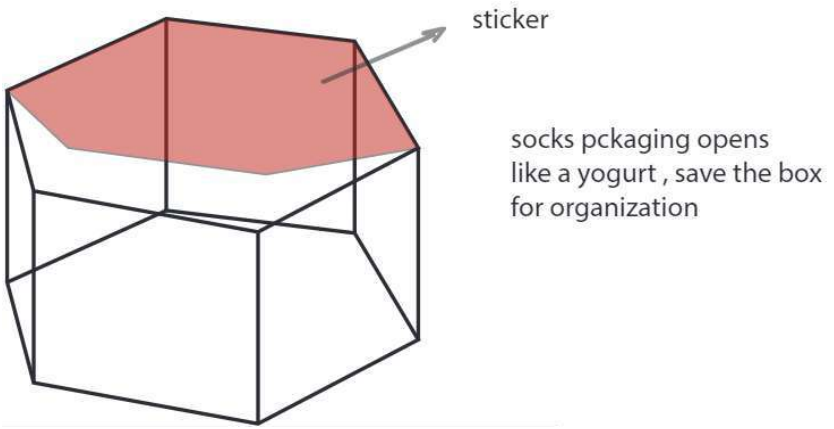
Common Values

- Simple design
- Displays product well
- Creative design
- Multipurpose
- No glue

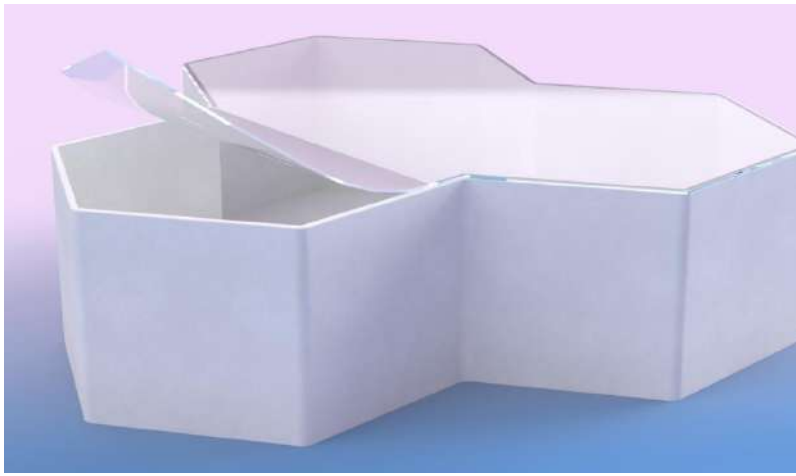
Context

Concept Progression

Our first focus was a tessellating sock packagingconcept, this idea came out of the first ideation session after we converged down to a couple of workable ideas.



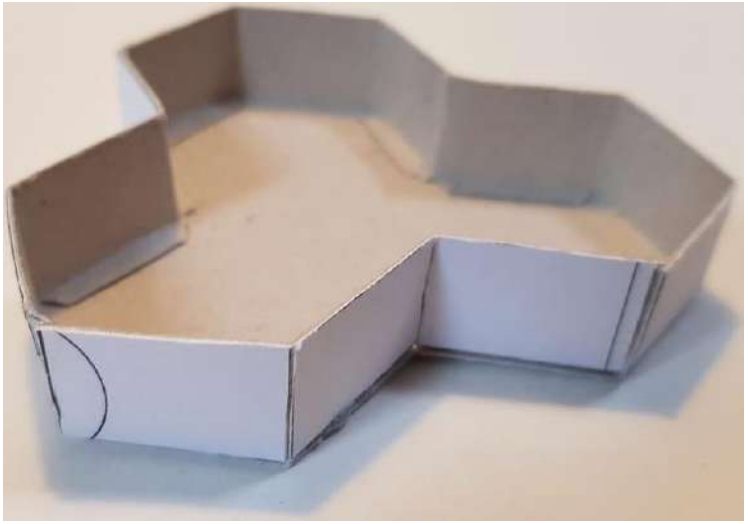
We explored tessellating shapes to come up with ideas for shapes, looking into the likes of M.C. Escher for inspiration.

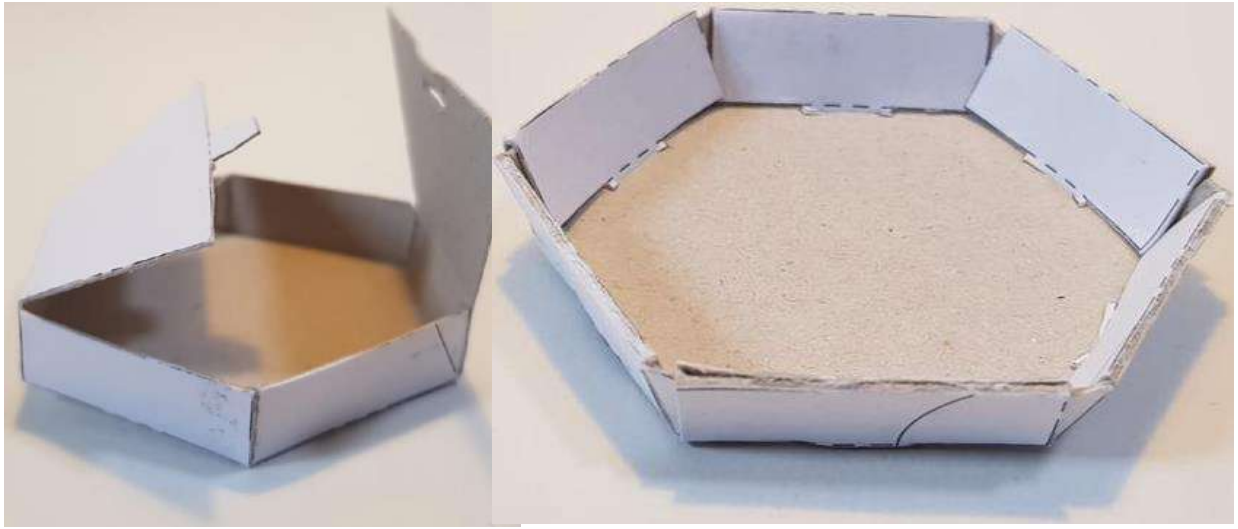


Context

Concept Progression

To prove our concepts, we went to the workshop and recreated the packaging. This was an essential step toverify whether the ideas we had on paper would work in real life as well.



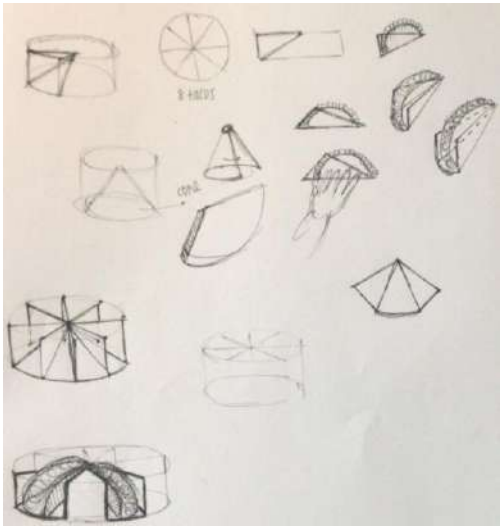


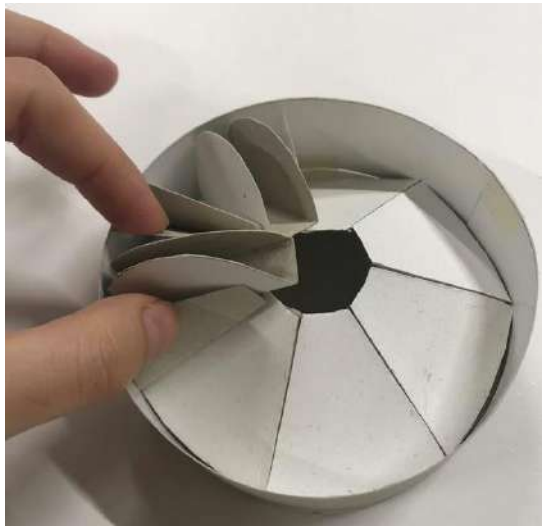
Context

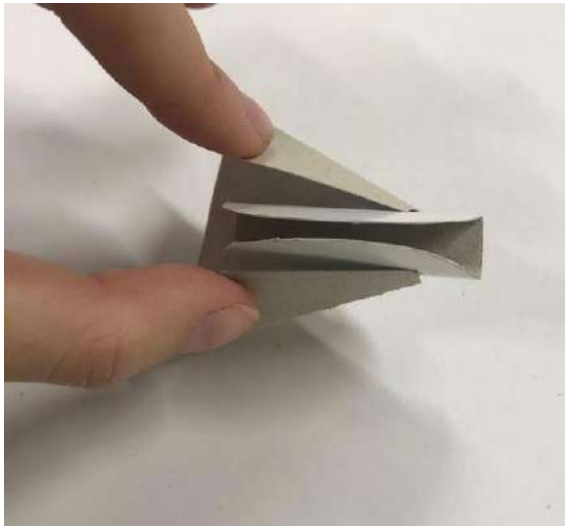
Concept Progression

While creating these prototypes in the workshop, Alicia decided to revisit the taco packaging idea we haddiscarded in the first couple weeks to rapid prototype the concept.

This led to an impressive idea, which would "wow" the user, however it wasn't too practical as the taco filling
would most likely end up shifting to the lower side during transport.



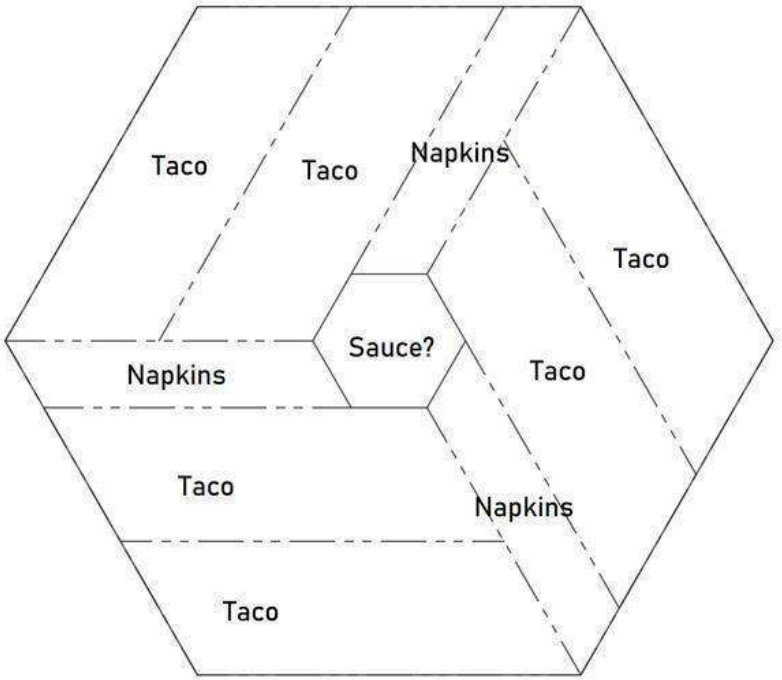




Context

Concept Progression

After the prototyping session and further discussion,we attempted to combine two ideas leading to the following concept – we further worked through the idea of taco packaging following this.



Context

Concept Progression

Alicia decided to order tacos as well to research what is out there currently, and what can be done to improve the user experience and impressiveness. As itturns out, a lot can be done.

Context

Concept Progression

To further our taco packaging concept, we decided to use a mix of the brain drawing/writing and designcarousel methods.

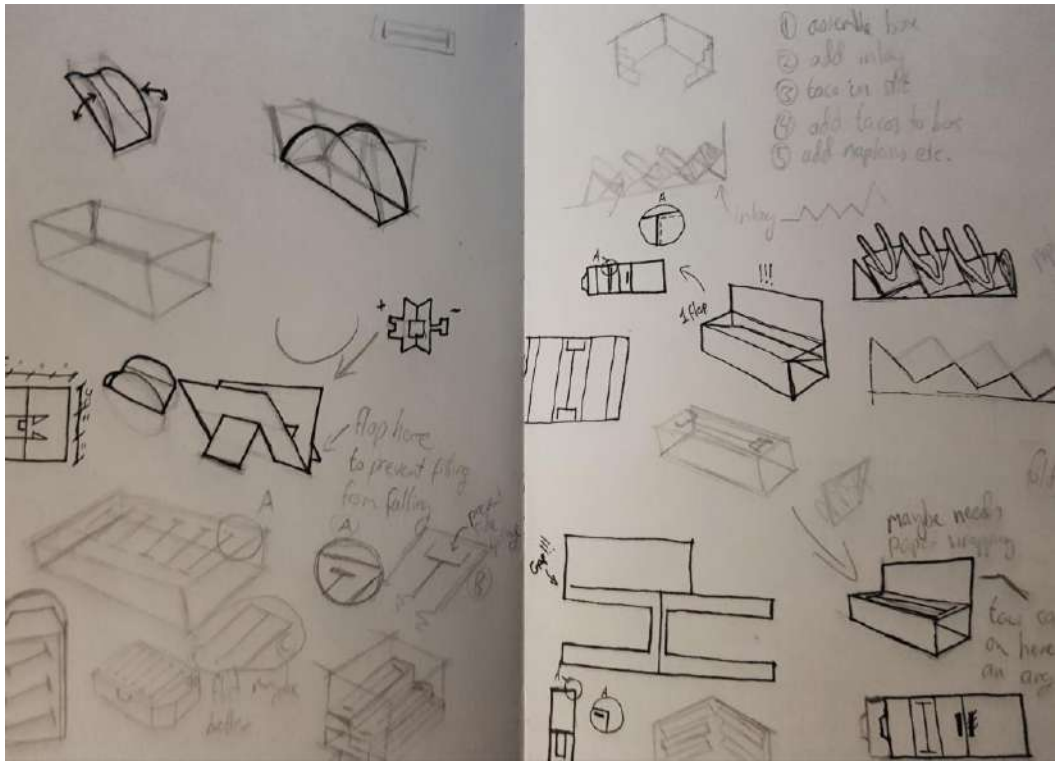
We decided what the individual parts of the concept should be, and ideated into each part separately.Following this, we would switch which parts we ideated on at a consistent time interval.

This led to a plethora of ideas (between 7-10 ideas for each part, with there being 5 parts).

Context

Concept Progression

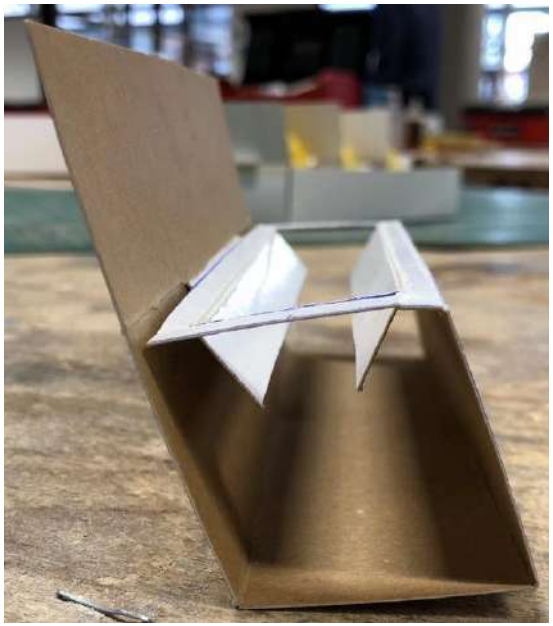
With all the ideas for separate parts, we now had the task of bringing these separate parts together into one complete concept. While doing this we focused on impressing the user, and at the same time being as efficient with materials as possible.

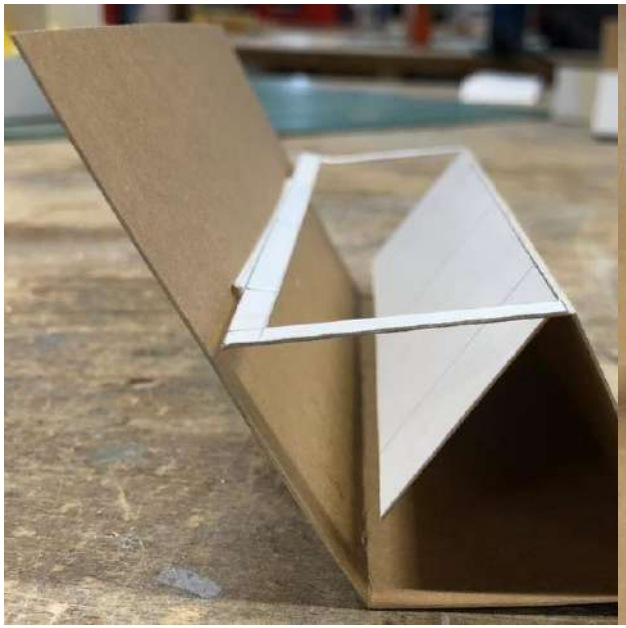


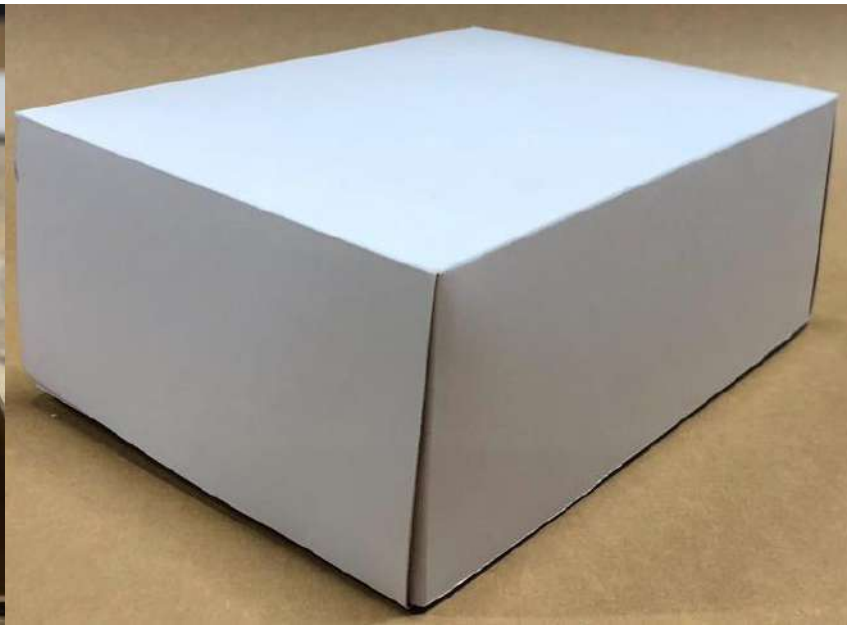
Context

Concept Progression

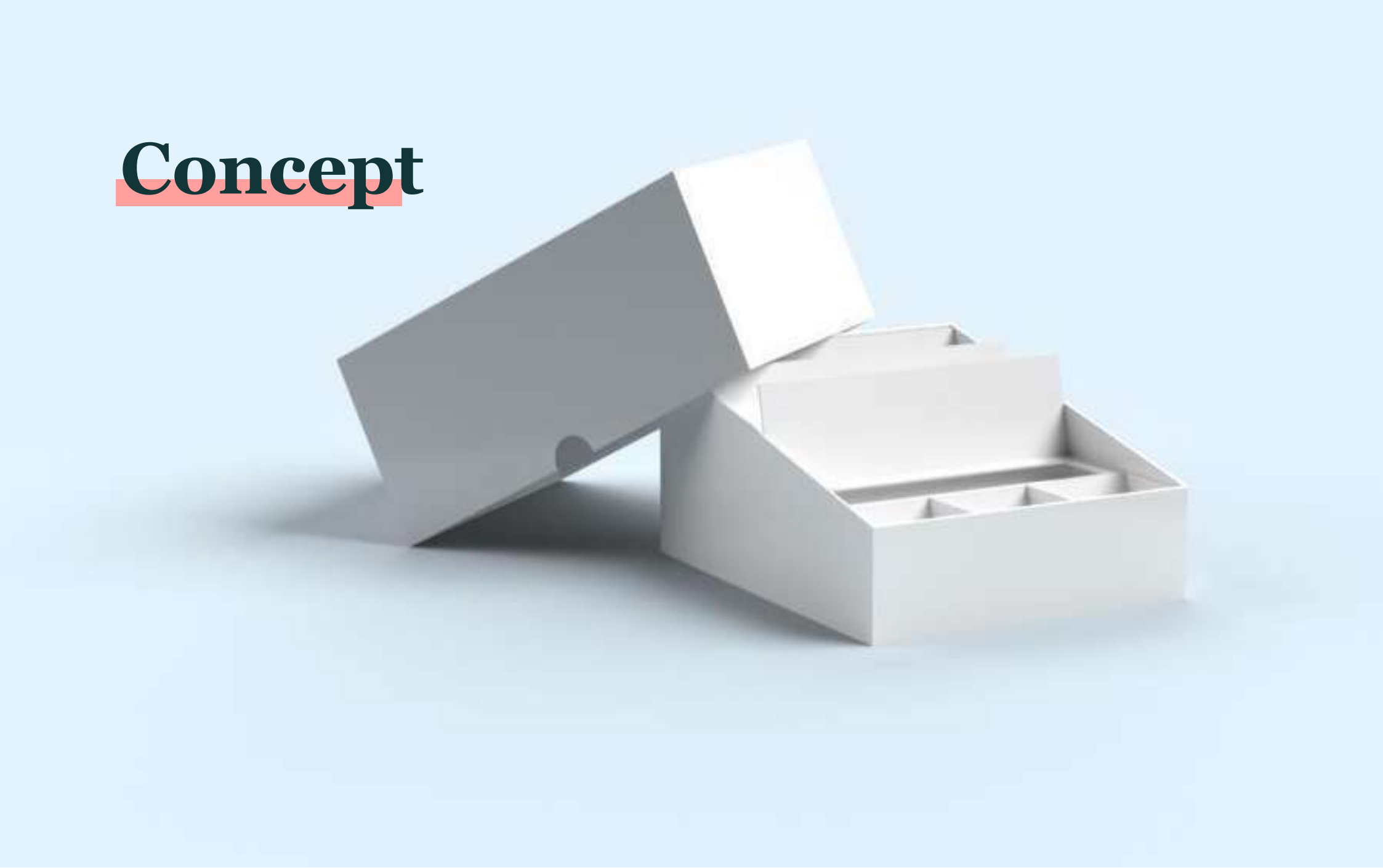
Now with a concept we had worked out, we returned to the workshop to prototype and test our concept.



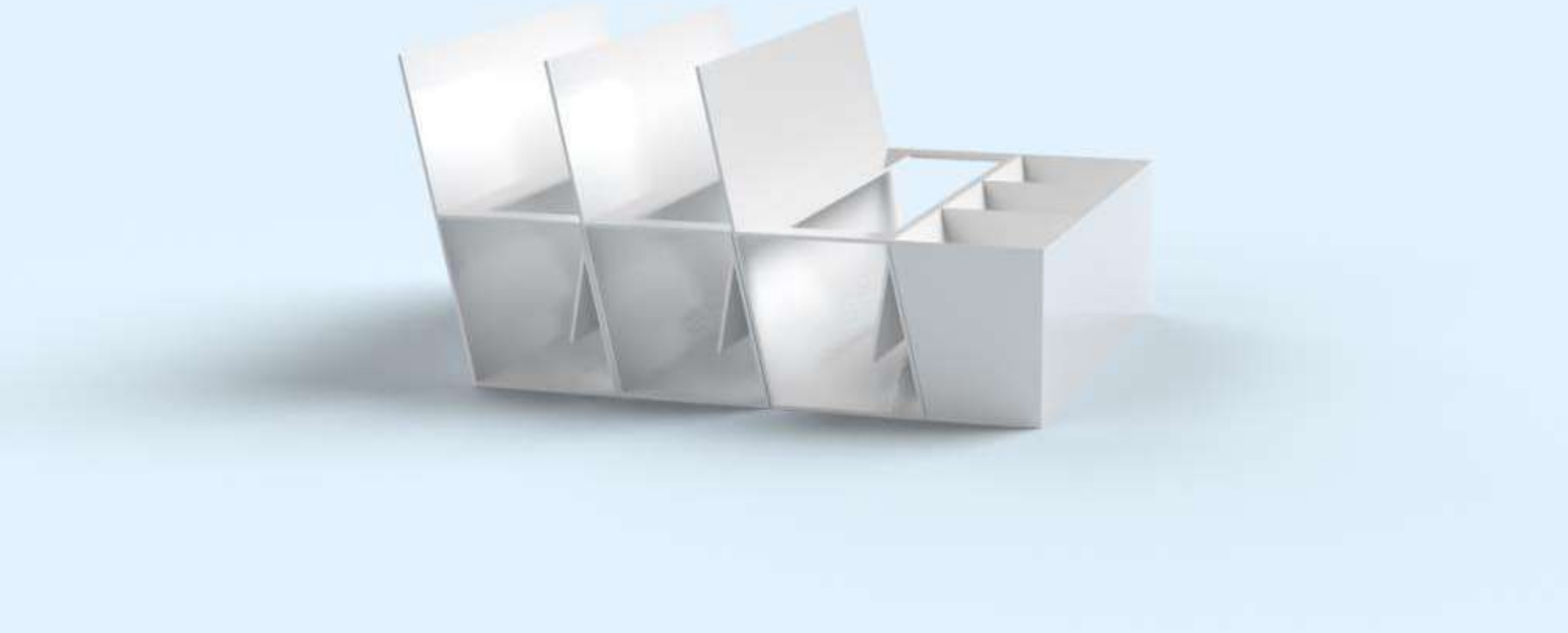




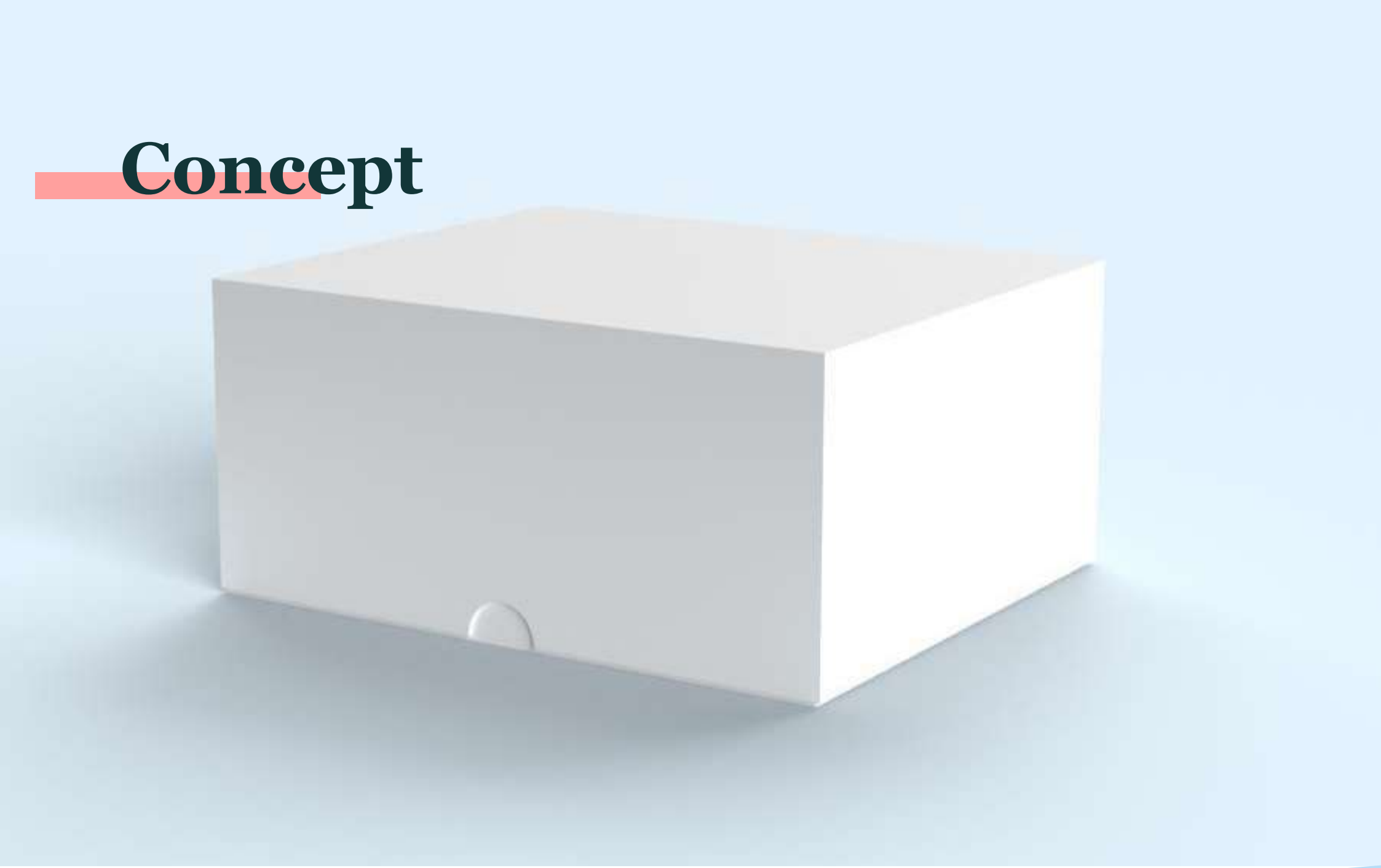
Concept



Concept



Concept



Concept

Concept

Product Highlights

- An impressive taco packaging concept, designed with impressiveness in mind
- As environmentally friendly as possible (little material waste due to smart design, glue only used inessential parts)
- Great user experience, able to take out a single taco and have it stand on its own
- Compact form factor makes it easy to transport for both users and delivery drivers
- Design is modular, possibility to make larger or smaller outer boxes for different meal sets (e.g. single tacoand single sauce)
- Outer box comes flat for storage/transport efficiency, can be folded together in a similar fashion to pizzaboxes
- Taco holder comes flat for storage/transport efficiency, can be assembled by simply pulling one tab througha slot

Evaluation

Stakeholders wants (User)

- ❑ Facilitates transport of the product without causing damage to it ✓
- ❑ Easy to unpack at the location the user needs to unpack it (tool availability) ✓
- ❑ Contents should remain isolated from external microbes and forces ✓
- ❑ As sustainable as possible ✓

Evaluation

Stakeholders wants (Retailer)

- ❑ Reasonably "theft proof" ✓
- ❑ Catches the consumers attention ✓
- ❑ Contents should remain isolated from external microbes and forces ✓
- ❑ Protects the user from harm ✓
- ❑ As sustainable as possible ✓

Evaluation

Stakeholders wants (Pro Carton):

The stakeholder wants for Pro Carton were deduced from previous winners by looking at the values they hadin common.

- ✅ Sustainable design
- ✅ Simple design
- ➖ Multifunctional
- ❌ Replaces a plastic product
- ✅ Clearly displays the product
- ✅ Catches the users eye
- ➖ Doesn’t use glue

Next Steps

- Adjust and finish the technical drawings to allow for soft shell tacos to be used (⌀150mm instead of ⌀140mm)
- Weigh the positives and negatives of redesigning the sauce holders, and coming to a final conclusion

Thank you for listening!

Pro Carton poster :

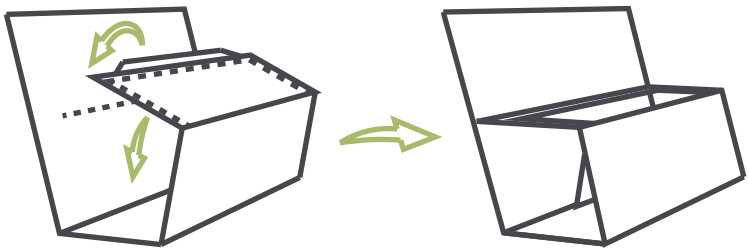
One of the indispensable requirements for the participation in the contest was the creation of a poster that would illustrate the concept of the designed product.

This shows to the public or jury a simple but clear view of the product and its features.

In the next page there is our poster proposal for the contest.

Taco2Go

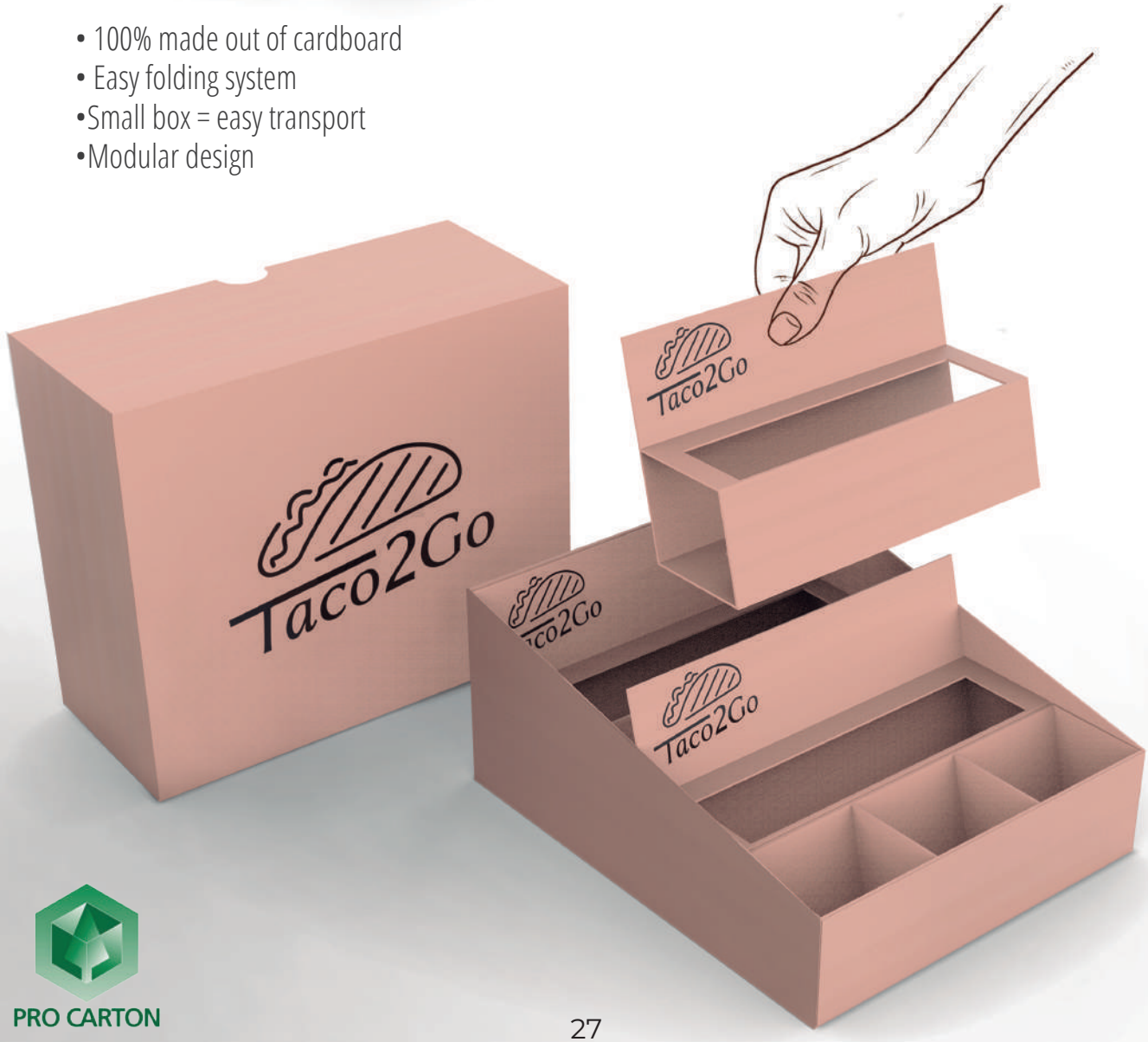
Raj Vaidya, Thijs Seelen, Alicia Sanchez
minor PDI 20-21 Spring (16/04/2021)



Taco holder comes flat for storage/transport efficiency, can be assembled by simply pulling one tab through a slot

Taco2Go is a new concep for taco packaging. The principal aim is to keep the tacos upright while transporting. Each taco can be grabbed individually. Moreover provides three diferent sauces

- 100% made out of cardboard
- Easy folding system
- Small box = easy transport
- Modular design



PRO CARTON

Pro Carton project report :

The "Taco2Go" project for Pro Carton went through many stages before becoming the final product. Throughout the project we kept updating the project report to document all the stages.

The first stage was the analysis, here we analyzed the requirements that our product had to meet in order to participate in the contest. In addition, we also analyzed the winners of other editions to see the qualities that interested the jury.

The next stage was the ideation where we did brainstorming sessions to get as many ideas as possible. This stage was followed by conceptualization where the ideas that stood out were worked on in more detail.

After all this process, in the final stage we developed a new proposal for the contest, “Taco2Go” is our solution.

In the next pages there is the report mentioned above.


Taco2Go

PDI Report

Course

Packaging design and innovation
Haagsehoge School

Project members

Alicia Sanchez
Raj Vaidya
Thijs Seelen

Location

The Hague

Date

16-04-2021

Inhoudsopgave

Introduction

During the minor packaging design and innovation, we have been working on a design project containing the pack Aton contest. During this project we have had variable faces and thoughts. We started off with the analysis followed with the ideation, conceptface and final product proposal. In this report you will find al the steps we made during this project. And ad the and will do a evaluation.

1.- Start of

During the start of fase we started with figuring out which of the given subject we wanted to go for. To be able to make a grounded decision we first looked at wat these different subjects contain

- Creative Carton board Packaging: Eat & Drink
- Creative Carton board Packaging: All other
- Creative Carton board Ideas
- Save the Planet

We first did some analysis on the previous contesters. We did this for every category where we looked at the pro's of this product but also the cons. Also we analyzed the jury comments to see what they were interested in and why that product was chosen. Putting all the things next to each other we came up with the following list of the 2020 contesters. (2019 contester analysis can be found in appendix 2)

Creative Cardboard ideas

2020

Pro's

- Nicely displayed
- Simple
- Unexpected ting (folding is out)
- Something special
- Environment friendly by making it easy to clean up your waste
- Made out one piece
- Added a video of how it works

Jury comment

The judges found this to be a most inventive concept where the inner pack contains a folding pocket to house the used tampon and the pocket behind holds a new tampon. That in itself was something but the aesthetic of that also worked very well with the outer, retail, pack.

Creative Cardboard packaging food & Drink

2020

Pro's

- Nicely displaid
- Adding Something more than just removing plastic
- Easy to handle

Jury comment

This is definitely one of those where we all thought 'why didn't anyone think of that before'. A flour sifter built into the packaging construction, not only provides an immediate consumer benefit butcreates a premium offering, adding value in a sector that is dominated by price.

Creative Cardboard packagingallother

2020

- Clearly displaid
- Making it easy to see the product so no need for plastic see through
- Made of one peace
- Special shape

Jury comments

In short, this is simply brilliant or brilliantly simple or just genius. A packaging design construction for a knife that not only looks special, holds the knife perfectly securely and yet you can fully see the knife. The creativity and strategic thought that produced this concept, we have rarely seen.

Save The Planet

2020

- Nicely present
- Good use
- Simple
- Environment friendly
- Replaces plastic

Jury comments
This entry falls into the ‘simple but equally effective’ category. The cardboard pads provide protection and cushioning for the product e.g. electronic items, through the simple use of carton and paper and remove the need for bubble wrap or other plastic protection.

2.- Ideation

First Ideation

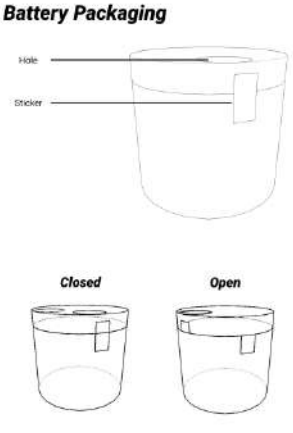
After looking at the 4 subjects and having done quit some research we still were not sure which subject we wanted to choose. At the same time we did not wanted to narrow down already sins we could not come up with good arguments her for to keep our vision broad we decided to not choose one yet but just start with ideating and analyzing. And so first come up with some cool ideas how could then be fitted in these.

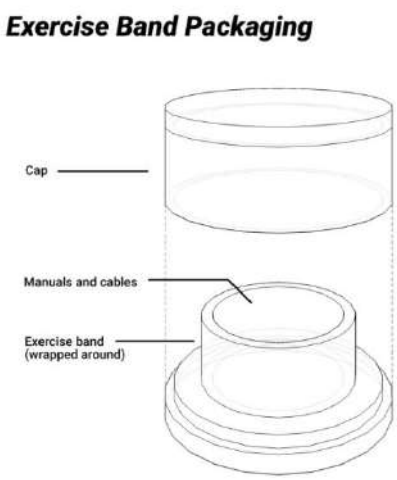
We started ideating and come up with some ideas based on the bellow listed aspects. We each came up with a list of around 20 ideas so 60 total (appendix 1) we shared all these ideas with each other to brainstorm over it and come up with even more ideas. That way we would have some inspiration and a start. We road down some pro’s and count’s to see later if that ideas had some potential. It helped us with making some first ideas and getting the creative project started. In Appendix 1 you can find all the ideas we came up with in the first place.

- original
- good first impression
- simple but effective
- low priced production
- new in the market
- additional value
- protect the product
- material waste
- makes your life easier
- easy transport
- luxurious experience

Finally we decided to focus on the category “Creative Carton board Packaging: All other” so the three ideas chosen in this category were

- Battery packaging
- Exercise band packaging
- Socks packaging





Criteria	Weight	Battery	Weighted 1	Exercise Band	Weighted 2	Shocks	Weighted 3
Simplicity	8	6	48	6	48	7	56
piece	5	0	0	0	0	2	10
Uniqueness	10	6	60	5	50	6	60
Multipurpose	5	3	15	3	15	3	15
Clearly displays product	5	2	10	2	10	2	10
Unique shape	2	1	2	1	2	0	0
Solves problems	10	5	50	3	30	7	70
Sustainability	8	3	24	3	24	4	32
Protects product	10	10	100	10	100	10	100
Informs user	2	2	1	2	4	2	4
Transports product safely	15	15	225	15	225	15	225
Preserves product	15	15	225	15	225	15	225
Total Score	100		**760**		**733**		**807**

Using the values that we found to be important to the judges on the previous list, we came up with a weighted objectives chart to analyze and rank the concepts we will be creating next week.

The chart weight will be adjusted according to how important we believe each criteria to be.

A weighted objectives chart will also give us an overview on what can be improved for any given concept.

3.- Concepts

Before define the concepts we were about to start to work on we took a look back to analyze one more time we we had until this moment to keep working forward.

Stakeholder Analysis

- Pro Carton

Being the European Association of Carton and Carton board manufacturers, Pro Carton is actively looking for innovation within carton and cartonboard packaging design. To achieve this goal, Pro Carton uses design competitions in which designers can innovate within the field of cartonboard packaging.

Needs: A sustainable design for packaging using carton or cartonboard along with accompanying documents.

- Retail companies

Large chain supermarkets are looking for alternatives to plastic within their packaging to achieve their goals for reductions in plastic (Ahold Delhaize, n.d.). While sustainability might be important, product safety is a priority for retailers. Product safety can be physical (ease of theft), microbial (preventing microbes from affecting the product), or protecting users from harm (child proof closures).

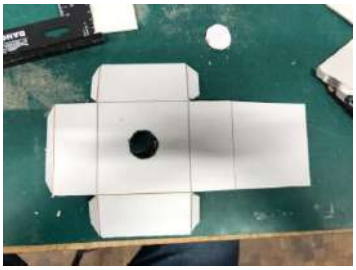
Needs: Designs for packaging which are sustainable, “theft proof”, protect the user from harm, and protect the product from microbes (if applicable).

- Potential user

The user will be expecting several criteria for packaging to be fulfilled. It is presupposed that the packaging of a product will be able to reasonably protect the packed items. The packaging design should also facilitate the user to transport the product home. When the product is ready to be unpacked, it is also useful if the user can unpack the product with ease. Another important feature would be to protect the user from harm (protecting the user from the content of the packaging or protecting the content of the packaging from external microbes). An increasing trend of sustainability means users will be more likely to expect sustainable packaging.

Needs: Packaging that facilitates transport without causing damage to the product. The packaging should be easy to unpack at the location the user needs to unpack it (keeping availability of tools in mind). The content of the packaging should remain isolated from external microbes and forces (if applicable). Sustainability would be a bonus to the users, however it is not paramount to the success of the packaging.

We went to the workshop to create some mockups to se id the ideas work in real life. In the workshop we focused on the sock packaging but we tried other ideas like the wine bottle packaging and the shoes packaging.

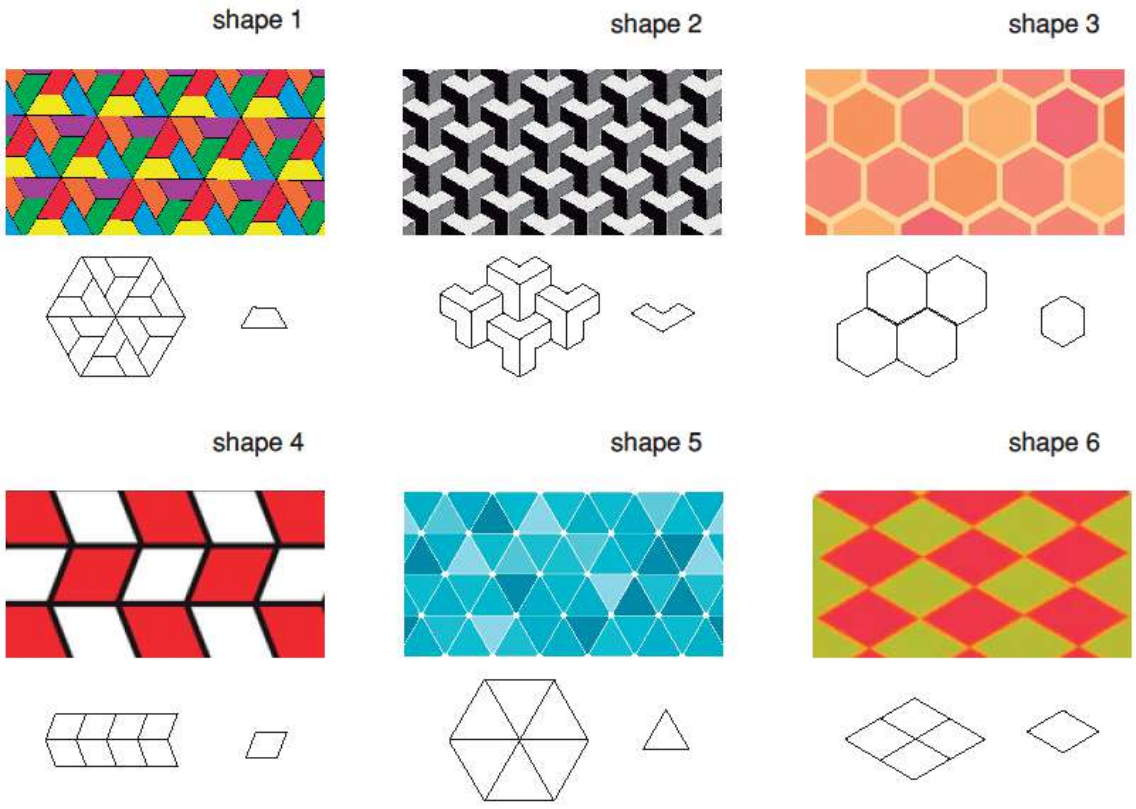


- Bottle packaging

- Shoe box

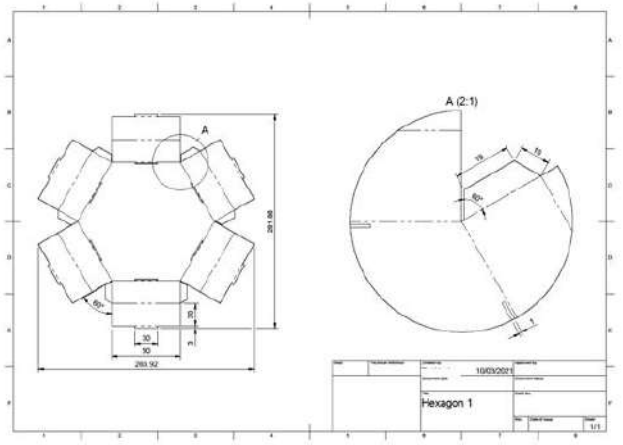
Product Vision

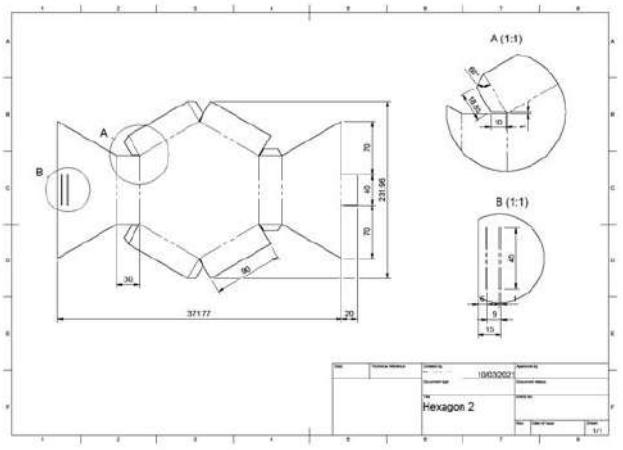
- Sock packaging which can also be used for storing socks at home
- Uses cardboard as the main material with a chance of needing a plastic foil on the top to display the product
- Tessellating shape to allow for the packaging to be neatly organized
- Uses mechanical connections to snap together the separate modules
    - Potential to design the packaging in such a way that it can be hung on the wall/placed vertically
- Uses interesting graphics to incentivize users to collect the packaging

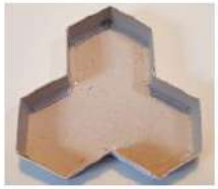


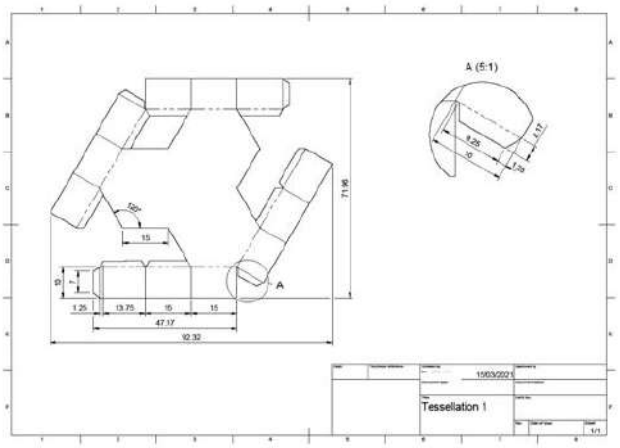
Research was done into tessellating shapes to find the ones most useful for our packaging.

We were looking for shapes where socks could be rolled up and stored in.


A (2:1)
A
Hexagon 1


A (1:1)
B (1:1)
A
B
Hexagon 2




A (5:1)
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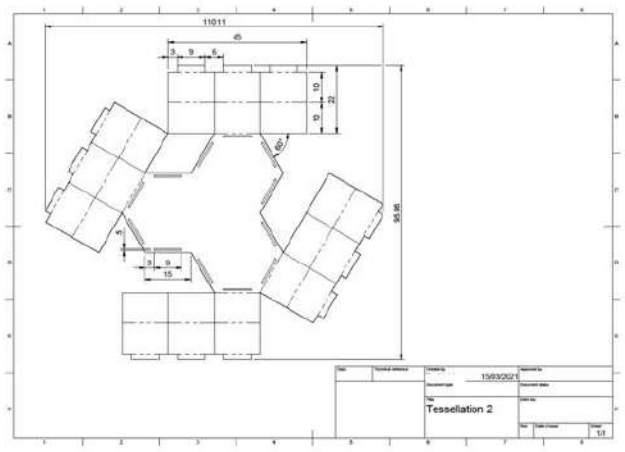
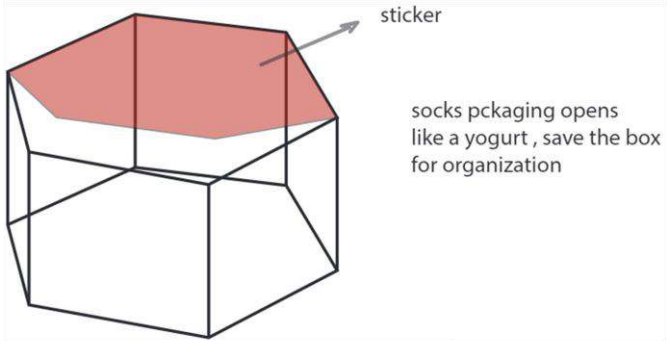
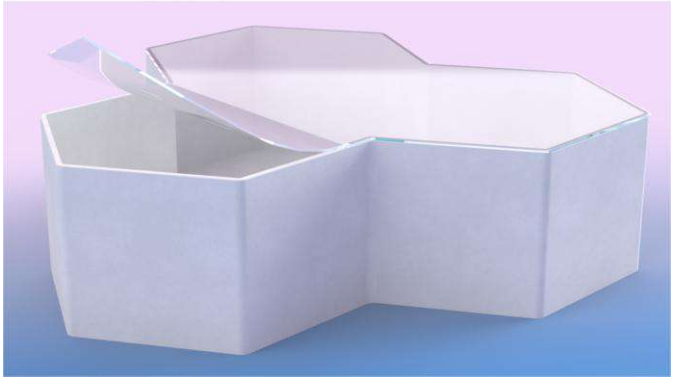
Tessellation 1



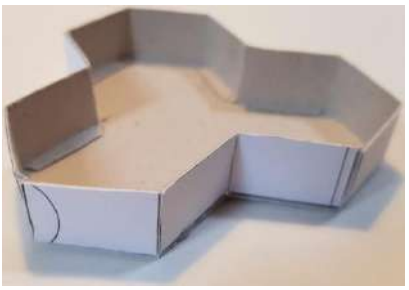
4.- Materialization

In the first couple of weeks we had a lot of disjointed ideas; packaging concepts for things like batteries, fruits, and wine bottles. We however saw the idea of sock packaging as something with a lot of potential, hence we focussed on this concept. We needed the packaging to tessellate to align neatly where you would want to store the socks so we looked into inspiration from M.C. Escher, and looked into the maths of tessellation.

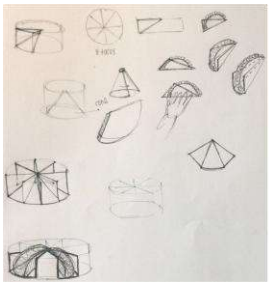
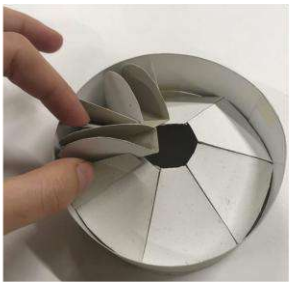
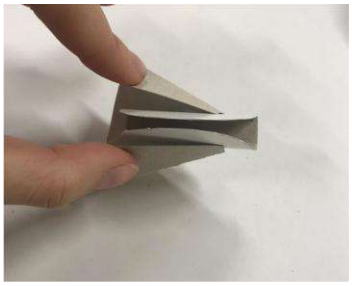




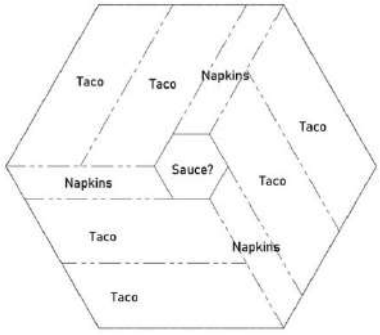
We wanted to prove our concepts and to do this we needed to create prototypes. This led us to going to the workshop at school and folding our sock concepts into prototypes. We found that the glue designs looked a neater than the ones without glue, you can probably guess which one we skipped using glue on.


During this same prototyping session, we decided to revisit the taco packaging she came up with during our early ideation sessions. The concept would have been very impressive to the user, however we came to the realisation that the angle, while it may look good, would cause all the taco filling to shift onto one end of the taco, especially during transport, which isn't ideal.

After we prototyped, we had a discussion with Gerard where the idea of mixing two concepts together came up. This led to the following concept for taco packaging. We decided to use the hexagonal shape of the socks to create a layout for tacos and all the relevant paraphernalia.



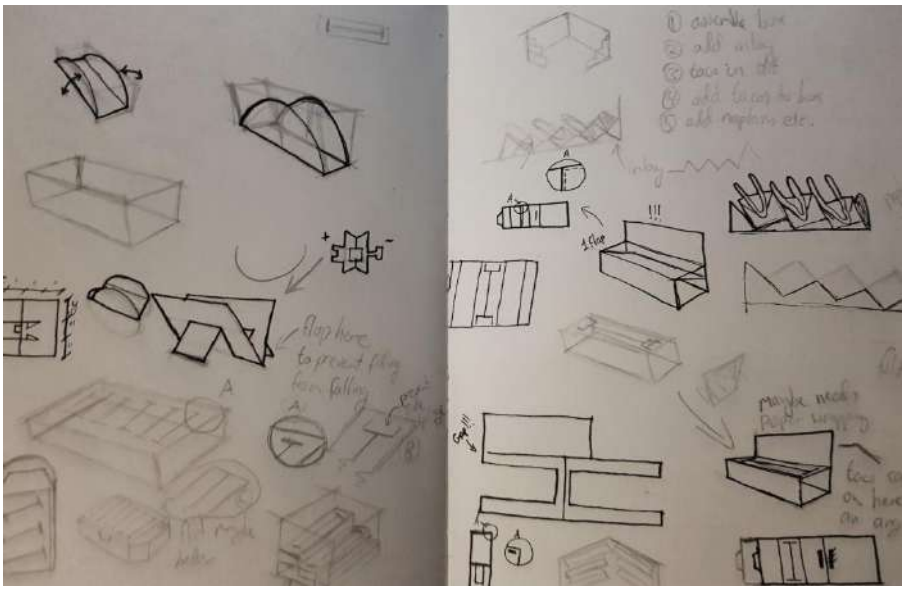
While working out the taco packaging concept, Alicia decided to order tacos for market research reasons. This helped us to see what was in use at the moment, and how we could improve upon it. As you can see from the picture, there are quite a lot of improvements that can be made.

When we had trouble coming up with further ideas, we decided to use a mixture of the braindrawing/writing method, along with the design carousel method. To do this method we had to split up our concept into separate functions, namely, protect tacos, hold tacos upright, hold sauce, hold napkins, and being an impressive design.

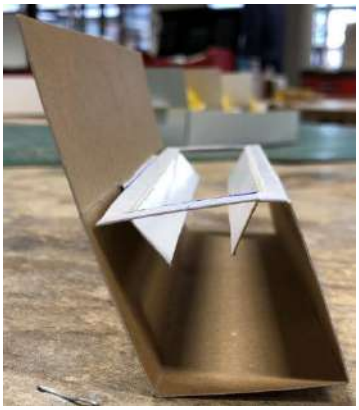
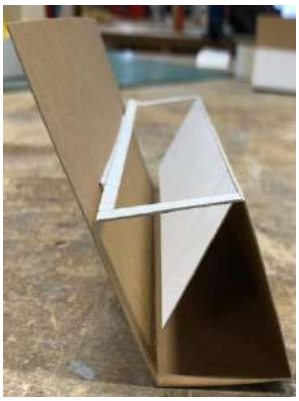
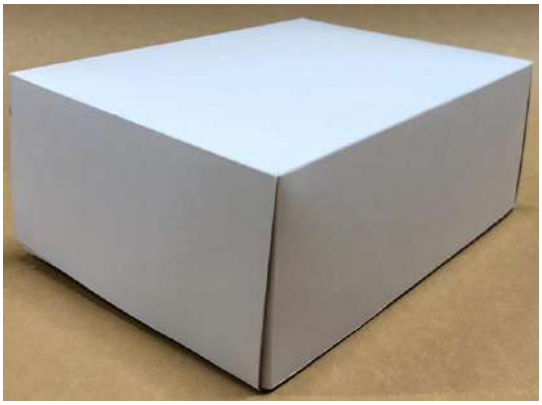
We then each took one of the five functions and ideated on it for around 10 minutes each, after the 10 minutes was over we would move down the list by one and continue until we all reached our original function.

This was very successful as it led to between 7-10 ideas for each function and gave us a good starting point.

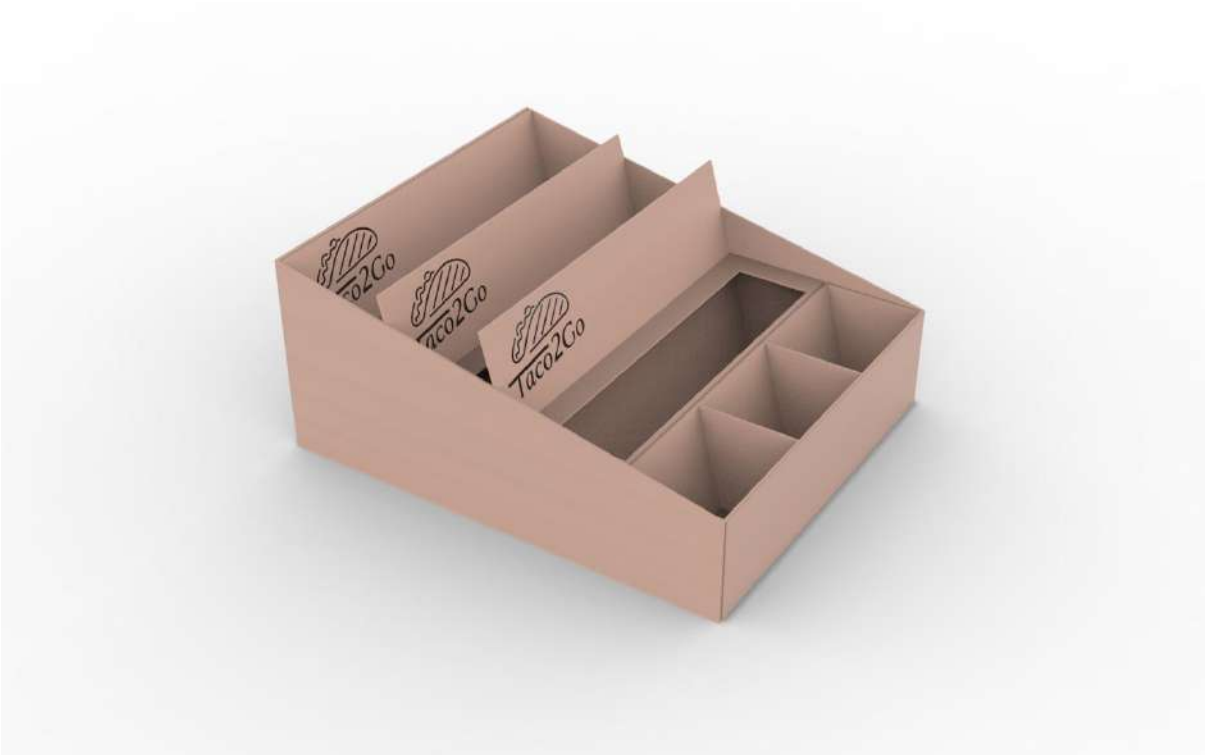
Now that we had all these separate functions, we had to combine the functions into one whole concept. While doing this we kept the impressiveness of the concept in mind, and we tried to be efficient with materials by keeping offcuts to a minimum.



After we settled on the final permutation of our functions, we went to the workshop to prototype our concept. We did a little bit of testing in the workshop as well to see whether our taco holder would be better with 2 flaps, or a single flap. We ended up going for the single flap design as it had the least chance of clamping down on the taco as it was being removed from the holder. We also rapid prototyped a box concept which could be folded into shape easily.

So this is the final product:


Taco2Go
Taco2Go
Taco2Go


Taco2Go
Taco2Go

5.- Evaluation

Taco2Go is the final product and for evaluate it we want to see all points of view, the user, the retailer and the values needed to participate in ProCarton. These needs come from our earlier stakeholder analysis.

Stakeholders wants (User)

- ✓ Facilitates transport of the product without causing damage to it
- ✓ Easy to unpack at the location the user needs to unpack it (tool availability)
- ✓ Contents should remain isolated from external microbes and forces
- ✓ As sustainable as possible

All the needs were met for the user.

Stakeholders wants (Retailer)

- ✓ Reasonably “theft proof”
- ✓ Catches the consumers attention

- ✓ Contents should remain isolated from external microbes and forces
- ✓ Protects the user from harm
- ✓ As sustainable as possible

All the stakeholder wants for the retailer were met as well.

Stakeholders wants (Pro Carton):The stakeholder wants for Pro Carton were deduced from previous winners by looking at the values they had in common.

- ✓ Sustainable design
- ✓ Simple design
- \- Multifunctional
- × Replaces a plastic product
- ✓ Clearly displays the product
- ✓ Catches the users eye
- \- Doesn't use glue

Not all the ProCarton needs were met since our concept is not replacing a plastic product. For the product being multifunctional, it is a possibility due to the modular nature of our product; however it is not strictly multifunctional, hence we didn't tick the box. Along with this, we believe we have good arguments for using glue for the sauce packaging and avoid using it in the rest of the concept, which is why we didn't give ourselves a point for that either.

Appendix

Appendix 1

(Thijs)

Eat& drink

1. Packaging cheese in cardboard box just like sprinkles.

- Wrap rage
- Environment friendly
- Easy to use

2. replace plastic, grease packaging for paper net.

- Environment friendly
- Wrap rage?

3. plastic packaging bake off rolls in carton.

- Environment friendly

Save thePlannet

1. Paper towel packet in cardboard

- Environment friendly

2. Scourer packet in cardboard

- Environment friendly

3. Detergent packet in cardboard ish

- Environment friendly

Creative carton board ideas

1. The good-looking upside down wine bottle case.

- Made out of recycled paper
- Read before you drink

2. The cable managet box.

- Multi functional
- Sustainable
- Cable rage

3. The Shoe box stand.

- Multi functional
- Sustainable
- Recycled material?

4. The stacked screw box

- Multi functional
- Sustainable
- Recycled material?

Allother

1. The more than 1 measure box.

- Environment friendly
- Multi functional

2. The click out pil box

- Easy to use
- customer friendly

(Alicia)

1st idea (eat and drink)

(not only for oranges, useful for onions, potatoes..)

2nd idea (eat and drink)

(similar measurement idea but with rice, lentils..)

3rd idea (eat and drink)

cardboard tray + wrapping paper

4th idea (outside the box)

(second life for the packaging)

5th idea (all other)

(nails can be in a box but this is cool)

6th idea (outside the box)

(second life for the packaging)

7th idea (save the planet)

(change pills packaging for one made by cardboard)

8th idea (save the planet)

9th idea (outside the box)

(reduce the amount of cardboard used for the packaging

10th idea (outside the box)

(clothes don’t wrinkle)

11th idea (outside the box)

(using the product for a creative packaging)

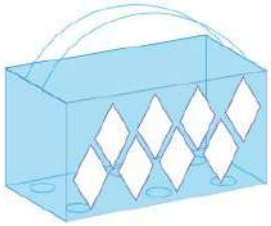
12th idea (save the planet/eat and drink)

13th idea (save the planet)

socks pckaging opens like a yogurt , save the box for organization

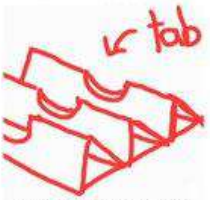
-strawberries
-kiwis
-mandarine
-grapes
-tomatoes

same cut pattern all around the box?



(Raj)

Taco Packaging 1

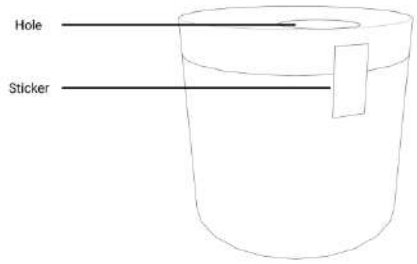


One long piece of cardboard, held together by a tab. Offcuts make it easier for the user to grab the tacos.

Taco Packaging 3

Uses a tab to lock everything in place, and made from one part

Battery Packaging



Taco Packaging 2

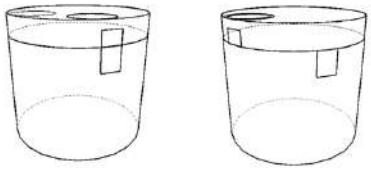
Problems: people will probably open it upside down due to its shape, problem can be solved by using clear labels.

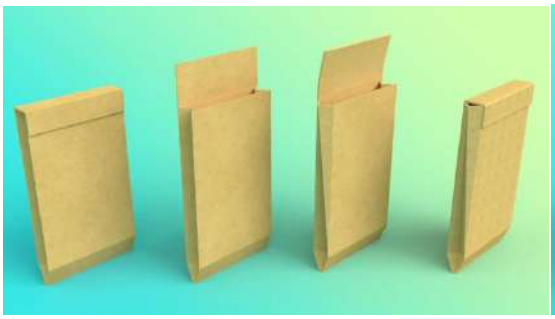
Salt Packaging 1

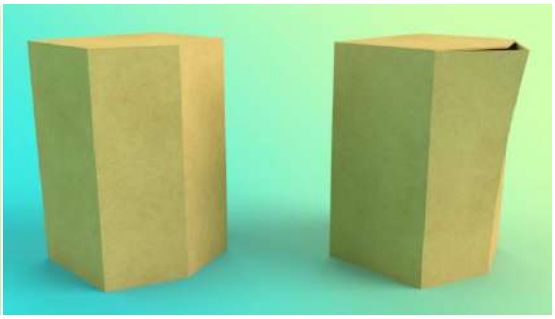
One side has a cover with mm holes to allow small amounts of salt through. The other side could have a similar paper with one larger hole (if salt flows too quickly from the regular hagelslag packaging)

Might be better to put both openings on the same side, needs testing to see if it stays closed or not under the weight of the salt.

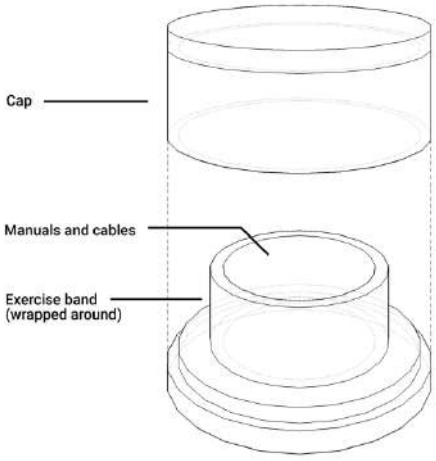
Closed **Open**







Exercise Band Packaging



Appendix 2

Puplic award

2020

- Nicely shaped

- Problem solver
- Carring 2 things at once

- Replacement of something good

- Goodlooking
- Making the product visual
- Luxerydising

- Multi functionale
- Sustainable
- Easy to handle when not using
- Special looking

- Packaging for high end product
- One peace
- Complicated

Individual assignments :

Parallel to the group work, four individual tasks proposed by the teachers were carried out.

The first one consisted of analyzing the packaging of seven products from seven different categories that we use in our daily routine and proposing improvements.

In task number two a hypothetical growing bakery was looking for a new shop, this task consisted of making an economic approximation of the machinery and tools used as well as making plans of the layout of the shop.

The brief for task three was to improve the packaging of a small electronic device.

Finally, the fourth task consisted in analyze lists or articles related to bad packaging and identify the reasons why the packaging does not work.

In te next pages there is the document with these tasks.

Alicia Sánchez 20224915

ASSIGNMENT 1: Marketing and enviroment

1. Introduction
2. Products to study
   (analyse, rubric, improvement, sustainability)
   -Dairy product
   -Bread product
   -Soft fruit
   -Meat product
   -Flowers (gift)
   -Smarthone or tablet
   -Detergent tabs
3. Conclusion
4. Sources
5. Annexes

1.- INTRODUCTION

Marketing and environment are two words that can go hand in hand when we talk about packaging. Every day people are more aware of how important it is to take care of the planet and which means more and more people are looking for products that fit with their values. Therefore, if we look at it this way, taking care of the planet is a great marketing strategy.

The purpose of this work is to analyze the packaging of seven products from seven different categories that we use in our daily routine. These categories are dairy product, bread product, (soft) fruit, meat product, flowers (gift pack), smartphone and tablet, detergent tabs.
The criteria used for study this products is if the packaging is visually appealing, if it is informative and if it provides appropriate protection. The method used to analyze these aspects is to first describe these characteristics of the products and then summarize this information in a numerical value in the rubric.

Once all this analysis is clear, it will be about improving these products to make them more visually attractive, to provide clearer information and to protect the product even more.
All possible information about the sustainability of these products and the values and future goals (about the environment) of the company that manufactures them will also be collected. This will be kept in mind when improving product packaging.

2.- PRODUCTS TO STUDY

DAIRY PRODUCT

Name: original mini Babybel

Content: 8 pieces

Brand: Babybel

Price: 2,85

ANALYZE

Appealing

The Babybel cheeses have had the same shape and size since 1977 and little has changed their logo or their aesthetics in general in all these years. It has a very striking red packaging and the logo is also very easy to recognize. At this time the brand does not need to stand out from the competitors because it does not have any but perhaps in the past it was useful to get where it is in the market right now.

Information

Attached to the plastic net is a label in which we can find the nutritional information of the product and also the ingredients. An important warning appears and it is that to avoid the risk of suffocation, children less than 4 years of age should eat them cut into smaller pieces and under the supervision of an adult.

Protection

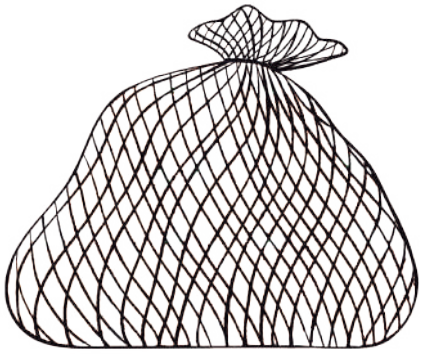
The red wax is part of its DNA and brings a unique consumption experience. It prevents desiccation or molds and helps preserving the cheese in proper hygienic conditions until consumption. The cellophane wrapping completes the cheese protection. It prevents the wax from shock damages and sticking. The net is made from polyethylene and it is used to keep all the mini cheeses together.

RUBRIC

Categories	25	20	15	0	
Visually appealing	x				25
Informative		x			20
Protection	x				25
Total points	50	20			70

IMPROVEMENT

-Replace the outer plastic net with a similar one made of cardboard



SUSTAINABILITY

“Babybel® aleady ensures a Zero Deforestation certified sourcing on paper and cardboard packaging and plans to reach 100% of recyclable-ready and / or biodegradable packaging by 2025. In Babybel®’s packaging, we keep the weight and amount of packaging to an absolute minimum and every piece of packaging has a very clear role.But at Babybel® we keep on challenging ourselves and we have been initiating many projects with our research and innovation teams for years to keep on reducing the amount of packaging and offering more and more sustainable solutions. As Babybel packaging are not yet widely recyclable, they can’t be placed in your recycling bin at home so need to be recycled in a special way, which is where our recycling partner TerraCycle® come in. TerraCycle® gives you the opportunity of recycling Babybel packaging while supporting local charities and schools with donations at the same time. All you have to do is find out where your local public drop-off location is below and drop off your Babybel packaging TerraCycle® will then recycle all Babybel packaging elements, turning the recycled material into new products such as candles or picnic tables.” (babybel.co.uk/)

BREAD PRODUCT

Name: Bimbo natural 100%

Content: 16 pieces

Brand: Bimbo

Price: 1,89

ANALYZE

Appealing
The illustrations that decorate the bread bread package give the sensation of being handmade and therefore the consumer appreciates quality in this product.

Information
The packaging provides to the costumer all the necessary information about the product, the nutritional information and the ingredients are placed in one lateral side, the contact information as well as the factory address from which the product comes and finally some additional information is included.

Protection
This type of packaging does not provide great protection for the product, it is a bag therefore the walls are not rigid and care must be taken when transporting the product so as not to crush it. However, it does provide the necessary insulation to preserve the product and that it does not dry out and remain tender.

RUBRIC

Categories	25	20	15	0	
Visually appealing		x			20
Informative	x				25
Protection			x		15
Total points	25	20	15		60

IMPROVEMENT

- It is not possible to reduce the amount of plastic because it is necessary to preserve the bread, the cardboard is not sufficiently insulating for this case.

- The actual size of the bread bag is sometimes too big for a person living alone, so a good improvement would be to divide the package into two plastic wrappers inside a larger wrapper which could be cardboard.

SUSTAINABILITY

“2016, Grupo bimbo begins a collaboration with ECOCE, a packaging collection and recycling company, to ensure that, by 2020, none of our packaging ends up in landfills
2017, Grupo bimbo is named as one of the most ethical companies globally by the Ethisphere Institute
2018, Committed to the RE100 Pact, we announced our commitment to use 100% renewable energy globally by 2025.
2019, Bimbo Solar launched in Chile, the largest self-sufficient solar energy system in the country and in South America. We are taking concrete steps to transition to using renewable energies around the world. “ (grupobimbo.com)
This brand focuses more on the environment in terms of renewable energy than packaging because it continues to use a lot of plastic although its website says that it is 100% recyclable and 30% recycled.

SOFT FRUIT

Name: strawberries

Content: 500 gr

Brand: Cuna de Platero (Mercadona)

Price: 2,25

ANALYZE

Appealing

The packaging consists in a transparent plastic box (PP or PET) with little holes to allow air to flow through the box to preserve the product longer, also useful to clean the strawberries. Transparent packaging permit the costumer to see the product that is buying, in this case with strawberries the costumer needs to see if they are still green, too much mature or ready for eat. It is possible to open the box once it is opened.

Information

A sticker placed on the boxes indicates the origin of the product as well as its expiration date. It is indicated to wash the product before consuming. No more information is needed for this product. No instructions required.

Protection

Protects the product from being crushed or damaged, also ensures that no one touches it personally I do not think it is important because you have to wash them anyway but some people prefer it that way. Once the box is open, you can close it again, preventing the strawberries from falling out.

RUBRIC

Categories	25	20	15	0	
Visually appealing		x			20
Informative	x				25
Protection		x			20
Total points	25	40			65

IMPROVEMENT

- The improvement here it can be just changing the material, instead of plastic use cardboard, but keeping the original shape and the holes of the actual packaging.

- Add a handle.

SUSTAINABILITY

"We reduce the environmental footprint. At Cuna de Platero we are committed to our environment so we responsibly manage our resources and waste, deciding to save energy and recycle. Thus, we collaborate with the maintenance of our natural and social environment with a small brand.
Agricultural plastic waste: we trust local companies specialized in recycling processes.
Toxic waste: we put an authorized company with a long history such as Antonio España e Hijos in charge of the management.
Paper and cardboard: we return them to the Abriendo Puertas Association for reuse, also collaborating with their social project.
Phytosanitary containers: they receive an adequate treatment for the SIGFITO management system." (cunadelatero.net)

MEAT PRODUCT

Name: Snakin mini fuets

Content: 40 pieces (aprox)

Brand: Campofrio

Price: 5,45

ANALYZE

Appealing

The product itself draws a lot of attention since it is not the normal format in which we find “fuet” (typical Spanish embutido), it is usually a long stick, so this is more like a ready to go version. In addition to this, both the purple color and the graphic design are quite attractive.

Information

The packaging contains all the essential information that a box packaging should include. the place where it is manufactured, the customer service information and most importantly the nutritional information

Protection

The cylindrical box is made out of strong plastic so even though the product does not need too much protection the packaging provide it.

RUBRIC

Categories	25	20	15	0	
Visually appealing	x				25
Informative	x				25
Protection			x		15
Total points	50		15		65

IMPROVEMENT

-Replace the hard plastic bucket with a cardboard box that will unfold a little when opened to be able to access the snack more easily

SUSTAINABILITY

"We have implemented initiatives to optimize energy consumption in our factories, improve the efficiency of our transport and logistics systems, and reduce packaging materials. By virtue of our Energy Efficiency Plan, launched in 2009, we are reducing the consumption of electricity, fuel, gas and water.
We have invested in new energy efficient technologies and have started a process of transforming the refrigeration units to be compatible with environmentally friendly refrigerants. On the other hand, we investigate with bio-based plastics made from natural materials and biodegradable sheets of paper and aluminum." (campofrio.com)

FLOWERS (GIFT)

Name: flowerbox longlife scarlet wit

Content: 24 -26 roses

Brand: Rosuz

Price: 224, 95

ANALYZE

Appealing
The packaging is really good visually speaking, the red color wraps the entire box and the velvet material provides warmth and a luxurious finish. The heart shape makes it perfect for a birthday gift but especially for an anniversary or Valentine's Day.

Information
The box does not provide any information about the product, as it does not require instructions for use or any other type of information.

Protection
The box containing the flowers has a tap which provides protection for all the flowers. This box is made out of strong cardboard. Also this box is inside a bigger box

RUBRIC

Categories	25	20	15	0	
Visually appealing	x				25
Informative		x			20
Protection	x				25
Total points	50	20			70

IMPROVEMENT

- Take advantage of the bottom of the box and make two drawers for chocolates or other gifts such as jewelry

SUSTAINABILITY

“Website hosting in a green data center. The data center where our web store is hosted is completely powered by green electricity generated from the wind by wind turbines. With 100% Dutch wind, from Dutch windmills. No CO2 is released during the production of this sustainable energy.
Eco-friendly packaging. Packaging material has a great impact on the environment. Rosuz packaging is produced in the most environmentally friendly way possible. For example, packaging is made primarily of paper to limit greenhouse gases. All containers are also reusable.
Waste separation. Waste collection, especially waste separation, is a high priority for Rosuz. Good waste separation results in increased recycling and a significant reduction in impact on the environment. In addition, all products are tailor-made and delivered, which means that there is also little residual waste.” (rosuz.nl)

SMARTPHONE OR TABLET

Name: IPhone 12 64GB

Content: IPhone 12, Cable USB-C

Brand: Apple

Price: 909

ANALYZE

Appealing

In order to open the box, you must remove a transparent plastic wrap first. The box is made using white strong cardboard and has a real-size image of an IPhone with colorful wallpaper. The style of the packaging is simple and elegant. The first thing you find when you open the box is the IPhone also protected with plastic wrap, under the IPhone there is a plastic tray and when you remove it you found the USB-C charge cable, and the instructions.

Information

In the back of the box there is information about the model and what it is included (IPhone 12 and USB-C charge cable) in different languages. Also you can find the serial number of the product.

Protection

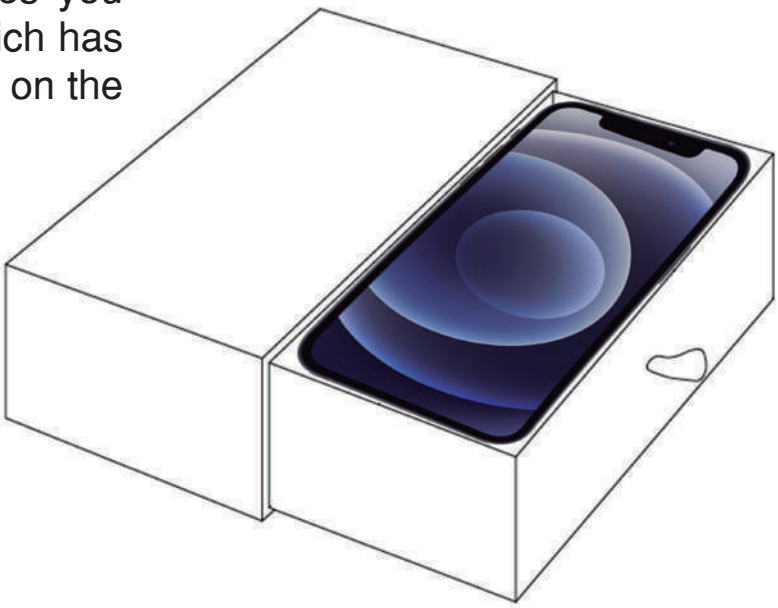
The packaging provides high protection to the product because it is made with fragile material components like the glass screen. With the growth of online shopping and deliver system, the box has to guarantee that the product arrives to the customer in perfect condition.

RUBRIC

Categories	25	20	15	0	
Visually appealing	x				25
Informative		x			20
Protection	x				25
Total points	50	20			70

IMPROVEMENT

- The way the IPhone box is opened despite having a very luxurious finish sometimes forces you to turn it over to open it, which has caused some user to drop it on the floor.



SUSTAINABILITY

“We’ve maintained our circular supply chain for paper, by sourcing from recycled and renewable sources and by creating as much responsibly sourced fiber as we are using. Sourcing responsibly: 100 percent of the wood fiber in our packaging comes from recycled sources or responsibly managed forests.12 Regrowing forests: We’re protecting or creating enough responsibly managed forests to cover all the wood fiber we use in our packaging. This helps us ensure we are not taking away from, but instead growing the world’s supply. Enhancing recyclability: All the retail boxes for our products can be recycled at standard paper recycling facilities. And we are continuing to transition internal packaging trays to model fiber or other fiber-based solutions to enhance recyclability even further.” (apple.com)

DETERGENT TABS

Name: Clothes detergent All in 1 Ariel in tabs

Content: 15 tabs

Brand: Ariel

Price: 3,30

ANALYZE

Appealing

Ariel has green as the corporate color of the brand this makes it easy to distinguish its products in the supermarket. In addition, the brand name is written in red on white to create contrast and make it stand out. A photo of one of the tabs is on the front sticker to know how the product looks without seeing it since the box does not allow you to see the inside because it is opaque plastic.

Information

The packaging provides information about the instructions the costumer has to follow to use the product correctly. These instructions are located in a big sticker in the back of the box.

Protection

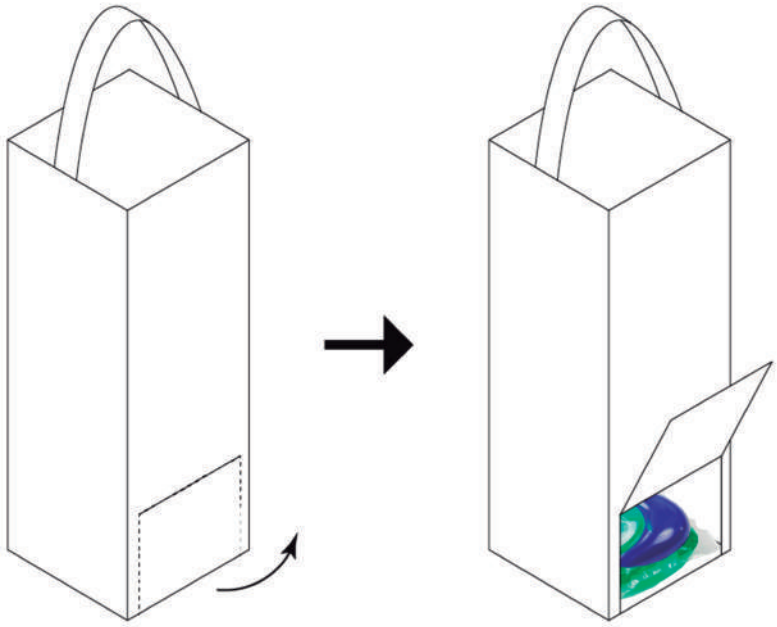
The box is made out of strong plastic to protect the tabs from water, even though the product has to be storage in a dry place. The open/close system is a “click” so the box has a very visible sticker that indicates “keep the product away from the children” that means the packaging himself it is not made to avoid children manipulation.

RUBRIC

Categories	25	20	15	0	
Visually appealing	x				25
Informative		x			20
Protection			x		15
Total points	25	20	15		60

IMPROVEMENT

- Include a handle for an easier transport
- Include a system that dispenses tabs one by one
- Changing plastic for cardboard



SUSTAINABILITY

“More than 90% of our packaging is already recyclable, and we are constantly looking for solutions to make the rest recyclable, too. To that effect we are doubling the amount of Post-Consumer Recyclate (PCR) in our plastic packaging by 2020. In Europe, our bottles are currently made from 25% PCR plastic. Globally, P&G’s fabric care bottles are made from up to 50% PCR and in 2015 we increased the amount of incremental recycled material that P&G Fabric Care uses per year increases by 3.8 kilo tons.” (ariel.co.uk))

3.- CONCLUSION

Marketing and environment are two words that can go hand in hand when we talk about packaging. Every day people are more aware of how important it is to take care of the planet and which means more and more people are looking for products that fit with their values. Therefore, if we look at it this way, taking care of the planet is a great marketing strategy.

The purpose of this work is to analyze the packaging of seven products from seven different categories that we use in our daily routine. These categories are dairy product, bread product, (soft) fruit, meat product, flowers (gift pack), smartphone and tablet, detergent tabs.
The criteria used for study this products is if the packaging is visually appealing, if it is informative and if it provides appropriate protection. The method used to analyze these aspects is to first describe these characteristics of the products and then summarize this information in a numerical value in the rubric.

Once all this analysis is clear, it will be about improving these products to make them more visually attractive, to provide clearer information and to protect the product even more.
All possible information about the sustainability of these products and the values and future goals (about the environment) of the company that manufactures them will also be collected. This will be kept in mind when improving product packaging.

4.- SOURCES

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ASSIGNMENT 2: Materials, production and packaging lines

1. Introduction
2. List of needed products
3. Costs
4. Distribution
5. Conclusion
6. Sources

1.- INTRODUCTION

The first step when creating a new business is have a clear idea of what you want to offer, once this is defined the next step is create a business plan.With this plan it is possible to analyze the business from all points of view so as not to leave anything to chance. Economic aspects are very important since the reason of starting a business is make money.

In this assigment we are going to study the hypothetical case of how to create a bakery. The context is that a woman or man has a small business in which she / he is the only employee, therefore is in charge of the production, packaging, transport and sale of the cookies. This business begins to grow and after four years the workshop is too small, consecuantly it needs a new place and a new economic plan to start producing on a larger scale.

In this case, the bussines has already started so it only need a new plan to handle a bigger production. This requires a huge investment that includes renting the new place, buy the necessary machinery, tools, packaging and finally the ingredients to start cooking.

In the following pages we will create a breakdown of the approximate costs that would suppose to equip a bakery that produces a greater number of cookies to satisfy the demand. Over and above that we create the plans for the distribution of the machinery within the rented stablishment.

2.- LIST OF NEEDED PRODUCTS

1. Oven. The most important piece of equipment on this list. It has to be an industrial one not a domestic one considering that we want to cook a big amount of cookies

2. Food processor. Its sharp blades can tackle tasks like crushing, chopping, slicing, shredding in seconds so do you save more time than if you do it by hand.

3. Baker's rack / Shelf rack. It is necessary to store cookies before baking when the oven is busy and after baking to let them cool down. Shelves are necessary to to store other things such as food and tools. Mobile racks are a good investment as they can be moved around and placed near the oven to conveniently insert and remove cookies.

4. Stand mixer / Hand mixer. Tabletop stand mixers will make a quick and efficient work and they are very useful for creams and sauces but the floor mixer is an ideal choice for make large batches of dough at once.

5. Baking pans. You have to be sure that you have enough pans because you are not going to need them only for baking they are going to be used for storage too.

6. Weight scale. Although many times the mixers include their own scale, sometimes one is needed for more precise measurements.

7. Kitchen utensils. Such as knifes, spatulas, cups, scissors, kitchen brush, roller, piping bags and nozzles, moulds.

8. Refrigerators. Some ingredients and foods such as creams and meringues need to be kept cold.

9. Packaging machine. Makes packing the bakery goods easier and saves so much time to the employees. Also the boxes to pack the products are necessary.

10. Office material. A phone, a laptop and a printer are needed, to be in touch with suppliers and customers. Also for administrative reasons.

3.- COSTS

1. OVEN

Radiance RBDO-33U, Three Deck 9 Pan Electric Bakery Oven, 3 Phase

PRICE:13.570,69 € ($16,222.50)

QUANTITY: 1

Bakery oven Rotary oil 800x1000mm EUROPA

PRICE: 17,520.00 €

QUANTITY: 1

2. FOOD PROCESSOR

Cutter / Kitchen Machine - 220-240 V - 1800 W - 6 Liters - Gastro

PRICE: 289 €

QUANTITY: 1

3. BAKER'S RACK / SHELF RACK

Vogue regaalwagen GN 1/1 with 20 shelves

PRICE: 266,13€

QUANTITY: 2

Stainless Steel Kitchen Shelf 5 Tier Garage Shelving Rack 122x183 Cm Storage

PRICE: 153,18€ (£132.99)

QUANTITY: 2

4. STAND MIXER / HAND MIXER

Planet mixer Buffalo, 30L / 11KG, 230V / 1500W

PRICE: 1.831,52€

QUANTITY: 1

Kitchenaid mixer, K45, white, 230V / 275W

PRICE: 430,41 €

QUANTITY: 2

5. BAKING PANS

Baking tray - Bakery standard - 600x400 mm

PRICE: 21,00€

QUANTITY: 60

6. WEIGHT SCALE

MY WEIGH MAESTRO 8KG X 0,1GR

PRICE: 69,99€

QUANTITY: 1

7. KITCHEN UTENSILS

Victorinox swiss classic kitchen set 5 pieces

PRICE: 78,80€

QUANTITY: 1

3-piece Spatula Set - Multipurpose Silicone Heat-resistant Nonstick Flexible

PRICE: 20,31€

QUANTITY: 2

Schramm® Set of 10 measuring spoons and measuring cups made of stainless steel with measuring ruler engraved readings stackable

PRICE: 17.90€

QUANTITY: 2

Culinare Culinare Scissor Set 3 Piece C33001

PRICE: 15,95€

QUANTITY: 2

Brabantia Tasty+ Baking Brush Silicone - Fir Green

PRICE: 6.75€

QUANTITY: 3

Tuuli Kitchen Professional Roller Stick Dough Roller With Handle From Beech Wood Padding Roll Baking Roll With Ball Bearing 44 x 5.5 cm

PRICE: 13.92€

QUANTITY: 3

8 Pcs / Set Silicone Kitchen Accessories

PRICE: 9,69€

QUANTITY: 5

WiseGoods - Cookie Cutters - Baking Cookies - Cookie Molds - Cookie Mold - Heart / Flower / Round / Star - Stainless Steel - 12 Pieces

PRICE: 18,95€

QUANTITY: 4

3 pcs / set Rolling Angel

PRICE: 11,99€

QUANTITY: 2

8. REFRIGERATORS

Double Stainless Steel Refrigerator | AGR-125 | Suitable for 1/1 & 2/1 GN Grids | 125x67.5x (H) 207.5cm

PRICE: 2.466,00€

QUANTITY: 1

9. PACKAGING MACHINE

Packaging Carton Box Packing Machine

PRICE: 6.091,39€ ($7.300,00)

QUANTITY: 1

Gooseneck boxes 25 x 25 x 8cm (cake boxes) 50 units

PRICE: 21,35€

QUANTITY: 10

10. OFFICE MATERIAL

Iphone 12

PRICE: 912,10€

QUANTITY: 1

Macbook Air

PRICE: 1.129,10€

QUANTITY: 1

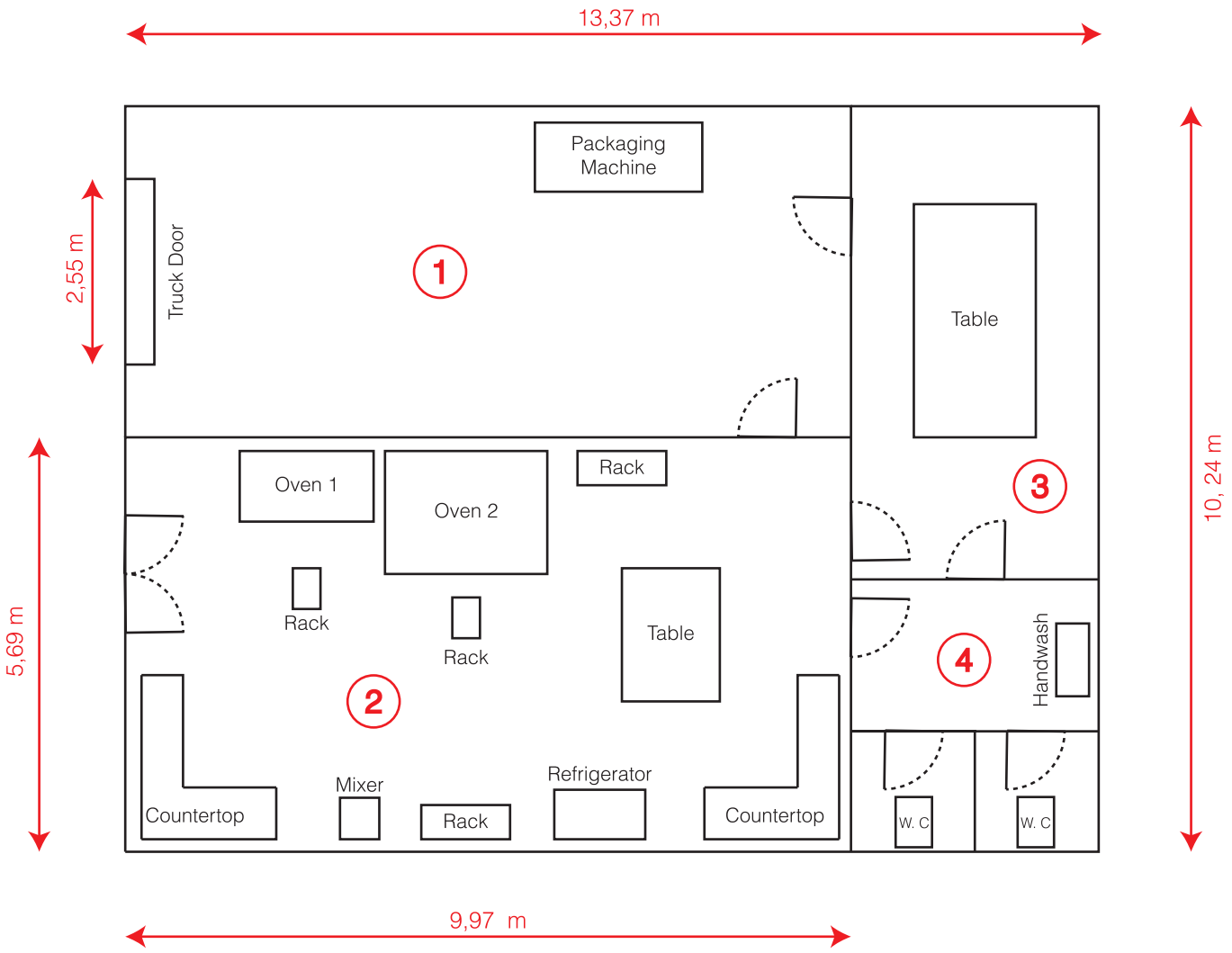
EPSON EcoTank ET-2721

PRICE: 219€

QUANTITY: 1

Needed product		Price	Quantity	Total
Oven	Three Deck Oven	13.570,69 €	1	13.570,69 €
	Rotary Oil Oven	17.520,00 €	1	17.520,00 €
Food Processor	Cutter/Kitchen Machine	289,00 €	1	289,00 €
Baker's Rack/Shelf Rack	Vogue regaalwagen	266, 13 €	2	532,26 €
	Kitchen Shelf 5	153,18 €	2	306,36 €
Stand Mixer/Hand Mixer	Planet Mixer	1.831,52 €	1	1.831,52 €
	Kitchenaid Mixer	430,41 €	2	860,82 €
Baking Pans	Baking Tray	21,00 €	60	1.260,00 €
Weight Scale	My Weight Maestro	69,99 €	1	69,99 €
–Kitchen Utensils	Victorinox Knives	78,80 €	1	78,80 €
	Spatula Set	20,31 €	2	40,62 €
	Measuring Spoons	17,90 €	2	35,80 €
	Culinare Scissor Set	15,95 €	2	31,90 €
	Baking Brush Silicone	6,75 €	3	20,25 €
	Professional Roller Stick	13,92 €	3	41,76 €
	Piping bags and nozzles	9,69 €	5	48,45 €
	Cookie Cutters	18,95 €	4	75,8 €
	Set Rolling Angel	11,99 €	2	23,98 €
Refrigerators	Stainless Steel Refrigerator	2.466,00 €	1	2.466,00 €
Packaging Machine	Carton Box Packaging	6.091,39 €	1	6.091,39 €
	Gooseneck Boxes	21,35 €	10	213,50 €
Office Material	IPhone	912,10 €	1	912,10 €
	MacBook	1.129,10 €	1	1.129,10 €
	Epson Printer	219 €	1	219 €
Total				47.669,09 €

4- DISTRIBUTION



1 **Stock and packaging room.** This room is where the orders are packed with the packaging machine and where they are stored before being introduced into the truck that will transport them.

2 **Kitchen.** This is where the magic happens, it is the most important space and where most of the bekery's resources are found.

3 **Office / Meeting room.** This place is destined for meetings and office work such as managing suppliers, clients, etc.

4 **Toilets.** Very needed in every work space.

In the description of the assigment, the amount of square meters available was 500, with an optimal distribution and the approximate number of machines required, the amount of square meters used for the new bakery factory ascended to 136.9 m^2. Perhaps doubling the number of products and machines described in the budget, which would double the amount of investment, a greater number of the available square meters would be used.

The total of 136.9 m^2 is distributed as follows:

The stock and packaging room (1) has 45,36 m^2, and in it is the packaging machine (2,30 x 0.95m), the rest of the room is destined to store the boxes od cookies and raw material. In this room we can find the truck door that is 2.55m wide since this is the average width of a large truck.

The kitchen (2) has 56,73 m^2, and the equipament that has in it is the smallest oven (1,84 x 0,97m) and the bigger one (2,23 x 1,69m), two mobile baker's racks (0,38 x 0,56m) and to fixed racks (,22 x 0,47 m), also includes one floor mixer (0,54 x 0,57m) and a big refrigerator (1,25 x 0,68 m). The rest of the objects described in the budget like the food processor, the tabletop mixer, the weight scale and all the kitchen utensils do not appear in the kitchen layout plan as they are smaller objects and are placed on the table or countertops.

The office / meeting room (3) is made up of 22,10 m^2, and has a big table for meetings with the suppliers and the customers and here we can find all the office material like the laptop and the printer.

And last but not least the toilet (4) has 12,72 m^2, here we can not find any of the objects decribed in the budgets but is also part of the building.

The toilet like the tables and countertops are not included in the budget as we suppose they are included in the renting contract.

5- CONCLUSION

Starting or taking a business to the next level is an action that requires a lot of time, to elaborate the business plan in detail, find all the necessary materials, find the right place... it is not something that can be created overnight. Once the plan is perfectly elaborated, the next step is the great investment, in this the assignment focuses, although the figures described here are an approximation.

The total figure obtained is 47,669.06 €. This only includes de machinery and the kitchen utensils, the rent and electricity and water supplies are not included, nor are workers wages and fees and other spenses. It is also true that perhaps the items described in the budget could be found at a lower price with further investigation, but it is also true that the bakery may need twice as much machinery to meet the demand.

Even so, this project is useful to have an approximation of the work that would entail taking the first steps in a business, since although it seems that it is an easy task, this is not the case.

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FOOD PROCESSOR:

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BAKER'S RACK / SHELF RACK:

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STAND MIXER / HAND MIXER:

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BAKING PANS:

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KITCHEN UTENSILS

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REFRIGERATOR

https://www.xxlhoreca.com/nl/dubbele-rvs-koelkast-agr-125-geschikt-voo-74874293.html?utm_source=googleshopping&utm_medium=cpc&utm_campaign=Koelen%20%26%20Vriezen%2FKoelkasten%20Horeca%2FHoreca%20Koelkasten%20met%20Dubbele%20Deur&utm_term=Dubbele%20RVS%20Koelkast%20%7C%20AGR-125%20%7C%20Geschikt%20voor%201%2F1%20%262%2F1%20GN%20Roosters%20%7C%20125x67%2C5x(H)207%2C5cm&utm_content=Coreco&gclid=Cj0KCQjwpdqDBhCSARIsAEUJ0hPC2cLKcUuE_afuLuQbwZx91NAZOSSlkSSUyjYQ_XWDQ-UTLUOlFLkaAsDdEALw_wcB

PACKAGING MACHINE

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OFFICE MATERIAL

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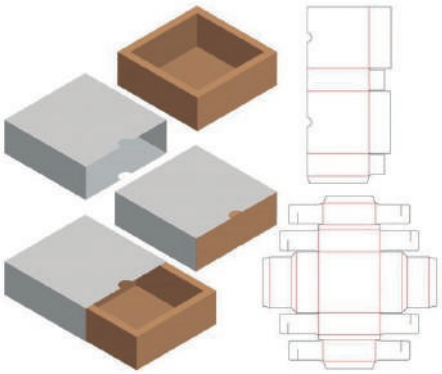
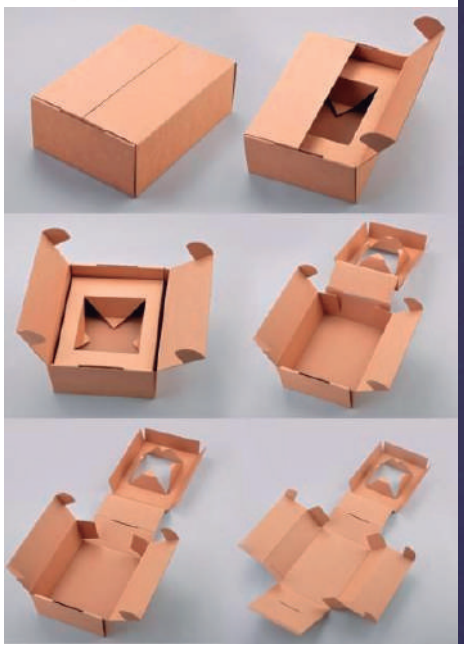
ASSIGNMENT 3: Packaging related methods of optimization and logistics

1. Box analysis
2. Electronic analysis
3. Chosing the box and the electronic
4. Improvements

In this assignment we are comparing types of boxes for different products that already exist in the market and we are going to improve one of them to create a delivery package for a small electronic that prvides the necessary protection.

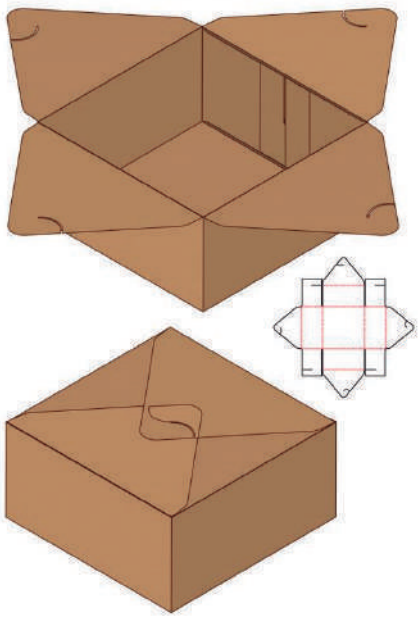




1.- BOX ANALYSIS (outer structure)

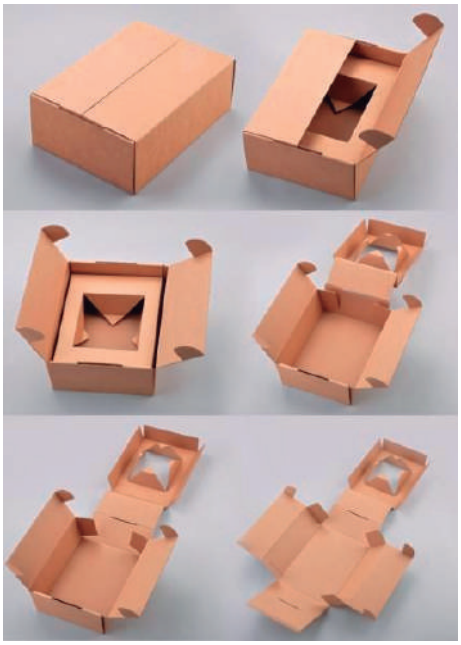
This is the most common and most used type of box when shipping a product. Normally inside it carries paper or some padded material to avoid that the product inside suffers any type of damage

The structure of this box allows it to be stored without taking up much space since it can be folded easily. depending on the quality of the box it may contain a magnet so that the box maintains its shape



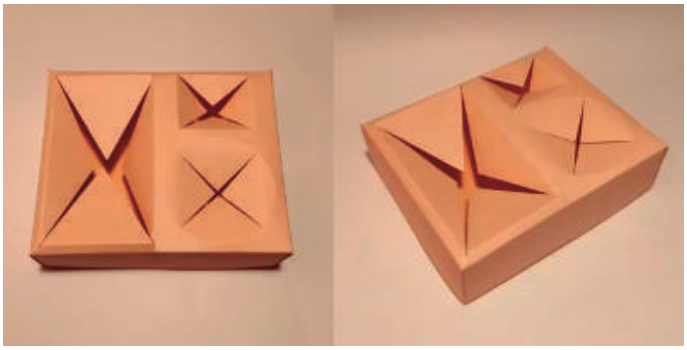
This opening system is not the most suitable for the consumer since it can break those small cuts when opening it and it is also difficult to close it since you have to rejoin the fourth cuts and if one of them is broken it will no longer close properly

1.- BOX ANALYSIS (internal structure)



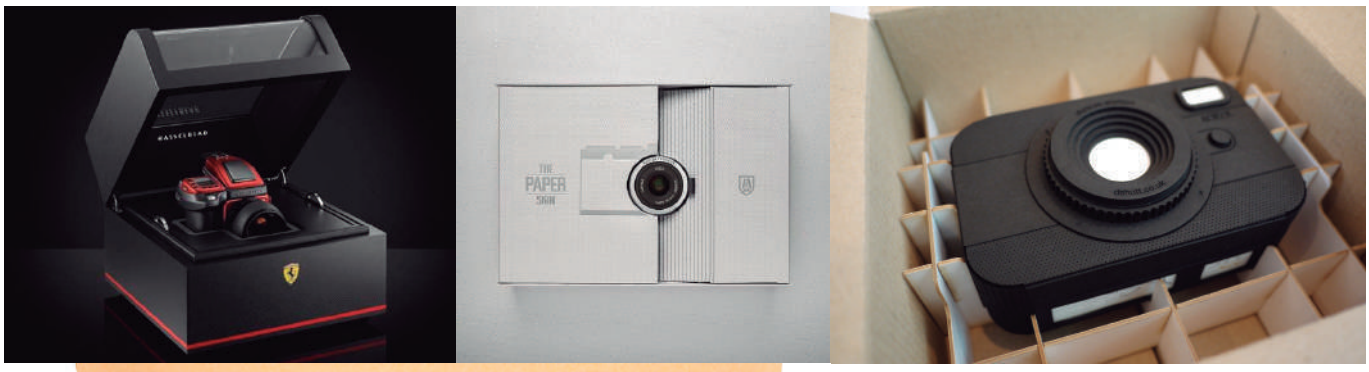
This box provides a high protection of the product since it prevents the electronic device from being in contact with the walls of the box and in case of receiving a blow and the box is damaged, the product does not.

Each component has its pre-established place, this has a good and a bad side, the good part is that it prevents objects from moving inside the box but on the other hand it conditions that the box can only be used for the same product every time.

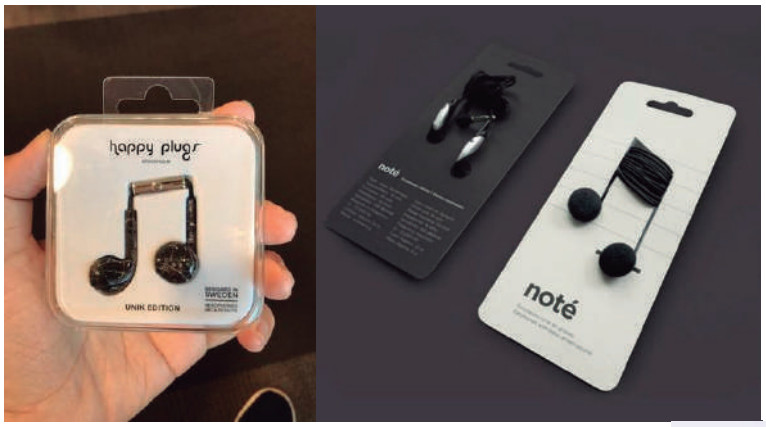


This system of cuts seems to have the function of holding the product. It is a good idea since you can cut the desired shape but on the other hand it does not seem very effective at first glance.

2.- ELECTRONIC ANALYSIS



Camera packaging.
You can try to give a nice presentation to the packaging witout forgetting the protection. The images on the top are concepts and the one on the bottom is a real nikon packaging, every element is perfectly wraped in plastic.



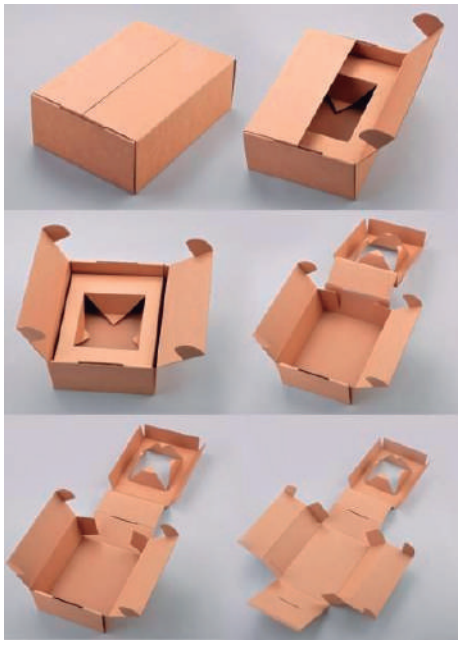
Headphones packaging.
You can give the same look to the packaging but changing plastic for carboard. A very important point in a headphones packaging is be able to put it back without messing the cables.

2.- ELECTRONIC ANALYSIS

Phone packaging.
Tthese boxes are normally very compact and make good use of the available space.They also tend to have a luxurious finish since they are expensive products. In this type of product they have a great competitor that is Apple with their iPhones, so the rest of the companies try to keep up.

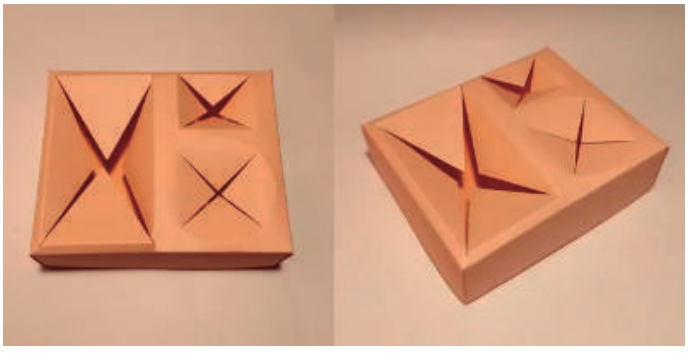
Speakers packaging.
On the contrary that mobile phones that have a similar shape and size in the loudspeakers, otherwise, there are many shapes and sizes which are not always rectangular, so brands play with the shape of the packaging in order to highlight their product.

3.- CHOOSING THE BOX AND THE ELECTRONIC

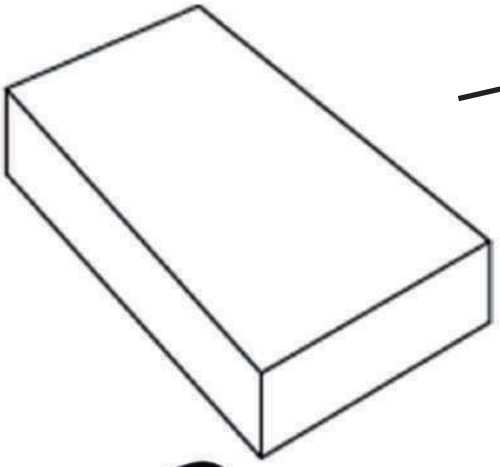


The product chosen to do the redesign is a mobile phone and these will be the boxes that will help to create a new version of phone packaging.

The need is to keep a fragile object such as the phone, among other things for its delicate screen, as well as to keep the accessories in place so that they do not hit inside the box.

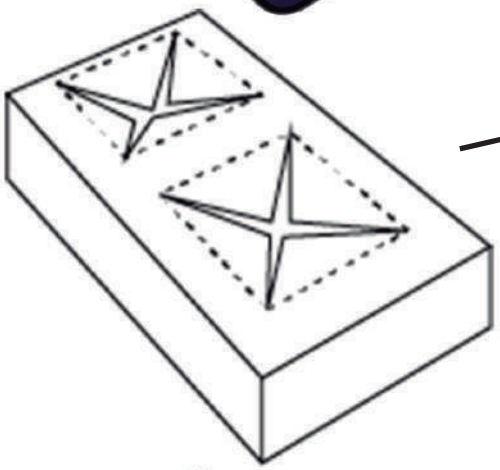


4.- IMPROVEMENTS

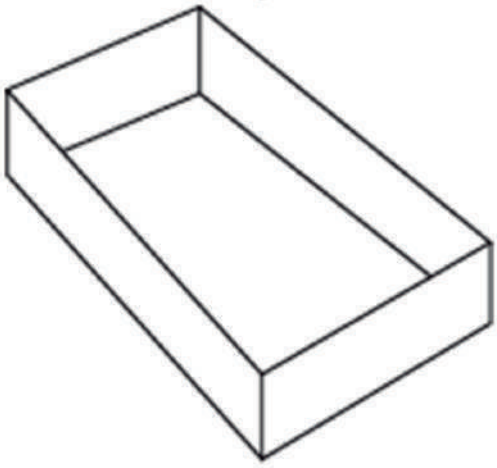


The outer box is made of recycled cardboard

The phone is on a chipboard tray made with a mold



Cuts in the cardboard that hold the accessories in place



Alicia Sánchez 20224915

ASSIGNMENT 4: Usability of packaging, Wrap Rage

1.- INTRODUCTION

Everyone has had a hard time opening a package, and not just once, probably at least a couple of times a week. Some people may think that it is something normal, or even that it is their fault, but the reality is that this is a problem and has its own name, it is called **wrap rage**.

Some products even though they have the "easy open" label when you need that product, it is really impossible to open it. At that moment the frustration of not being able to open it begins and the user resorts to tools that are available such as scissors or a knife. And at this point is when rage and a sharp tool come together and this combination can lead to cuts and wounds.

And we were just talking about average people, without any physical or cognitive illness. For example, older people, with age they lose strength and they have more troubles trying to understad how to open a package.

This assigment is all about analysing lists or articles relating to bad packaging and identify the causes why that paackaging is not working. Then all the information obteined from those lists or articles will be put together in the "Wrap Rage Table". This will provide an overview in percentages of the most common reasons why a package is difficult to open.

3.- ANALYSIS OF HUMAN ABILITIES

When it comes to analyzing why a product is difficult to open or even sometimes impossible without the help of a tool, it can be caused by some kind of human disability.

It can be due to three different types of disabilities, it can be sensory, physical or cognitive.

Sensory: as 95% of the information about the world around us comes from our sight and hearing, a sensory disability can affect how a person gathers information from the world around them. Touch, taste, smell and balance are also sensory abilities.

Physical: decrease or absence of motor or physical functions, which in turn affects the development or way of carrying out certain activities in a society that presents severe limitations and barriers. May affect, either temporarily or permanently, a person's mobility, manipulation, strength, endurance, dexterity or speech.

Cognitive: is a term used when a person has certain limitations in mental functioning and in skills such as intellect, memory, language and literacy.

Mild symptoms of any of these disabilities may not be a big problem in the daily lives of people who suffer from them, but people with severe symptoms can find great difficulties in such everyday actions as opening a package of cookies. It is the responsibility of designers to try to design packaging and objects that are as simple to use for all people, in order to ensure that these people with a disease or elderly people feel as integrated as possible in society.

3.- LISTS/ARTICLES

1ST ARTICLE

Nathan Rao (2014). 'Wrap Rage' soars over packaging we can't open. Express UK
https://www.express.co.uk/news/uk/456493/Wrap-Rage-soars-over-packaging-we-can-t-open

1. Hard plastic packages ('Clamshell' cases)
2. Tins with a key
3. Plastic security seals on medicine bottles
4. Yogurt pots with foil lids
5. Plastic wrapped CD cases
6. Pull-top lids on tins of food
7. Resealable food bags
8. Plastic food bags heat-sealed on all sides
9. Peel-off foil lids where it is impossible to see where to peel from
10. Jam jars with tight lids

This article talks in a general way about using tools for opening the packages, we will understand that the tools are used for every case.

2ND ARTICLE

Rachel Clemons (2021). Which food packaging causes wrap rage? CHOICE Australia (consumer advocacy group)
https://www.choice.com.au/shopping/packaging-labelling-and-advertising/packaging/articles/impossible-to-open-food-packaging

1. Induction seals on bottles (knife)
2. 'Peel here' tab seals (no tool mentioned)
3. Peel to open vac packed meat (sharp object like a knife)
4. Lid with ring-pull seal (knife, fork)
5. Glass jars with metal lids (jar opener)
6. 'Tear here' serrated edge or notch (scissors)

3.- LISTS/ARTICLES

3RD ARTICLE

Cristina Cantudo (2014). 16 abrefáciles y envoltorios que no siempre se abren fácilmente.
Mia Revista
https://www.miarevista.es/salud/fotos/abre-faciles-y-envoltorios-que-no-se-abren-facilmente/latas-de-conserva-con-anilla

1. Tin cans with pull-tab (no tool mentioned)
2. Bottles with very tight caps (no tool mentioned)
3. Easy open cookie packaging (no tool mentioned)
4. Cookie packaging with red ribbon (no tool mentioned)
5. Cheese triangles with red ribbon (no tool mentioned)
6. Milk carton without cap (scissors)
7. Brick with pull-tab (no tool mentioned)
8. Glass jars with metal lids (spoon)
9. Candy sticks (no tool mentioned)
10. Liquid glue stopper (no tool mentioned)
11. Vacuum fiambre packaging (scissors)
12. Film paper (no tool mentioned)
13. Bags that tear when the edge is cracked (no tool mentioned)
14. Sealed foil bags (no tool mentioned)
15. Sachets of ketchup, mustard, or other sauces (no tool mentioned)
16. Smoothie Bottles with Metal Cap (knife)

4TH ARTICLE

Unknown (2020). El SOS de un cliente a Mercadona tras desesperar con un abrefácil
Economía Digital (online newspapel)
https://www.economiadigital.es/consumo/mercadona-cliente-ayuda-redes-abrir-abrefacil_20069343_102.html

1. 'Peel here' tab seals (knife)

3.- LISTS/ARTICLES

5TH ARTICLE

Caroline Mayer (2012). Wrap Rage: Easy-to-Open Packages Are Coming. Next Avenue Org
https://www.nextavenue.org/wrap-rage-easy-open-packages-are-coming-0/

1. Hard clamshells (metal cutters)
2. Plastic security seals on food and medicine (knife, scissors)
3.” Resealable” bags for food (scissors, knife)
4. Pulltop lids on metal cans for food, from soup to nuts (can opener)
5. CD cases (sharp implement)

6RD ARTICLE

Jake Kirk (2013). The packaging that makes you want to scream. Kite Packaging
https://www.kitepackaging.co.uk/blog/pack-and-wrap-rage/

1. Blister packs (can opener)
2. Cling film (no tool mentioned)
3. Re-sealable packs that just aren´t (no tool mentioned)

4.- WRAP RAGE TABLE

	Problems with opening of packaging			Human abilities according to ISO/IEC71 (2001-2014)		
	Number of packaging types mentioned (A)	Need for additional tools (B)	Only resentment (C)	Sensory (D)	Physical(E)	Cognitive(F)
Article 1	10	8	2	2	7	1
Article 2	6	5	1	1	5	0
Article 3	16	4	12	2	13	1
Article 4	1	1	0	0	1	0
Article 5	5	5	0	2	3	0
Article 6	3	1	2	2	1	0
Total (items)	41	24	17	9	30	2
Total (%)	100% of 41	58,54%	41,46%	21,95%	73,17%	4,88%

These figures have been obtained assuming that the wrap rage problem is always caused by a human disability, which it is not really true in all the cases.

For example, clamshell packaging in the wrap rage table has been clasiffied as caused by a physical disabilitie, maybe the user is not strong enough to open it, but the true of this packaging is that no matter how strong you are, it is going to be impossible to open anyways. Therefore the problem here does not reside in the person but in the packaging design.

The same thing happens with the package of article 4. The man in the video tries to pull the easy opener but when he does it it breaks so he has to resort to a knife. It is the company that makes the packaging for this product that has to check why their easy openers are not working and solve the mistake.

5.- CONCLUSION

Has we can observe in the 'Wrap Rage Table' , in most cases a tool such as knives or scissors are used to open the package, this can result in minor injuries or cuts, although in some cases they can be more grave.

The percentage of packaging where tools have been neded in this study is around 60%, but it may be even higher in view of the fact that to obtaining these figures, only cases where the use of tools was explicitly cited in the article have been counted as valid. However in real life this percentage will be more than around 90% since when we try to open a food packaging we are usually in the kitchen so at the first sign of anger we take out a knife to open it more easily.
Normally we do not only resent for the reason that we want to get the food that is inside the difficult to open packaging, so the percentage of 'only resentment' will be less that 10% (even though in the table is around 40%)

If we talk about the human abilities that are affecting when opening a package the higher percentage goes to physical disabilities (around 70%), normally the lack of strength is the biggest obstacle when trying to open packages., as a general rule they too tough for the strength of an average person.

Sensory disability (around 20%) follows in second place, sometimes the labels that indicate where to open the package are not large enough or do not have the right colors to contrast in the background and are difficult for users to see, consequently sight is the sense that affects the most.

Lastly, the cognitive disabilities (around 5%), usually the previous knowledge that a person has is enough to open a package, very likely they aready been in a similar situation, if it cannot be opened, it is probably not for this reason.

Of couse, all these numbers have been obtained using an average adult as the object of study. If we use an older person to analyze how they open a package, all the percentages would go up since the probability that these people have a disability of any of the three types is higher. Over the years problems such as loss of vision, loss of strength, loss of memory are accentuated and diseases such as arthritis, Parkinson's or Alzheimer's

6.- SOURCES

https://www.express.co.uk/news/uk/456493/Wrap-Rage-soars-over-packaging-we-can-t-open

https://www.choice.com.au/shopping/packaging-labelling-and-advertising/packaging/articles/impossible-to-open-food-packaging

https://www.miarevista.es/salud/fotos/abre-faciles-y-envoltorios-que-no-se-abren-facilmente/latas-de-conserva-con-anilla

https://www.economiadigital.es/consumo/mercadona-cliente-ayuda-redes-abrir-abrefacil_20069343_102.html

https://www.nextavenue.org/wrap-rage-easy-open-packages-are-coming-0/

https://www.kitepackaging.co.uk/blog/pack-and-wrap-rage/

https://www.aruma.com.au/about-us/about-disability/types-of-disabilities/types-of-sensory-disabilities/#:~:text=A%20sensory%20disability%20is%20a,from%20the%20world%20around%20them.

Minor Sustainable Packaging Design & Innovation

Teachers :
Wander Colenbrander
Gerard de Koning

In the second minor, the individual work it is about to prepare a lecture on one of the topics proposed by the teachers and present it to classmates and teachers.

The group work in this minor consist in a proposal to fight against food waste.

Lecture presentation :

The individual work for this course consisted of preparing a lecture of approximately forty minutes on one of the eight topics proposed by the teachers.

The main goal was to do research work and improve presentation skills, both in the creation of the presentation itself as well as oral skills.

In the next pages there is the presentation given to the class whose theme was Eco Design.

ECODESIGN

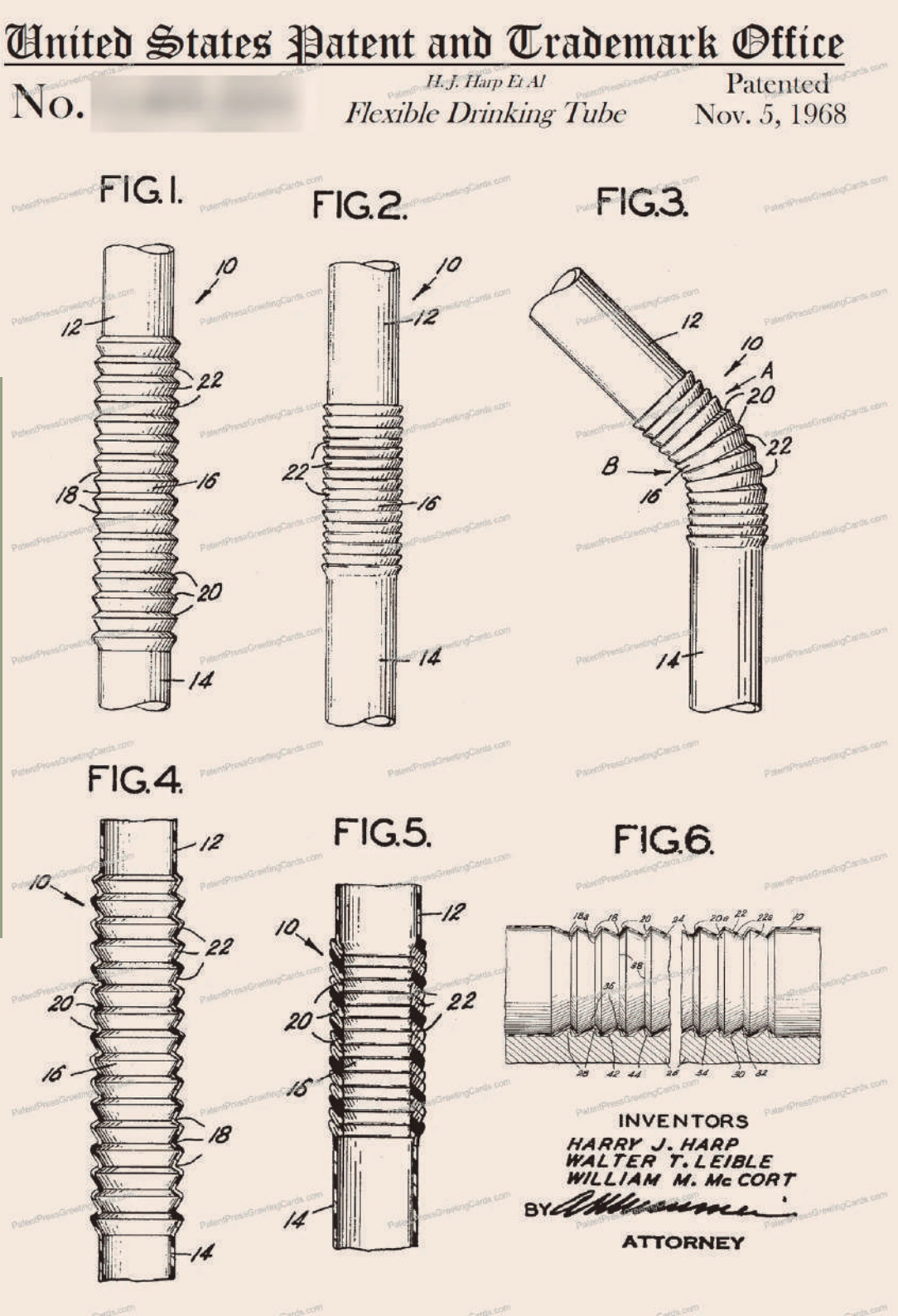
Alicia Sanchez

2020/2021 Minor
Sustainable Packaging
Design & Innovation

CONTENTS

Introduction

In the past, design was simply focused on solving problems without taking into big account the impact of the solutions obtained as a result.


United States Patent and Trademark Office

No. [redacted]

H. J. Harp Et Al

Flexible Drinking Tube

Patented Nov. 5, 1968

FIG. 1.

FIG. 2.

FIG. 3.

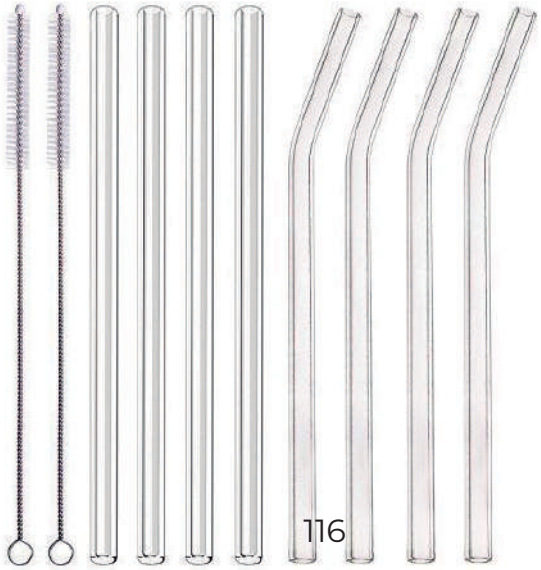
FIG. 4.

FIG. 5.

FIG. 6.

INVENTORS
HARRY J. HARP
WALTER T. LEIBLE
WILLIAM M. Mc CORT
BY
ATTORNEY

In recent decades, design is not only focused on finding solutions but also on redesigning existing solutions so that they have less negative impact on the environment.



The concept of the car has evolved over the years by reducing consumption to minimize environmental impact.

e - Beetle

What is Eco Design?


Developing goods and activities that don’t impact negatively the environment

Eco Design also keeps a product's quality level according to its ideal usage

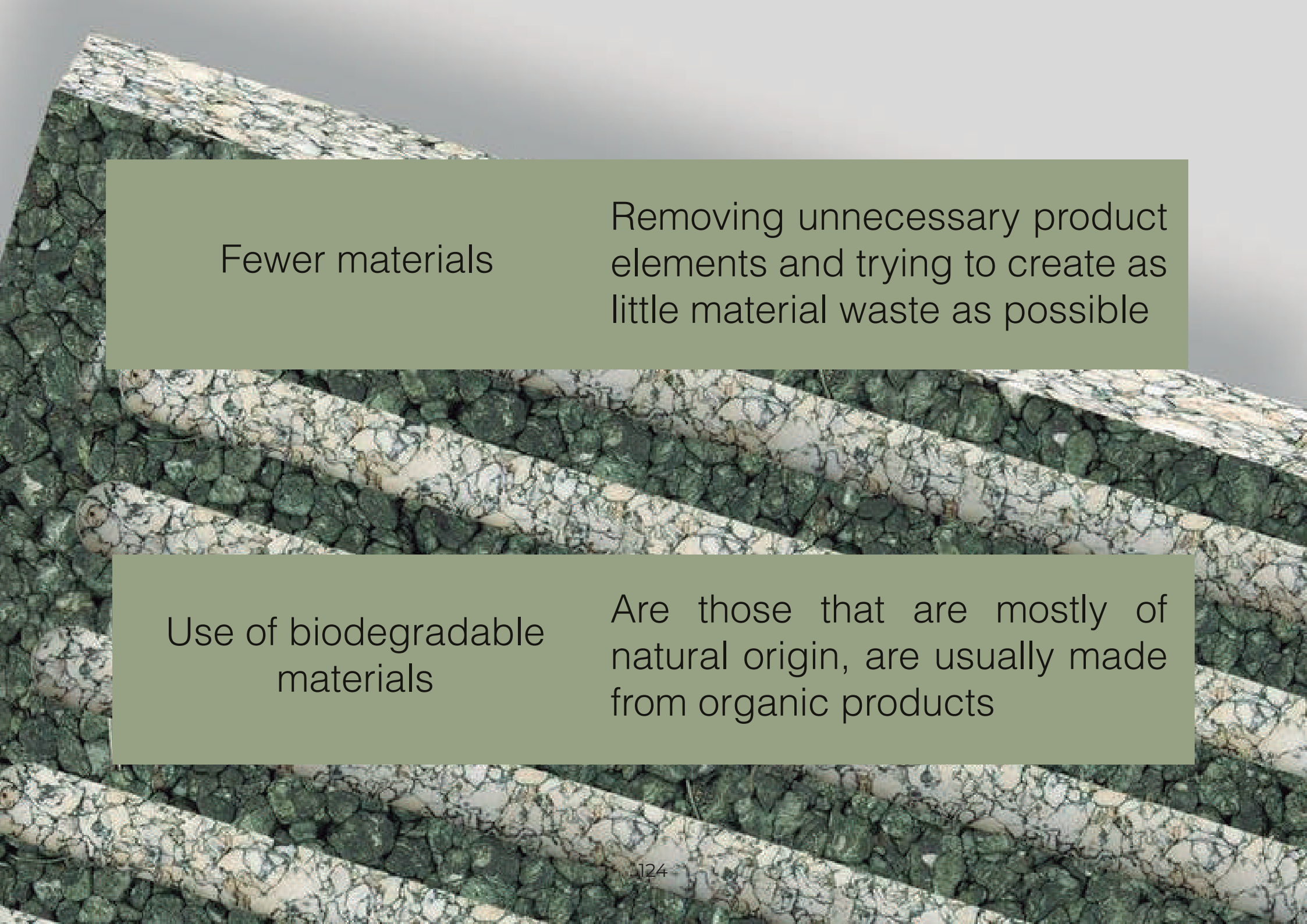
A ONU report estimated that 50 million tons of electronic waste are generated in a year.

Of this, only 20% is properly recycled.

The new circular economy action plan (CEAP) in March 2020.

It is one of the main building blocks of the European Green Deal that is Europe's new agenda for sustainable growth.

Principles



Fewer materials	Removing unnecessary product elements and trying to create as little material waste as possible
Use of biodegradable materials	Are those that are mostly of natural origin, are usually made from organic products

Easy to recycle

Easy disassembly means using easily identifiable, reusable or recyclable materials

Multipurpose, reusable and recyclable

Long lasting	Materials should be durable, maximizing product life.
Lowering emissions	Efficient packaging allows a higher number of units per square meter, space is very important during transportation.

Innovative

Technological innovations can optimise product efficiency and sustainability

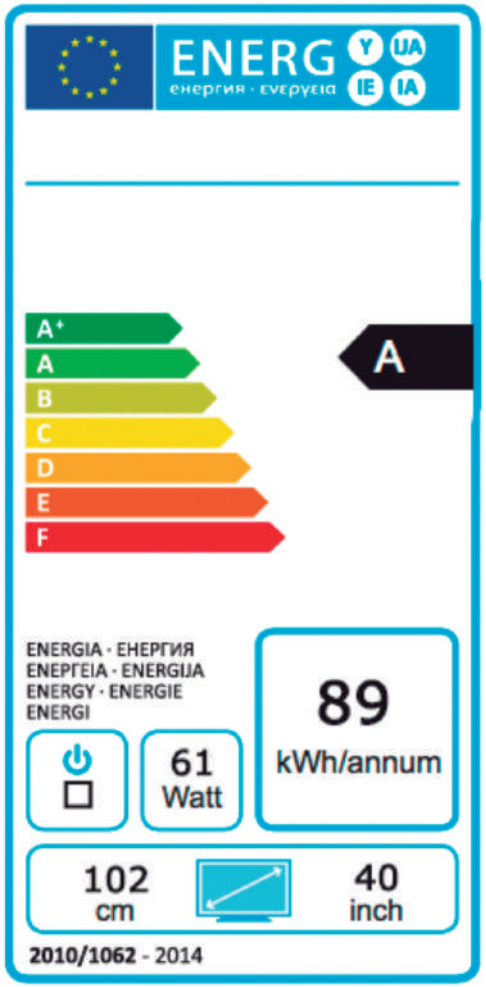
Lorem ipsum

Green message

Sustainable design spreads the idea of sustainability with messages intrinsic to the product itself

Regulation

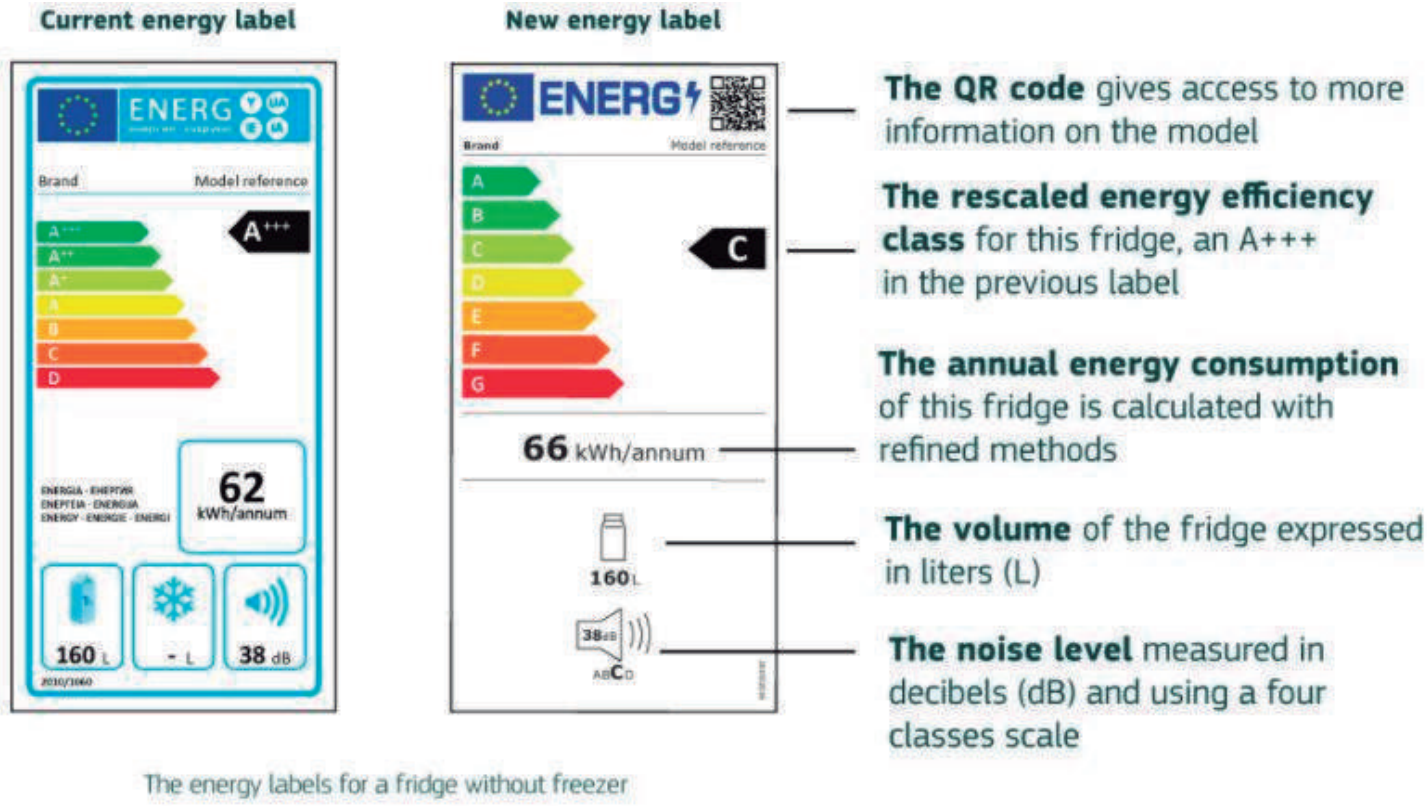
Energy Labels



The EU energy label has been a key driver for helping consumers choose products which are more energy efficient.
It also encourages manufacturers to drive innovation by using more energy efficient technologies.

Europe plans to change the old labes for new ones as a result of the development of more and more energy efficient products.

The EU energy labels categories will be gradually adjusted to reintroduce the simpler A to G scale.



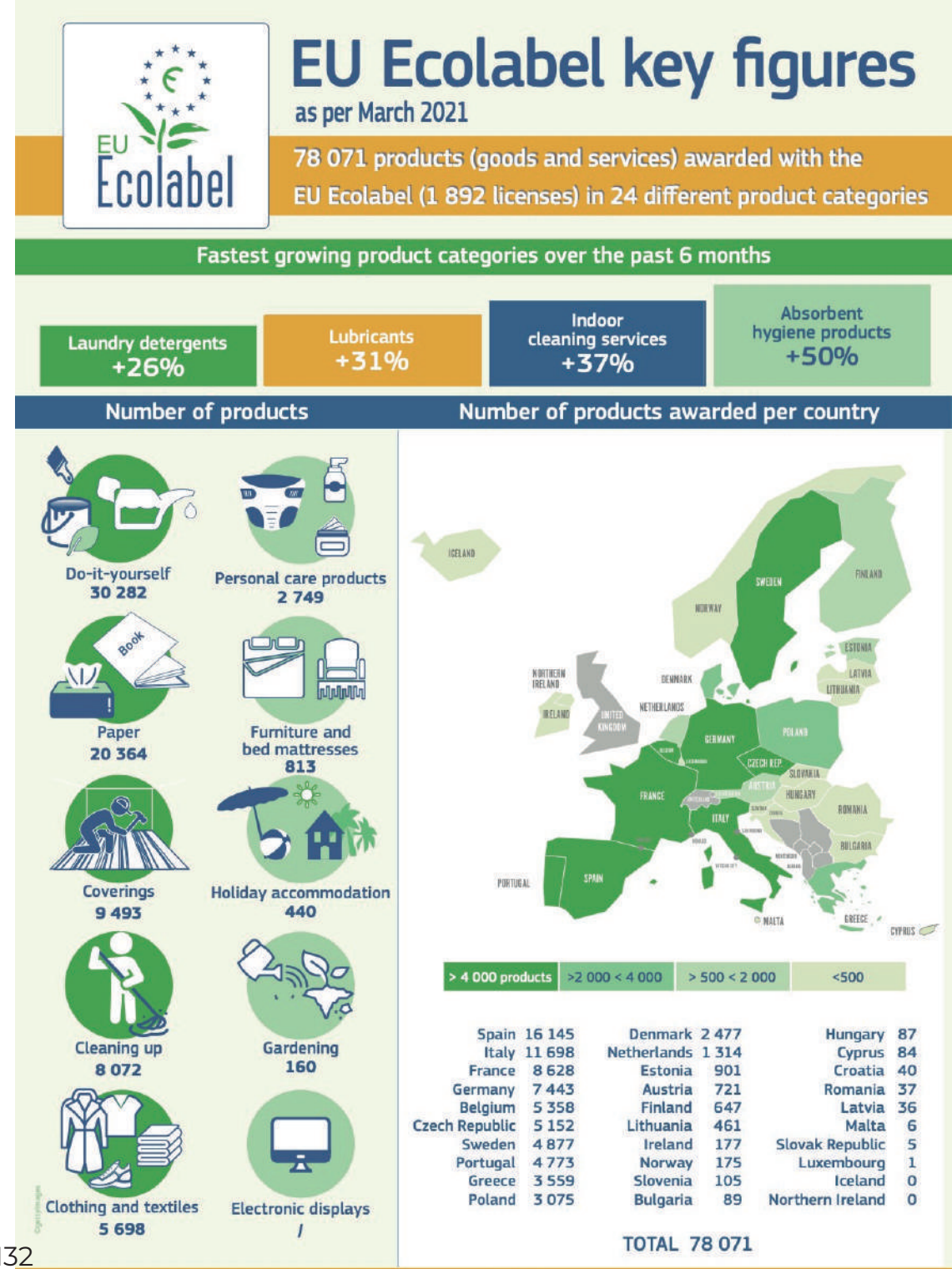
The energy labels for a fridge without freezer

EU Ecolabel

The EU Ecolabel is a label of environmental excellence that is awarded to products and services meeting high environmental standards throughout their life-cycle.

The EU Ecolabel figures kept growing.

As of March 2021, 1 892 licenses have been awarded for 78 071 products (goods and services) in the EU market.



ISO 14006:2020

ISO 14006 defines guidelines to help organizations establish, document, implement, maintain and continually improve Ecodesign Management as part of an environmental management system.

Examples

KAVAT®

SWEDEN SINCE 1945

Swedish shoe company committed to the environment, which in 2008 obtained its first Ecolabel on one of its shoe models; currently they have more than 100 models with this label.

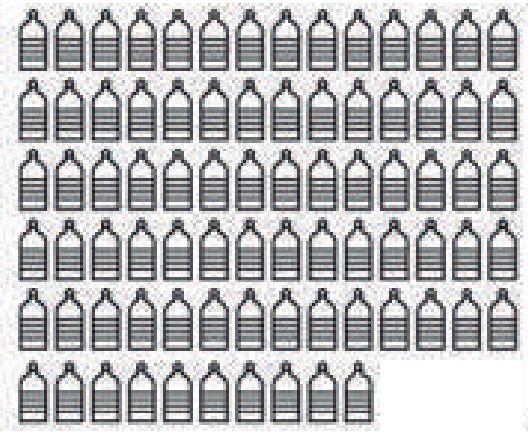
Adidas' latest concept shoe and introduces a mushroom-based material.

ECOALF

BECAUSE THERE IS NO PLANET B

Ecoalf is a Spanish company that manufactures clothes and accessories, using as raw material, various types of waste that are thrown into the sea

=



80

BOTELLAS DE PLÁSTICO

FLAX chair by
Christien Meindertsma.
Made by natural fibres of flax with strong bio-plastic fibres, making a revolutionary material that can be heat-pressed into unbelievable shapes.

Ecobirdy is transforming unwanted plastic toys into kids' furniture.


this change is happening
and it is happening now

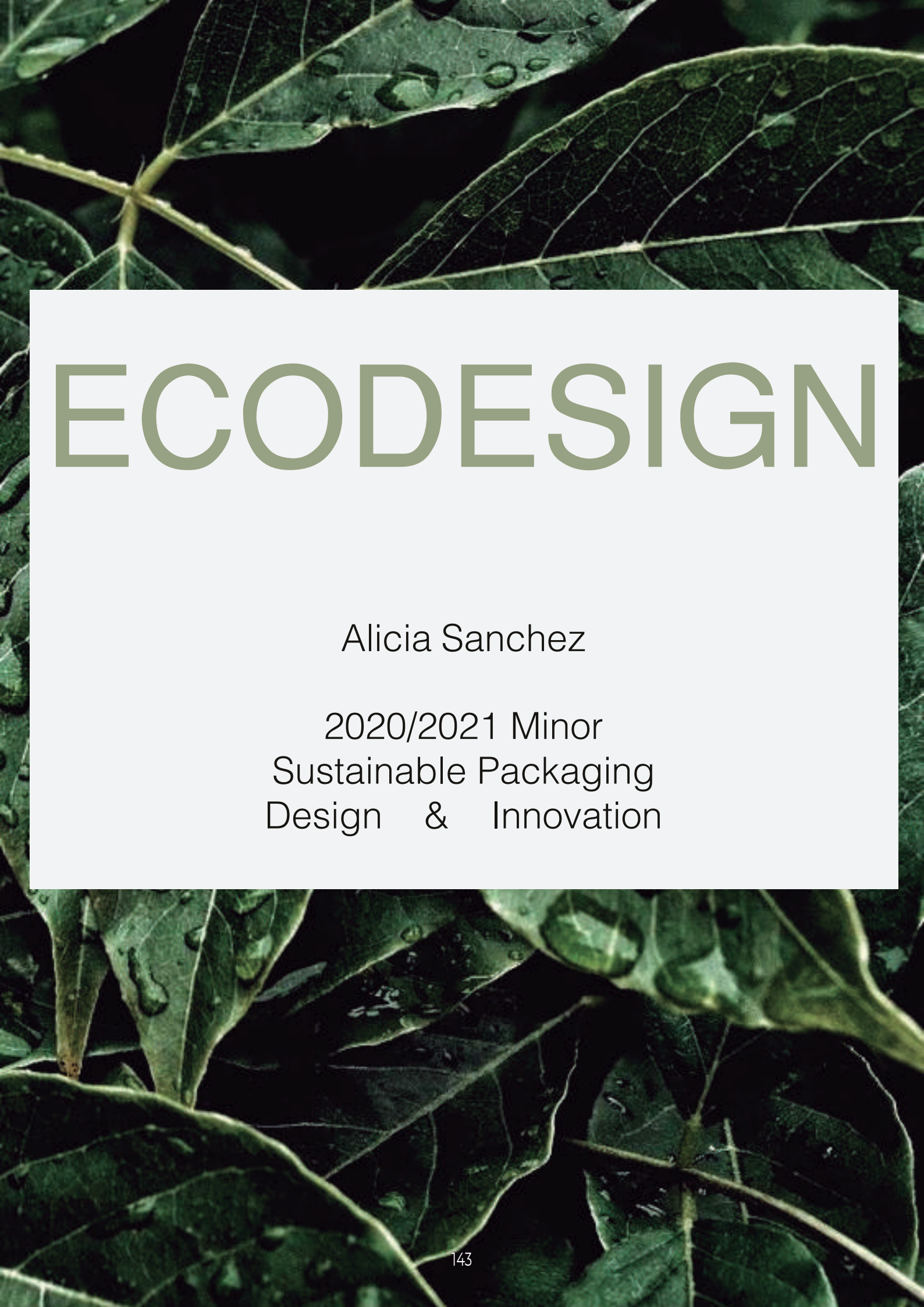

THANK YOU

Lecture report :

The presentation was made as pleasant as possible by including little text and many illustrations. Therefore all the research done for the lecture was included simultaneously in the report.

At the end it includes all the links used.

In the next pages there is the report mentioned above.



ECODESIGN

Alicia Sanchez

2020/2021 Minor
Sustainable Packaging
Design & Innovation

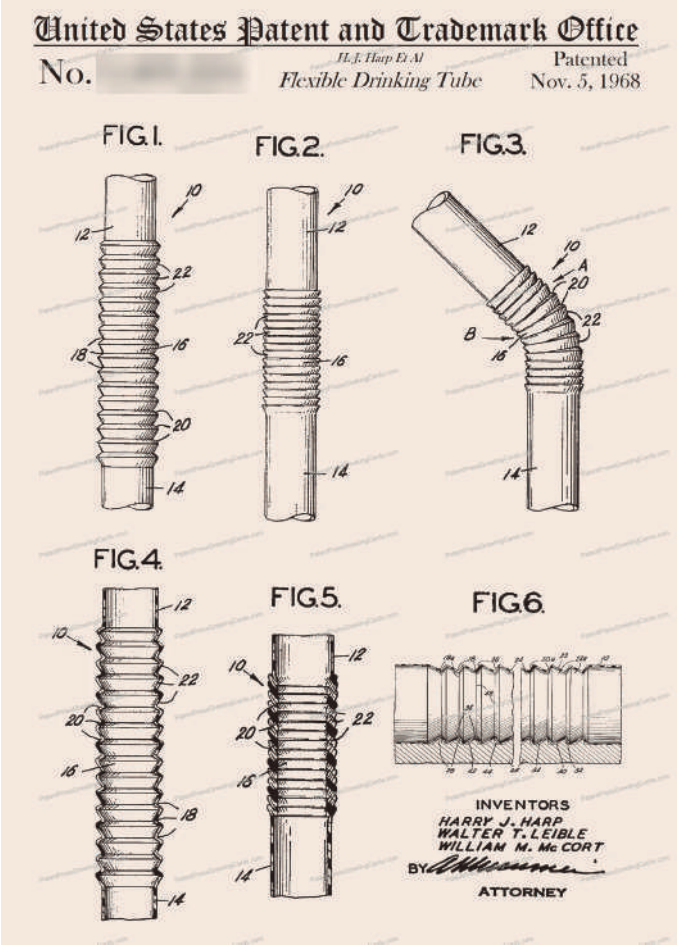
CONTENTS

01. Introduction

In the past, design was simply focused on solving problems without taking into big account the impact of the solutions obtained as a result.

What I mean by this is that everyday objects such as a straw, although the first artificial straw created more than 130 years ago was made of paper, the type we were all used to was made of plastic.

According to an article by Greenpeace Spain in 2018, the number of straws used per day was 13 million at that time, which is more than a third of the population.
These figures are crazy but fortunately the European Union has banned the use of plastic straws and now we can no longer see them.
As a replacement we now have straws made of other materials such as silicone, steel, glass, which are reusable, as well as single-use straws such as paper and even edible straws.



I think this example of an everyday product perfectly defines the change that the design field is undergoing.

In recent decades and with greater force in recent years, design is not only focused on finding solutions but also on redesigning existing solutions so that they have less negative impact on the environment.
These new straws have not changed at all in their shape, the only significant change is the substitution of plastic for a material that allows their reuse.

And so we can extrapolate this example to thousands of products. One of them, which require a more elaborate redesign, is cars.

Cars were conceived as a solution to a problem, in this case transportation. But the concept of the car has evolved over the years by reducing consumption to minimize environmental impact. Engines have evolved to be much cleaner thanks to particulate filters, additives and hybrid technology. Nowadays, electric cars are making headway in the automotive sector.

But not only the engine has improved, but also the chassis, improving the aerodynamics of the vehicle, which makes it more efficient.

02. What is Eco Design?

Now that we have seen the evolution of design we can ask ourselves, what is Eco Design?

Eco Design is both a principle and an approach. It consists of integrating environmental protection criteria over a service or a product's lifecycle which make the lowest possible impact in the nature. The main goal of eco design is to anticipate and minimize negative environmental impacts at all stages of the product development process (manufacturing, using and disposing of products).

If we try to resume this in one simple sentence will be:

Developing goods and activities that don't impact negatively the environment.

Simultaneously, Eco Design also keeps a product's quality level according to its ideal usage. Because there is no point in creating a product with the most environmentally friendly materials on the market if it is going to break in a couple of days, even if the materials are suitable we also have to take into account the pollution involved in its manufacture and transportation.

Not just a couple of days but as we all know nowadays most products, especially electrical products, are destined to last for a certain period of time, this is what we call programmed obsolescence.The average life of a household appliance such as a refrigerator or a washing machine is just over 10 years according to the OCU, the Spanish consumer and user organization.

Not just a couple of days but as we all know nowadays most products, especially electrical products, are destined to last for a certain period of time, this is what we call programmed obsolescence.The average life of a household appliance such as a refrigerator or a washing machine is just over 10 years according to the OCU, the Spanish consumer and user organization.

Likewise, users themselves like to change them from time to time due to new improvements that companies are constantly creating for their products. The thing is that it is the brands that dictate the timing which leaves you no choice but to buy a new one, even if it is not a good time. That's how the economy works in the world.

The most visible problem caused by planned obsolescence to the environment is electronic waste. The shorter the useful life of a product, the more of it is discarded. A ONU report estimated that 50 million tons of electronic waste are generated in a year. Of this, only 20% is properly recycled. The rest is scattered in fields and large landfills, such as those maintained by some countries in the Gulf of Guinea.

The second problem generated by planned obsolescence can be found in the extraction of materials. Electronic devices require a wide variety of raw materials that are extracted from mines.

A third impact on the environment is the energy consumption of production. Here, the footprint of manufacturing each component, transporting them to the factory and assembling them must be taken into account.

The solution to this spiral of production, consumption and waste involves a change in the philosophy of industrial design. This is where the concept of eco-design comes into play. Based on extending the useful life of a product and facilitating its repair.

The European Commission has focused on forcing manufacturers to design products to be easily repairable and easily recyclable. The aim is to make it possible to repair it in parts, and to make it simple for the technicians who have to fix it. If you make it too complex to disassemble an appliance, the repair will cost you more money, because the technician will take a long time to disassemble it, so the consumer will opt to buy a new one.

Two years ago, the European Commission adopted a regulation that makes it compulsory to manufacture spare parts and repair information for some products, such as washing machines, dishwashers, refrigerators or televisions. The next step comes with the Circular Economy Action Plan.

The new circular economy action plan (CEAP) in March 2020. It is one of the main building blocks of the European Green Deal that is Europe's new agenda for sustainable growth. The EU's transition to a circular economy will reduce pressure on natural resources and will create sustainable growth and jobs. It is also a prerequisite to achieve the EU's 2050 climate neutrality target and to halt biodiversity loss.

The new action plan announces initiatives along the entire life cycle of products. It targets how products are designed, promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible.
It introduces legislative and non-legislative measures targeting areas where action at the EU level brings real added value.

03. Principles

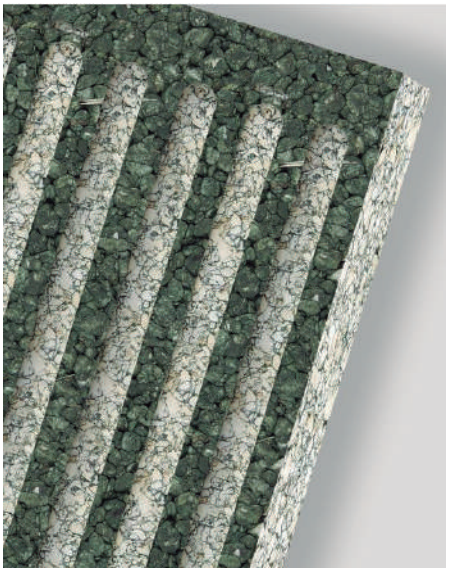
Now will see the principles that follows the Eco Design.

Fewer materials

Manufacturing with less material is taken into account in the design phase by removing unnecessary product elements and trying to create as little material waste as possible. In addition, this simplification of the product leads to lower energy consumption. This protects resources and reduces emissions.

Use of biodegradable materials

Using a a biodegradable material is best, whether natural or a derivative. Biodegradable materials are those that are mostly of natural origin, are usually 'organic' or made from organic products, and therefore degrade/ or recycle without the need for human processes. Heat from the sun, rain, fungi, wind, moisture and bacteria can break them down naturally.

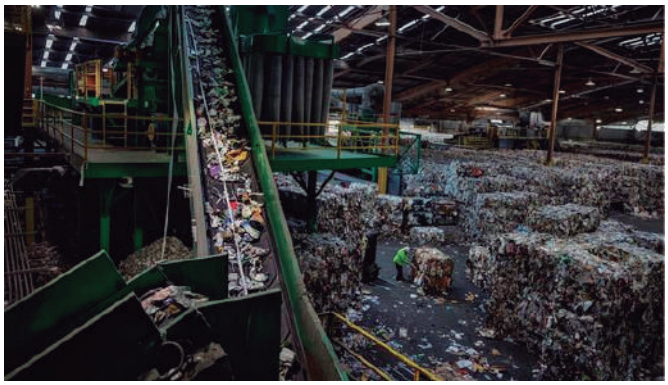


Multipurpose, reusable and recyclable

Products should have multiple uses if possible, like this one in the photo, be suitable for reuse so you don't throw them away after use, and be made of recyclable materials as much as possible.

Easy to recycle

Ensuring easy disassembly means using easily identifiable, reusable or recyclable materials. In addition, the use of as few different materials as possible also favors recycling.



Long-lasting

Materials should be durable, maximizing product life. Another way for a product to have a longer life cycle is to make it modular and easy to disassemble, and for this there must also be an availability of spare parts.

Lowering emissions

Products should be sized to save material and fuel consumption during transportation to reduce CO2 emissions. In the design phase we also think about how the product is going to be packaged for transportation, efficient packaging allows a higher number of units per square meter, space is very important during transportation. A clear example is Ikea, this company packs its furniture in a very efficient way, assembling the furniture yourself at home saves a lot of space during transportation. This also saves costs, which is why it is such a popular brand.

Innovative

Technological innovations can optimise product efficiency and sustainability.
Very briefly, we can define energy efficiency in household appliances as the capacity of an appliance to perform all its functions with the lowest possible energy consumption. Logically, the less energy consumed, the more efficient an appliance is.
How can we know this information? If we look at any type of large household appliance, we can find an information label (mandatory throughout Europe) which includes a series of letters and colors. The letters go from A to D and the colors from green to red.
These labels are also changing to adapt to new technologies and to offer clearer information to the users, we can see a sneak peak in this image. But we will talk about this later, in the legislation section.

Green message

Sustainable design spreads the idea of sustainability with messages intrinsic to the product itself.
Companies spread that idea thought the “green marketing”, which is a unique category of marketing in which products are promoted based on their environmental benefits. The purpose of using the word “Green” is that the production of products is done causing the less damage to the environment, and also ingredients and packaging of products are environmental-friendly.

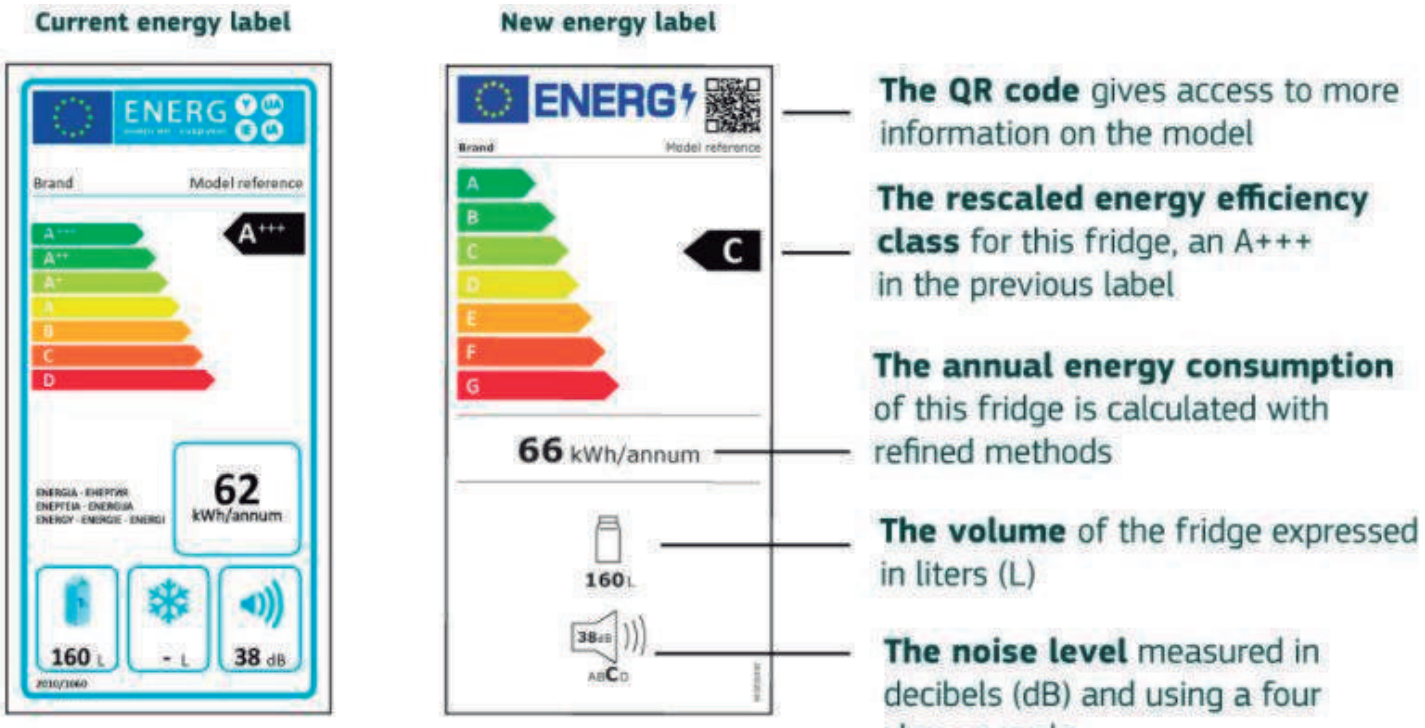
04. Regulation

The EU energy labelling and ecodesign legislation help improve the energy efficiency of products on the EU market.

Ecodesign sets common EU wide minimum standards to eliminate the least performing products from the market. The energy labels provide a clear and simple indication of the energy efficiency and other key features of products at the point of purchase. This makes it easier for consumers to save money on their household energy bills and contribute to reducing greenhouse gas emissions across the EU.

ENERGY LABELS

The EU energy label has been a key driver for helping consumers choose products which are more energy efficient. At the same time, it also encourages manufacturers to drive innovation by using more energy efficient technologies.
In addition to information about the product's energy consumption, the labels can also provide specific data about other relevant features of usage, such as the product's noise emissions or water consumption.



The energy labels for a fridge without freezer

Europe plans to change the old labes for new ones as a result of the development of more and more energy efficient products, and because the difference between A++ and A+++ is less obvious to the consumer, the EU energy labels categories will be gradually adjusted to reintroduce the simpler A to G scale. For example, a product showing an A+++ energy efficiency class could become a class B or lower after rescaling without any change in its energy consumption. The class A will initially be empty to leave room for more energy efficient models to be developed.

This means that 5 product groups will be "rescaled" in 2021, which are: refrigerators and freezers, dishwashers, washing machines, televisions and lamps.

EU ECOLABEL

Established in 1992 and recognised across Europe and worldwide, the EU Ecolabel is a label of environmental excellence that is awarded to products and services meeting high environmental standards throughout their life-cycle: from raw material extraction, to production, distribution and disposal.

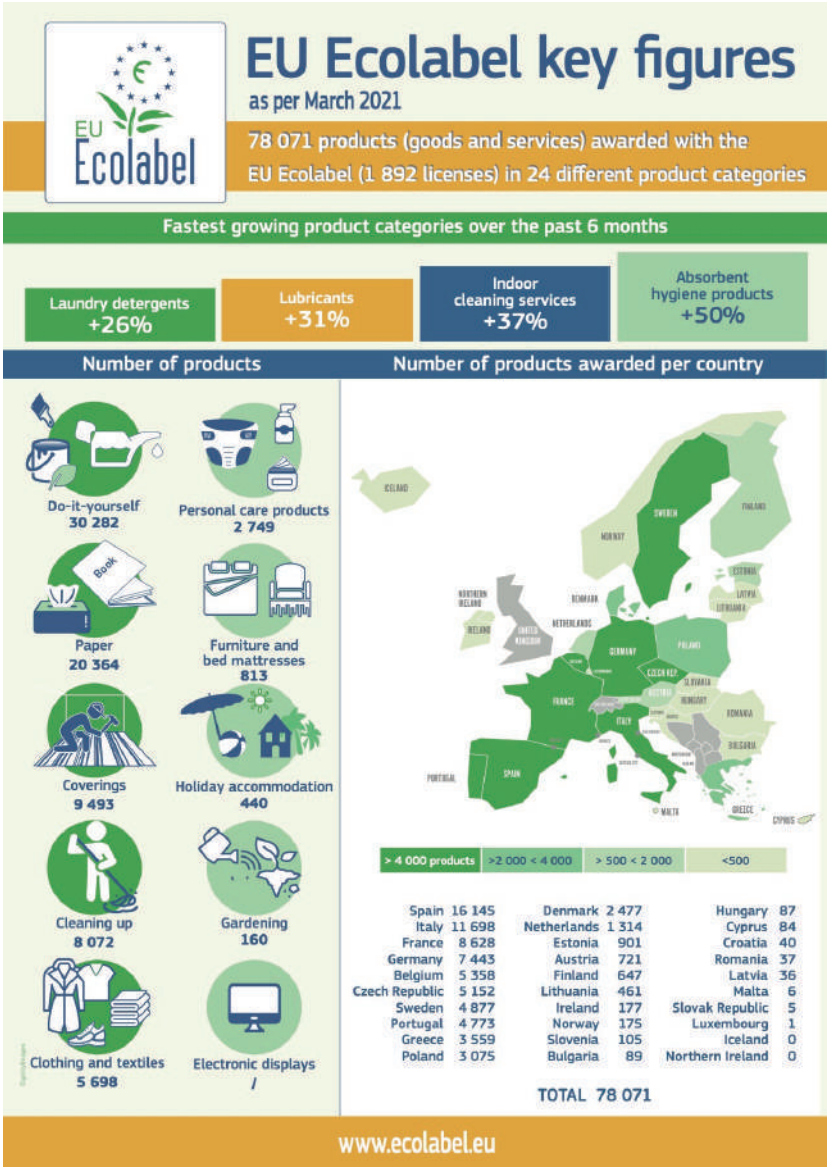
The EU Ecolabel promotes the circular economy by encouraging producers to generate less waste and CO2 during the manufacturing process. The EU Ecolabel criteria also encourages companies to develop products that are durable, easy to repair and recycle.

The criteria provide exigent guidelines for companies looking to lower their environmental impact and guarantee the efficiency of their environmental actions through third party controls. Furthermore, many companies turn to the EU Ecolabel criteria for guidance on eco-friendly best practices when developing their product lines.

This label is a voluntary scheme, which means that producers, importers and retailers can choose to apply for the label for their products.
On the website of the european commission you can find all the products that have obtained this certificate and you can search them by category and within each category you can filter by country.

http://ec.europa.eu/ecat/

The EU Ecolabel figures kept growing. As of March 2021, 1 892 licenses have been awarded for 78 071 products (goods and services) in the EU market.
The vast majority of EU Ecolabel product groups have witnessed an increase in both the number of licences and products. This demonstrates a real interest for more eco-friendly products in the marketplace.



ISO 14006:2020

ISO 14006:2020 Environmental management systems — Guidelines for incorporating ecodesign

ISO 14006 defines guidelines to help organizations establish, document, implement, maintain and continually improve Ecodesign Management as part of an environmental management system.

Basically, the focus of the standard is based on the following concepts:

- Continuous improvement: "PDCA Cycle or Deming Cycle", consisting of planning, doing, verifying and acting to continuously improve the implemented management system, seeking to improve the environmental impacts generated by products or services.

- Life cycle. Consider the environmental aspects associated with all stages of the product/service life cycle, and not only the manufacturing stage.

- Prevention. Prevent the impacts of the product or service, promoting its minimization from its design.

Once the ecodesign management system has been implemented, the organization is ready to certify the system. To do so, it will contact an accredited Certification Organization (for example: AENOR, BVQi, etc.) to carry out the certification audit and verify that the requirements of ISO 14006 have been implemented.

If the result is satisfactory, the certification organization will issue the corresponding "ISO 14006 Certificate".

The organization may disseminate the certificate, communicating it to interested parts.

In 2016 SEAT became the first company in the automotive sector in Spain to be certified to the ISO 14006 standard for eco-design.

05. Examples

Example #1

KAVAT®
SWEDEN SINCE 1945

The first example, and continuing with the theme of European labels, is the Kavat brand.

It is a Swedish company committed to the environment, which in 2008 obtained its first Ecolabel on one of its shoe models; currently they have more than 100 models with this label.

Its focus on sustainability extends to all levels of the company, from materials and production to packaging and transportation. So to rest assured that they take responsibility, through the entire lifecycle of the products, they provide two different services to help extend the life of their shoes. (As New is of now only available in Sweden)

Example #2

Stan Smith Mylo™, is adidas' latest concept shoe and introduces a mushroom-based material. It is still a concept so only prototypes have been made so it is not yet for sale.

Adidas has revealed a mycelium leather version of its classic Stan Smith trainers, becoming the latest in a flurry of brands creating products from the sustainable leather alternative. The concept shoe has an upper grown in a lab from mycelium, the spiderweb-like filament structure that fungi use to grow much like the roots of a tree.

Sheets of the material were grown over the course of two weeks and then tanned and dyed to create a mycelium leather called Mylo, which was originally unveiled by US biotechnology company Bolt Threads in 2018.

The material has now been refined in collaboration with Adidas to make it fit for its first application in high-performance footwear.

Example #3

ECOALF

BECAUSE THERE IS NO PLANET B

Ecoalf is a Spanish company that manufactures clothes and accessories, using as raw material, various types of waste that are thrown into the sea. With more than 80 million plastic bottles recycled, is currently positioned as an example worldwide.
In order to have access to the garbage that is thrown into the sea, Ecoalf works together with fishermen from different regions of Spain to collect the material that will be converted into clothes.

Upcycling the Oceans is a project of Ecoalf in collaboration with HAP Foundation that aims to eliminate marine debris from the bottom of the oceans with the help of fishermen. To date, Upcycling the Oceans is present in Thailand and Spain; they had managed to involve more than 550 boats, recovering approximately 330 tons of trash from the bottom of the sea.

Example #4

FLAX CHAIR

Designer Christien Meindertsma and natural fibre specialist Enkev have teamed up to create groundbreaking material that combines the natural fibres of flax with strong bio-plastic fibres, making a revolutionary material that can be heat-pressed into unbelievable shapes.

The Flax chair is composed of layers of woven flax and layers of dry-needled felted flax, both containing PLA fibre. It goes into a mould and is heat-pressed. The PLA then melts into everything and makes the composite hard and strong. Christien designed the chair to be made from one sheet of composite measuring roughly 2 feet by 3 feet, with very little waste.

FLAX chair designed by Christien Meindertsma was the winner of the product category and won the future award with her in the Dutch Design Week — impressing the jury on all fronts.

Now, all product development has been finalized and the chair is ready for series production. The price is 490 Euros, not very affordable in my opinion but it is really beautiful.

Example #3

ecoBirdy®

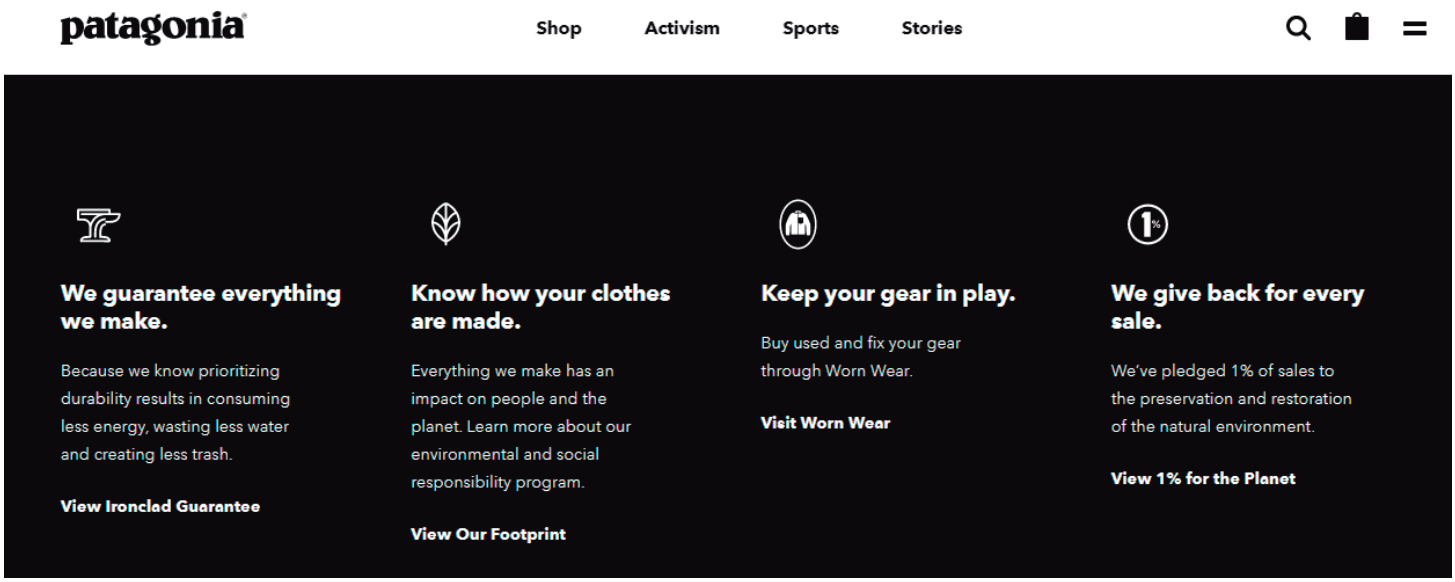
In a bid to raise children's awareness of plastic waste, recycling and sustainability, Ecobirdy is transforming unwanted plastic toys into kids' furniture.

According to the brand, 80% of plastic toys end up in landfill or incinerators, while 90% have a lifespan of just six months. In response, it has developed a system that encompasses the collection and recycling of unwanted plastic toys, right through to the design and production of furniture pieces.

Following an two-year study period, ecoBirdy created a special production process that gives the characteristic look to its products. The material resulting from this unique production process we named ecothylene®.
The patented technology features integrated material separation and an improved binding formula for polymers. The result is that no pigments or new plastics need to be added. Making ecothylene® is significantly more eco-friendly than most recycling procedures for plastics.

They chose to keep the source material visible. This is done on purpose to remind the user of the importance of making the most of the limited resources. Is their way of raising awareness among children in order to instill these values in them from a very young age.

I wanted to show all these examples to demonstrate that both small and big brands are increasingly opting for sustainable design and the evolution towards more environmentally friendly materials. Maybe some of these brands are doing this change for pure marketing, to reach a wider audience, it is possible. But the fact is that for whatever reasons this **change is happening and it is happening now.**



06. Annexes

https://youmatter.world/en/definition/definition-eco-design-examples-definition/

https://www.eea.europa.eu/help/glossary/eea-glossary/eco-design

https://www.iberdrola.com/social-commitment/eco-design-sustainable-products#:~:text=There%20are%20examples%20of%20eco,ocean%20and%20ecological%20gold%20jewellery

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https://www.designboom.com/design/christien-meindertsma-flax-chair-dutch-design-week-2016-10-31-2016/

https://kavat.com/eu/eu-ecolabel

Food Waste final presentation :

For the group project of this subject it was proposed to create a product to fight against food waste. The delimitations of this project were few since this was the only requirement.

The proposed problem to be solved was the food waste generated at home by food delivery. Normally the food portions of the restaurants that offer this service are quite large so the leftovers are usually stored in the refrigerator. But how long do these leftovers remain in good condition?

The solution devised was to create a reusable packaging with a sensor that detects changes in the atmosphere that mean its deterioration.

In the next pages is the final presentation of this project.

FOOD WASTE PROJECT

Sensor packaging

"Identifying out of date food is difficult"

Inspiration

Packadore collective connected - packaging solution to change behaviours and reduce waste

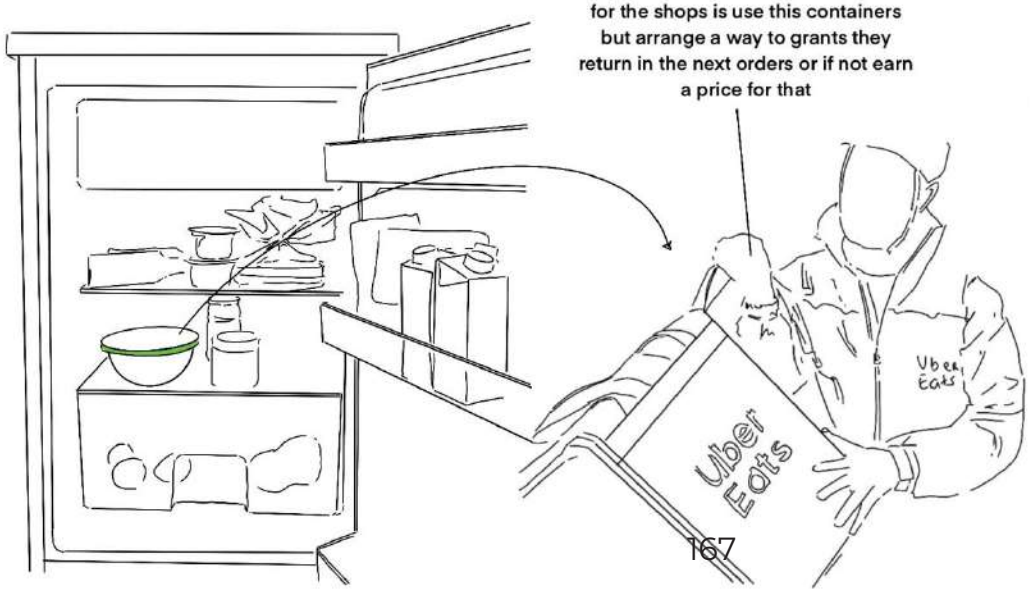
Excess of food for portion

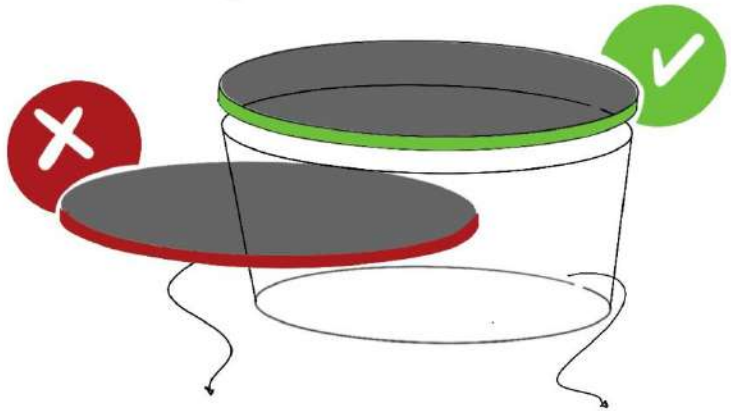
Problem:
Big portion on the take away that causes food waste and the packaging don't are able to safe the food for another time

TAKE AWAY

Food waste and because is no reusable packaging is excess of waste

Because of this containers are expensive maybe one the solutions for the shops is use this containers but arrange a way to grants they return in the next orders or if not earn a price for that





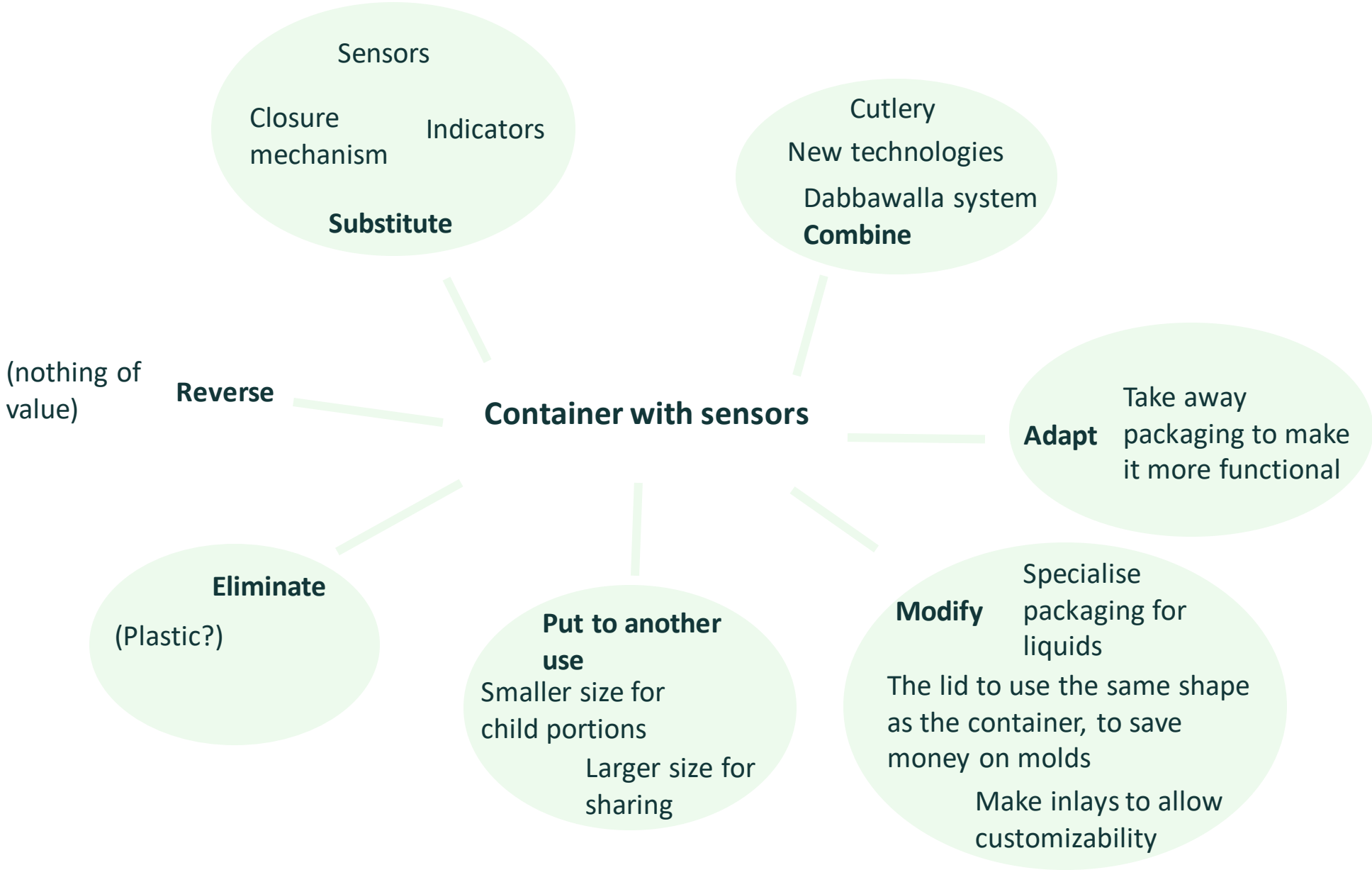
The lid have a technology that inform the consumer when the food is good to eat or not

A packaging that is reusable, so have a bigger circle of life

When someone orders food normally it comes with a lot of it, so in order to combat that this container (package) is able to use more then ond time, and keep our food safe,inside the fridge or outside

Sensor packaging

Scamper



Sensor packaging

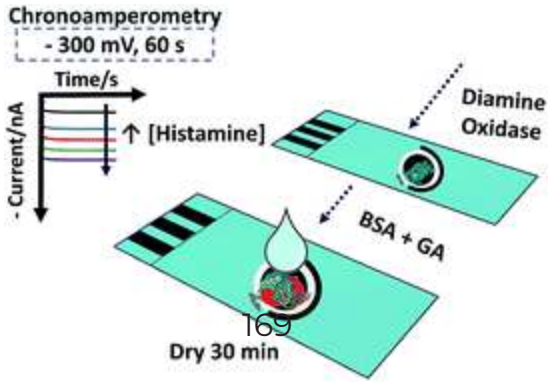
When returning the packaging:

- User receives discount when returning the packaging
- User can also collect multiple boxes at once to receive a larger discount at once

For the sensor:

Instead of using a sensor, a timer can be set by the restaurant. For example rice leftovers can last around 2 days, the restaurant can set a timer for 2 days and the packaging will alert the user when the timer is up.

Sensor that detects histamines in food



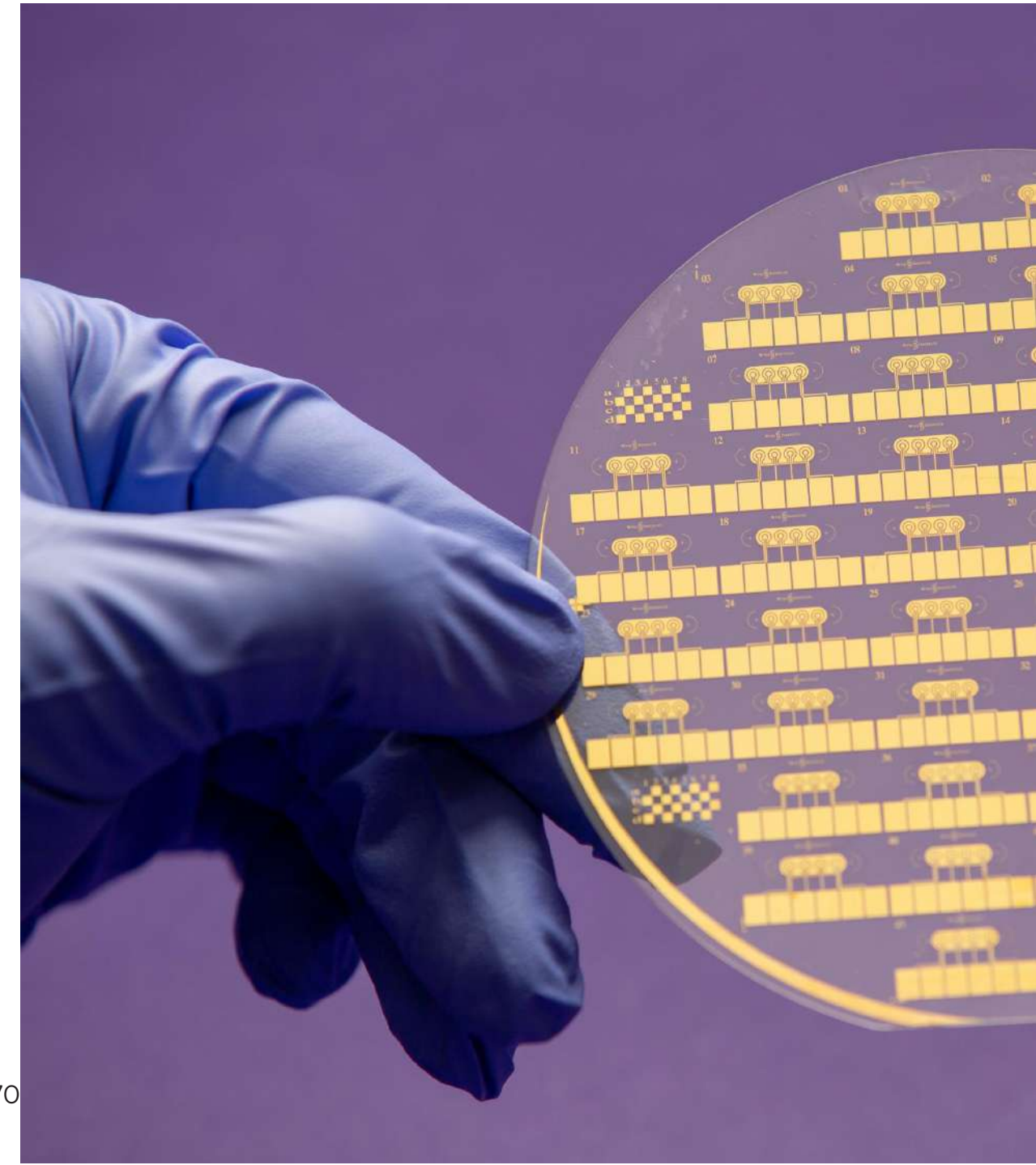
Sensor packaging

Sensor research

Histamine sensor

"The researchers produced the disposable food safety sensors with a low-cost, aerosol-jet-printing technology that's precise enough to create the high-resolution electrodes necessary for electrochemical sensors to detect small molecules such as histamine"

https://www.futurity.org/histamine-sensors-graphene-food-2394482/

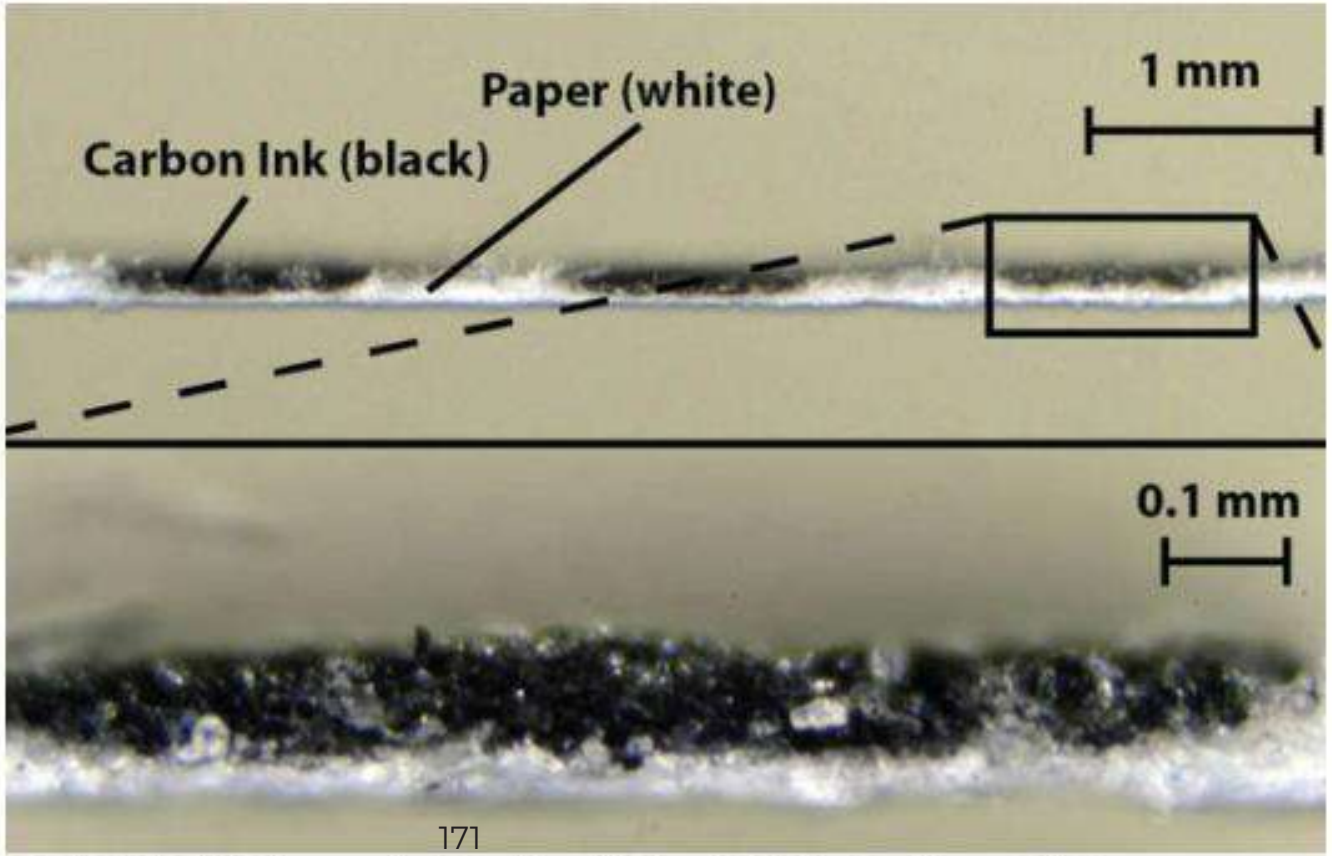


Sensor packaging

Sensor research

Imperial College develops NFC tag-based freshness detection system to reduce food waste

By Liz Morrell • 12 June 2019



171

CROSS SECTION: The sensor is attached to an NFC tag to detect food spoilage and alert consumers

Sensor packaging

Material choices

Materials

For plastics we had three good choices for materials:

Polypropylene (PP)

~0.56 EUR/kg

- Tough
- Flexible
- Fatigue resistant
- Does not react to most acids, alkalis, organic solvents, and fats, at room temperature.
- Microwave resistant

Polyethylene Terephthalate (PET)

~0.50 EUR/kg

- Impact resistant
- Rigid, strong
- Resistant to oils, greases, most acids, and most alkalis
- Shatter resistant
- Recyclable
- Microwave resistant

High Density Polyethylene (HDPE)

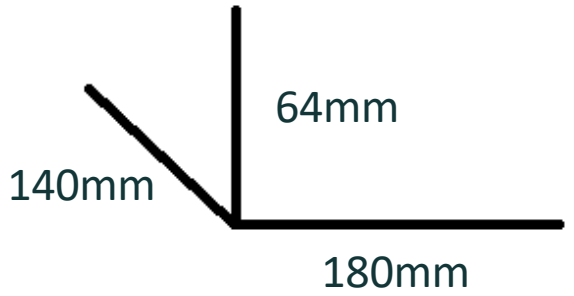
~0.71 EUR/kg

- Resistant to acids, alkalis, and alcohols
- Slightly resistant to oils and greases
- Flexible
- Recyclable

Cost calculations

Part	Price (€)
Sensor	0,01
NFC chip	0,11
Material Plastic	0,386
Mold top (Class 103)	0,01
Mold bottom (Class 103)	0,01
Transport	0,4
Total (per piece)	**0,93**

17404 pieces fit on one euro pallet
33 euro pallets fit on one truck
~**574332** pieces on one truck



Two molds need to be made: one for the lid, and one for the container.

The two pieces can be vacuum formed due to its shape, and as vacuum form molds usually receive less wear than other manufacturing methods, it will hopefully keep the price down.

Class 103 moulds can run less than 500 000 cycles, with the right production methods and mold care, it should run around 500 000 cycles.

Sensor packaging

System design

- Use the delivery drivers to return the packaging to the restaurants.
- Customers have 8 weeks, to return the packaging, if not they'll charge the cost of the packaging plus a fee.

Sensor packaging

How food waste is affected by the product

The sensor will reduce food waste from delivered food by removing doubt from the users' mind

The return system will reduce problems caused by single use packaging.

Food Waste poster :

A poster was created to illustrate the work done in a simpler way and on a single page.

In the next page there is our poster proposal for food waste project.

Food waste & Packaging design

Analysis

Too much food is being wasted and not enough materials are being recycled.

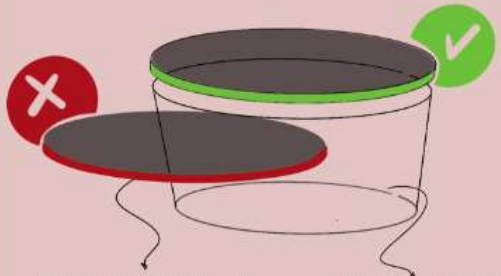
Our food waste analysis puts the issue in a better perspective.

Food waste starts from production to sale and consumption.

People miscalculate portions often (rice and pasta being the main culrpits).

Conclusion: Focus on restaurants and portions

Concept



The lid could indicate whether food is spoiled or not

The packaging being reusable improves the sustainability

Replaces current single use packaging. This means less single use material wasted due to it being in contact with greases or oils. Container keeps food safe in the fridge, and allows for microwaving

After a meal is prepared, the restaurant puts it in our container. There are **different container shapes to be able to hold a variety of foods.**

The top of each lid secures the next container on top of it if these are to be stacked. This is **handy for transport, especially during delivery.**

The restaurant owner activates the timer/sensor, then the delivery service brings it to the customer

If there are leftovers, the **sensor or timer is able to indicate when these are spoiled.**

The NFC chip allows the user to scan the packaging with their mobile device to find an estimated time till expiry.

This results in less food waste, and a more sustainable packaging solution

Sensor/Timer

Either a timer or sensor can be used to indicate food being spoiled.

A timer paired with an NFC chip can be set by the restaurant for when the first ingredient is past its expiry date.

Paper based electrical gas sensors (PEGS) technology is used to detect spoilage gases

If a sensor is used to detect when food is expired, the low cost PEGS system can be paired with an NFC chip.

This system would be more accurate, however it would only detect certain foods being spoiled.

Inspiration

Packadore solution: Changes consumer behaviour and reduces waste

Excess food in portions causes waste

We took inspiration from existing packaging solutions, and used common food waste problems to ideate.

We converged down to one idea using a Harris profile.

Ideation

	Idea 8 (Container with sensors)			
	--	-	+	++
Feasibility				
Desirability				
Viability				
Sustainability				
Food waste prevention				
Net Effect	7			

SCAMPER

The SCAMPER method was used to further develop this idea.

Food Waste report :

This report contains the whole process that led to the final idea for the food waste project.

First we worked on the analysis phase, identifying the problem we wanted to address, in this case food waste, and looking for existing solutions in the market.

The next step was the idea phase where nine different ideas were obtained. Those ideas were combined and worked on in the next phase.

Later we worked on the concept phase where we developed three of the most outstanding ideas.

To conclude, in the final phase we developed the idea of an intelligent packaging that warns the user when the food they order by delivery is no longer suitable for consuming.

In the next pages there is the report mentioned above.

Minor Sustainable Packaging Design & Innovation
June 2021

Project members

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Wander Colenbrander

1. Analysis

First problem statement

For this minor we need to design a packaging that avoid waste. Our assignment is to create a packaging solution to prevent food waste. The focus should lay on either raising awareness of food waste, tackling food waste head on, or nostalgia/fun regarding food waste prevention. This should be done with originality, relevance, and potential in mind.

Our vision is creating food waste awareness through sustainable packaging, nudging users in the right direction.

Our design questions and points of action are the following:

Problem definition	
	1.1. What is the problem?
	1.2. Who has the problem?
	1.3. What are the goals?
	1.4. What are the side effects to be avoided?
	1.5. Which actions are admissible?
Target audience review	
	2.1. Main stakeholders
	2.2. Community stakeholders

1.1. What is the problem?

Between harvest and retail, around 14% of food is wasted globally. In the Netherlands, between 30-50% of the food produced was wasted (€4.4bn in produce!), with households wasting around 34kg in solid foods per person per year (pppy)

After wasted food is thrown in the landfill, it emits methane which is 25 times more harmful than carbon dioxide for trapping heat in the atmosphere. This accounts for around a quarter of manmade greenhouse gas emissions globally. Food waste also means water waste due to foods in general requiring large amounts of water to produce, for example, wasting 1kg of beef means 50,000L of water wasted.

1.2. Who has the problem?

Food waste is a problem in nearly all the food industry, the largest area of wastage in more developed economies lays with the consumer (nearly 100kg pppy) as they are less efficiency orientated than businesses. In less developed countries, most of the wastage comes from production.

1.3. What are the goals?

Reduce food waste in a sustainable, novel, and relevant manner using packaging. The packaging can; raise awareness for food waste, tackle the issue of food waste head on, or provide a nostalgic/ fun solution to food waste.

1.4. What are the side effects to be avoided?

The packaging solution causing littering problems. The concept must not impact the environment worse than current solutions.

1.5. Which actions are admissible?

Use of plastic.

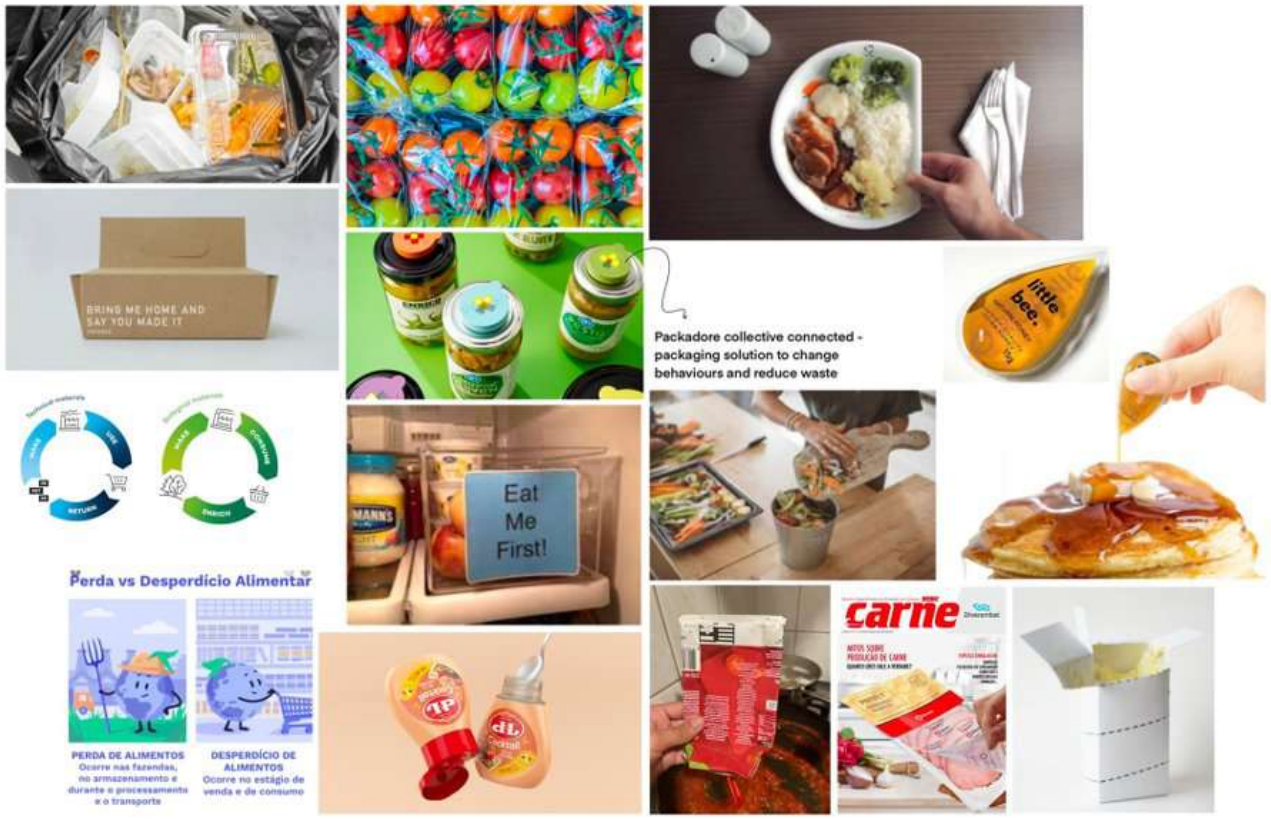
Final problem

Food waste is a global problem with large environmental and financial consequences. A quarter of the global manmade greenhouse gas emissions are due to food waste. Food waste naturally means water waste as well due to the large amounts of water involved in the production of food.

Across the food industry, many inefficiencies can be found which lead to food waste. The highest amount of food waste however lays with the consumer (in more developed countries) due to consumers being less efficiency minded compared to businesses.

The goal is to reduce food waste in a sustainable, novel, and relevant manner using packaging. This can be done through raising awareness for food waste, tackling the issue of food waste head on, or providing a nostalgic/fun solution to food waste.

Packaging litter should be avoided, along with this a concept with an impact to the environment worse than current solutions shouldn't be considered. If plastic were to be used, it would be admissible.



Target audience review

Stakeholder analysis

2.1. Main stakeholders

2.1.1. Retail companies

Retailers are looking for more sustainable substitutes for packaging to meet sustainability goals. In stores, one of the higher priorities is product safety. Product safety has 2 paradigms, namely, physical (ease of theft), microbial (preventing the product being affected by external microbes) or preventing harm to the user (use of child proof closures).

Needs: A sustainable substitute for packaging with a priority on product safety (ease of theft, microbial protection, and preventing harm to the user).

2.1.2. Potential user

The potential user has a lot of needs regarding packaging. The packaging must adequately protect the contents. Alongside this, the packaging should facilitate the transport of the product if needed. For unpacking the product, the user would appreciate a packaging solution that allows the packaging to be opened in the relevant context (no scissors needed when the product is intended to be a snack). The user should also be protected from harm caused by the product/ packaging. The recent sustainability trend would indicate a rise in users expecting sustainable packaging. It would be desirable for the user if the sustainability of the packaging does not increase the price of the product by an unreasonable amount.

Needs: Sustainable packaging that adequately protects the contents, while facilitating transport of the product. The user should be able to open the packaging in the relevant context, as well as protecting the user from harm (physical and microbial). Users also expect more sustainable products at a reasonable price.

2.2. Community stakeholders

2.2.1. Waste disposal/recycling companies

If the packaging has unusual innovations, it could potentially be helpful to the waste disposal or recycling companies to know about it to be able to properly deal with it.

Needs: Knowledge about the packaging if unusual innovations are made.

2.2.2. Packaging manufacturers

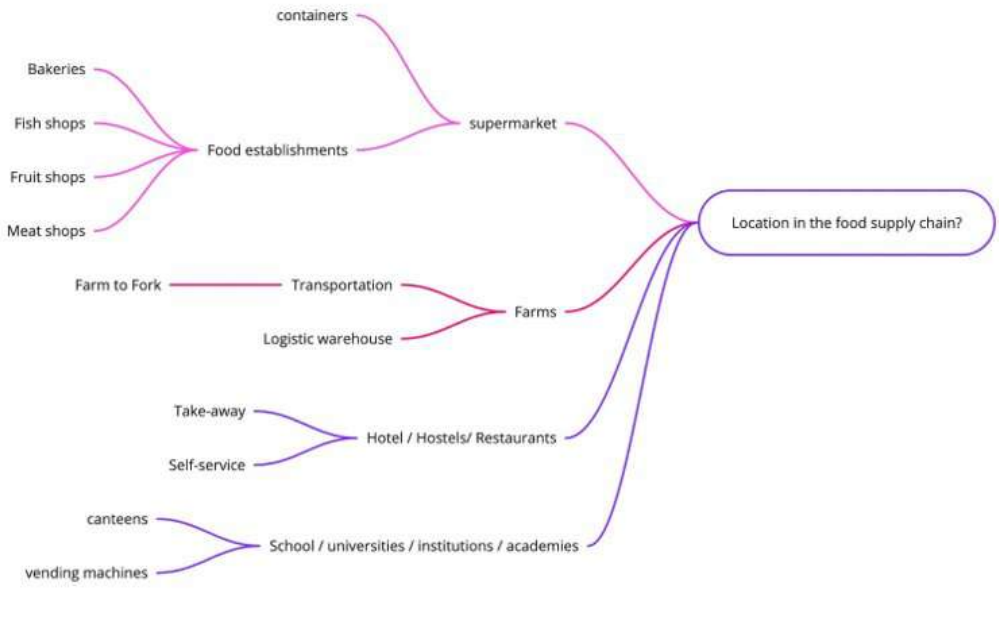
Packaging manufacturers are looking for sustainable solutions, while maintaining profits. To maintain profits, the packaging should be manufacturable with common machines. The manufacturers do not want legal trouble; hence it is important to create packaging that is safe for the end user.

Needs: Safe and sustainable packaging which is manufacturable with common machines.

Brainstorming

We did a brainstorming session in order to better understand what food waste is, where it is located, what types of food are most wasted, and what it means for packaging and how it influences it. In the process, we also think about know solutions- famous examples that prevent food waste and also non-food solutions that avoid waste and can be redesigned for food.

3.1. Location in the food supply chain?



Food waste starts from its production to sale and consumption. The places we identified as common food waste generators were:

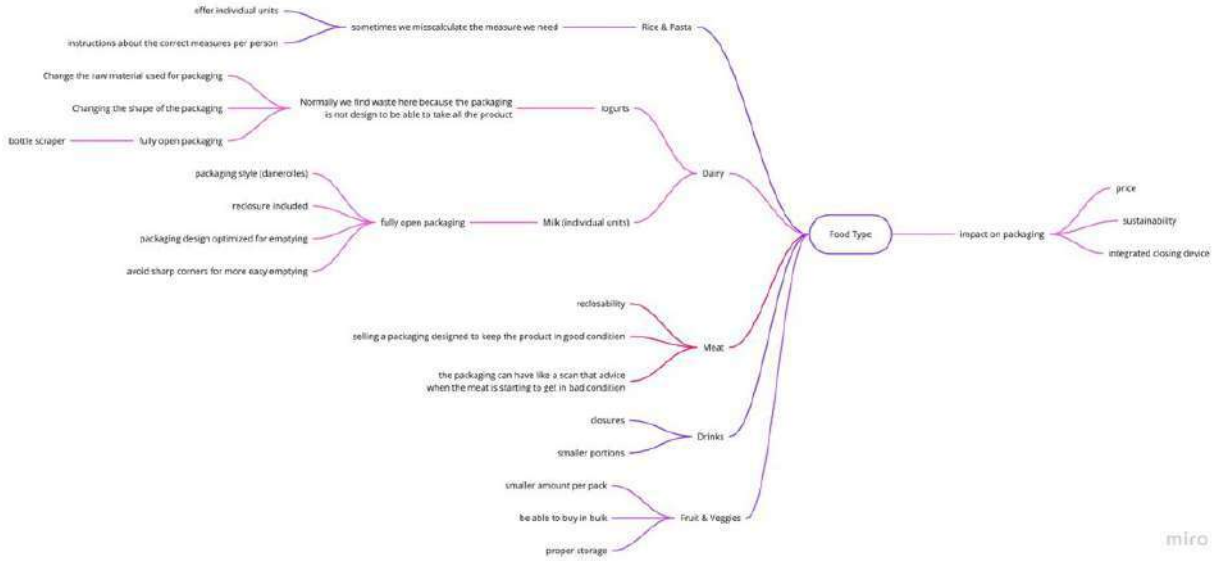
-supermarkets, both in the warehouse and in food establishments like bakeries, that at the end of day send at least 20% of what they produce in that day to the trash.

-Farms, there are several reasons that can lead to waste at the production stage such as: damage by extreme weather, insects, spoilage, etc.. also a lot of food is lost during transportation.

-Hotel / Hostels / Restaurants, in these places it is easy to ask for more food than we can eat, in the end this food goes to the trash, this is because we don't now how to measure, how much food we can eat, or how give another purpose to the food.

-School/ Universities / Institutions/ Academies, are the same as hotels, they have a large selection and big portions that are too much for the person in the end.

3.2. Food Type



Thinking about all types of foods and subdividing them in groups, we realized which ones are most wasted and why.
In the category of rice and pasta, the biggest reason for food waste is the fact that sometimes we miscalculate the measurements that end in bigger portion than is needed.
In the dairy products, like yogurt and milk, is the shape of this products that normally don't are able too fully open the packaging and use the product totally.
For meats, fruits and vegetables, the main reason is the fact that they are sold in big portions, so for people that live alone or with a few people, it can be difficult to consume it all before the food is expired.

3.3. Causes of waste

There are many reasons for waste such as:

Production
- Damage by extreme weather
- Spoilage
- Unharvested product
- Overplanting

Processing
- Rejected blemished product
- Damage
- Spillage
- Mold

Retail and food services
- Damaged product due to packaging
- Unsold holiday foods
- Overstocking
- Spoilage

Consumer (house)
- Inadequate storage
- Plate waste
- Confusion about date labels

3.4.Known solutions






To prevent food waste, it starts with education. There is already a rise in food waste education within schools. Mentalities are changing and forming them to be careful not to waste. In addition to education, there are many known methods to reduce food waste by using packaging. These methods are: portioning (i.e. portion packs), reusing old food, reclosability, suggestion recipes for leftovers on the packaging, and instructions for use on the packaging.

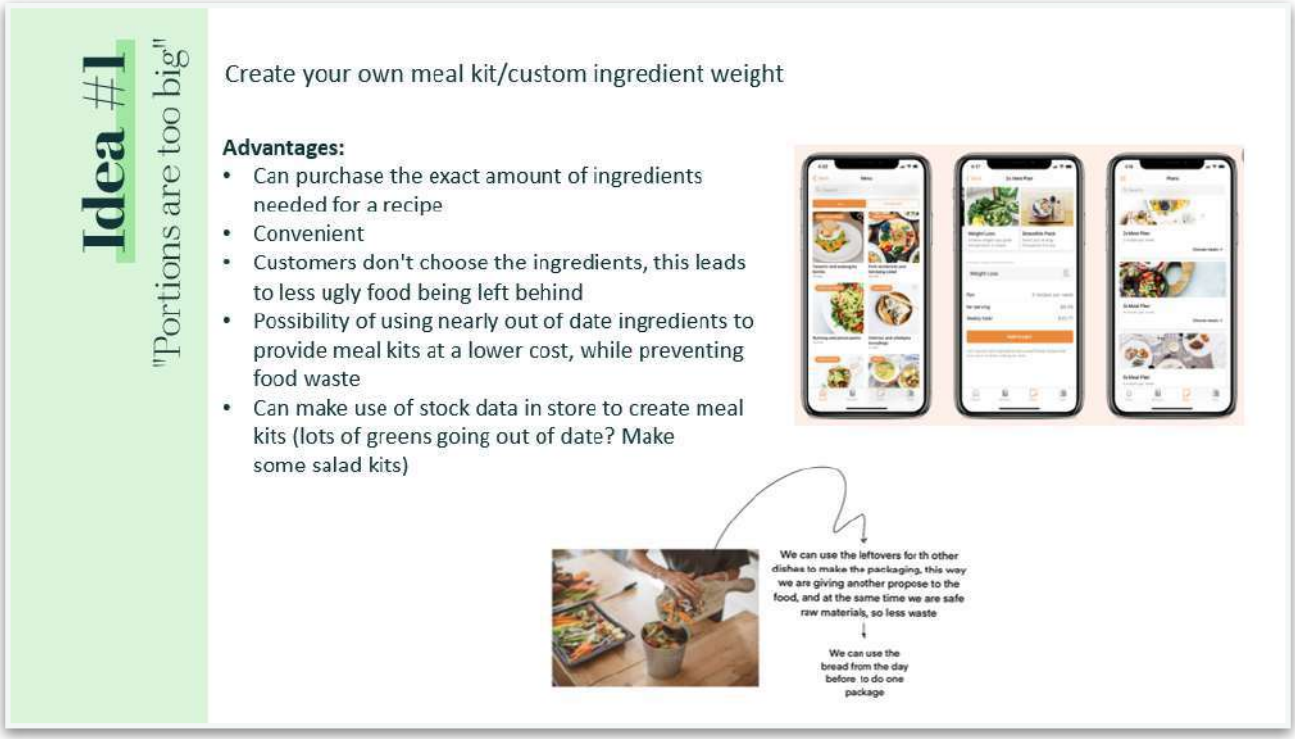
3.5. Non-food solutions

- Two components (glue solution: long shelf);
- Openable when its almost empty to get everything out;
- Shape of the product (hygienic products);
- Flat top to put upside down (let gravity do the work)
- Design of the container, allowing evening to evenly flow out;
- Deliberately design an upside down bottle;
- Rounder shapes; (facilitates the contents in being dispensed)

2. Ideas

To generate ideas that solve real problems, we used the SCAMPER method that is an amalgamation of what we should eliminate, combine, adapt, replace, among others. Using this method, 9 ideas have emerged, all with different concepts but these can be combined to enrich the ideas further

2.1. DIY mealkit



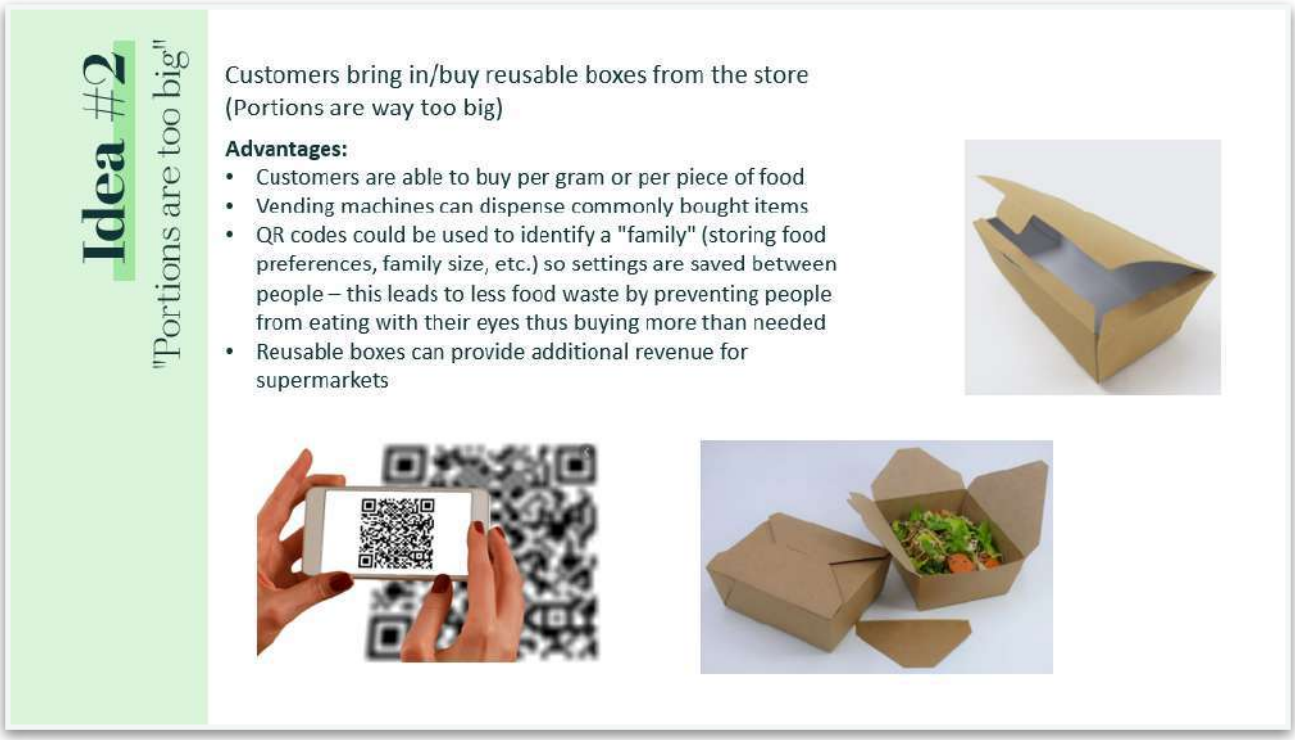
The first idea was creating a meal kit system, this system consisted of creating an app for the supermarket in which you can save your recipes and when you select one of them the supermarket prepares a kit with the necessary ingredients and the exact amount of each. This is really convenient when it comes to looking to buying ingredients for a meal because you purchase just the precise amounts needed for a recipe avoiding having small leftover ingredients in the refrigerator.
As these kits are prepared by the supermarket, that means customers are not able to choose the food, which leads to less ugly food being left behind.

It would be nice if the app had a database of stock along with expiration dates, this is something that supermarkets already have so it would just be a matter of linking it to the app, this would allow the supermarket to discount kits that have ingredients close to expiring.

The application could have both the option for users to be the ones to enter their recipes and the option to choose recipes provided by the supermarket or even other users to share their recipes with cooking instructions to make it more appealing to young people who do not know how to cook.

To summarize, this idea would fight against food waste both in terms of consuming ugly food, consuming products that are about to expire and not having leftover ingredients in the fridge.

2.2. Reusable boxes

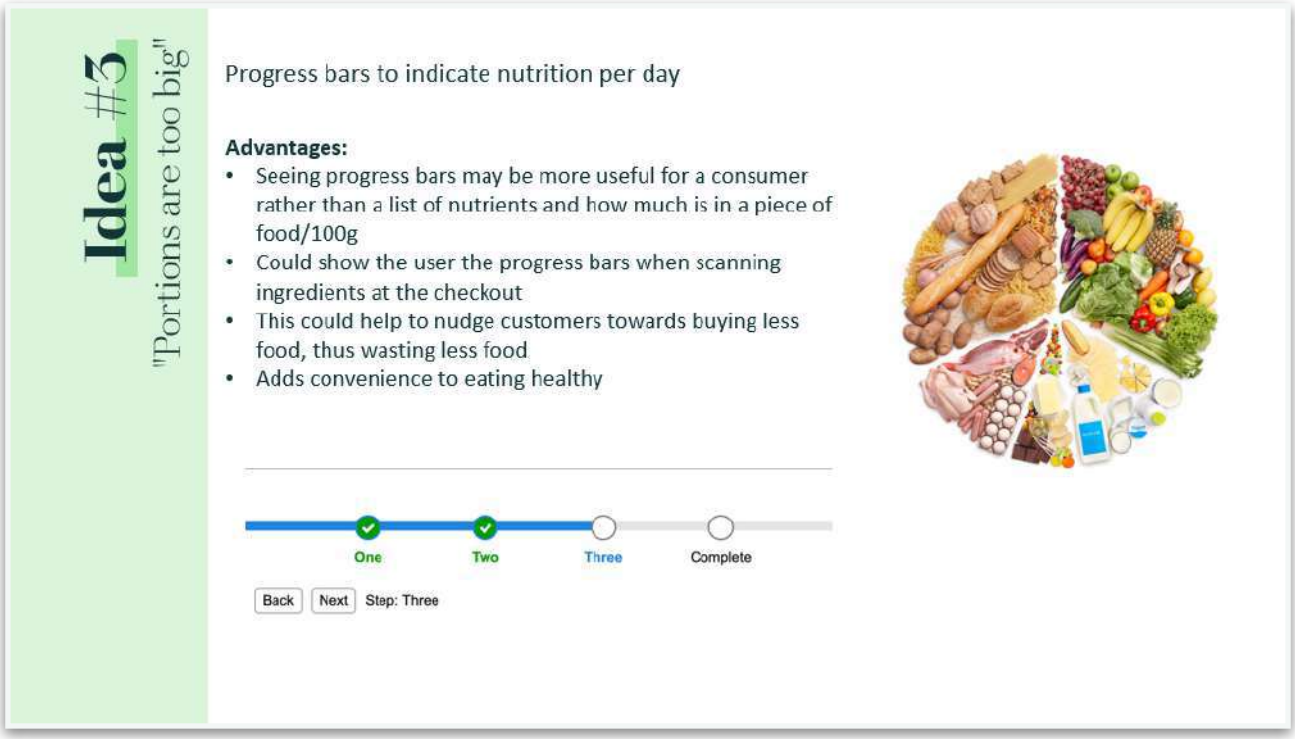


This simple idea also seeks to put an end to leftover ingredients by adjusting food portions to the customer's needs. The idea consists of a vending machine that dispenses some of the commonly sold foods that are dispensable. The customer pays per gram or per piece of food.

In order to make this system more suitable with no waste, the boxes used in this system can be either brought by the consumer or reusable boxes are provided by the supermarket, this can be an additional revenue stream for the store.To make this system more convenient, QR codes could be used, these could store certain information such as family size or food preferences.

The vending machine prevents over-purchasing food by not allowing customers to eat with their eyes.

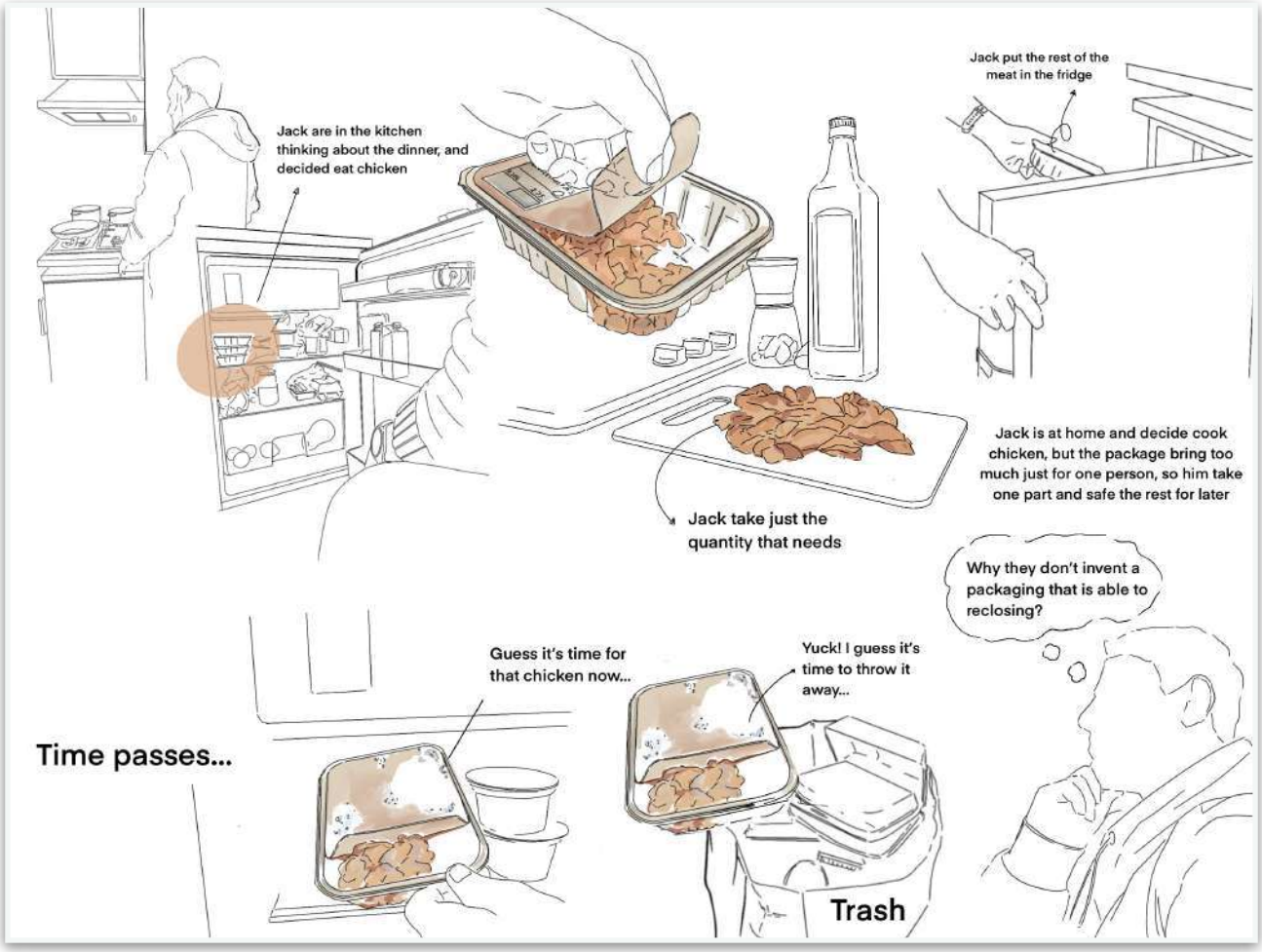
2.3. Progress bars



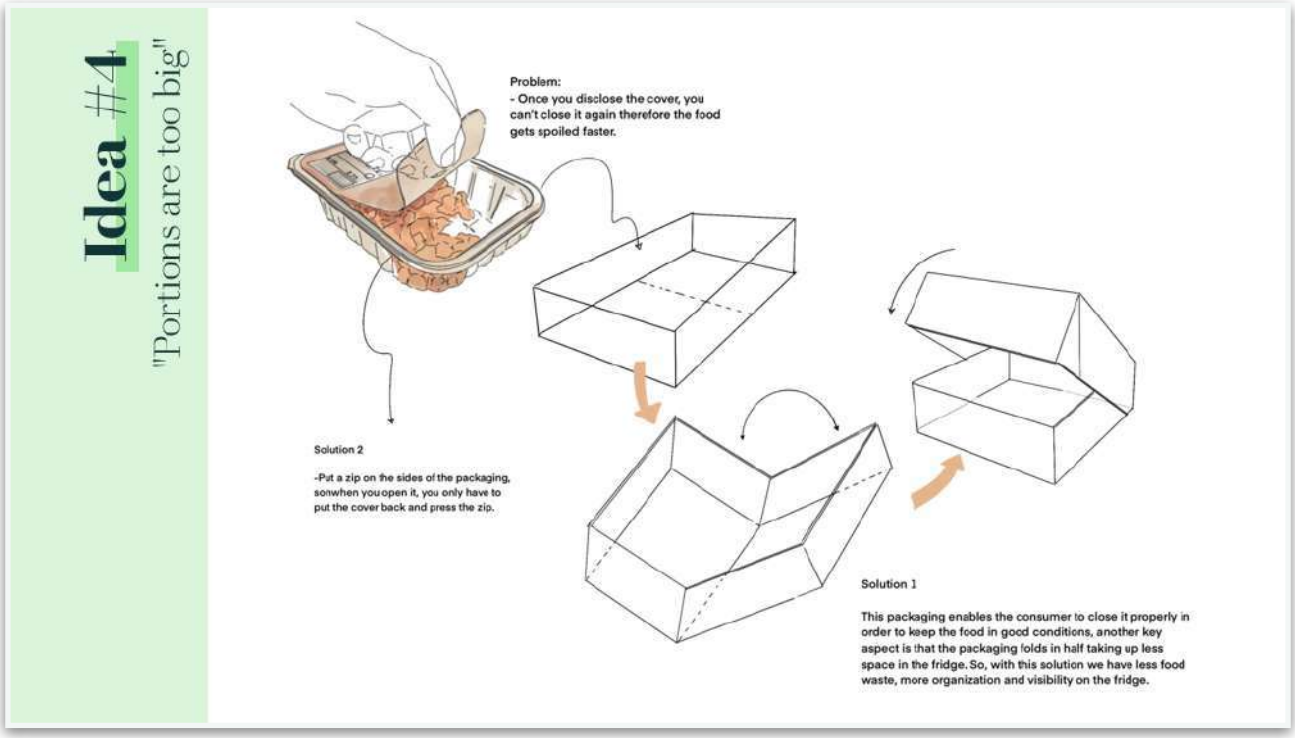
The third idea consists of progress bars to indicate nutrition required per day. Rather than a nutrient stat sheet on the back of products, a progress bar for nutrients needed per day might be more useful to the user than "this is x amount of your required daily intake per 100g".

This leads to consumers eating healthier and being aware of the amount of food they are eating, while nudging the users to waste less food by being able to portion food properly. Progress bars could be shown at the checkout, adding up as you scan items.

2.4. Foldable packaging



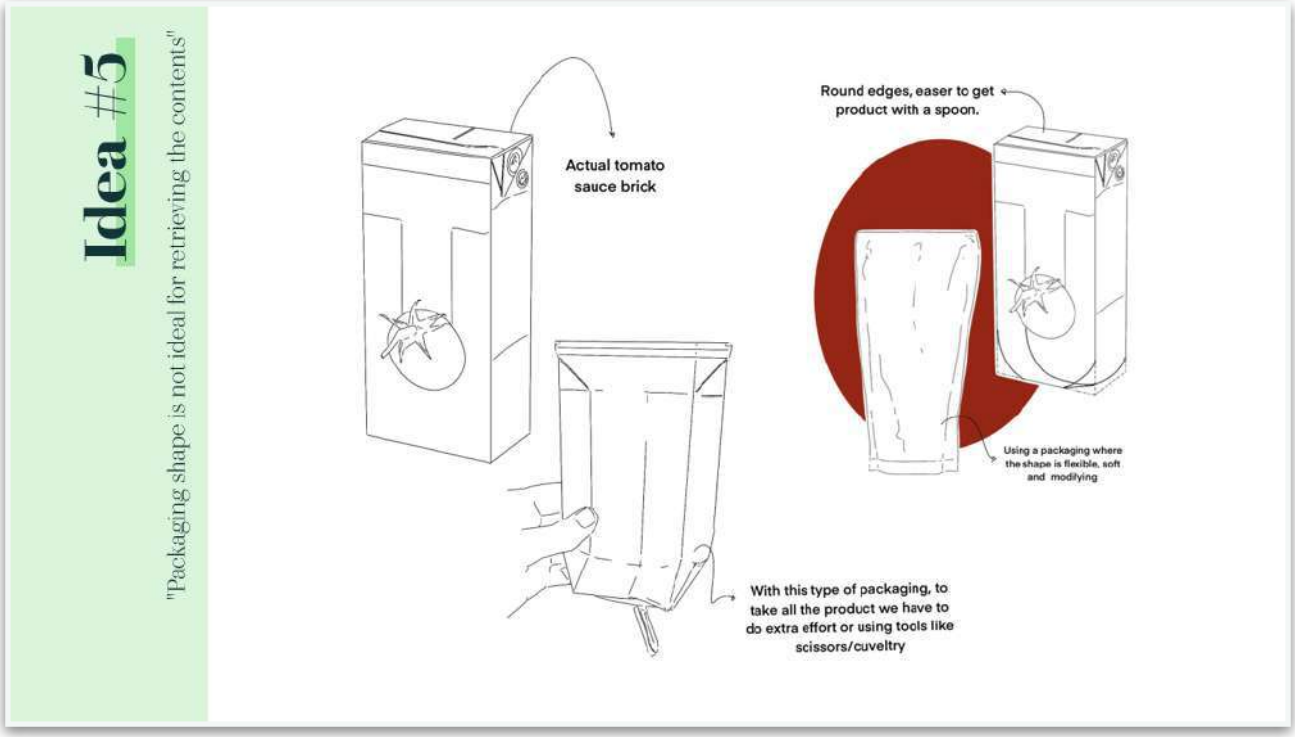
This is the storyboard created for the fourth idea, which is a resealable meat packaging concept. This storyboard describes how a persona buys a bulk tub of meat, however as a single person home, not all the meat is needed at once. The problem here is that having a packaging half open leads to food deteriorating faster due to external microbes, and the meat can also go brown due to oxidisation leading to some consumers thinking the food is off, when it's not.



The proposed solution consists of a box which can be folded in half allowing the packaging to be properly closed. It is a the combination of regular clamshell style box with the regular tub in which meat is sold.

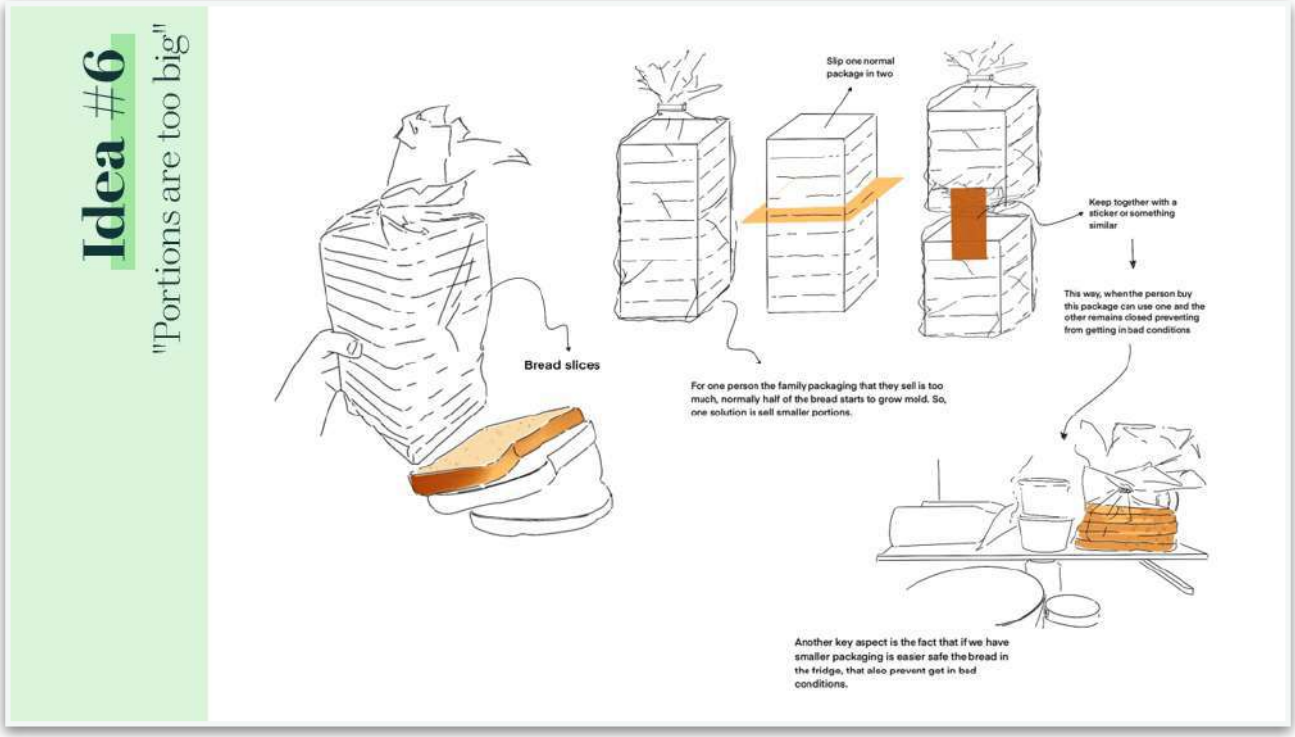
This way of resealing the packaging not only prevents it from spoiling quickly but also reduces the space used in the refrigerator. This indirectly combats food waste as well, since a more organized fridge means a better view of the inside of the fridge, this means you avoid forgetting about products that you didn't see because of poor organization.

2.5. Packaging designed for spoons



We thought that sometimes the issue of food waste can be related to the shape of the packaging so with some simple changes, packaging can be improved to be more effective in retrieving the contents.
Just changing the use of sharp edges to rounded edges can work for foods that require the use of a spoon, this will be more convenient and safe for the user than cutting open the box to get things out of any nooks and crannies.

2.6. Sticker

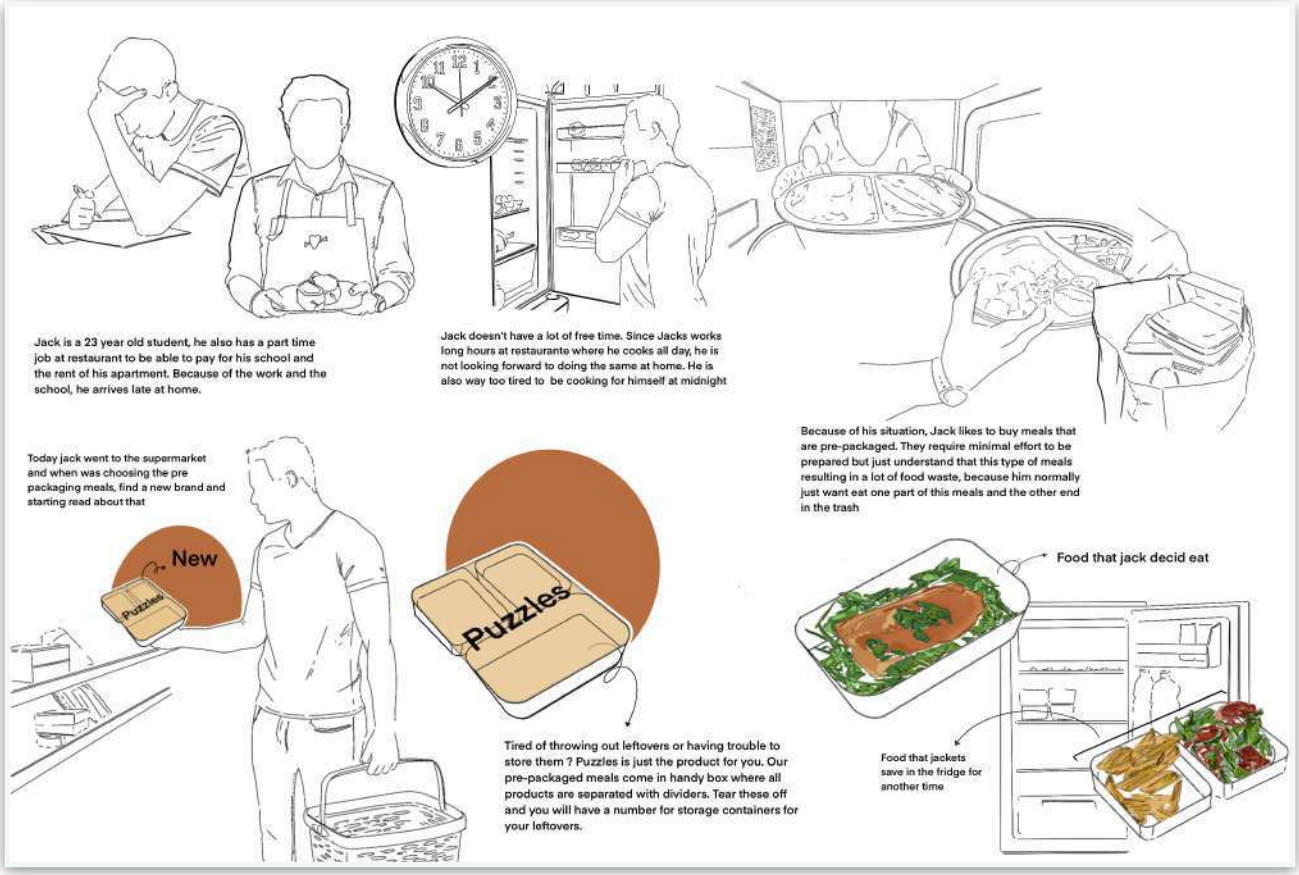


Keeping in mind a person that is living alone, subdividing the portions further can be useful. In this example we used bread but it could be any type of food.

The main advantage is that since it is divided in two, one part is not used until the other part is finished, and since it remains closed, it retains its freshness for a longer period of time.

Also smaller packaging is easier to store and organize, as we mentioned before, better organization helps to prevent food from being forgotten and ending up in the trash.

2.7. Puzzle design



For the storyboard of this idea we have a 23 year old student, who also has a part time job at a restaurant to be able to pay for his bills. He works 5 days a week at the restaurant after school, so he is often home late. Since he works long hours at the restaurant where he cooks all day, he is not looking forward to doing the same at home. He is also too tired to be cooking for himself at night. Due to his situation, he likes to buy meals that are pre-packaged.

The problem with these pre-packaged meals is that once you open them, you have to eat the entire contents because you cannot close them again, and sometimes you just aren't that hungry.

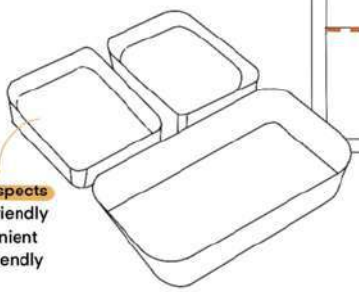
Idea #7

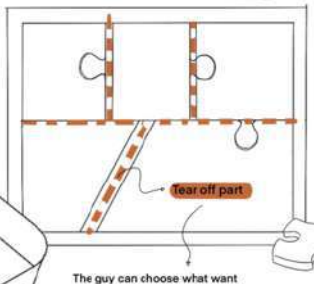
"Portions are too big"

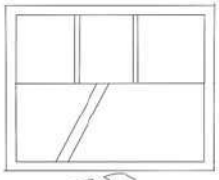
This pre packaging use dividers but continue all together, so we can't choose eat some food and safe the rest for another time

But if it was possible?

Pre packaging meals





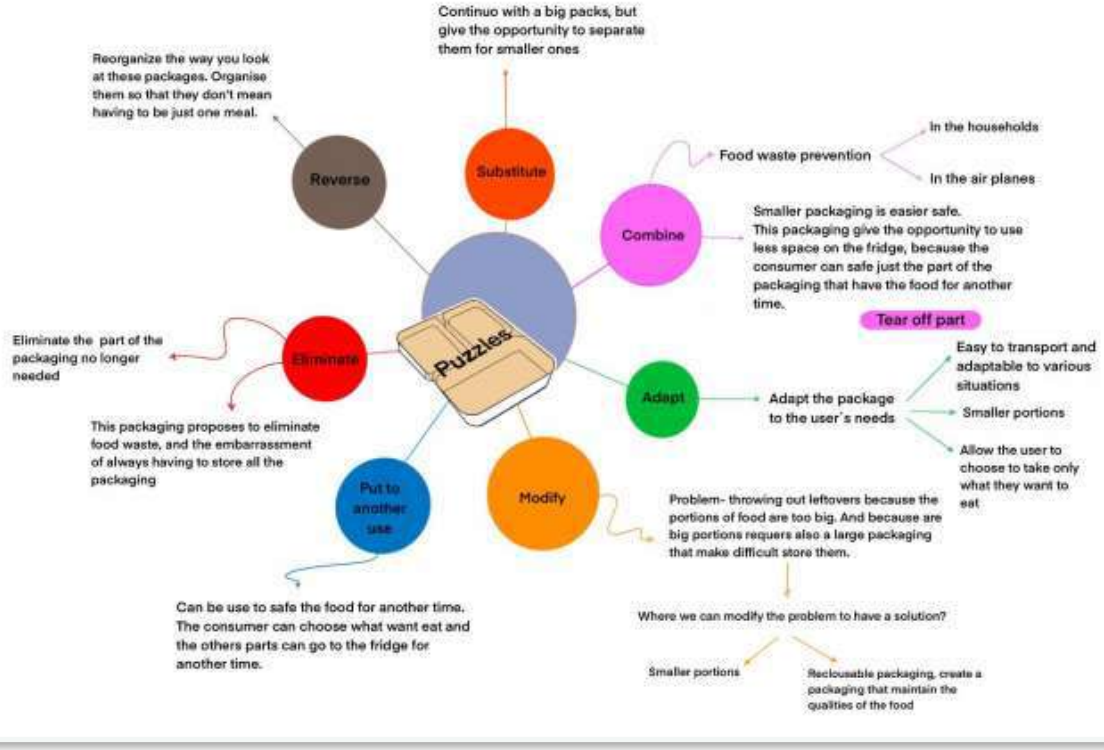


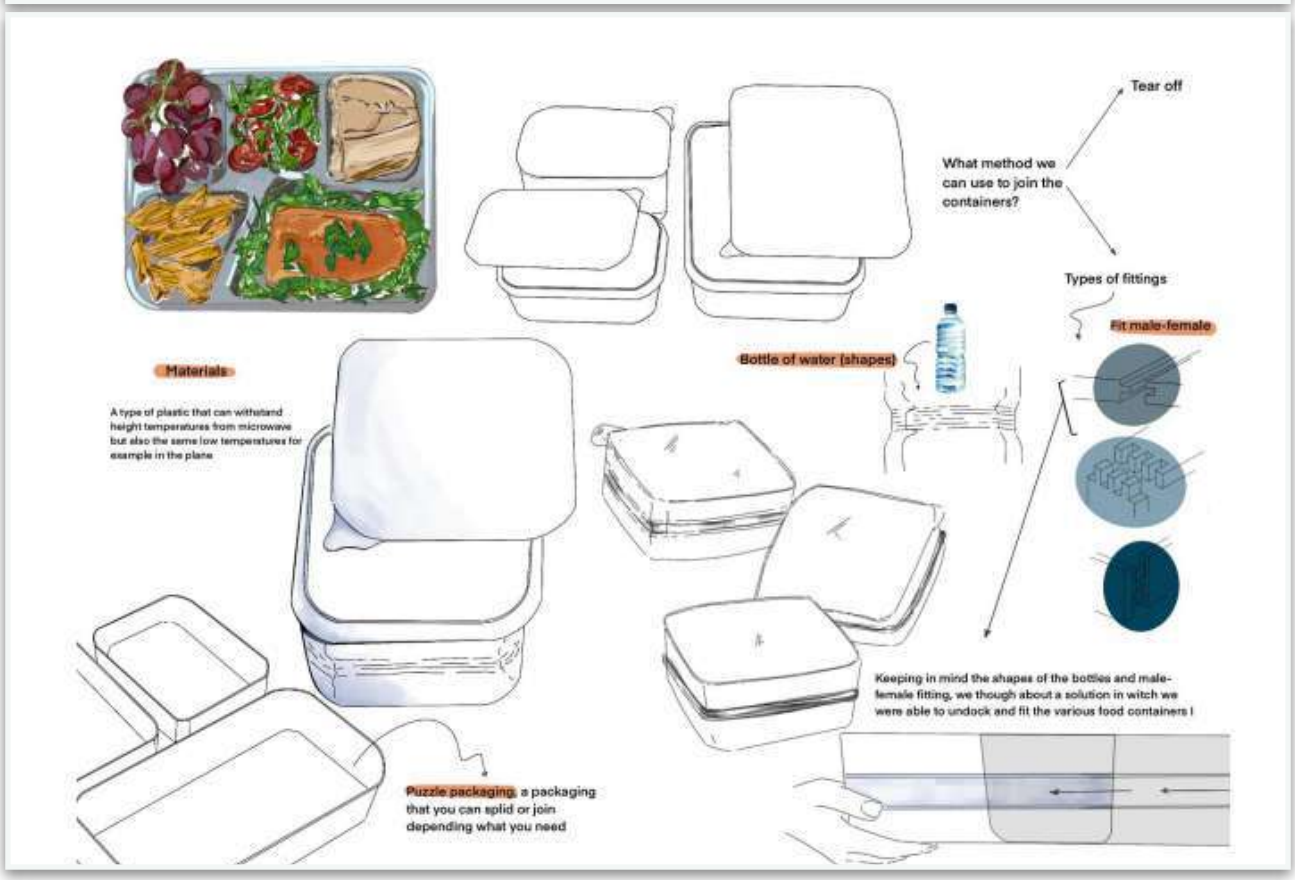
Tear off part

The guy can choose what want eat and the others parts can go to the fridge for another time

Inspired on puzzles, we can do a packaging, where is possible separate this boxers

Keys aspects
-user friendly
-convenient
-eco friendly

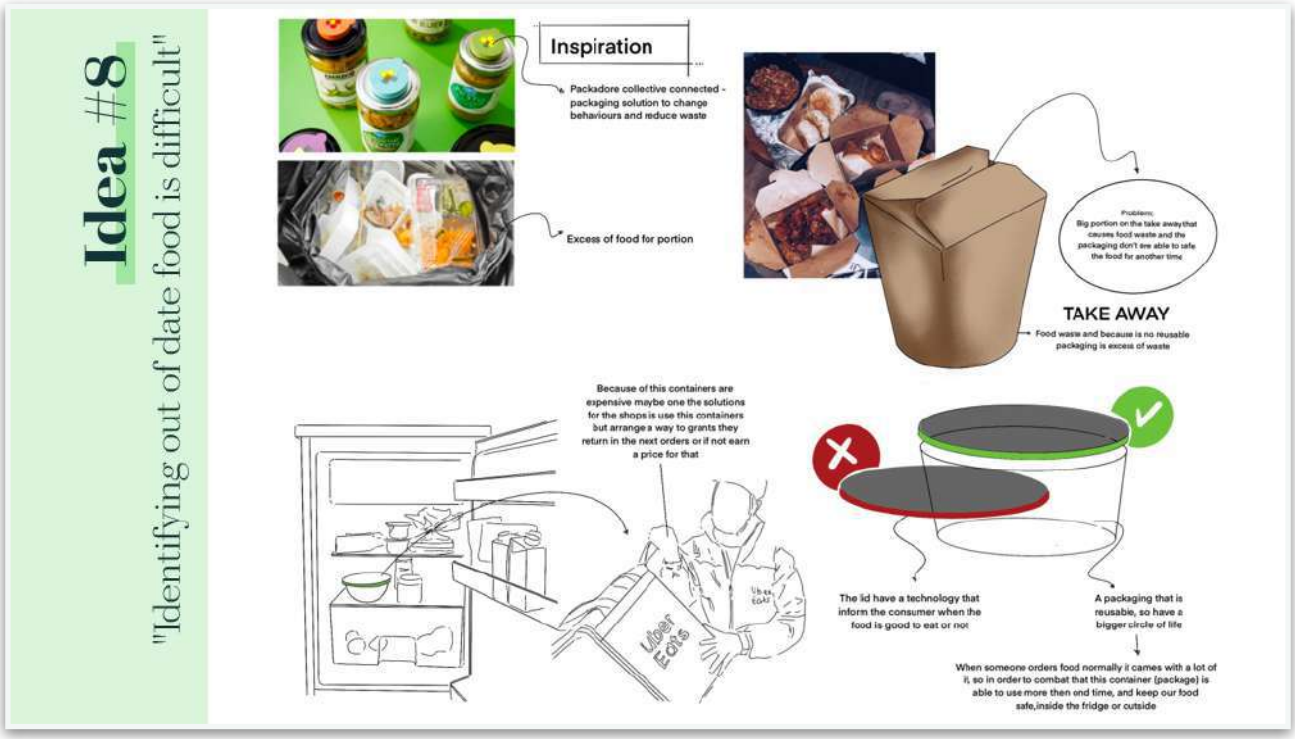




The subtopic for this idea is ' portions are too big ' and as a solution to the problem described above is to make use of puzzle like locks to attach subcomponents together. These packaged meals come in a handy box where all products are separated with dividers and you can tear these parts off.

With this system you can eat only the portions you want at that moment without wasting the rest. Since you can separate them, you don't have to keep the whole box if you only have a couple of portions left over so you can keep only those portions. That is more convenient than having a large half full tupperware clogging up the fridge.

2.8. Container with sensors



Another subtopic we discussed was customers being unsure about when food goes off.

This problem occurs more often than we think. Sometimes we forget the products we have in the fridge we do not know if they are in good condition and when we want to use them again. This not only happens with the ingredients we normally use but also with the food we order in takeaway apps. The portions of these restaurants are usually quite large and we do not end up eating all the contents, in this case we usually save these leftovers for later, but how long do they last in the fridge?

To solve this problem, we have thought of adding something to the packaging to warn us when we can no longer eat the food. A timer programmed by the restaurant would be a solution, though not very precise. In this case sensors that would determine changes in the atmosphere inside the packaging would be the most accurate option but it would require research on which of the sensors would be the most suitable.

2.9. Portioning mechanism

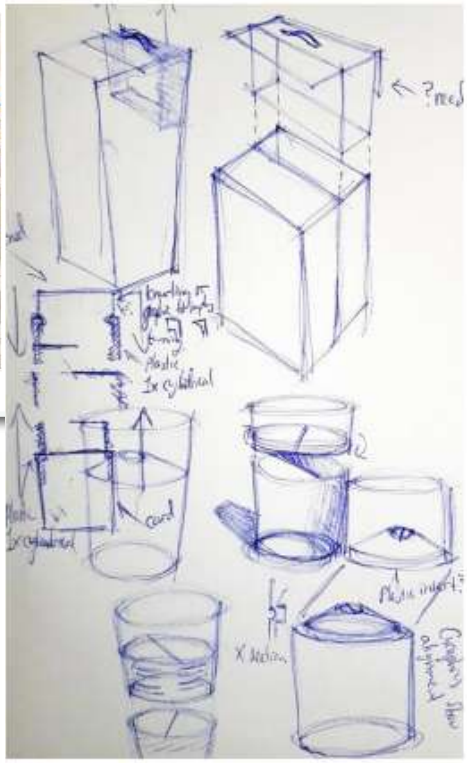
Idea #9

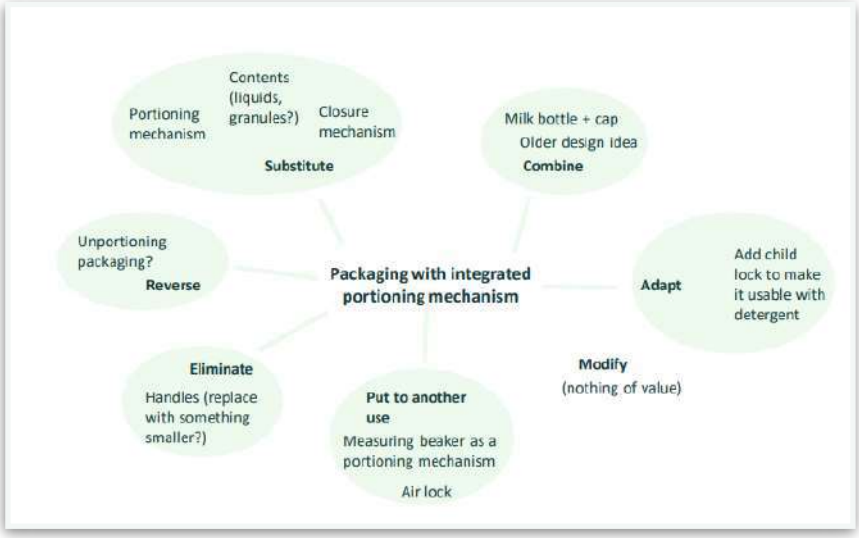
"Portions are too big"

Packaging with integrated portioning mechanism

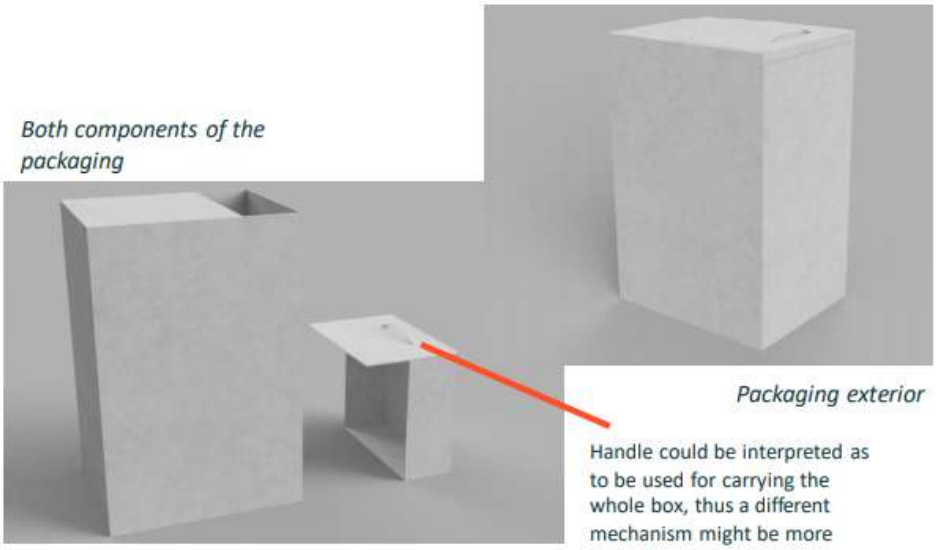
Advantages:

- Pre portions food, this can help to reduce food waste
- Helps with organisation
- Could add an educational aspect about portioning food
  - Good for marketing





Packaging with integrated portioning mechanism



Packaging with integrated portioning mechanism

Packaging exterior with lid off

Mechanisms combined without housings

Subconcept 1:
This subconcept consists of a box which contains another container for dosing. To dose the contents of the packaging, the user needs to rotate the packaging to allow the contents into the dosing container, then rotating the container back so the dosing container can be pulled out without the contents spilling. The way this concept prevents food waste is by portioning the contents for the user.

Subconcept 2:
The portioning mechanism in the second subconcept is a lot more complicated than the first. The actual mechanism consists of three parts, namely; the knob, the female screw, and the male screw. This creates an “air lock” where the contents of the packaging is able to move into the dosing container and not fall back into the contents storage area. Since the concept is able to preportion the contents of the packaging, it prevents food waste.

3. Harris Profile Description

Harris profiles were used during our converge phase. This was due to Harris profiles providing an overview of all ideas – allowing us to rank them. Alongside being able to rank ideas, the insight gained from a Harris profile about what a certain idea excels at, or is not great at – gives us a stepping stone to improve the ideas.

	Idea 1 (DIY mealkit)				Idea 2 (Reusable boxes)				Idea 3 (Progress bars)			
	--	-	+	++	--	-	+	++	--	-	+	++
Feasibility												
Desirability												
Viability												
Sustainability												
Food waste prevention												
Net Effect	1				7				5			

Idea 1

The DIY mealkit idea did not score well in feasibility and viability due to the complexity of the idea, and requiring a large amount of electronics and systems built on top of that. The idea is however quite desirable, as it can cut down costs for the consumer by making use of meal kits which use food that is going out of date. When looking at the idea through a lens of sustainability, it performs well due to it only requiring a terminal where users can order the mealkits (this could even be done online). The only negative point in sustainability is that the electricity that the terminals use could be generated through unsustainable means.
Another way this concept tackles food waste is by not allowing the user to pick which food items they get as customers will usually pick out the best looking food, leaving “ugly” foods behind.

Idea 2

How this packaging prevents food waste is by allowing users to buy exactly the amount of food needed (in grams or per piece, depending on the food item). This prevents users from needing to buy a larger pack of food than needed, thus saving food. This idea can be made more convenient by using QR codes to save information of the customer which makes the idea desirable and viable. This concept is exceedingly sustainable as the packaging is reusable (to an extent), the only negative in sustainability would be the water used when cleaning the boxes.

Idea 3

Making use of progress bars doesn't require much to implement, this makes it very viable and feasible. In terms of desirability it would replace the current table of nutrients, making it more usable for customers who don't usually check the table. This might also nudge the general public into eating healthier due to the numbers being visualised.
This idea didn't score well for food waste prevention. This is because the concept is not actively fighting food waste, it provides more of a nudge for consumers to not buy more food than needed and provides an aid in planning. Consumers overestimating the amount of food needed, and having trouble with food planning is a couple of the many causes of household food waste (van Geffen, van Herpen, & van Trijp, 2019).
One of the largest problem with this idea was that it was too simple of an idea. This concept could however be integrated into other concepts to provide consumers with even more of a push towards reducing food waste.

	Idea 4 (Foldable packaging)				Idea 5 (Packaging designed for spoons)				Idea 6 (Sticker)			
	--	-	+	++	--	-	+	++	--	-	+	++
Feasibility												
Desirability												
Viability												
Sustainability												
Food waste prevention												
Net Effect	2				-1				-4			

Idea 4

Allowing packaging to be refolded to close packaging once it has been opened allows food to be kept fresh a tiny bit longer while also saving space in the fridge – both of which being desirable. Sustainability and feasibility wise, the idea doesn't score so well. We found the idea to be less feasible due to requiring a plastic that can be folded, while maintaining its rigidity. The sustainability scored lower as well due to the idea not doing much to improve sustainability, it just increases the usefulness of the packaging to the consumer.
The idea is good at food waste prevention by allowing oxidisation to affect the quality and looks of the food less. Most people find meat that has gone brown due to oxidisation to be unattractive, this casts doubt on the edibility of the food. With the average consumer being uncomfortable in deciding the edibility of food, this can lead to food waste.

Idea 5

More than half of the participants of a survey (57%) stated that the worst perceived packaging malfunctions were related to the packaging being difficult to empty (Williams, Wilkström, Otterbring, Löfgren, & Gustafsson, 2012). To counter this, designing packaging to be emptied by either keeping tools in mind (spoon often being used to empty yoghurt packaging), or allowing the contents to be emptied consistently (squeeze bottles for honey). This idea is not as viable as others due to there not being a large increase in desirability, compared to the increased cost of production as a unique shape is required to aid in emptying packaging. Sustainability wise, this concept is comparable to others currently on the market, however the increased ease of emptying does not cancel out the increase in material used to facilitate rounded edges in the packaging.

Idea 6

This idea did not score well due to the fact that grocery stores are already selling products in smaller packages, the sticker did not add much other than joining the products together to be sold as a pair. The idea was however very feasible, due to the ease of making stickers. The idea was not desirable as there is already an easier to use alternative on the market with smaller packaging. Sustainability wise, there is an increase in material used, for no real benefit. In the context of food waste prevention, we did not find a good reason to implement this idea over supermarkets providing smaller packaging.

	Idea 7 (Puzzle design)				Idea 8 (Container with sensors)				Idea 9 (Portioning mechanism)			
	--	-	+	++	--	-	+	++	--	-	+	++
Feasibility			■				■				■	■
Desirability			■				■	■			■	
Viability			■				■				■	
Sustainability			■				■				■	
Food waste prevention			■	■			■	■			■	
Net Effect	6				7				6			

Idea 7

In terms of feasibility, desirability, and viability, the puzzle design for pre-packaged meals scores well, as the concept is similar to currently available pre-packaged meals – the only difference being that parts of the packaging are able to connect to each other. Sustainability wise it ranks similarly to currently available packaging as well.

The puzzle design for pre-packaged meals combats food waste by allowing the user to choose what they would like to eat and save the rest of the meal in the fridge without taking up unneeded space.

Idea 8

The idea of having a container with sensors (or a timer) was highly rated. It seems very feasible as reusable boxes are already on the market – the only things missing is the system in which the boxes are distributed and returned, as well as how to optimise the box to make it usable in a takeout context. The idea scored high in food waste prevention as well, this is due to one of the common worries of food being whether it is safe to eat, and humans being naturally risk averse (Evans, 2012). Consumers in general are not comfortable with estimating whether food is edible or not which compounds with the previous reasoning, leading to food waste (Farr-Wharton, Foth, & Choi, 2014).
The idea makes use of plastics, however the products will be used multiple times before being discarded. This removes the need for a single use packaging (especially plastics), thus being more sustainable. This does however mean that there will be increased water use due to the cleaning required.

Idea 9

Integrating a portioning mechanism into packaging is very feasible due to similar packaging being available on the market already (powder sugar packaging). Portioning is desired as it provides value in convenience to the user. There is some viability in this packaging, because it provides enough value to the user for it to be used over currently available packaging. For sustainability, the product is about as sustainable as competing packaging by using materials which can be recycled.
The way this packaging prevents food waste is by keeping the contents of the packaging fresh by making it difficult to leave the contents of the packaging out in the open. The portioning mechanism should also make it easier for users to dose the product accurately and with convenience, thus wasting less food.

4. Final concept

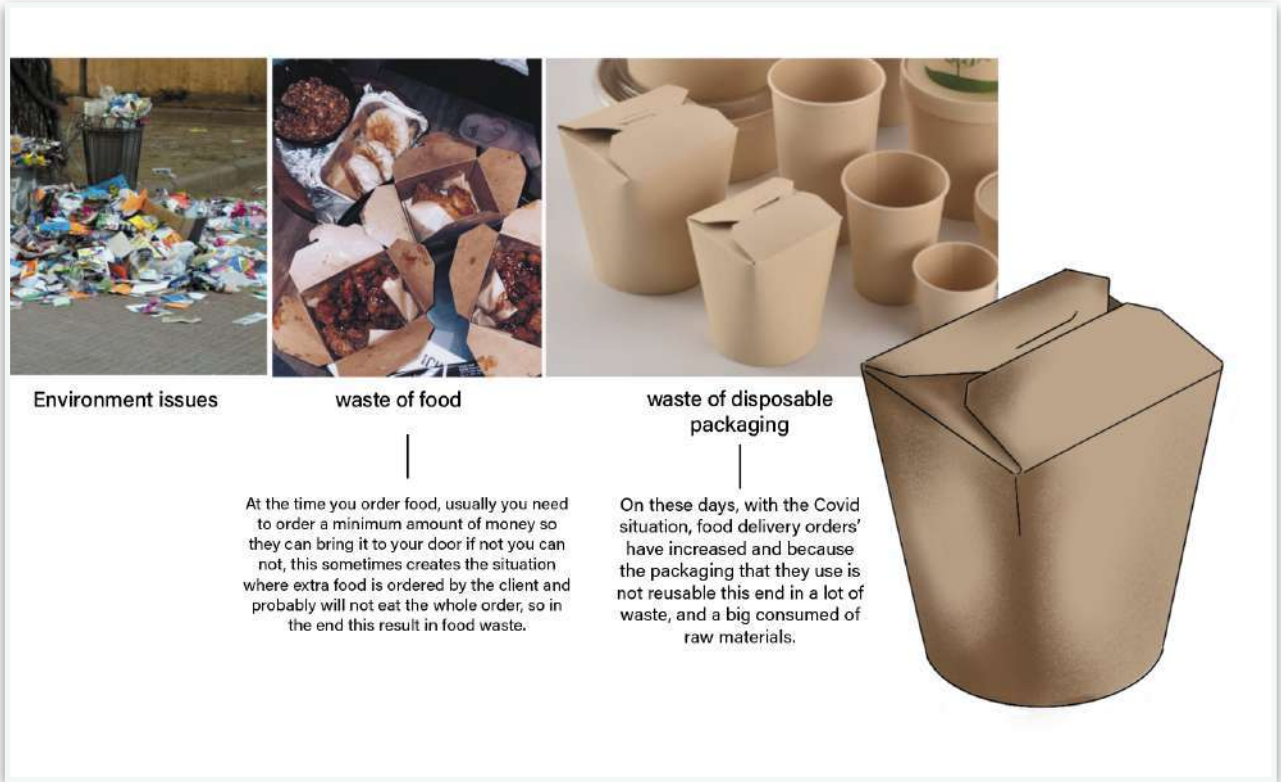
4.1.Main characteristics

- **Category:** To avoid the food waste that provide from take-away meals.

- **Target-Group**

Our Target-group is a consumer between 18-45 years old that has a habit of ordering food, usually realizing that they ordered too much food afterwards.
We are looking for a solution to this problem

- **Problem**



Nowadays, one of the most worrying global issues is pollution and climate change. We are living in a consumer society, younger generations are people that want things easier and quicker. On the other hand, younger generations are more conscious and aware of the global problem, it is understood by adolescents that this needs to change and that it is a problem which involves everyone.

Since the corona virus pandemic, food delivery orders' have increased since there. are many apps which offer many options for food from around the world to customers.
Using the personal accounts on the phone app, customers receive personalized discounts and offers on different week days, engaging them and incentivising clients to order more by offering the food at cheaper prices (some offers are real bargains!).

When ordering food, there is usually a minimum amount paid for the order to go through.This sometimes creates a situation where extra food is ordered by the client and can lead to the order not being eaten.This is where packaging is important and takes importance in the process. Usually, customers throw the excess food in the trash as they do not where the food can be stored, due to the packaging not allowing for storage

- **Vision**

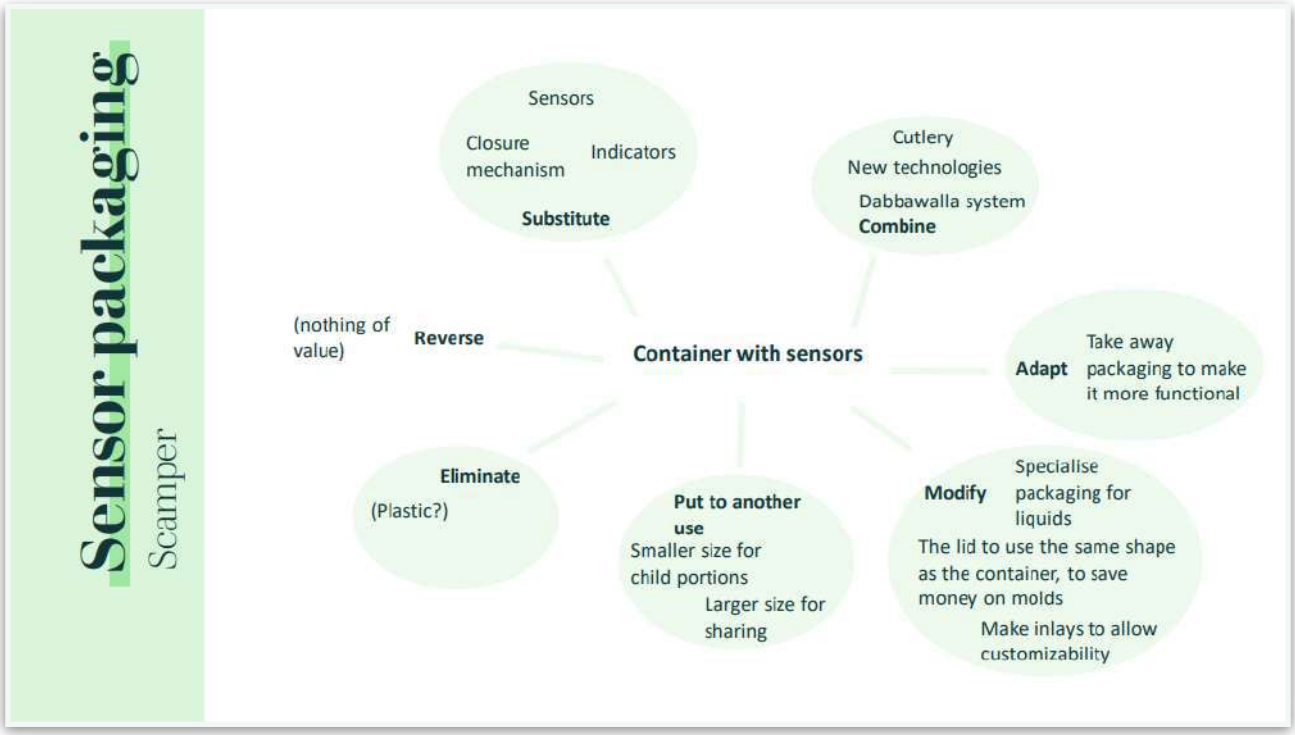
Offer the consumer the possibility of being able to store the food they order to make it possible to safely eat the food another time, without the food deteriorating too much. An indicator can be included to communicate food being spoiled to the consumer.This product should replace single use packaging.

4.2. Unique selling points

- Solving two of the main societal issues:
    - Food waste
    - Environmental issues (Pollution, excess of use raw materials)

- Sustainable food packaging (Two in three consumers care more about sustainable food packaging than five years ago);
- Making customers lives more convenient and more sustainable;
- Providing an easy-access system to check the food condition through the delivery food app;

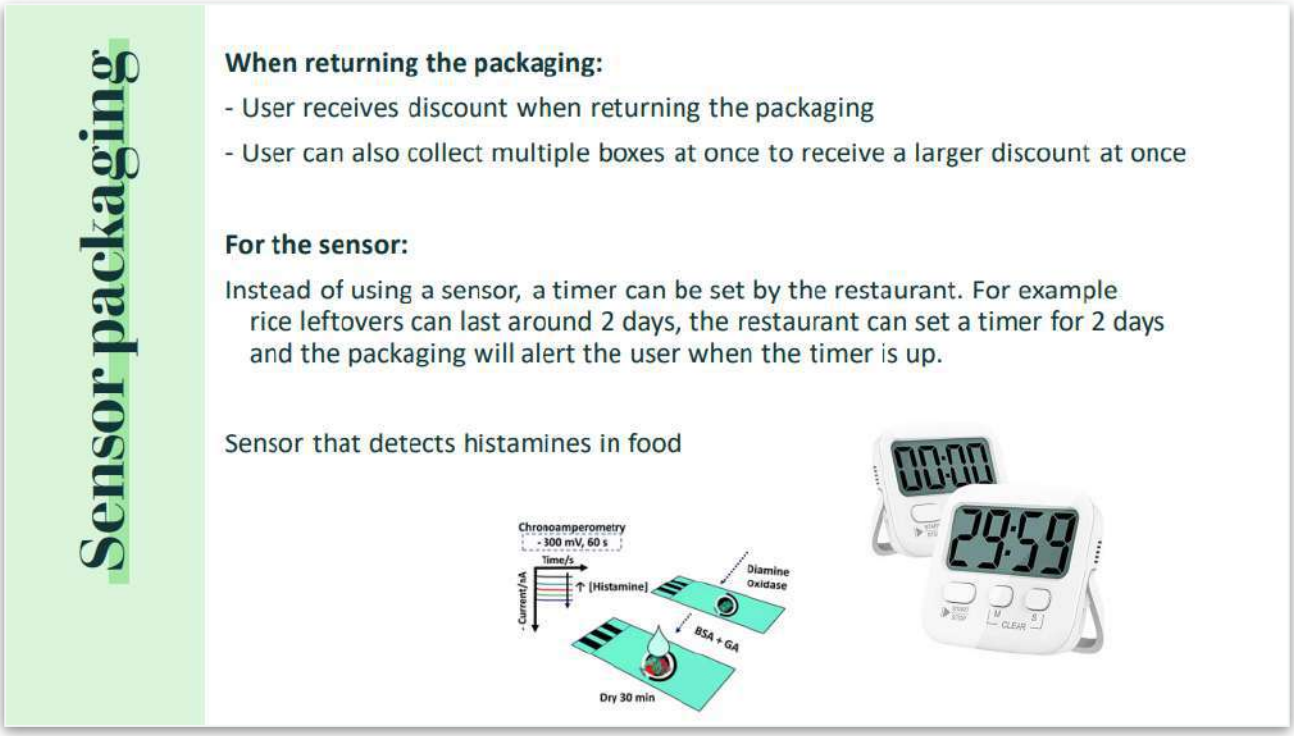
4.3. Materialization



Here we applied the SCAMPER method to have a vision of the concept from a perspective of improvements to actual food delivery packaging that sometime doesn't close correctly or are single use.

Some notable examples are larger or smaller sizes for different portions, inlays to allow the restaurant some customizability, and the dabbawalla system which is one of the few 6-sigma organizations (error rate of 1 in 16 million orders) delivering home cooked lunches to office workers daily.

In India they have been using metal containers which are reusable so our product sort of align so we can use this system to extract some ideas and apply them to our product when we want to scale upwards. The main difference is basically that dabbawalla meals are cooked by employees partner, rather than a restaurant.



How we can ensure the returning system works?

Offering a discount to the customers for returning the packaging was the first option that came to our minds. Later we will see how we opted for another method which was extracted from a link provided by the teachers.
Another possibility is that an agreement can be made with the customer within 14 days of the order being executed, it will have to be returned to the restaurant where the order was carried out (in case it is from a restaurant chain the customer will be able to deliver it to the one closer to its home).
Regarding the sensors we had the option of using a timer in case we could not find the right sensor.

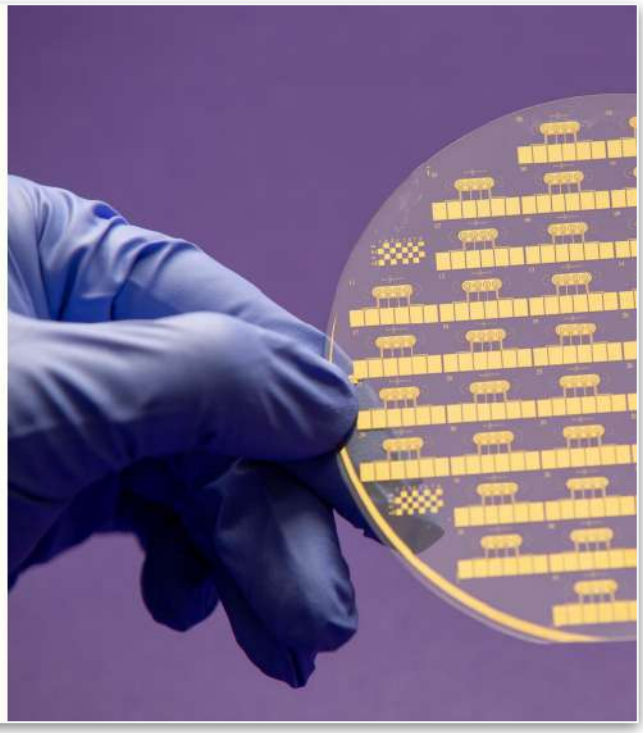
Sensor packaging

Sensor research

Histamine sensor

"The researchers produced the disposable food safety sensors with a low-cost, aerosol-jet-printing technology that's precise enough to create the high-resolution electrodes necessary for electrochemical sensors to detect small molecules such as histamine"

https://www.futurity.org/histamine-sensors-graphene-food-2394482/



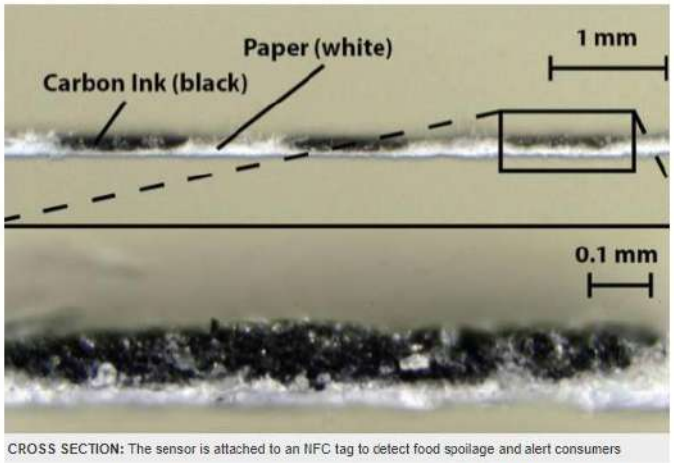
We first found this sensor that detects histamine which promised to be low cost and a very viable option but the teachers told us it was high tech so we decided to look for other options.

Sensor packaging

Sensor research

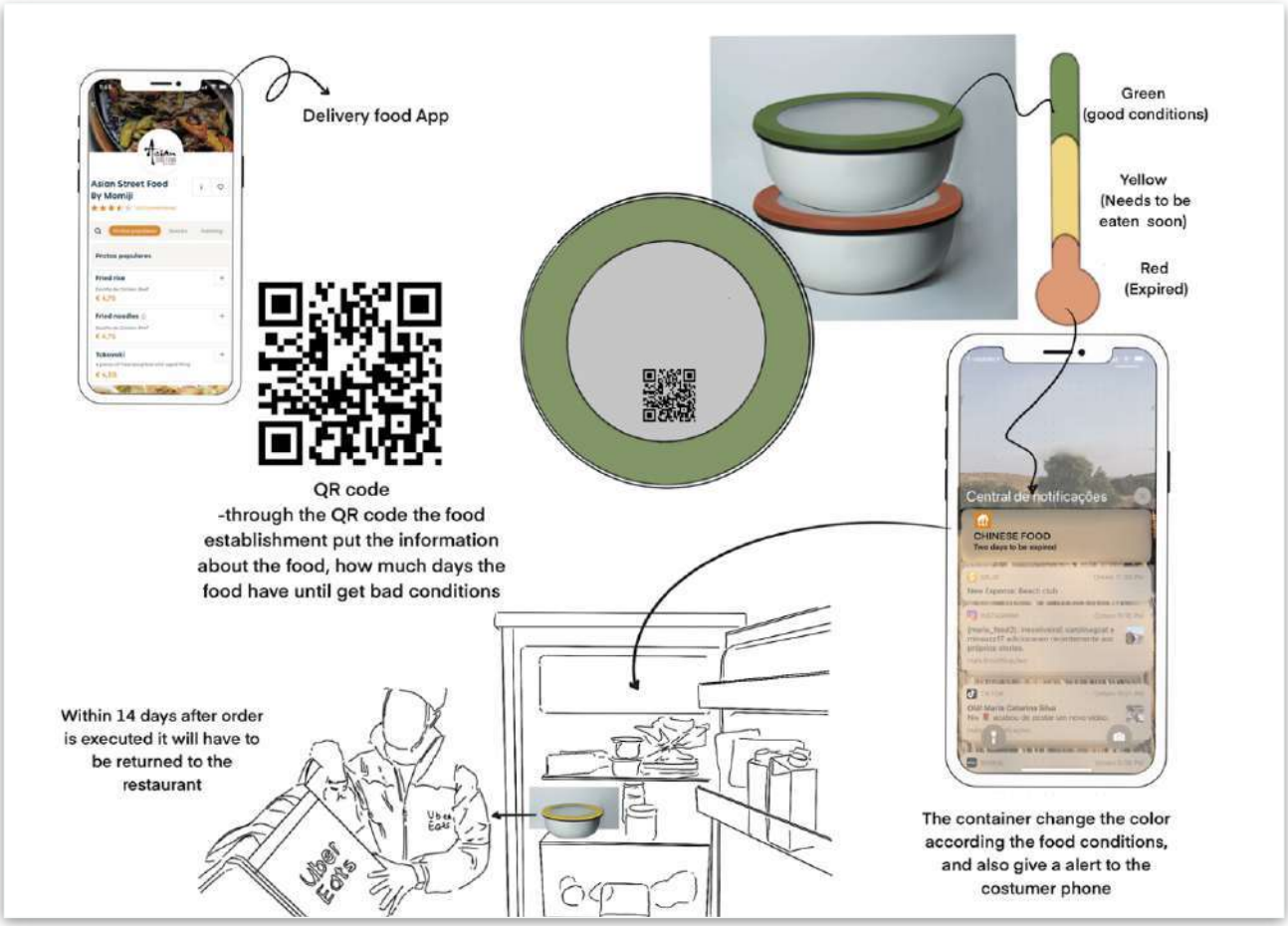
Imperial College develops NFC tag-based freshness detection system to reduce food waste

By Liz Morrell - 12 June 2019



CROSS SECTION: The sensor is attached to an NFC tag to detect food spoilage and alert consumers

Finally we found an option that look usable. PEGS (paper-based electrical gas sensors can detect spoilage gases like ammonia and trimethylamine.
These sensors are combined with NFC (near field communication) tags that can be read by mobile. Since food is often ordered using a phone, it should not be too much of an issue for the user to use their phone to check the NFC tag.
Looking at the costs, the price of the sensor is 0,02 $ and the price for the NFC tag is 0,13 $



Another option for this intelligent packaging is this one work through an app in order to avoid food waste.

- App Functionality (Customer)

In the case of there being leftovers, the customer can keep it home and use the QR code on the container cover which the client will be able to scan through the food delivery app. From the moment it is delivered the colour of the cover edge will change depending on the foods condition (*Green* (good conditions), *Yellow* (needs to be eaten soon), *Red* (expired)). Customers will be able to see it on two places, the edge line of the cover and using the app.

- App Functioning (Food Provider (Establishment))

Food establishments will have to input the expiry date that the order will be in good condition, since not all food can be kept for the same amount time.

Sensor packaging
Material choices

Materials

For plastics we had three good choices for materials:

Polypropylene (PP)

~0.56 EUR/kg

- Tough
- Flexible
- Fatigue resistant
- Does not react to most acids, alkalis, organic solvents, and fats, at room temperature.
- Microwave resistant

Polyethylene Terephthalate (PET)

~0.50 EUR/kg

- Impact resistant
- Rigid, strong
- Resistant to oils, greases, most acids, and most alkalis
- Shatter resistant
- Recyclable
- Microwave resistant

High Density Polyethylene (HDPE)

~0.71 EUR/kg

- Resistant to acids, alkalis, and alcohols
- Slightly resistant to oils and greases
- Flexible
- Recyclable

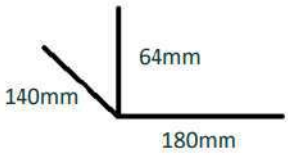
Once we saw the sensor will work with the container it became time to take a look at the materials of the container.
We were contemplating three types of plastics: Polypropylene, Polyethylene Terephthalate and High Density Polyethylene.
In the above we can see the properties of the three choices, there are differences both in price and in material qualities.
We chose Polypropylene due to its fatigue resistance, chemical resistances, and most importantly, its resistant to heat – which allows it to be microwaved. The cost is also not too much higher per kilogram than PET.

Sensor packaging
Cost calculations

Cost calculations

Part	Price (€)
Sensor	0,01
NFC chip	0,11
Material Plastic	0,386
Mold top (Class 103)	0,01
Mold bottom (Class 103)	0,01
Transport	0,4
Total (per piece)	**0,93**

17404 pieces fit on one euro pallet
33 euro pallets fit on one truck
~**574332** pieces on one truck



Two molds need to be made: one for the lid, and one for the container.

The two pieces can be vacuum formed due to its shape, and as vacuum form molds usually receive less wear than other manufacturing methods, it will hopefully keep the price down.

Class 103 moulds can run less than 500 000 cycles, with the right production methods and mold care, it should run around 500 000 cycles.

Above are the basic cost calculations. For transport we assumed a distance of 150km to include some overhead. We divided the size of the product over the size of a euro pallet. An average truck can hold 33 euro pallets which can be used to find the total amount of pieces that fit onto the truck.
We decided to use two molds, one for the lid, and one for the container. The production method we chose is vacuum molding, as the shape of the packaging allows for this. Vacuum molding also stresses the molds less, thus allowing more
cycles. This spreads the price per product out over more cycles which lowers the price.

Keeping in mind that there are different shapes and sizes of packaging for various types of food, we did a little research on the most appropriate shape and sizes, and ended up with three sizes and a rounder container.
The three sizes are:

1) Small 450 ml
Ø17,53 x 5,15 cm

2) Medium 1L
Ø21,15 x 7,25 cm

3) Big 2L
Ø24,87 X 9,82 cm

The round shaped packaging is the most appropriate because it is easy to wash. One point we could improve is to develop more shapes for food such as pizza or sushi, which require a specific format (more rectangular).

The benefits of incorporating this product in the take-away food business, a booming sector (especially post pandemic), is that it will avoid the waste of many leftovers that are normally discarded because consumers don't know if food is still good to eat.
In addition, this system of return and reuse containers will avoid the pollution that this sector produces every day with its current single-use packaging.
We know that even if something is recyclable it is not infinite, so at some point the packaging will have to be recycled as it can no longer be used to store food. The fact that the containers always end up in the hands of the restaurants to some extent guarantees their correct recycling as businesses can receive fines for improper disposal of waste.

4.4. Interview

In order to better understand the viability of our product with restaurants, if they would be interested in implementing these containers. We also realized what doubts there might be and how we could eliminate them, and improve some aspects.

4.4.1 Interview with restaurant owner:

Background information- We spoke with Ms. DeLuca who owns an italian restaurant in the South of Rotterdam, they also have a take-away option for their meals at the restaurant. We asked Ms. DeLuca what she thinks of our idea and whether it is feasible or not. She informed us that because of the pandemic, the restaurant had to raise their prices. This means that they also decided to make the portions a bit bigger as a form of compensation. Even though the bigger portions cost more to produce they still make some extra money on it with the higher prices. (The interview is shortened for clarity.)

Group: Would you consider using our timer-censor equipped storage boxes for your restaurant if these are made easily available at a reasonable price?

DeLuca: ‘’The idea does seem intriguing, however why would I need it for the meals that I serve?”

Group: We saw that you serve quite large portions, if your customers whom you deliver the meals to are unable to finish the meal our timer-sensor would come in handy. With our timer-censor equipped storage boxes people will have the ability to save your delicious meals for a longer period of time. The timer-sensor then indicates when the food can still be eaten and when not. This way customers do not ‘waste’ money on big portions and we have no food waste in general. They can also keep buying these big portions because they will know exactly how long they can keep them.

DeLuca: ‘’Can the material possibly damage or leak into the meals somehow?

Group: This is not possible since the container itself is from cardboard just as how a regular container would be. The timer-sensor is a low-cost produced attachment that is attached onto it. There are no bad chemicals used whatsoever.

DeLuca: ‘’I do like the sound of this. I think my customers would appreciate it if I can give out an extra service. My only concern is the costs and if anyone can use this product/ is it difficult?”

Group: Yes, the product is very easy to use. Your employees simply have to put the food into the container and close the lid as they usually would. The timer-sensor will then be activated. After which you can send the meal on its way to the customer. When it arrives the customer will see a small green light indicating that it is, of course, fresh. After that part of the food is consumed and the rest is stored away in the fridge, the light will gradually change color into yellow and ultimately red. Which indicates that the food is spoilt, if they leave it for too long. These instructions will be clearly visible on the box so that all parties understand the concept. Additionally, we will have two different shapes of boxes. A square one, good for pizzas, pies etc. and a round one. This one is better for soups, salads and pastas. Plus, it creates the illusion of a self-cooked meal on a dinnerplate at home. The boxes are aligned in a way that they can easily be stacked. When the courier brings the meals they will travel their last mile secured safely. Regarding costs, these will be as low as possible to encourage locals to use our product.

Conclusion based on the interview: A restaurant owner can be a potential customer to us and our product. Their main concern is the cost of such an invention. This is really a decision maker. A big corporation restaurant would probably go with our idea faster than a small local restaurant would. No matter how low the cost, for local’s it could still be too much. In terms of user-friendliness the product seems to get a good score. With a proper explanation and clear instructions people should not have too much of a problem using this.

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