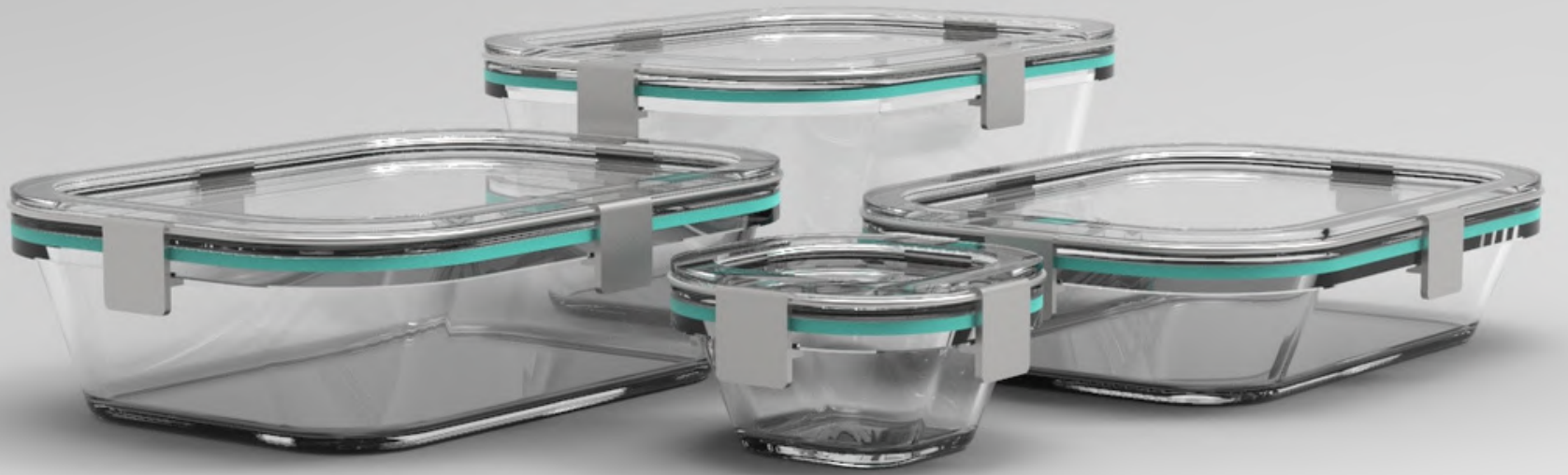
iTAL

Takeaway without the waste

Charles Kumor Parker



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iTal: A project that explores the design of
a circular takeaway food container.
by Charles Kumor Parker

Degree Project for Master of Fine Arts in Design
Main Field of Study: Industrial Design
from Lund University
School of Industrial Design
Department of Design Sciences

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Supervisor: Lecturer Anna Persson
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Abstract

Packaging of fast food and take-out food involves a significant amount of material that ends up in landfills, recycling and litter. This is because the packaging is designed only for a single-use. There's no future in single-use products and that includes single-use takeaway packaging.

Influenced by the negative image of plastic, individual restaurants and food vendors are increasingly switching to bio-based and compostable packaging alternatives in a bid to go green. In as much as these developments have the potential to reduce the environmental footprint of packaging and increase recycling, there is no fundamental system change towards a circular economy in which raw materials are preserved as much as possible.

This project sought out to find a better alternative that protects our planet's resources, minimizes emissions and resource use. The design challenge was to develop a premium reusable container for takeaway meals and a system to reuse towards a circular economy without compromising food hygiene or the safety of consumers. The result is in two parts; a reusable takeout food container made in borosilicate glass and stainless steel which is targeted at restaurants and customers who want to reduce their environmental footprint. The container offers the possibility of storing leftover food in the fridge or freezer and tossing it straight into the oven or the microwave without any worry of harmful chemicals leaching into the food as a result of heating.

While both recycling and remanufacturing are important approaches to recover and retain material value in a circular economy, designing products so they may be reused ensures that materials remain in use for as long as possible, generating the maximum value for customers and businesses alike.

iTal, the second part of the project, designs a circular service that manages the logistics involved in the delivery of takeout food aiming at delivering the same convenience single-use packaging offer but in a better way (collection, cleaning of containers and supplying to partner restaurants).

Table of content

Personal motivation and background

During Covid-19 quarantine, I could not visit the gym the way I used to due to the obvious health restrictions and recommendations by authorities. I thought of an alternative way of exercising regularly and the answer was to join Foodora. In this way, I can stay active by cycling and delivering food around on my own flexible time slots every week. Sounded like a perfect idea so I signed up.

Upon completing several deliveries to customers within my first month, I noticed some **problems**..

Problem #1 - Waste

Packaging of fast food and take-out food involves a significant amount of material that ends up in landfill, recycling, composting or litter. The carefully designed and nicely manufactured food packaging is only for a single-use. Usually made from paper, plastic, aluminum foil and styrofoam. The service life of these thoughtfully desiꞵned products is only a few minutes of lunch/dinner time. Then they end up in the waste bin in a repeated cycle by each customer. It takes a lot of thinking, energy and resources to produce these items that are used only for a few minutes before they become trash.

Problem #2 - Spillage

Once in a while there are spills upon delivery and the order is then rejected by the customer. Upon talking with a couple of riders, it turned out that almost every foodora rider has experienced the spill issue.

The questions!

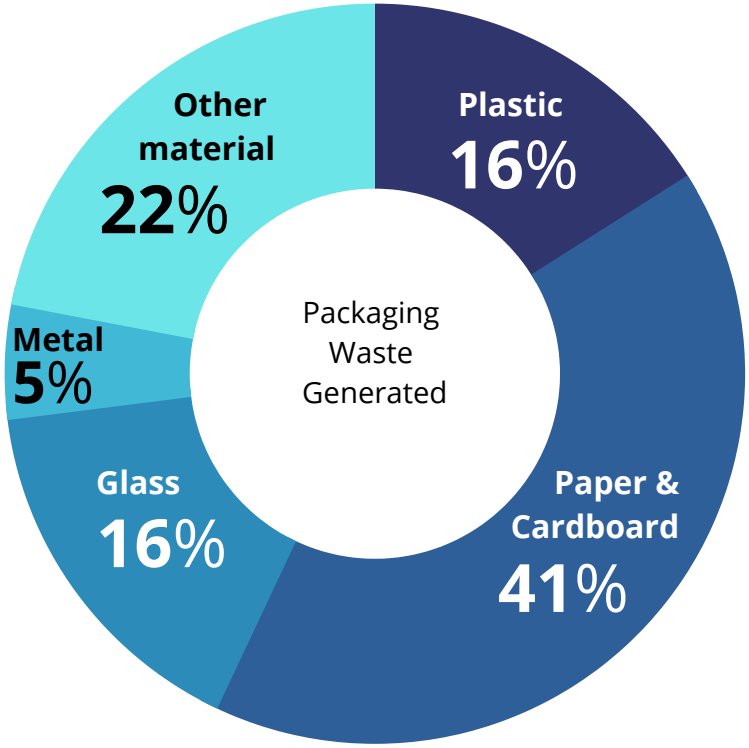
The question that kept popping on my mind is
Can takeaway be **zero waste**? And possibly **spill-proof**?
I then decided to focus on this topic as my masters' thesis design project.

Research 1.0

Gaining an understanding of the issues surrounding packaging waste is the first step in mitigating it.
In this research, I am looking to dive into the packaging waste problem with focus on the European Union.

The packaging waste problem

In 2016, Europe produced a total of 86.7 million tonnes of packaging waste which equal to the total weight of 350,000 of the world's largest airplanes. Of the 86.7 million tonnes of packaging waste generated, 41% was made up of paper and cardboard. Plastic and glass accounted for 16% each, while metal made up only 5%.



Breakdown of packaging waste generated in Europe in 2016.

According to Eurostat, the recycling rates for both paper and metal are higher than 80%, glass is at 76% and plastics is at 41%. The recycling of steel packaging has recently hit a new all-time high of 82.5%, according to figures issued by APEAL (Association of Europe-an Producers of Steel for Packaging). With plastic being the least recycled, it is the most widely used in the packaging industry as they are lightweight, durable, decay-resistant, inexpensive, and moldable. Many plastics are designed for single-use purposes, where customers have a product for mere seconds or minutes before the plastic is removed and disposed of. Most single-use plastics are not or cannot be recycled properly, and thereby end up polluting our oceans, waterways, and communities, negatively impacting our health directly, as well as the health of land and marine-based ecosystems. Many European countries ramp their recycling numbers up by burning in ovens to generate electricity and heating (European Parliament, 2018). This is method is known as *energy recovery* or by loading them unto container ships bound to Asia for recycling (European Parliament, 2018). Seventy-nine percent of the world's plastic is not recycled (Geyer, Jambeck, & Law 2017).

In 2018, the 9 percent that is recycled was threatened, as China banned the import of most plastics and other materials that it used to accept for recycling due to trash contamination issues (World Trade Organization, 2017). The year before China closed its doors, it imported 842 million tons of plastic waste from Japan, 629 million tons from the US, and 390 million tons from Europe's largest exporter, Germany (Earth.org 2021).

Most of that previously recycled plastic is now being landfilled or incinerated by many countries across Europe (European Parliament, 2018). However, incineration and landfill are also recognized as environmental threats. The exported waste is often burned openly or abandoned which eventually finds its way into the ocean and other natural bodies (Greenpeace Southeast Asia 2018).

The takeaway food industry

The world is witnessing a major shift in the way people buy and consume food. Modern consumers are more likely to use their mobiles to order food from a nearby restaurant or food outlet while sitting at home and watching Netflix than they are to cook. The current focus on convenience has created a strong and growing demand for web-based and mobile food delivery services that offer customers a variety of cuisines from many restaurants and takeaway outlets all across the globe. As a result, the number of people who order food online has grown from 1.32 billion in 2014 to 2.05 billion in 2020. In 2021, the expected growth is over 2.14 billion (Statista, 2021).

The environmental impact

The transformation of food consumption in the takeaway food sector has given rise to various sustainability concerns. One of these is the use of non-reusable containers with a low recyclability potential.

A study done by the University of Manchester revealed that 2025 million takeaway containers are being used in the European Union per year. It claims to be the first study to measure the environmental impacts of disposable takeaway containers. (Gallego-Schmid et al 2019)

According to the study, the three most widely used containers are made of aluminum, polystyrene, and polypropylene. This actually confirms what I mostly pick up from restaurants in Lund as a delivery rider.

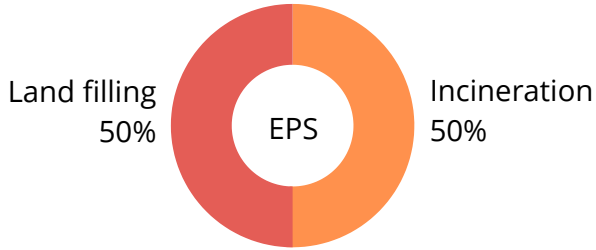
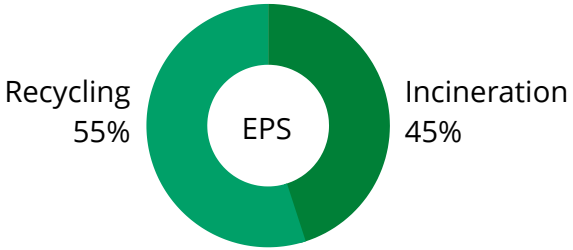
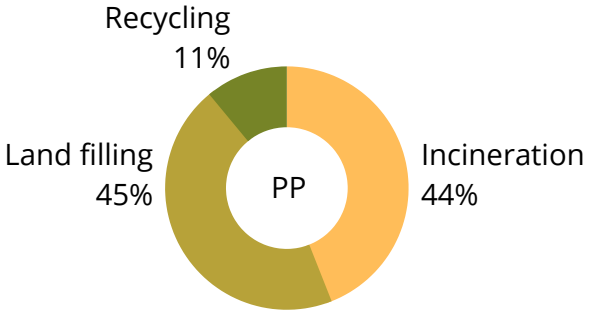
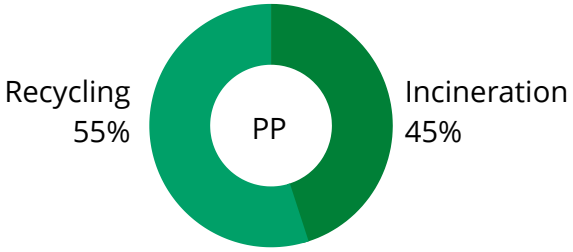
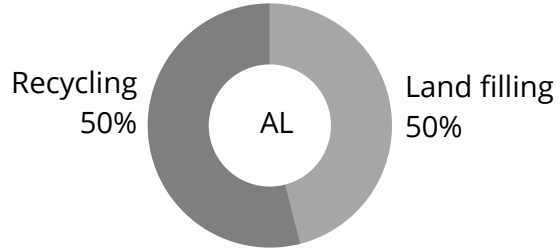
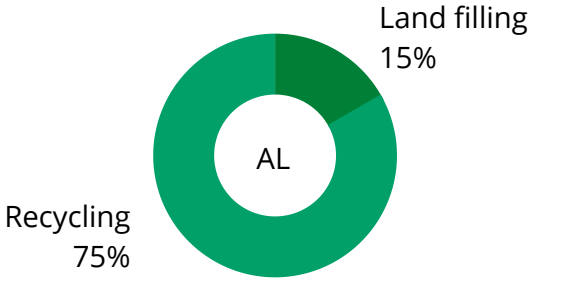
Polypropylene

Aluminium
(paper lid coated with polyethylene)

Extruded Polystyrene

End-of-life scenarios for the single-use takeaway containers in the European Union (EU28)

The European Commission has proposed that 55% of polystyrene, 75% of aluminium and 55% of plastic packaging waste should be recycled by 2025.

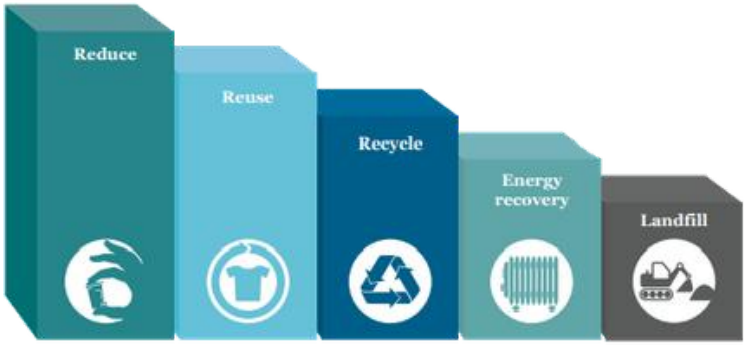
Material	Current Situation Eurostat (2016)	EU 2025 Proposal European Commission (2015b)
 Polystyrene		
 Polypropylen		
 Aluminum		

Reducing waste in Sweden

Looking further into the packaging waste issue leads me to the EU waste package and that made it easier for me to understand the steps being taken by the European Union and how the Swedish government is handling its affairs on waste (EU Waste Package 2018)

Sweden is aiming for a zero-waste society. This takes the country's recycling revolution one step further – from dumping rubbish in landfills, recycling to reusing, and finally, waste prevention (Swedish Waste Management 2019).

Preventing the creation of waste is the top step in the waste hierarchy. It is considered the most efficient way to improve resource efficiency and to reduce the environmental impact of waste. Therefore, it is the priority of both Swedish and European waste legislation which also contributes to the UN's goals for sustainable development.



The call for circularity

On April 12, 2018, the Swedish government decided to establish a delegation for a circular economy. The purpose of the delegation is to support the work of converting the whole of Sweden to a circular economy. This means that resources should not go to waste, rather use them several times and only use materials that are not bad for the environment (Circular economy – Strategy for the transition in Sweden, 2020)

The work of the Delegation for Circular Economy focuses on three areas: design for circularity, plastics and public procurement. With Design for circularity, the delegation wants to contribute to new business models and that circularity is an integral part of the design of both products and production systems.

My interest in finding sustainable solutions to waste finds a correlation with Sweden's goal on waste and this has brought me to this thesis topic area. Sweden is at the forefront of the sustainability movement and that makes it the right place to focus on this project.

In the news

My research into the topic of sustainability pointed me to check the news as new regulations were being discussed to come into effect in the near future. I went looking for current information on packaging waste and found a handful of information on disposable packaging. This is just like hitting a gold mine to me. This is the stuff I am looking for.

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Swedish government wants to ban plastic cups

The Local
news@thelocal.se
@thelocalsweden
8 July 2019
08:28 CEST

Environment
eu
Isabella Lövin
plastic

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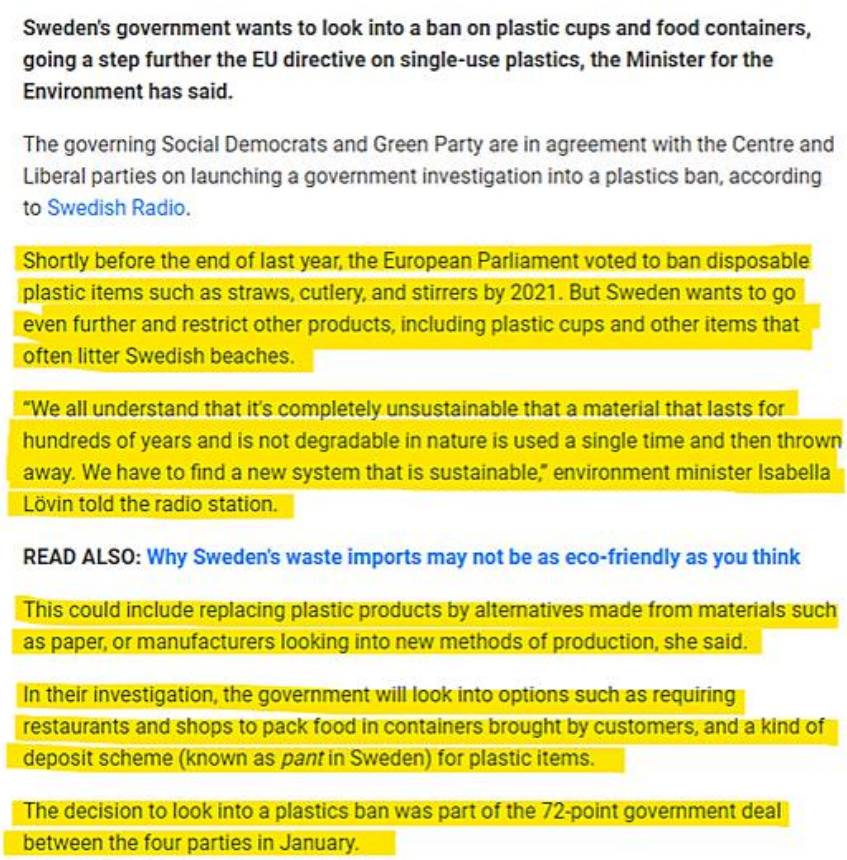
Sweden wants to go further than the EU's plastics ban. Photo: Jessica Gow/TT

Sweden's government wants to look into a ban on plastic cups and food containers, going a step further the EU directive on single-use plastics, the Minister for the Environment has said.

The governing Social Democrats and Green Party are in agreement with the Centre and



Sweden's government wants to look into a ban on plastic cups and food containers, going a step further the EU directive on single-use plastics, the Minister for the Environment has said.

The governing Social Democrats and Green Party are in agreement with the Centre and Liberal parties on launching a government investigation into a plastics ban, according to Swedish Radio.

Shortly before the end of last year, the European Parliament voted to ban disposable plastic items such as straws, cutlery, and stirrers by 2021. But Sweden wants to go even further and restrict other products, including plastic cups and other items that often litter Swedish beaches.

"We all understand that it's completely unsustainable that a material that lasts for hundreds of years and is not degradable in nature is used a single time and then thrown away. We have to find a new system that is sustainable," environment minister Isabella Lövin told the radio station.

READ ALSO: Why Sweden's waste imports may not be as eco-friendly as you think

This could include replacing plastic products by alternatives made from materials such as paper, or manufacturers looking into new methods of production, she said.

In their investigation, the government will look into options such as requiring restaurants and shops to pack food in containers brought by customers, and a kind of deposit scheme (known as *pant* in Sweden) for plastic items.

The decision to look into a plastics ban was part of the 72-point government deal between the four parties in January.

Isabella Lövin, the Minister for the Environment, tells Swedish Radio News that the government wants to look into options like requiring vendors to pack food in containers brought by customers, and a deposit scheme for plastic items (Radio Sweden, 2019). This gave me the idea to look into the takeout food business and see if I can come up with a solution of a reusable takeout container with a circular sharing system.

Research 2.0

Gaining an understanding of takeaway containers. Looking to answer these questions: What are restaurants using? Are there any sustainable options?
My goal is to find a gap that I can penetrate.

Paper containers

Towards a sustainable future

The global concerns on food packaging waste and the growing political regulation towards sustainability, circularity, and responsible production are forcing manufacturers to come up with a better alternative to plastic and extruded polystyrene containers.

As a rider, I do see paper containers when I pick up orders from the restaurants that serve food such as burgers, sandwiches, fries, and the likes. I am really pleased to see these restaurants making a shift towards reducing takeout waste. I usually give them *thumbs up* and ratings in my head to these businesses that are trying to do better by turning to these sustainable solutions that are evolving.

Researching on these paper packages for this project showed up that they are made from PE coated paper.

PE coated paper: This is paper coated with food-grade polyethylene providing a good moisture and grease barrier. Mainly used in various kind of food packaging; both hot and cold food, instant noodle cups, fast food container, etc. This provides a better alternative to the aluminum, extruded polystyrene, and plastic counterparts because this contains less “plastic” in a form of a thin layer offering a less carbon footprint.

I take photographs of orders I pick up and I observe the environment for interesting findings towards my research.
The first photo from the top left is from Tugg Burger, followed by Burger King on the right. Bottom left and right photos from Orvars before and after the food was packaged. These are all restaurants that serve fries and the likes.

Charles Kumor Parker 2021

Plastic and aluminum containers

Towards a sustainable future

I realized from my observations during my pickups at restaurants that serve regular meals with sauce (wet/soggy foods) are lacking sustainable alternatives to pack their takeaway orders. This makes many of them use these unsustainable provisions made from plastic, extruded polystyrene and aluminum. The aluminum containers may seem better but they are not recycled because of food contamination (Recycle Bank, 2016). For customers that eat in the restaurant, they are served in ceramic, glass, wooden and stainless steel tablewares which are reuseable and quite sustainable as well. However, I do see some efforts and the willingness to do better if the opportunity exists as the majority of restaurants use paper bags for takeout orders.

Compostable containers

Latest innovation is taking out plastics and plastic coatings.

The pulp fiber alternative is usually brown in color and marked as 100% biodegradable, compostable and plant-based. These are usually made out of wheat straw, corn starch, bagasse, paper, and bamboo, a rapidly renewable resource. It also delivers a superior performance as it is grease and moisture resistant along with freezer and microwave friendly. However, for effective decomposition, there is a need to involve a commercial composting facility (Responsible Purchasing Network, 2012). The price is competitive enough to make change happen at scale as it has become ubiquitous in town, cafeterias, and restaurants due to "green" consumer trends, government bans, and strict regulations on extruded polystyrene and other plastic products. The food industry needed a convenience-friendly replacement and has now settled on molded fiber bowls, which has become the perfect solution for operators to showcase sustainable practices, and make “eco-conscious” diners feel virtuous. I have started seeing a few of these containers in Lund.

The revelation!

Ever since the introduction of the plant-based alternative, I have been amazed about this thoughtful solution and always wondered how pulp could hold liquid so well that it does not soak up the liquid over time. This project gave me the opportunity to dig deeper into how pulp containers are made, then my shovel struck on something hard. Every single fiber product contains PFAS. Per- and Poly-fluoroalkyl substances (PFAS) are a class of man-made chemicals used to manufacture a wide range of consumer and industrial products due to their unique chemical and physical properties, including oil and water repellency, temperature and chemical resistance, and surfactant properties (US Food & Drug Administration, 2021).

The development of PFAS begun in the 1940s and there is currently over 5000 varieties on the market and most haven't been closely studied according to the US Food and Drug Administration (FDA). They are often called “forever chemicals” because they’re close to indestructible. They are likely to remain in our bodies for a long time and can take years before they exit our system completely. In the United States, the FDA phased out of production a long chain of PFAS when it discovered serious health risks associated with these compounds - which includes links to kidney and testes cancer, thyroid disease, preeclampsia, ulcerative colitis and high cholesterol.

However, many countries, especially in Asia, continue to have little to no regulations on the use of PFAS in products (IPEN 2019). It is mentioned that every single molded fiber container, cup and plate meant for food service that needs to be liquid-resistant is coated in a layer of PFAS-containing film, without which these fiber products would simply fall apart (The Counter, 2019).

In the news

12:43

endseurope.com

ENDS EUROPE

PFAS found to be 'widespread in food packaging'

A pan-European investigation conducted by nine UK and EU green groups has proven that most packaging from global fast food chains is treated with toxic PFAS.

by Gareth Simkins

A bin overflowing with food containers, December 2018 in Cardiff, UK. New evidence suggests widespread use of PFAS in paper packaging. Photo:

12:42

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PERSISTENT POLLUTANTS

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EU countries to propose restrictions on PFAS

Plan would effect all but essential uses

by *Cheryl Hogue*
December 20, 2019

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Fidra

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15th October 2020

EU to ban all non-essential uses of PFAS: Will the UK be equally ambitious?

The new European Chemicals Strategy announces many ambitious plans and puts comprehensive PFAS policy front and centre. Recognising the widespread contamination of EU soils and waters and the growing number of associated health impacts, the commission commit to banning all PFAS, allowing their use only where they are proven to be irreplaceable and essential to society. But the big question on Fidra's mind right now is 'will the UK be equally ambitious?'.

Per- or poly-fluorinated alkyl substances (PFAS) are a group of over 4,700 industrial chemicals. Despite being widely used in everything from carpets to cosmetics, cookware and food packaging, the

12:39

eea.europa.eu

European Environment Agency

Publications > Emerging chemical risks in ...

BRIEFING

Emerging chemical risks in Europe — 'PFAS'

It is currently not possible to perform in-depth environmental and health risk assessments of all chemical substances in use in Europe because of the great variety of chemicals and their diverse uses. New and legacy chemicals continue to be released into Europe's environment, adding to the total chemical burden on Europe's citizens and ecosystems. Early identification of emerging risks one of the activities of the European Environment Agency (EEA). This briefing summarises the know and potential risks to human health and the environment in Europe posed by a group of very persistent chemicals, the per- and polyfluorinated alkyl substances (PFAS).

Published 12 Dec 2019 — Last modified 09 Mar 2021 — 12 min read
Photo: © imani vDQ e3RtaoE / Unsplash
PDF

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foodpackagingforum.org

Food Packaging Forum

NEWS

EU ministers recommend PFAS restrictions

European environmental ministers announce intention to draft PFAS restriction proposal, prohibit non-essential uses, create EU action plan; emphasize need to manage substances as a group

January 6, 2020 Justin Boucher

In an public session of the Environment Council of the European Union (EU), the Netherlands informed of their intention to draft a REACH restriction proposal on non-essential uses of per- and polyfluoroalkyl substances (PFAS), and Sweden announced the intention to create an EU PFAS action plan. Regulatory news provider *Chemical Watch* has reported that Denmark, Luxembourg, and Norway then supported Sweden and the Netherlands in sending a letter on December 17, 2019 to the EU Commission's vice-president and EU Commissioners calling for creation of a "coherent and coordinated" action plan that allows only

Identifying the gaps

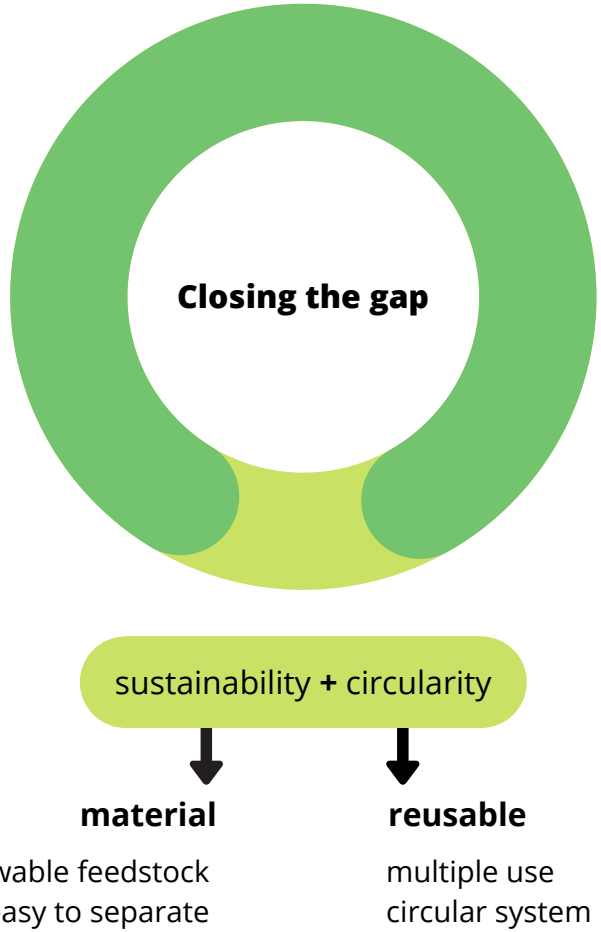
I find a gap in this current solution despite the fact that it is made from a plant-based material which is better when compared to the fossil-based predecessors, but it remains DISPOSABLE! There is no future in single-use and this project seeks to close this gap with a durable and re-usable option.

A Greenpeace USA report, Throwing Away the Future: How Companies Still Have It Wrong on Plastic Pollution "Solutions" (2019) warned consumers to be skeptical of solutions that produce more single-use items and put undue pressure on environmental resources.

The second gap I have identified is material. Since fiber must be treated with a film of the resistant compound in order to attain the required barrier properties (against liquid, grease, oil, and heat), these products compromise the safety of consumers and in fact, make compost more toxic. This project seeks to close this gap with a safer material.

In 2019, all of the compost manufacturing facilities that serve Oregon in the United States signed a letter stating they won't accept compostable products.

"These materials compromise our programs and limit many of the environmental benefits of successful composting,"

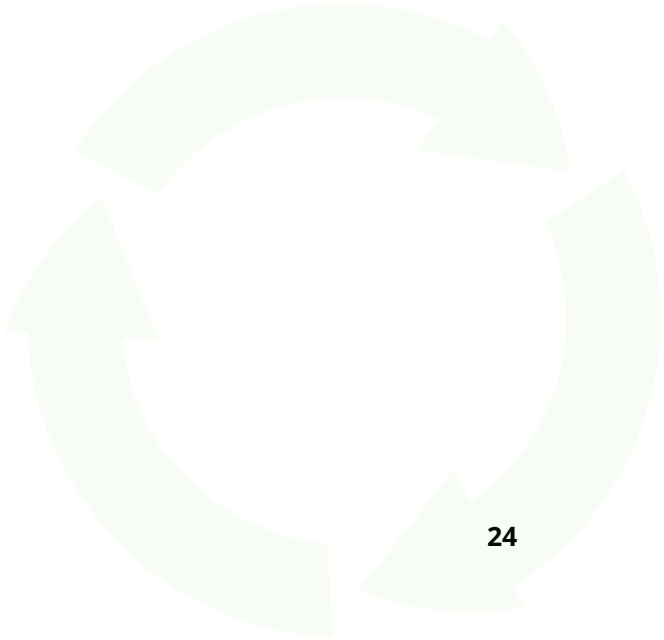


An ideal picture of a sustainable packaging ...

- Should be a renewable feedstock that goes back into the circular economy
- Should have a multiple-use without entering into the waste stream
- Should have a circular system that enables the next user
- Should have a mono-material or layers be easy to separate for recycling

Research 3.0

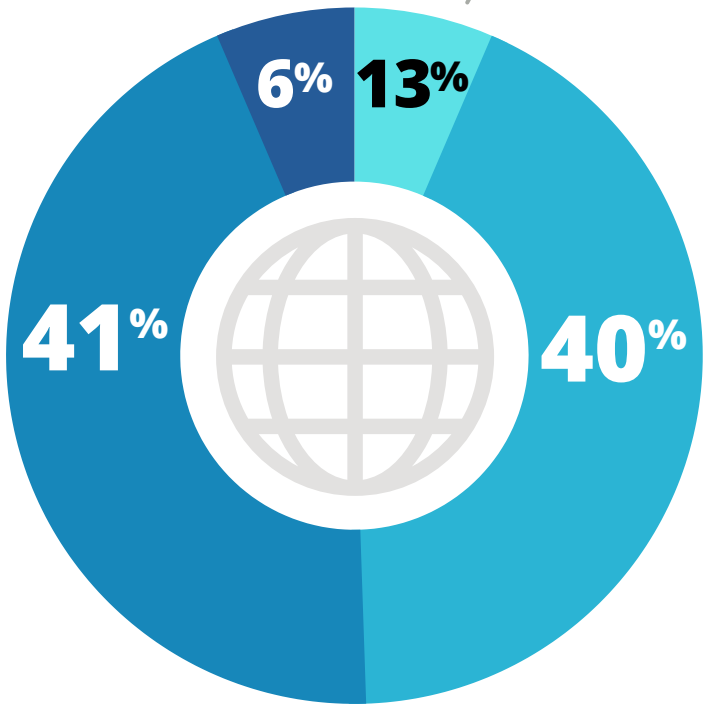
Knowing the user and the system: through interviews, surveys, observation, and internet research.



Who are the 2020 consumers?

Product driven
Focus on product functionality
Relies on research for nearly every new product purchase

Brand driven
Tust brands, and brand is a major factor in their purchasing decisions.

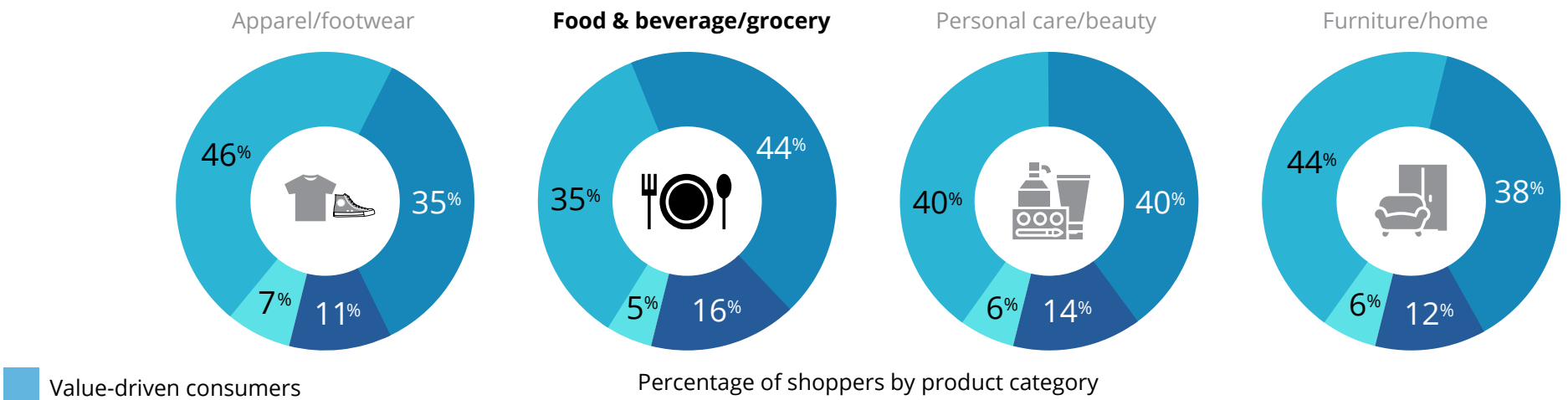


Value driven
Want good value, convenience, and products/services to simplify life and are willing to pay for those benefits

Purpose driven
Seek products and brands that align with their lifestyle and those with health/wellness benefits.

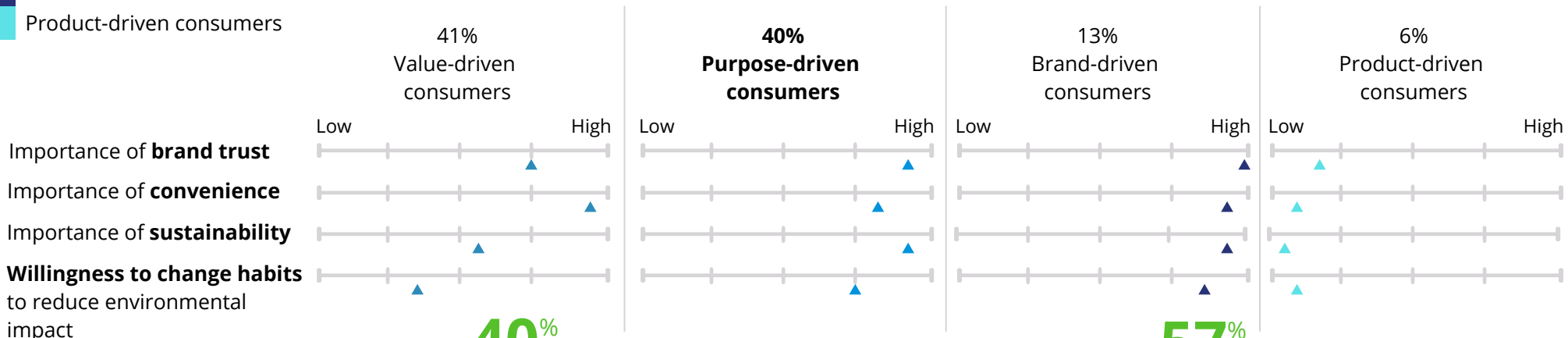
Source: IBM Institute for Business Value, 2020

Defining my target group



Percentage of shoppers by product category

- Value-driven consumers
- **Purpose-driven consumers**
- Brand-driven consumers
- Product-driven consumers



40%

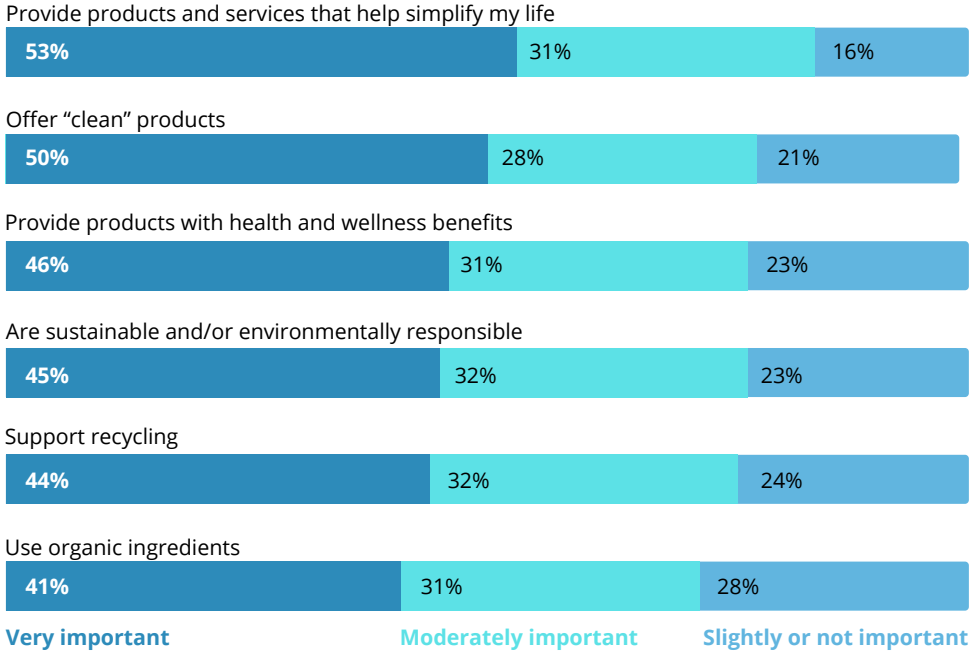
My target group is **purpose-driven:** They are looking for a brand that stands for something bigger than just the products and services it sells

57%

of total consumers are willing to **change their purchasing habits to help reduce negative environmental impact.**

Source: IBM Institute for Business Value, 2020

Consumers are looking for brands that:



For attributes they say are **very important** to them, consumers are willing to pay a premium for brands that

Source: IBM Institute for Business Value, 2020

My target group is looking for a sustainable option when purchasing a product or service.

My target group is willing to pay a premium for products and services that aligns with their values and lifestyle.

Participatory design

To understand the needs of everyone involved in the use cycle of my circular proposition(s) – the end-users or beneficiaries, and others who may use or reuse my product/service.

The recycling stream

As everything that has a beginning has an end, it is inevitable to consider the end of life before creation begins in the circular world. All glass ends up at the glass recycler after it has served its life purpose so I needed to look into Svensk Glasåtervinning to ascertain their requirements and consider them in my design process and material selection for the sake of recycling and the environment

I learned from my inquiry that my material and design choice can greatly facilitate their recycling process, therefore making these few pointers will guide me while I design the container.

- Protective bottleneck sleeves made of aluminum/tin alloys and plastic on bottlenecks that are firmly pressed into place can easily be removed after crushing and can be separated for recycling.
- Lids and caps made from metal and plastic that have been left on bottles come off easily after crushing and can be separated because they are pressed firmly into place by design.
- Rings that remain on the bottleneck after the seal is broken and other heavier rings, e.g. drip rings made of plastic, are difficult to separate and are more likely to follow the end product to the glass factory. From a recycling standpoint, it is best if the ring splits and stays attached to the cap when the seal is broken.
- Glass packaging which is completely encased in metal or thick tough plastic can cause recycling problems. The packaging is the reason for relatively large glass losses in recycling.

Industrial cleaning

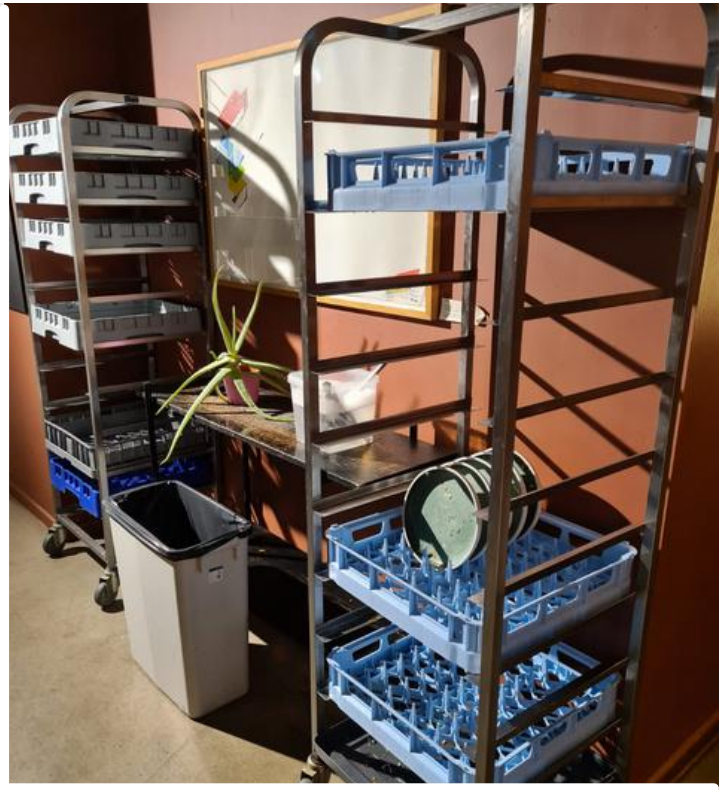
I met Maiken Larsen in Copenhagen to talk about the industrial cleaning of tableware in the food industry. Maiken is a Chef and has worked in the kitchen for over 20 years. My goal for talking to her is to know the nuances that go on in the kitchen, especially during the cleaning, drying, and storage of bowls, plates, containers, and cutlery. My goal is to develop a container that will be compatible with the kitchen standards. My meeting with her will help me to develop a good and functional container. She was really glad to help with the project.

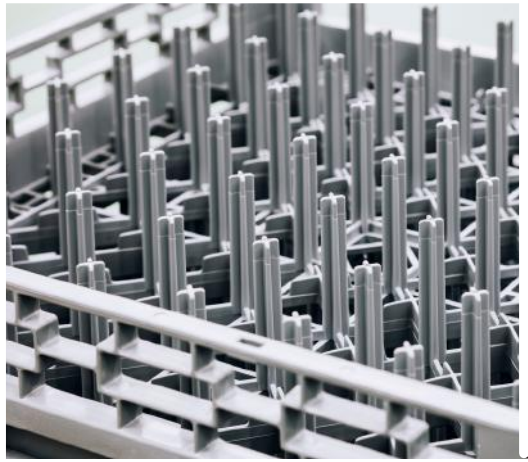
I learned from Maiken that even though there are dishwasher racks for bowls, a dish with a shorter height and a wider angle is much easier to fit and sit steadily in standard peg racks compared to containers with tall walls. It allows arranging a lot in the rack as they could sit with a slight incline facing down so they don't fill with water, unlike plates. Short walls allow access to the pegs on the rack. Water jet gets to pass in between each piece. Sometimes light wares fall off the rack and also when they could not sit correctly. This relates to dishes made of light materials like plastic.

When the walls are high, you don't have more room for adding more dishes. Wares come out of the dishwasher sanitized with heat at 180 degrees Fahrenheit (82 degrees Celcius) so plastic containers stand a chance of warping over time. Pewter, brass, bronze, copper and tin items should be washed by hand because dishwasher detergents can oxidize or permanently change the color of their finishes. Wooden tableware is not safe because high heat, water, and steam can cause wood to warp and split.

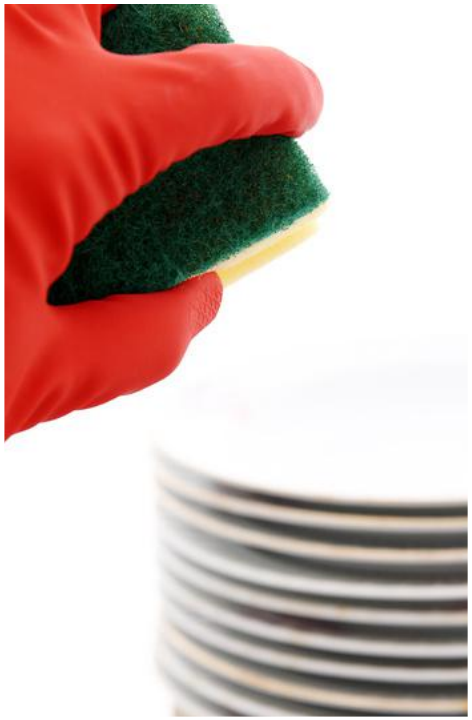
"design with the pegs in mind 'cos they are meant to hold the dishes"

Distance in between pegs is 1.5" x 3.5"





"Stackability is a very important factor in the kitchen and should not be compromised"



The restaurant

Basant Indisk is an Indian restaurant located on Sodra Sodargatan 59, Lund. They serve Indian recipes that I would describe as heavy and soggy meals. I noticed their meals require sturdy containers as it most often goes with sauce. I took this snapshot of their containers during one of my pickups and spoke with Lakshmi Manogna about my project. She works in the kitchen and sometimes as an attendant. She liked my topic and agreed to an interview.

I needed to know their needs in selecting a takeout container for their restaurant. I needed to understand what is important to them so that I can develop something functional in their setting.

The interview

I structured my questions in a way that can elicit the technical information I needed for the project. An in-person interview was not possible as she is busy so I e-mailed my inquiry to her and got a response after 3 days.

The response

Question: Tell me about what you focus on when selecting a container for your takeout service.

Answer: Since most of the food made in this restaurant is liquidy (has different sauces) and is very hot (straight from the stove), it is really important that the container can resist that heat and contain it without spillage. Hence, these containers are microwave safe, freezer safe. We use Polypropylene containers [PP5].

Question: How many (average) containers do you use in a week?
Answer: No response

Question: Do you have different containers? What are they?
Answer: Yes we have different containers.

500ml PP5 containers
650ml PP5 containers
35ml sauce containers
150ml sauce containers

350ml extruded polystyrene containers (we usually use them for dry food)
900ml extruded polystyrene containers (for dry food)
500ml paper boxes with plastic coatings
500ml compostable and biodegradable boxes
(the usage of the boxes in bold are is relatively low when compared to the above ones)

Lakshmi Manogna

Question: How do you store your containers?
Answer: These containers come to us in cardboard boxes, 50 boxes are packed in plastic and a set of 500 containers and their lids arrive in a single cardboard box.

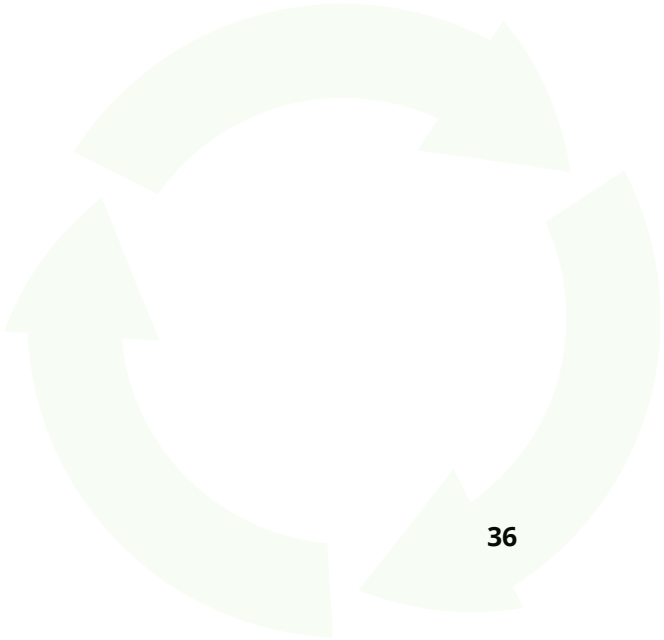
Based on her response, I marked out some requirements

Design requirements

heat resistant
spill-proof
microwave safe
freezer safe
500ml
650ml
35ml
150ml
stackable

Define

Put into words the design challenge and my intention as a designer



The brief

There’s no future in single-use and that includes single-use takeaway packaging.

This project seeks to find a better alternative that protects our planet’s resources, minimizes emissions and resource use. Reuse is the way forward, and takeaway packaging is the perfect place to start!

The challenge

Develop a premium reusable container for takeaway meals and a system to reuse towards a circular economy without compromising food hygiene or the safety of consumers.

Target audience

Purpose-driven consumers who want to reduce their environmental footprint

Intended outcome

To reduce single-use takeaway containers in Lund and the industry’s environmental and climate impact.

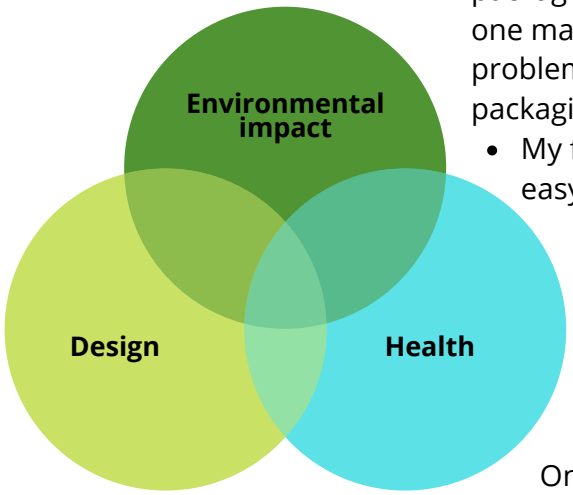
Research 4.0

Material selection

Material selection is a very critical aspect of this project because not all materials are fit for a circular economy. Some contain chemicals that are hazardous to humans or the environment.

Additives are often used unintentionally or for performance reasons - such as improving flexibility or durability - but there are ways to design them out. By choosing materials that are safe and circular, I can build a better solution for my users, while ensuring that the product and service that I create fit within the circular economy. My material selection is based on three factors I have developed from researching packaging manufactures on their quest to developing sustainable solutions.

My focus areas in material selection



In this aspect, I am looking at creating a less carbon footprint aiming at minimizing the environmental impacts of my solution from a life-cycle perspective eg. the benefits of using bio-based materials and materials suitable for multiple recycling and/or reuse. From my research, packaging is most easily recycled when it consists of only one material so developers of new packaging face one big problem, how to create the perfect mono material for packaging.

- My focus in this regard is, materials or layers need to be easy to separate for recycling

Is ownership really necessary? How about offering access to the user instead of ownership of the product? Many customers often only require access to a product for a short period of time after which they can return it to the service provider or pass it on to a new user. I am thinking in terms of rental, subscription, sharing, or leasing rather than selling a product to the customer forever where the product is underutilized in the sense that the next customer requires a new product. For users to feel comfortable and embrace sharing of a product with everyone else requires a **premium material**.

One of the current industry challenges is to create a mono-material that guarantees food hygiene and the health and safety of consumers (EIT Food, 2019). Not all materials can perform well with food contact. In this regard, I am looking for a material(s) that can provide

- migration barrier eg. chemicals leaching
- functional barrier against external contamination eg. moisture

Focus #1 - Environmental impact

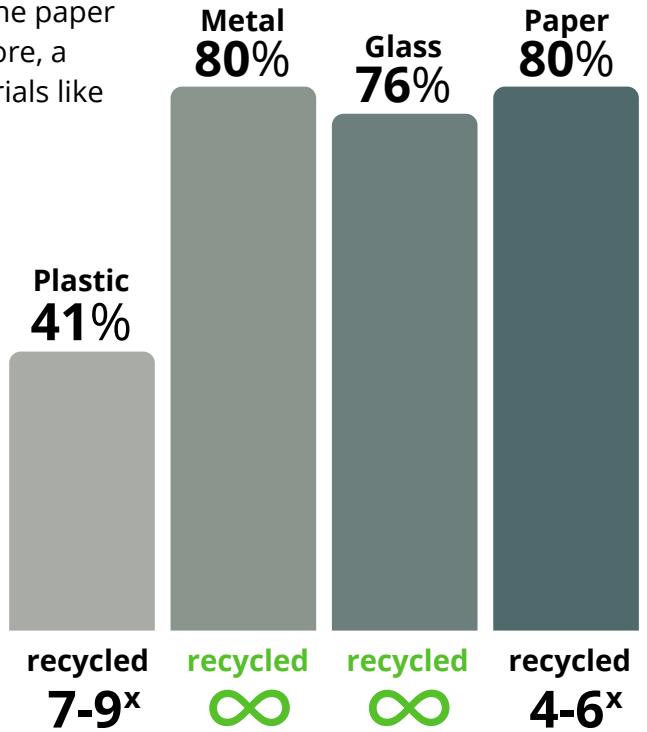
Searching for a sustainable material

Packaging material selection has become more complex in this era of increased environmental awareness in society. My material selection is partly based on the current packaging material pool being paper, metal, glass, and plastic. I chose these materials due to their established research, production setup, and processing technology already available. With sustainability at the core of this project, my material screening is partly based on their recycling rate. The raw materials of some packaging materials lose their purity in recycling and therefore cannot be reused for the same application and must be downcycled. This puts a burden on the environment to get virgin materials needed production.

Paper

The recycling numbers for paper are amazing. A whopping 80%. I decided to look further into the recycling process to see if I can use paper in any way for this project. According to the Bureau of International Recycling, paper can be recycled 4-6 times. Every time paper is recycled the fibers shorten. The Standford Recycling Program states that when paper is smeared with food or grease cannot be recycled. This is something many of us are not aware of. We habitually sort out paper packages after eating from them thinking it gets recycled. It further explains that once soiled, the paper fibers will not be able to be separated from the oils during the pulping process. Food is, therefore, a major source of contamination in paper recycling. It adds on to say that, while packaging materials like corrugated boards are recycled, food-contaminated materials like pizza boxes, PE-coated food containers, waxed papers, and the likes are not recycled. This is literally all the paper packages I pick up as a food delivery rider to customers that end up as household waste.

Recycling rates of packaging materials - EUROSAT 2017



Plastic

It has fibers a bit like paper, and these fibers shorten each time it is recycled. This means that plastic can be recycled 7-9 times before it can no longer be recycled.

Metal

Metal stays recyclable and maintains its quality no matter how many times it is recycled. The recycling of steel packaging has recently hit a new all-time high of 82.5%, according to figures issued by the Association of European Producers of Steel for Packaging.

Glass

According to the Glass Packaging Institute, glass materials can be crushed, melted, and reformed an infinite number of times with no deterioration of the structure. Furthermore, recycled glass can be substituted for up to 95% of raw materials. The container and fiberglass industries collectively purchase recycled glass annually, which is re-melted and repurposed for use in the production of new containers and fiberglass products.

Focus #2 - Health aspect

Searching for a non-toxic material

Plastic

From my research studies, I found out that certain chemicals in plastic materials used in food packaging can migrate into the food and beverages we consume when plastic is exposed to heat from boiling water, sunlight, or as a result of heating in the microwave (Yang, Yaniger, Jordan, Klein & Bittner, 2011). Among the more troubling chemicals are phthalates and bisphenol A (BPA). Both are endocrine disruptors, which are substances that interfere with the actions of human hormones (Yang et al, 2011). Health problems such as metabolic disorders (including obesity) and reduced fertility are also linked. This means users stand a greater chance of consuming potentially harmful chemicals simply by microwaving food in plastic takeout containers.

What about BPA-free plastic?

The BPA-free alternative containers have also been found to leach off chemicals that cause estrogenic activity when exposed to heat stressors (Bittner, Yang & Stoner, 2014).

Aside from plastic leaching chemicals, it also leaves odors and stains that become difficult to remove by cleaning. Dishes that have strong flavors such as tomato-based or strong spices such as turmeric, oil-packed tuna, and anchovies leave a permanent smell in plastic containers even after going through the dishwasher. When chili sauce is served hot or microwaved in plastic containers, it leaves the familiar orange stained color even after going through the dishwasher.

One may ask, why do plastic containers easily take on stains and odors? This is simply because plastic is porous so at a micro level the surface of the plastic is actually very porous with many bumpy gaps. Food particles like chili, tomato among others get embedded into these bumps that expand a little when the plastic gets heated. When the container cools down, it shrinks back to shape, trapping the stains permanently. In the case of this project, plastic will inevitably get scratches and marks from multiple-use and will not be a good material to consider.

While some may argue that plastic is **lightweight**, **durable**, **decay-resistant**, **inexpensive**, and **moldable**, I do want to stress the health and safety side of things. I found out that the integrity of the material begins to break down immediately upon washing, further decreasing the quality with each wash. When heated (and this is applicable to dishwashers and hot food, not just the microwave), the plastic container leaches 55 times faster than it does under normal conditions (Scientific American, 2008).

From this inquiry, it makes more sense to me why plastic is perfect for single-use in food packaging in the absence of heat but not in reusable food packaging, especially where heat is involved.

Stainless steel

Stainless steel doesn't absorb bacteria nor does it leach chemicals such as BPA and phthalates, so food contact with stainless steel offer peace of mind when it comes to health. This material is non-porous. This means the surface does not retain food particles that can cause contaminations. It is non-staining and odor-free from food particles such as fish, tomato, and chili sauce.

Stainless steel can go into the oven up to 450 degrees F, and the freezer as well without any concerns. The one huge downside I found about this material is that it can not go in the microwave since the buildup of electrons around the outer edges of a metallic surface will cause sparks and can potentially destroy the microwave. The heating of food is essential and microwaves are inevitable in modern society. With that being said, I can use it for locking the lid of my container which does not need to go in the microwave.

Paper

Paper or fiber on the other hand does not fit well into this project in terms of multiple-use. It will require layers of other material to gain functional and barrier properties (resistance to moisture, oil, and grease) required in food packaging. Paper is a porous material that can conceal bacteria and can also leach binding agents that are added during manufacture without masking the surface with other materials. Adding layers of other materials will compromise recycling after its use.

Materials commonly associated with waste incineration are municipal solid waste (MSW). This type of waste is typically general waste such as household waste, food waste, cardboard, and paper. However, the European Union recently excluded Waste-to-Energy (WtE) incineration from the recycling list as it does not support the Sustainable Development Goals (SDGs), as well as the EU climate goals in accordance with the Paris Agreement (Zero Waste Europe 2019)

At this point, I can say paper does not fit well into this project in terms of packaging meant for multiple-use. It will require layers of other material to gain functional properties in packaging food. Instead, I can use it in other ways like a carrier bag for the takeaway container but not the container itself.

Glass

Glass is the only widely-used packaging material considered “GRAS” or “generally recognized as safe” by the U.S. Food and Drug Administration (Glass Packaging Institute - USA). It is chemically inert and odorless with virtually all food products. The surface of glass is impermeable to gases and vapors so it maintains product freshness for a long period of time without impairing taste or flavor. The ability to withstand high processing temperatures makes glass useful for heat sterilization of food without any migration of chemicals. Glass containers can be frozen in the freezer and also reheated evenly and easily either in the oven or in a microwave without leaching any chemical. The transparency of glass allows consumers to see the content making it preferable in displaying food and beverages.

Focus #3 - Design

Searching for a premium material

Focus area 3 is about sustainable ways of consuming and using materials, products and services. Sustainable consumption patterns are an important part of reducing climate emissions. Reusing products, renting, sharing or leasing instead of buying new can contribute to more sustainable consumption, for example by using the products longer and more efficiently. I decided to focus on this while selecting my material because I want my users to feel comfortable with the sharing and reusing idea. I can influence this behavior with the right material.

Plastic

Plastic over time begins to discolor, scratch and warp as it goes into the dishwasher often. Secondly, plastic doesn't represent value as much as other materials do. It is a cheaper material, to begin with, and users know that for a fact. That is why manufacturers use it in designing budget versions of cell phones. Imagine yourself arriving at a public gathering and you are offered water in a reusable plastic cup. Exactly the feeling I am talking about. Nobody wants to drink from a cup that everyone else has drunk from. Plastic therefore does not fit very well for this project that involves sharing and using many times.

Stainless steel

Stainless steel over time begins to scratch and look ugly upon multiple uses like this lunch box. It needs special care to maintain its visual appeal. For a reusable product, it fits well in a personal setting but not so much in a sharing situation. It is better than plastic I guess but it cannot maintain the visual appeal that attracts users over time. However, for flatware, forks, knives and spoons are shared in restaurants by customers all the time even though disposable ones are also available for customers. I see this a lot during my visits.

Paper

I think for literature purposes paper plays a very good role. It has kept important archives for mankind for many years. In the food and beverage industry, paper represents a single-use material meant for disposable products and does not fit well for this project.

Glass

For purposes of this project, I decided to take observational shots when I go for pickups at restaurants. Basically, photos of the environment and interesting things I deem good for this project. I noticed one common thing in all the locations. Reusable drinking glass and jugs. It appears to me that it is a standard in Swedish restaurants to serve water for free to customers compared to Ghana where you have to buy water at the restaurant. Glass is transparent and makes it look appealing. It resists scratches and does not retain the smell of its content. People are committed and stay loyal to glass products in a way that they don't mind sharing at all compared to plastic. Of course, I have taken many glasses of water when I go for pickups and I have never thought twice about it, and so do many other customers. These glasses are there for their purpose and customers gladly share it when they come in to order food.

My final thoughts on sustainable packaging materials from my research findings.

I have chosen glass and metal as the main material to work with regards to environmental impacts and health concerns. Paper and plastic materials are more sensitive to downcycling compared to glass and metal. While plastic is a very useful and great material for many different applications, especially in the packaging industry, it is not a good candidate for this project despite its incredible properties.

Research 5.0

What are the thoughts of consumers on sustainable packaging materials? How much do they know? What do they prefer?

Consumer perspective

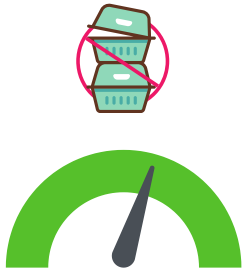
Health and environmental concerns are at the forefront of consumers' and regulators' minds. Studies shows that 67% of consumers now identify as environmentally aware. This fast growing awareness is forcing consumer brands to shift to a more sustainable packaging materials and how to go about that is the biggest challenge now. I need to look into consumer perspectives in order to understand how consumers think about packaging materials as I set to design for them. I realized the best way to get a general view is to use current surveys that has been done. This will give me a much broader information than to do my own survey that will reach only a few individuals.

The Buying Green report conducted by the Boston Consulting Group documents the responses of 15,620 consumers across the U.S., Europe and South America. Responders surveyed represents the population in age, gender and income distribution. The study covers packaging for products for the food, beverage, personal care and beauty, and home care and industrial markets.

On sustainability

53%

are actively looking for recycling or sustainability information on packaging.



59%

say they are less likely to buy a product in harmful packaging.

47%

of consumers won't buy products in packaging that is harmful to the environment.

Data source: Trivium - 2021 Buying Green Report

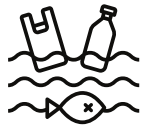
On material

57%

of consumers associate plastic with “harmful” — 80% more than metal.

5%

of consumers associate plastic with the word “premium,” and one in four associate it with “low quality.”

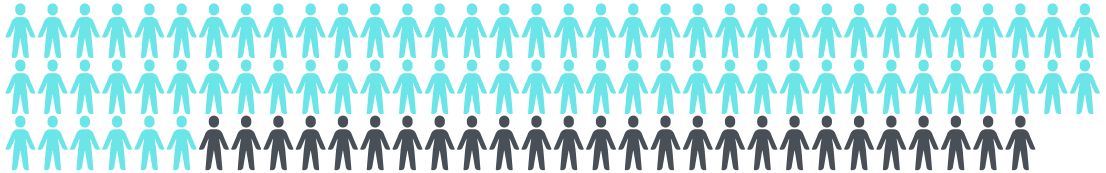


65%

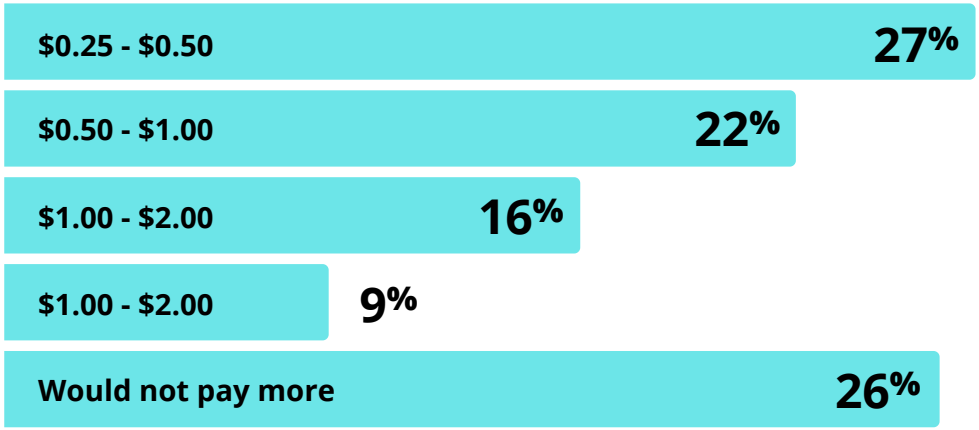
of consumers associate plastic with ocean pollution.

Data source: Trivium - 2021 Buying Green Report

How much are consumers willing to pay?



74% of consumers said they would pay more for sustainable packaging, and 25% are willing to pay an additional 10% or more.



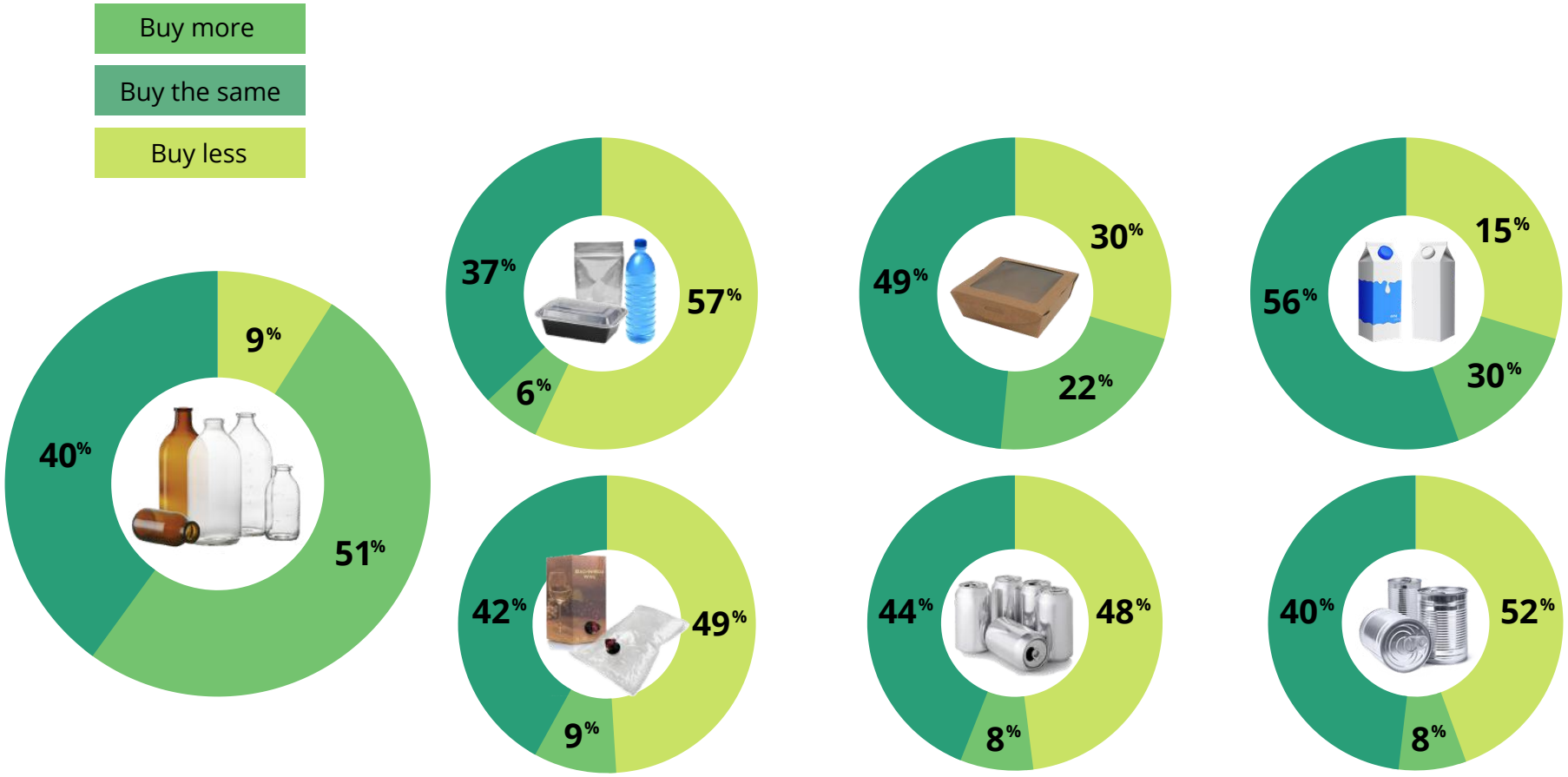
Based on a $10.00 product.

Data source: Trivium - 2021 Buying Green Report

Focus on Europe - consumer perspective on sustainable packaging materials

A survey conducted in 2020 tested consumers from 13 European countries (Austria, Croatia, Czech Republic, France, Germany, Italy, Poland, Portugal, Slovakia, Spain, Switzerland, Turkey and the UK) on perspectives on beverage and food packaging and how this affects their purchasing decisions, including environmental consciousness, attitudes and behaviors around recyclability, and perceptions and preferences for different forms of packaging.
In total, 10,605 Europeans took part.

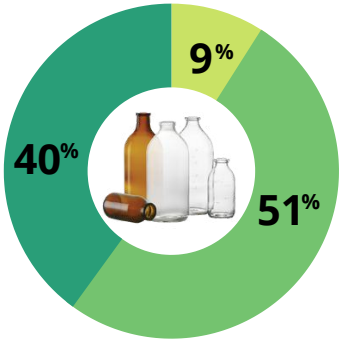
Half of the European consumers buy more glass packaging than 3 years ago; more than half are buying less plastic packaging for food and drinks



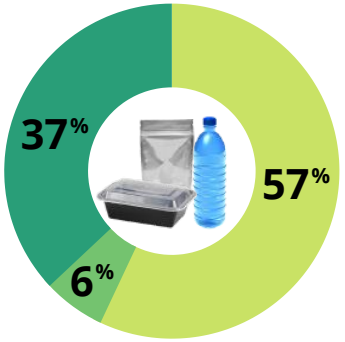
Participants were asked: Compared to 3 years ago, in what way has your purchase of each of the following food and beverage packages evolved?

Data source: FEVE & Weber Shandwick - Packaging & Recycling survey 2020

In all EU markets many consumers are buying more glass than before



Buy more
Buy the same
Buy less



	Buy more glass	Buy less glass	Buy more plastic	Buy less plastic
Austria	61%	5%	61%	5%
Croatia	54%	5%	54%	5%
Czech Republic	41%	11%	41%	11%
France	42%	11%	42%	11%
Germany	48%	7%	48%	7%
Italy	48%	11%	48%	11%
Poland	58%	8%	58%	8%
Portugal	56%	9%	56%	9%
Slovakia	50%	10%	50%	10%
Spain	54%	9%	54%	9%
Switzerland	45%	10%	45%	10%
Turkey	90%	5%	90%	5%
United Kingdom	32%	9%	32%	9%

Data source: FEVE & Weber Shandwick - Packaging & Recycling survey 2020

Conclusion

Based on consumer preference studies, and perceptions identified in both surveys, consumers are seeking out eco-friendly packaging and avoiding packaging they consider harmful.

Current view and recommendation (FEVE & Weber Shandwick - Packaging & Recycling survey 2020)

- EU consumers are highly concerned about littering of food containers and see it as an important decision driver in food & beverage purchase.
- EU consumers perceive glass as ‘best in class’ in addressing all issues related to food & beverage packaging; while plastics are perceived as worst in class.
- Glass is perceived as most recyclable food & beverage packaging material; plastics is at bottom of the list. For most consumers, recycling packaging is no worry, and if so, it is related to recycling plastics.
- EU consumers are buying more glass than before, mainly because it is more recyclable.

With a clear positive trend on the great perception of glass, high trust in the qualities of glass and plastics under intense pressure, EU consumers are open to changing their behavior around purchasing and recycling glass packaging and are using more products in glass packaging.

Market analysis

While some cities and food companies are pushing for compostable products, others are working to promote durable, reusable containers, leading the cultural shift back to reuse and reduce our use of materials.

Competitor analysis

During my research on the problem of waste and disposable packaging, I stumbled upon a startup in the US (Go-Box) with a similar concept of a reusable takeaway container. This leads me to uncover a couple more like-minded startups that are leading the journey to reusable takeaway packaging. The main goal of these companies is to eliminate single-use trash by providing reusable packaging to takeout vendors & customers. I used these companies for my competitor analysis. I needed to identify and evaluate their strengths and weaknesses so I could use the information to improve my solution.

DabbaDrop

sharepack

Deliver Zero

Go Box

Green to GO

Vytal

sharepack

Go Box

Pyxo Box

BarePack

Go Box

Metal containers

Strength

- Non-porous - surface does not retain food particles
- Non-staining, odor-free from food particles like fish, tomato and chili sauce
- Oven safe up to 450 degrees, freezer safe
- Recycling rate is high

Weakness

- Scratches from multiple use
- Not microwavable - Heating of food is essential and microwaves are inevitable in takeaway foods

Convenience level (High)

- Offer delivery service
- Customer drops-off or request pickup service

Plastic containers

Weakness

- migrate chemicals into food
- BPA-free alternatives? they are no good.
- Porous surface traps bacteria, odors and stains
- Stains permanently with certain food contacts even after going through the dishwasher
- material integrity breaks down upon washing, further decreasing the quality with each wash.
- Leaches 55 times faster than normal conditions when heated in the microwave, dishwasher and hot food contact
- Recycling rate is low

Convenience level (Low)

- Offer delivery service
- Customer goes to drop off after use

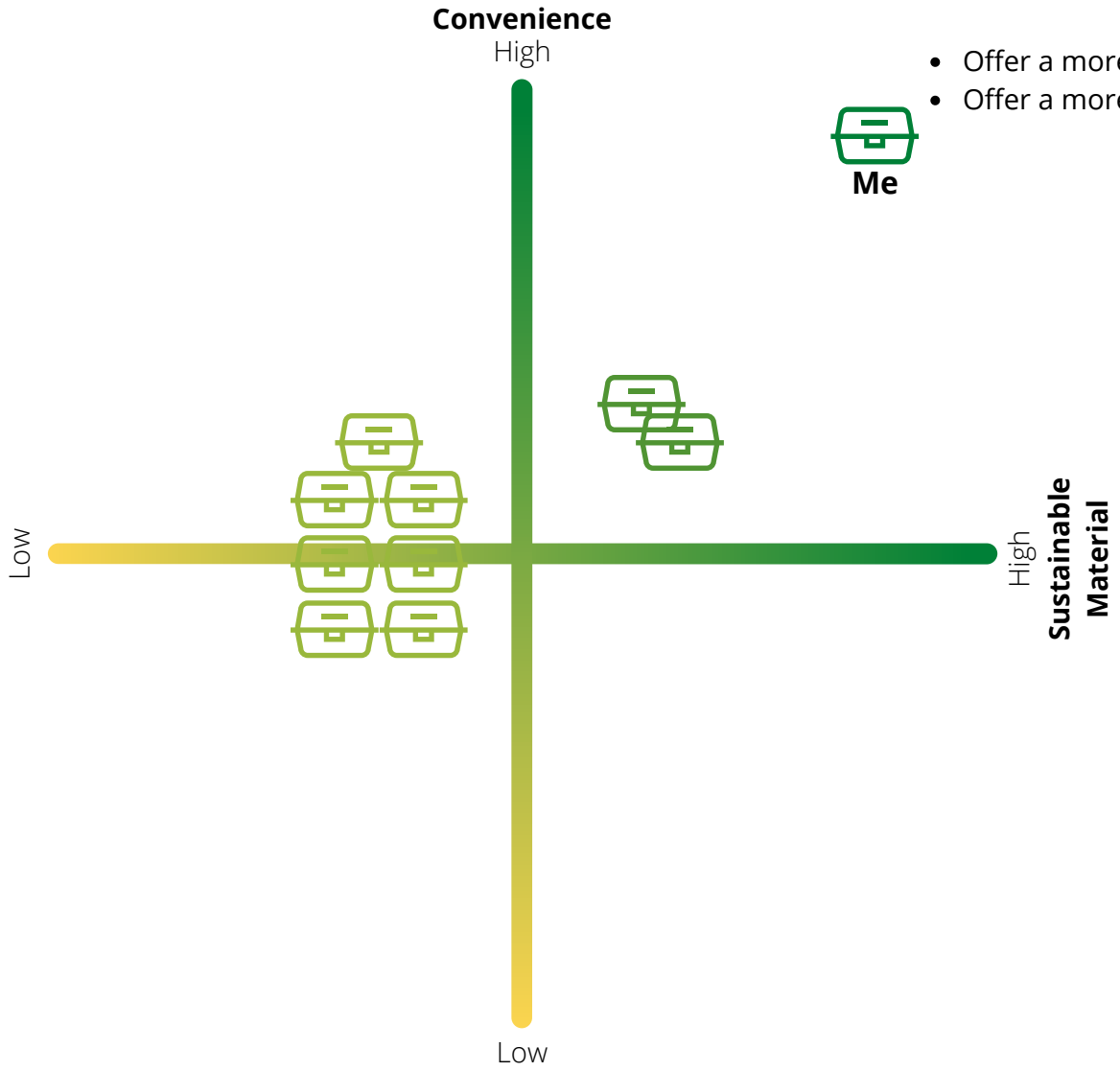
Strength

- Lightweight
- Durable
- Decay-resistant
- Inexpensive
- Moldable

Market Size

- Local community startup
- Scales up in other towns according to environment

Product analysis



- Offer a more sustainable material
- Offer a more convenient service

All glass is not made equal!

I know all glass are not the same, so I needed to know which type could fit the task. I did a bit of search on the different types that are often used in food packaging, their makeup, and characteristics.

Classification	Heat resistant glass	Tempered glass	General glass
Definition	Glass that is strong in thermal shock	Glass that is strong in physical shock	The most commonly used glass such drinking glass, bottle glass, plates etc.
Main ingredient	Silicic acid, 5% Boric acid	Silicic acid, Sodium bicarbonate, Lime (Soda lime glass)	70% silica (silica dioxide), 15% soda (sodium oxide), and 9% lime (calcium oxide)
Oven usage	✅	❌	❌
Microwave usage	✅	▲	❌

Hardness, Strength, and Durability

Borosilicate glass is an “engineered “glass developed specifically for use in laboratories and applications where thermal, mechanical, and chemical conditions are too harsh for standard, household-type soda-lime glass. On the Mohs scale of mineral hardness which rates a diamond as 10 and chalk as 1, borosilicate comes in at 7.5 and the other types of glass at 6. This means that its strength is superior to other materials used for making glass and it reduces its chances of shattering or breaking when dropped and also when exposed to extreme heat. On the other hand, leftover food can go from the freezer straight to the microwave with ease.

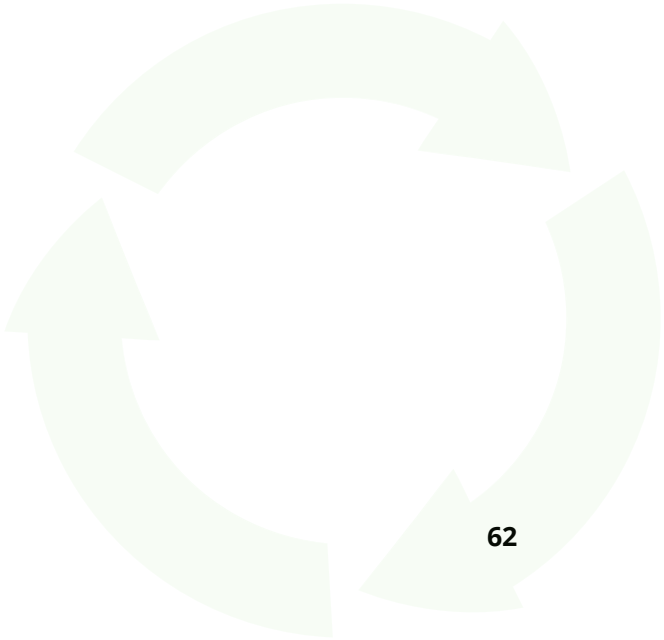
The problem with glass as a material

During my research on glass as a material, it appears glass is the savior of the planet. Everywhere glass is mentioned, sustainability and/or circularity tend to follow. At the same time, I could only find two common downsides being mentioned about glass, fragility and the weight problem. I was convinced at first until upon further reflection, I told myself, WAIT!
I think we are most often limited in the way we do things by the rules that are already set and this then becomes the benchmark to sizing everything else, or it becomes the spectacles through which everything else should be seen. In as much as weight is an important factor to consider in transportation, I cannot work away from it but rather work around it. A typical example that comes to mind as I write is the air freight transportation business. They still carry cargo in the air because they focus on the positive side which is the fastness of air travel compared to land and sea.

My perspective has changed; **weight** is not the problem, **waste** is.

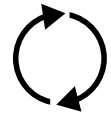
Make

Ideate, design, and prototype as many iterations and versions as I can.



My design ideation begins with a mapping that includes the product journey where I identified the possible touch points and pain points. Based on the needs of the various users I gathered through my research, I listed all the user requirements.

Product Journey • Touch Points • Pain Points • Requirements

Food Outlet	Transport	Consumer	Cleaning	Waste management
				
Preparing orders	Delivering the food	Eating from the container	Washing the container	Recycling stream
• Sealing/closing of container • Storage space	• Weight • Spillage	• Spill upon delivery • Warming of cold food	• Stain • Smell • Cleaning corners	• Separating multi-layer materials
• Easy to open and close lid • Stackable to save space	• Light weight • Leak proof	• Leak proof • Microwave safe • Heat vent	• Dishwasher safe • Curved corners for easy cleaning	• Easy to separate for recycling (think mono materials)

Functional barriers

- Should withstand **scratches** from multiple-use
- Should withstand **stain** from multiple food contacts
- Should withstand **heat** from microwave and dishwasher
- Should withstand **moisture**

Mood board

Keywords

- Breaking the rule = changing the game
- Challenge
- Glass on glass

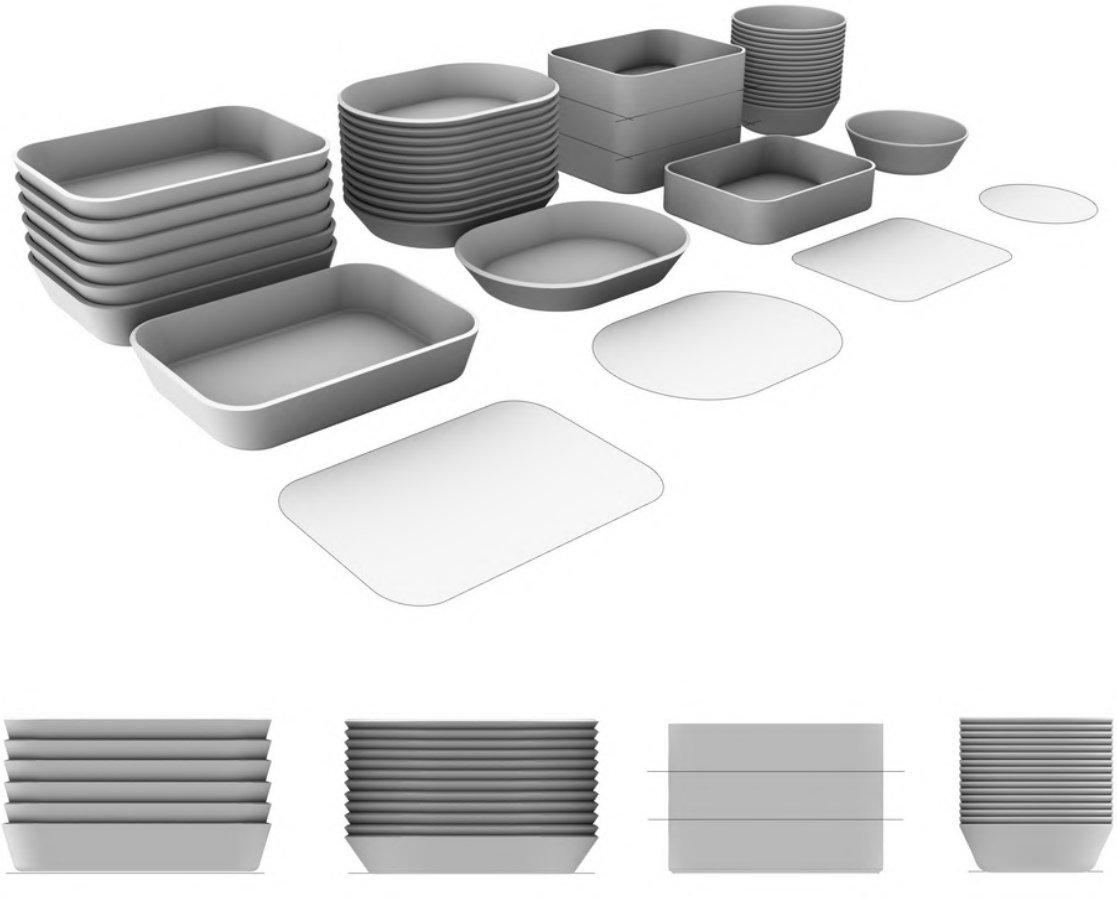
Apple iPhone 11 Pro

The glass kayak

In the past, plastic had set the rule in the cell phone manufacturing industry as the to-go material and then later metal, until the revolutionary iPhone came with a back glass design which broke the rule and changed the game. Now, glass back is the new rule in the industry. Despite the plastic material offering a robust and lightweight experience (resisting dents and scratches), glass offered an appealing result with a premium user experience that offsets the weight and fragility concerns. However, it is very risky to use glass phones without a good cover case. One drop and the hole in your pocket will be a quarter you shelled out for the phone itself. Tradeoffs but trade-ins too. Like everything in the world :)

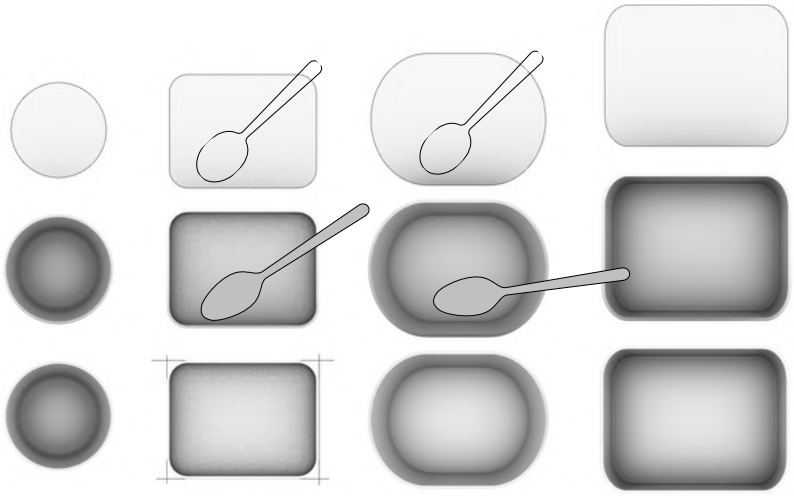
Most food containers packaging made in glass 9 times out of 10 comes with the lid made in materials other than glass. I see glass container lids come in plastic, metal, bamboo, and silicone. The obvious reason is that it is much easier to secure lids that are made in these materials onto the glass. Very few times glass is used and as a result, the challenge that goes into production translates as value to the user. After choosing glass as my material, I knew the challenge I was getting myself into by considering a glass on glass design.

Finding the right shape for stackability

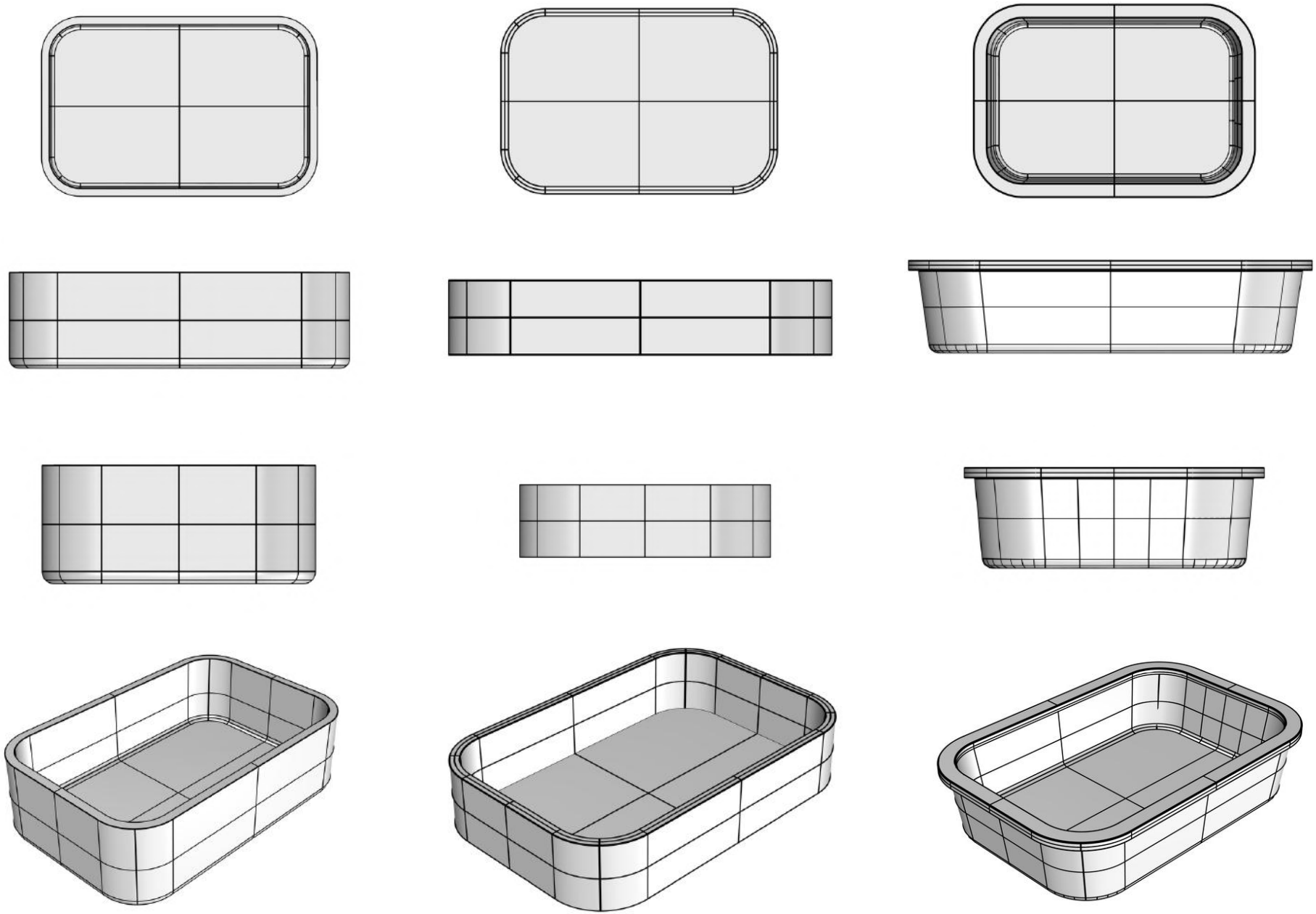


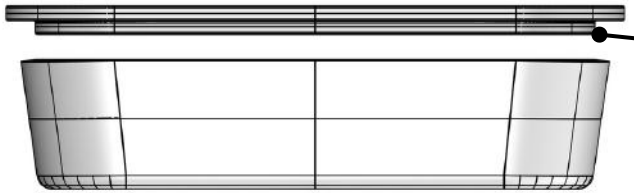
Keywords
Stackability
Packing
Storage

Finding the right curvature to reduce food waste

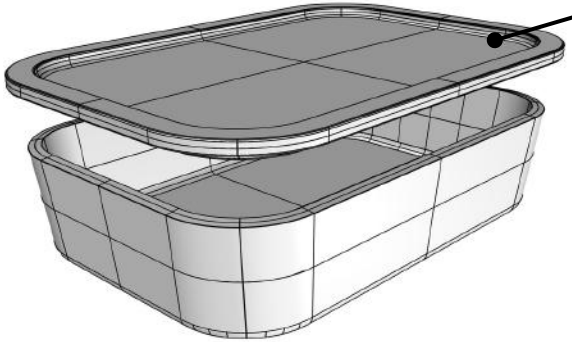


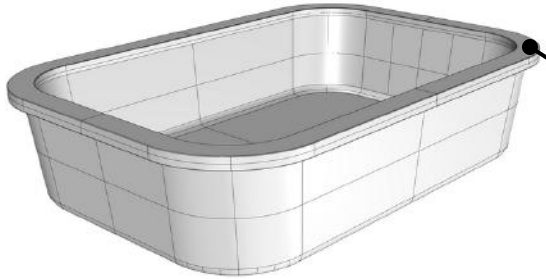
Design development



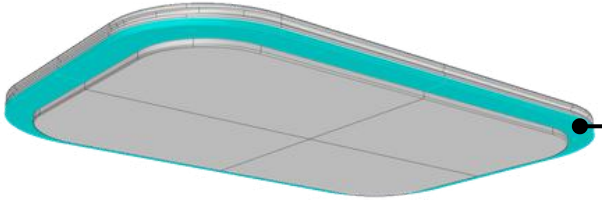


I made a 0.4cm dent on the lid that extends 0.4cm below the lid. The idea is to serve as a guide the lid onto the base. The dent on the top also helps to stack other containers to the lid





I figured out that I need a shoulder on which I will introduce the lock mechanism. Looking at the lid depression, the shoulder is the point of contact for sealing the connection between the base and the lid



0.3cm silicon gasket

Securing the lid is the biggest challenge

The challenging aspect of this project after choosing glass as the main material has been how to secure a glass lid to the glass base. My search for ideas online and at the second-hand stores in Lund could not provide me with any clue aside from the amazing glass-on-glass ideas by Weck and the clamp-trigger lid concept. My problem with these ideas is about cleaning, storage, and usage. With the clamp-trigger lid, the two parts are not designed to be separated on every single use. That means both parts have to go inside the microwave when the user wants to reheat the meal or when it needs to go inside the dishwasher. The lid has to be attached whilst the user is eating from it. This is not the experience anyone wants to have when they have to eat. Otherwise regular separating of the lid from the base during each of the stages mentioned earlier will cause the locking part to lose its tight grip over time. Holding the container in hand and eating from it with the weighty lid in place won't be a simple task. Hand cleaning won't be simple for the user either after eating from the container.

clamp-trigger lid

The Weck solution is much easier and faster to open and close during meal packing, eating, microwaving, and dishwashing but the problem will be misplacing the lockers. That will be so easy to happen. Kids are very likely to play with it and leave it elsewhere.

Weck

Requirement

I need a simple solution that will

- Secure the lid firmly to prevent leakage
- Be simple to open and close
- Withstand the test of time
- Be a compliment to the glass design

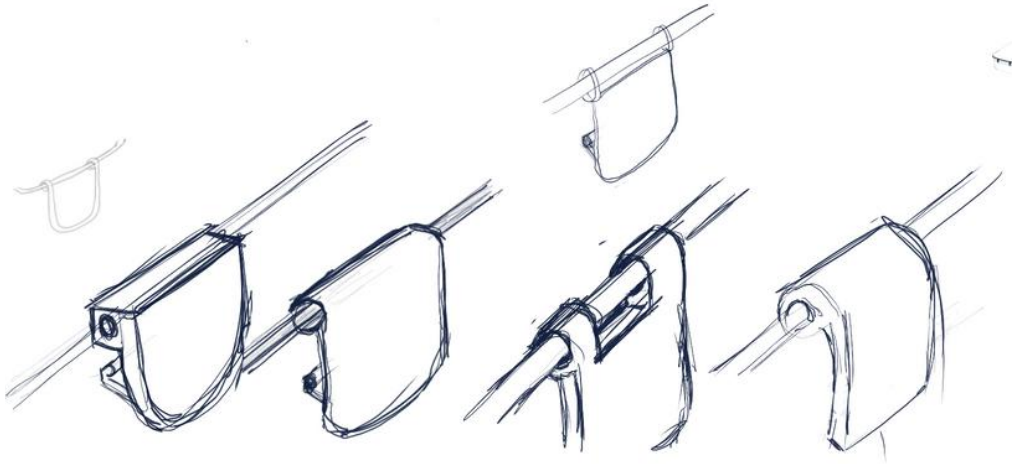
Ideation

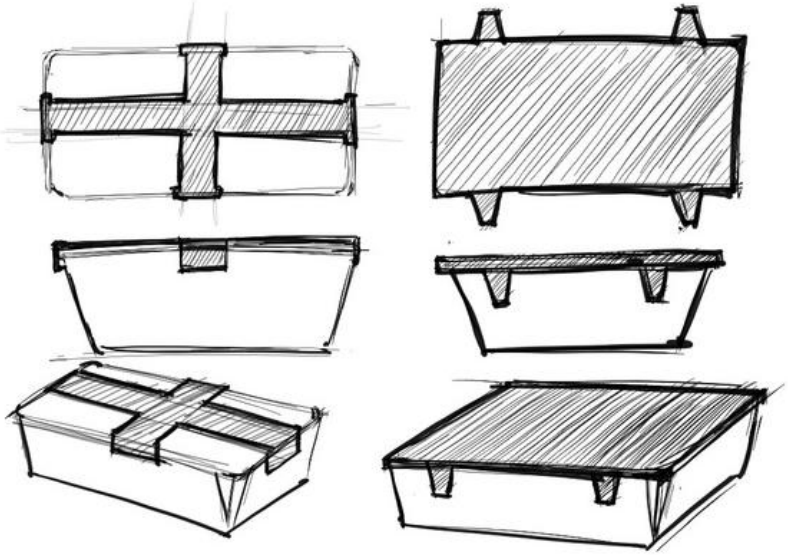
My search for ideas on both the online and flea market brought me back to my work desk staring at this plastic takeaway container I had sitting on my desk for several days.

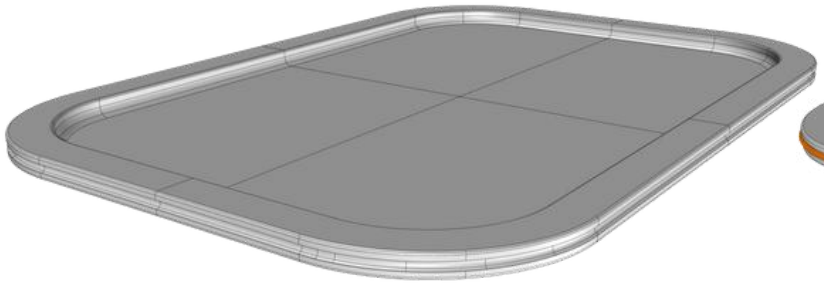
At one moment, a light bulb turned on in my head. "rubber band"

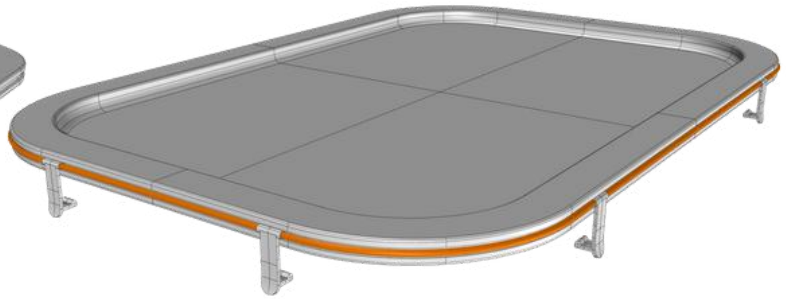
Inspired by the the clamp lid mason jar and the meal prep container

Initial sketches



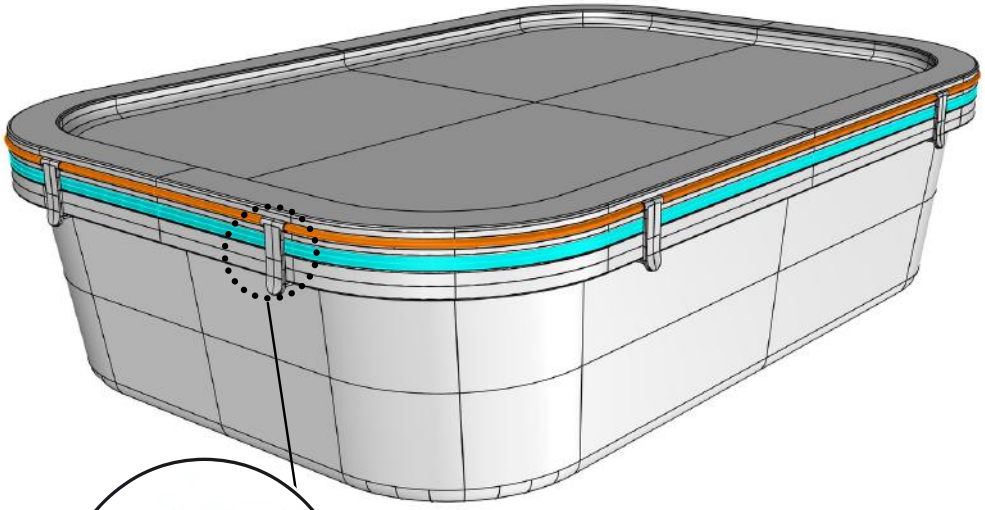


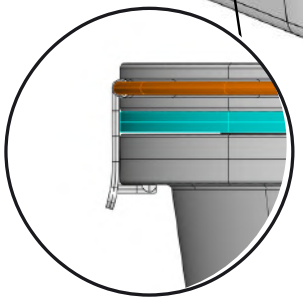




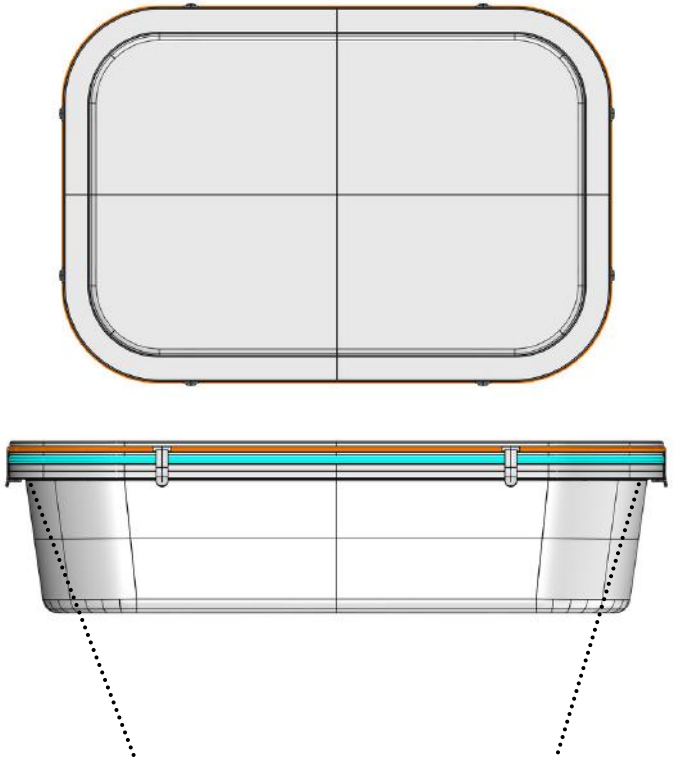
The groove idea

I began with a groove around the width of the lid. This offers the possibility to hold onto the glass lid with a ring around it else it would be very difficult to make a connection. Secondly, laying a metal ring around the width will serve as protection to the edge.



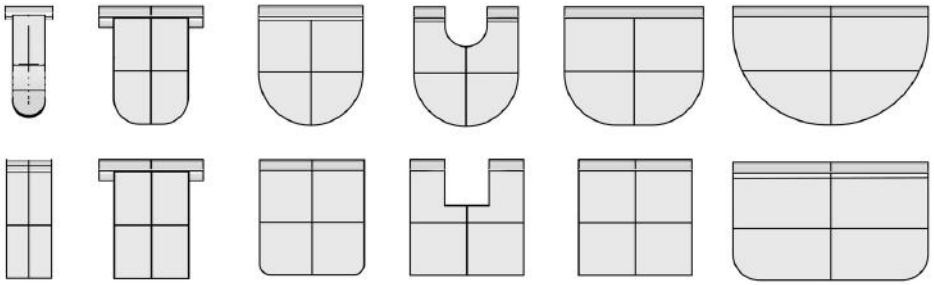


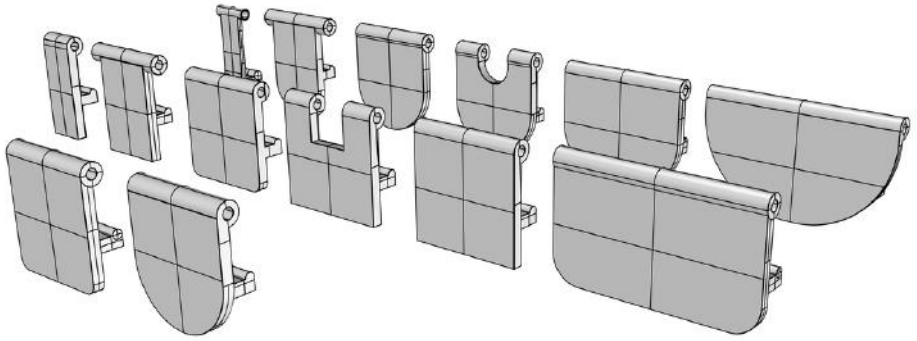
After modeling the locks I realized there were too many and also too thin and for that matter, the user would have 8 snaps to open and close. Nobody wants to do that job with a smile. I needed to develop it further.

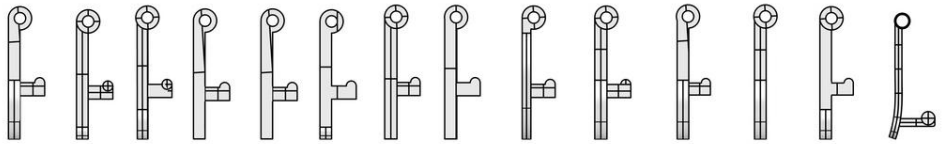


The angle of the wall needs to reduce to improve stackability

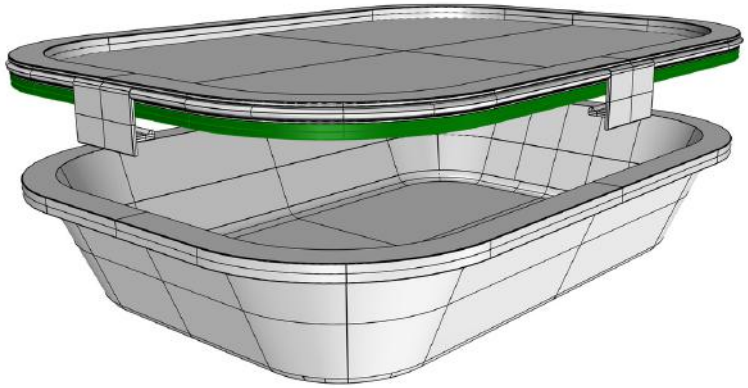
I increased the thickness and did many versions of the lock clips/flaps





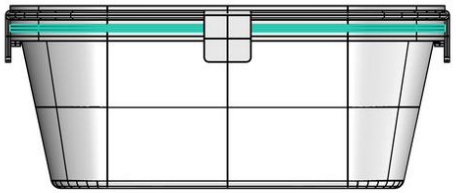
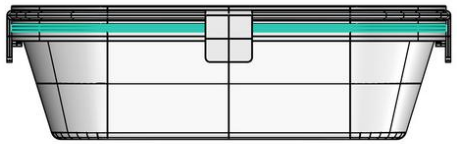
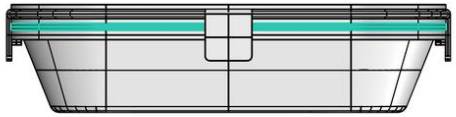
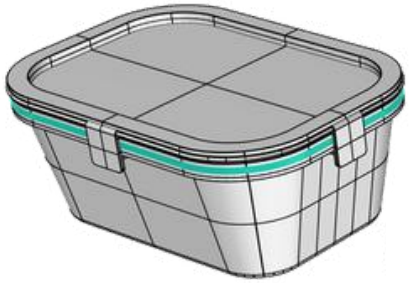
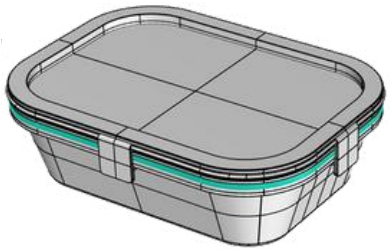
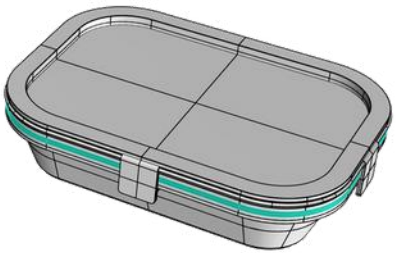
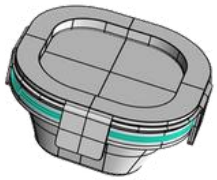
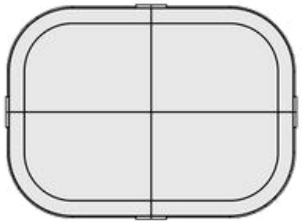
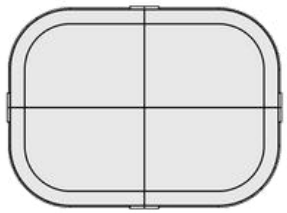
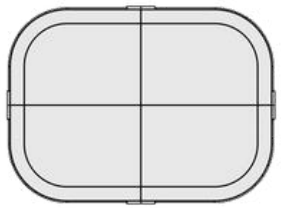
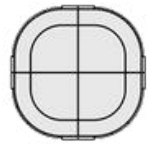


I closed in the angles to improve stackability



A more sturdy and simple lock clips/flaps. Reducing the number to 4 instead of 8 on the previous design. Easier and faster to open and close

Exploring different sizes

Family size	Big size	Medium size	Sauce pot
			
1000ml	**650ml**	**500ml**	**150ml**
			
			

Looking for a connection

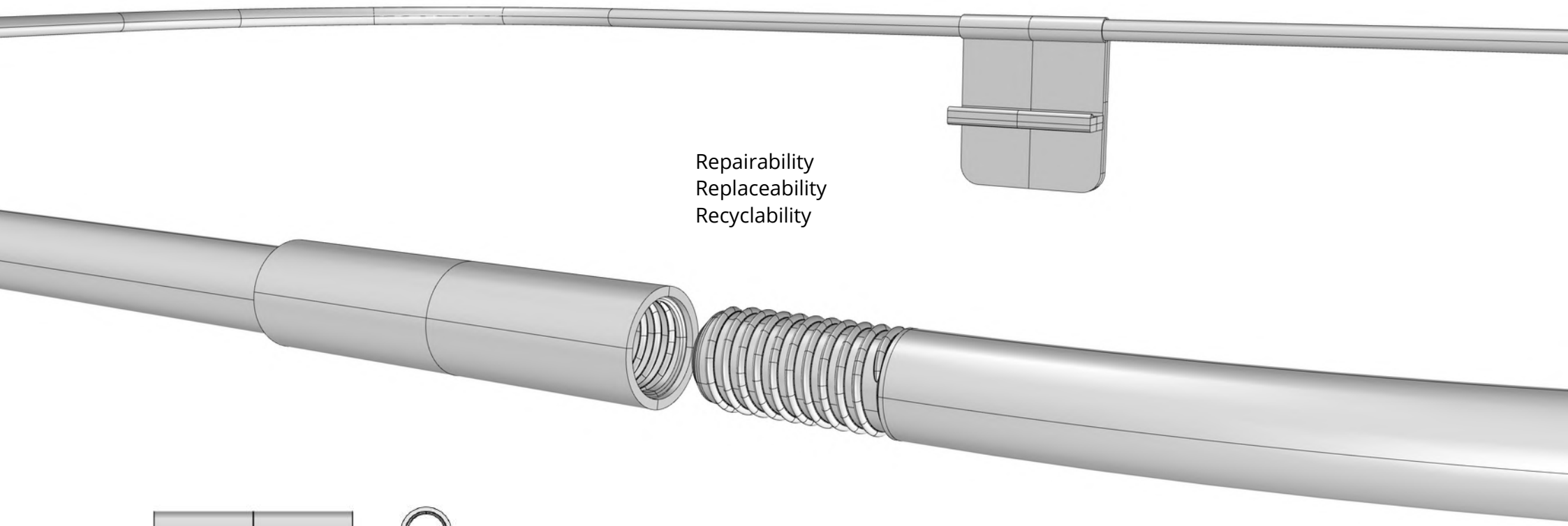
I asked myself, how will the ring be fixed around the groove? It better be simple to remove for repairing, replacing and recycling. This simple feature could extend the life of the container without being discarded because the ring is loose or broken.



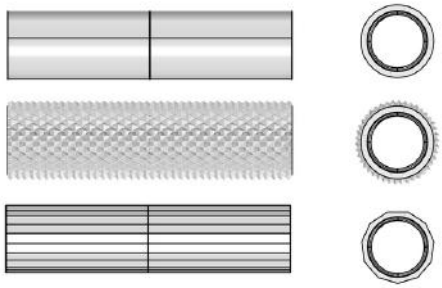


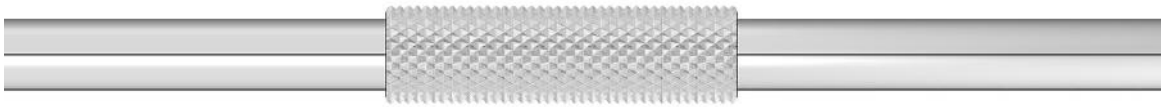



I adopted this screw lock connector style. It complements my design and it is very simple to operate using threads and nothing else to install. I placed much emphasis on the 0.2 cm metal wire.



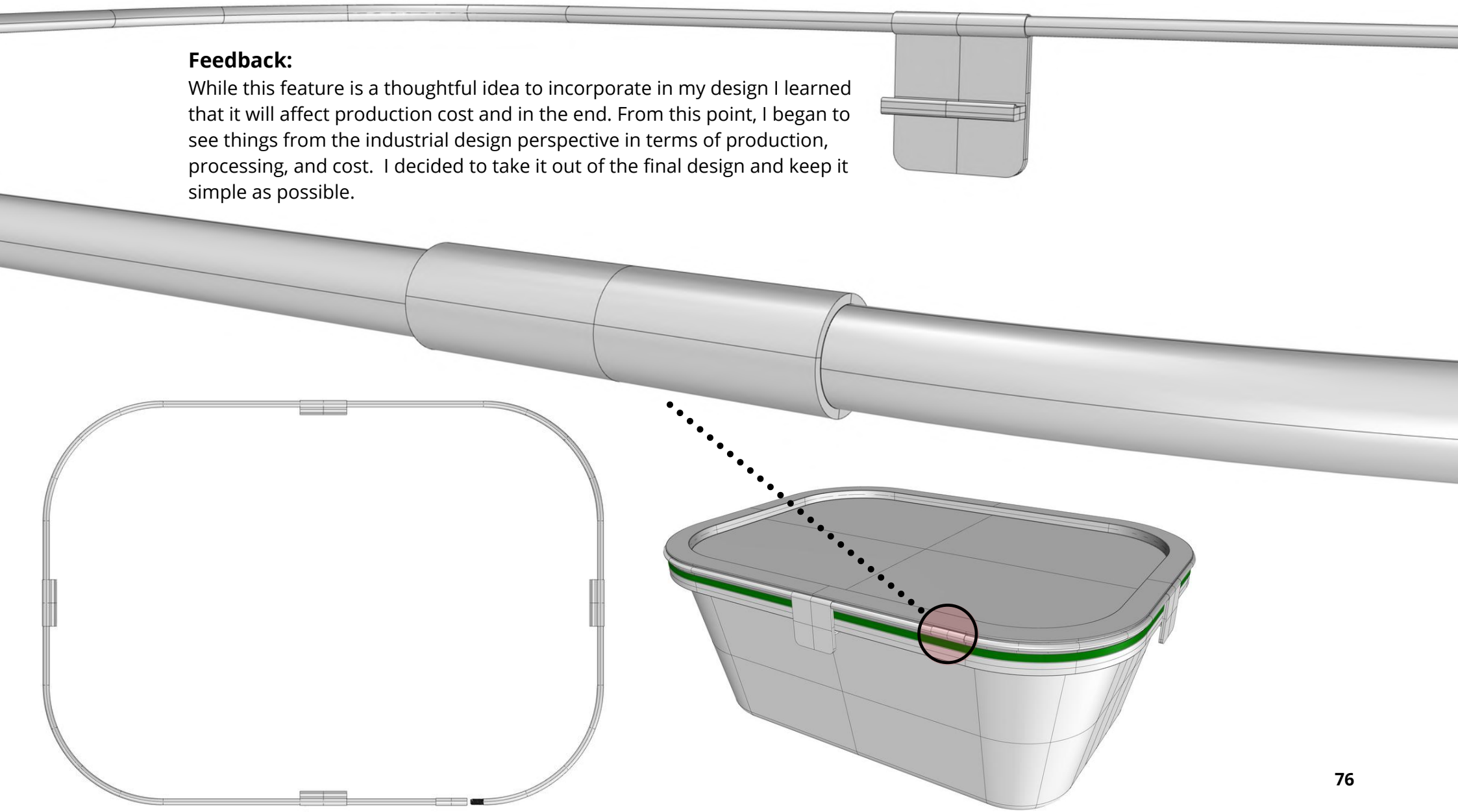
Repairability
Replaceability
Recyclability



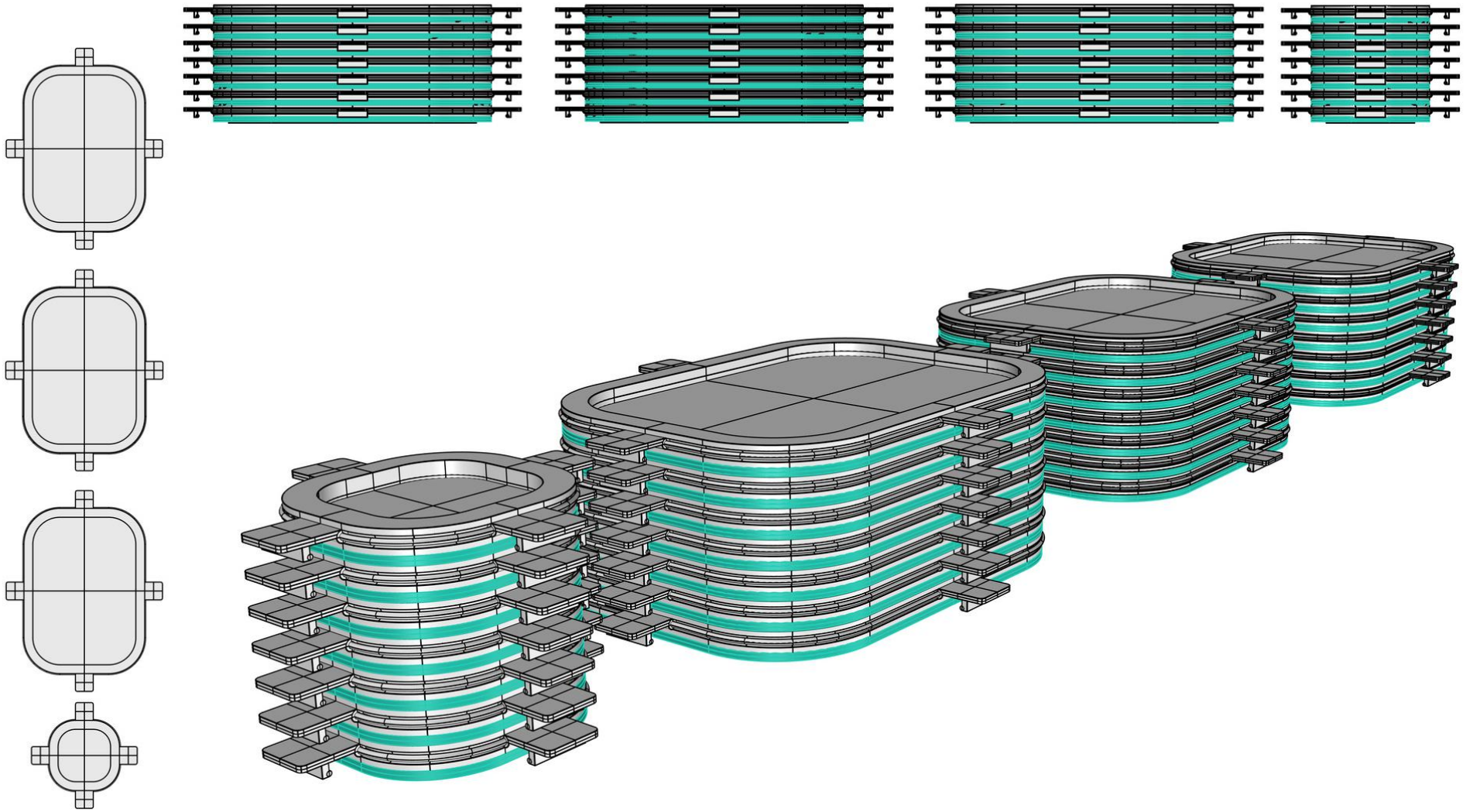


Feedback:

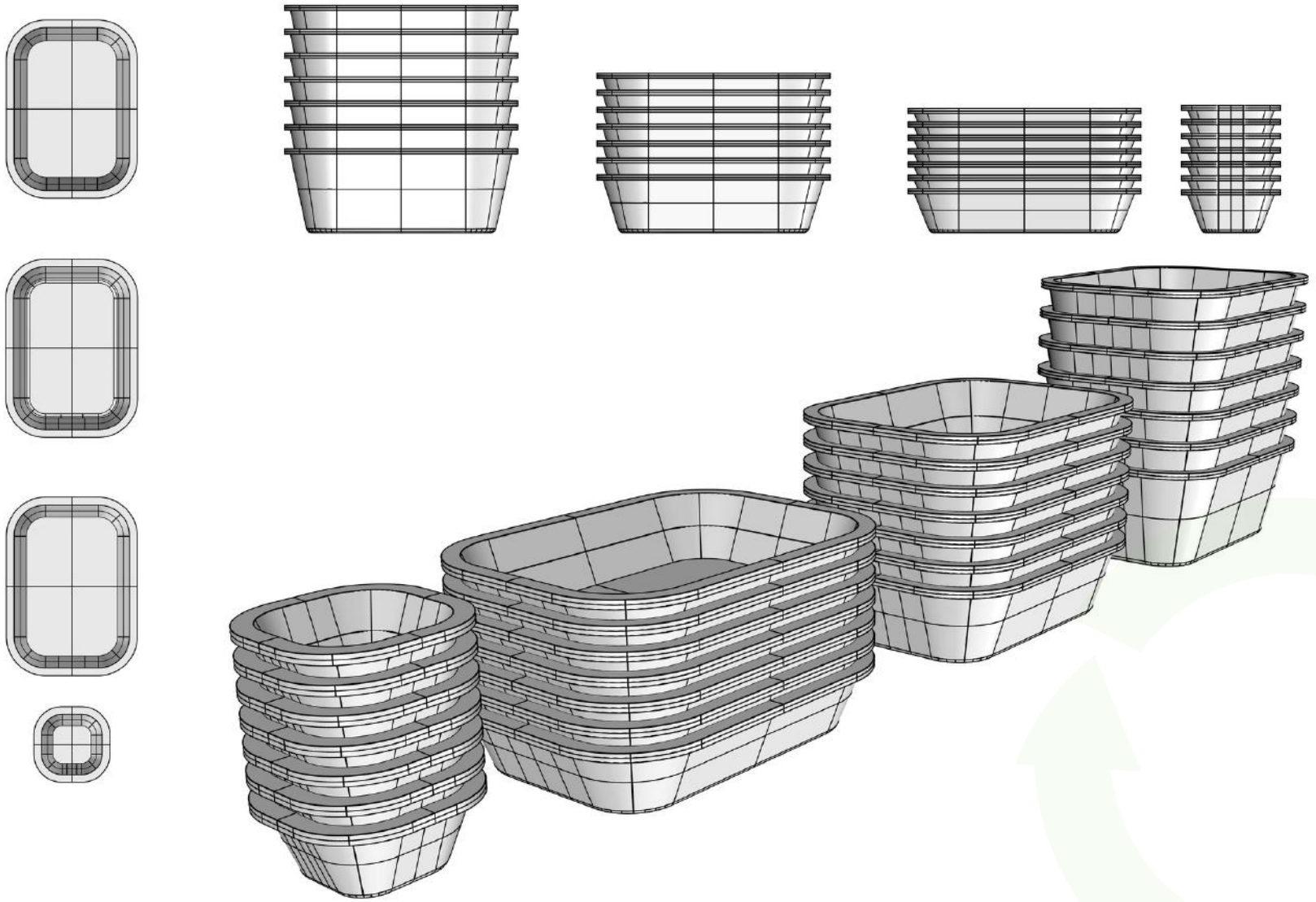
While this feature is a thoughtful idea to incorporate in my design I learned that it will affect production cost and in the end. From this point, I began to see things from the industrial design perspective in terms of production, processing, and cost. I decided to take it out of the final design and keep it simple as possible.



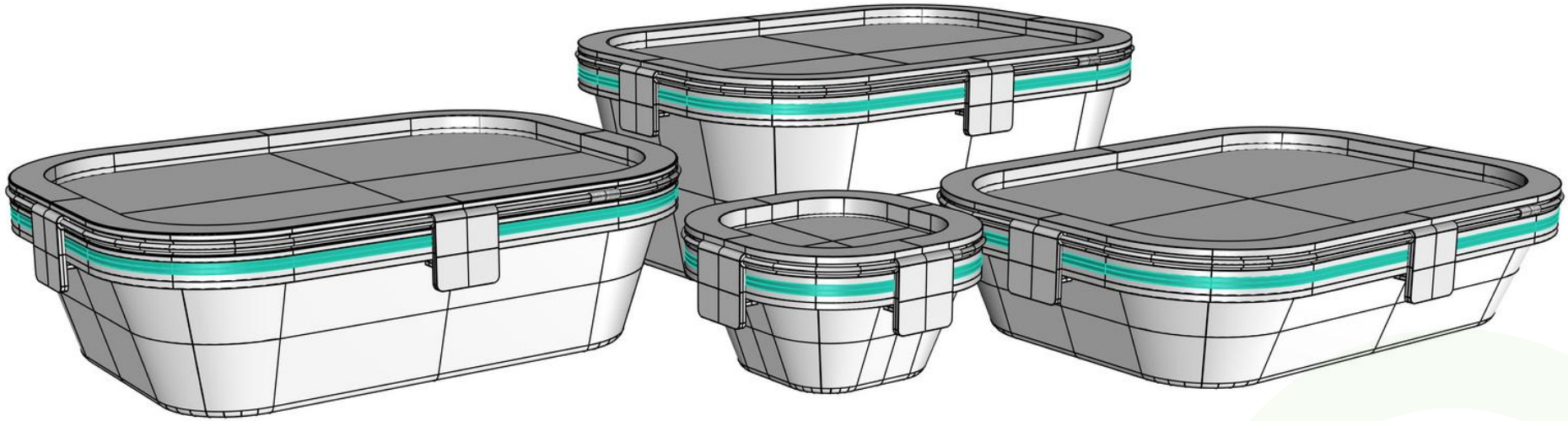
Stackable



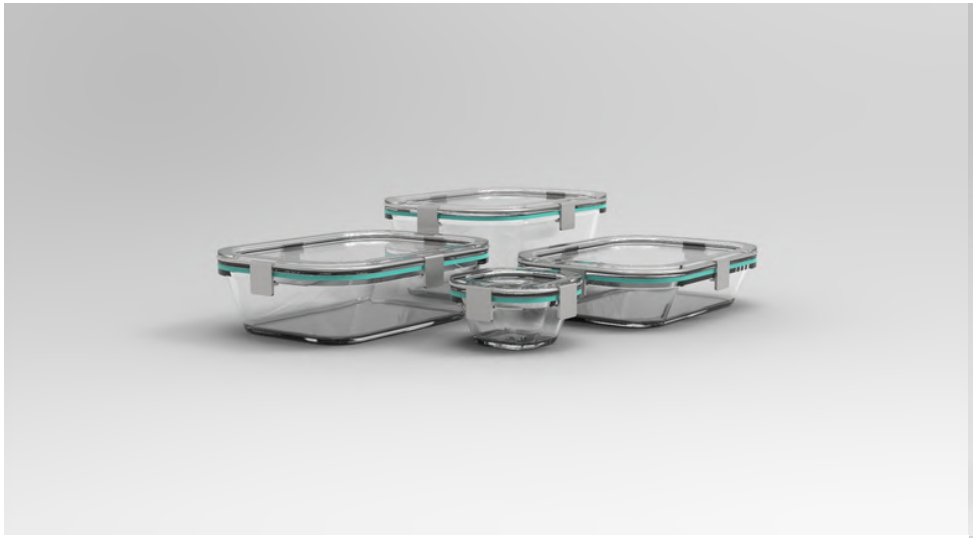
Stackable

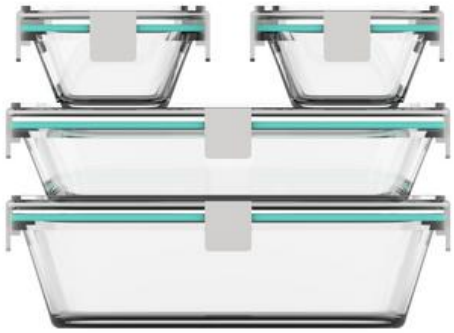


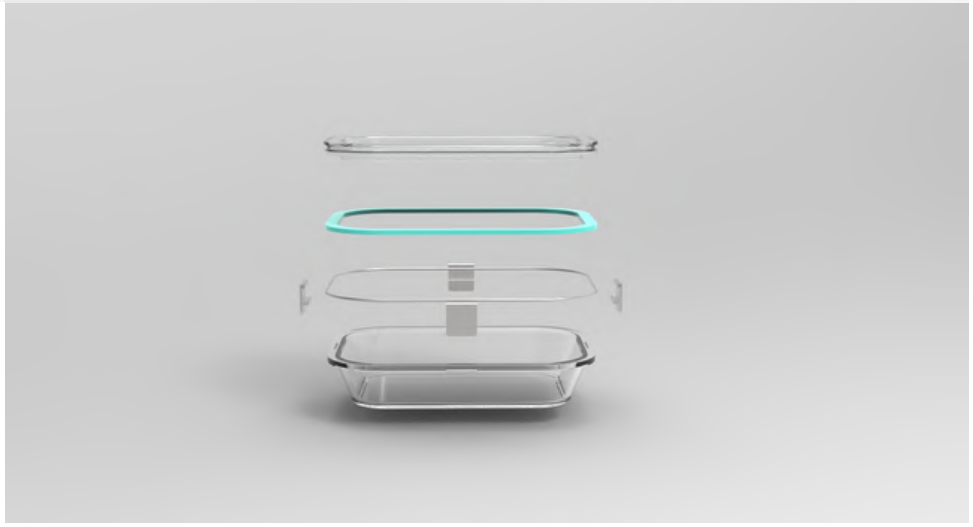
Final model



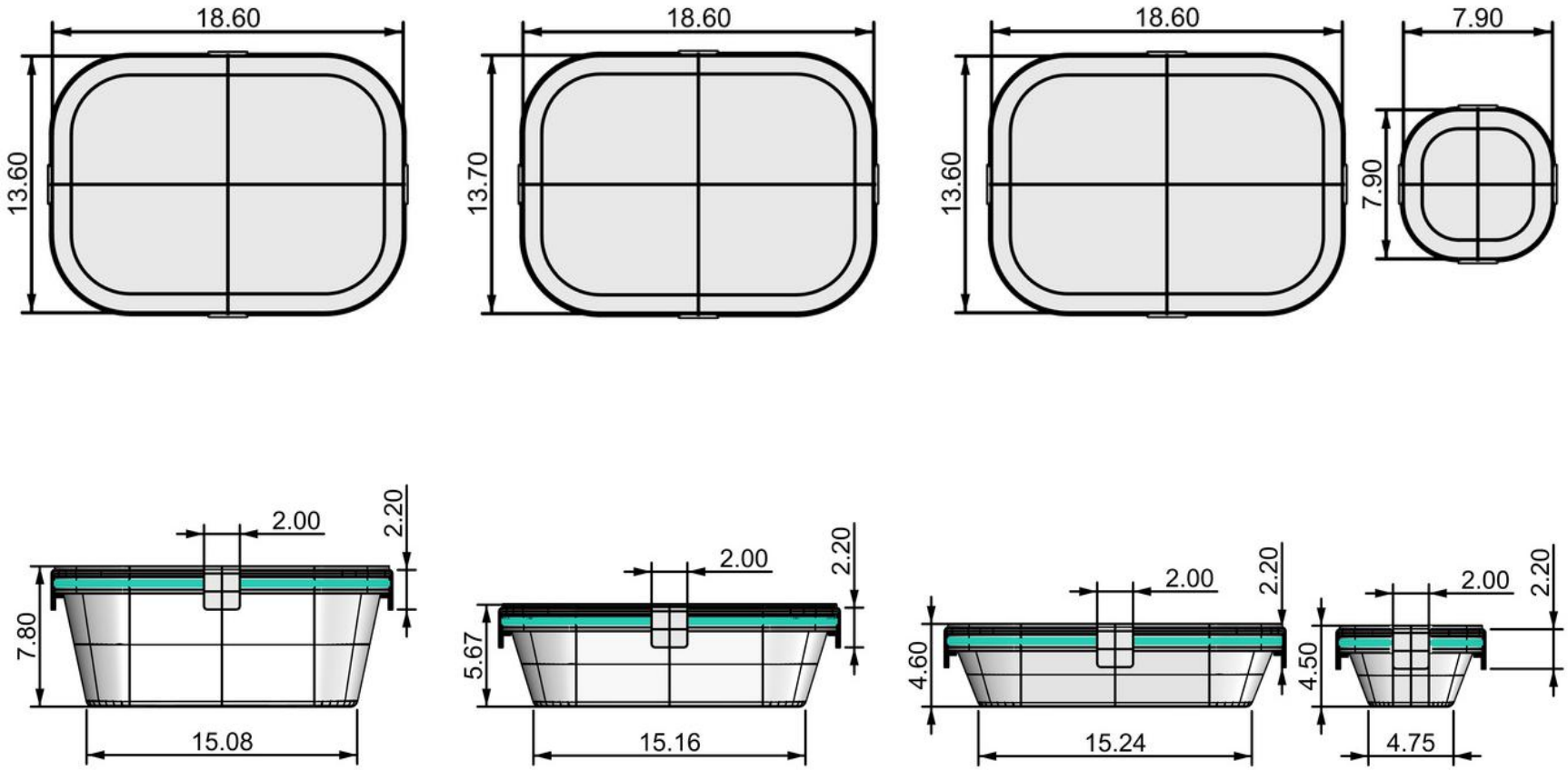
Final rendering







Technical details



iTal logistics - A circular service design

The second part of this project requires a service that will enable sharing and reuse of the glass takeaway container. In this way, the container is reused several times without going into the waste stream. This prevents the use of virgin materials for new production which also puts a burden on the environment.

On the other hand, there are a lot of restaurants that are willing and looking to go green. These restaurants find sustainability so important that they quickly switch to new packaging trends that market themselves as sustainable, compostable, eco-friendly, green and the likes in the hopes of reducing negative environmental impacts but have been disappointed by these products. These restaurants are at the heart of this project.

Requirements

Needs to work within the **existing workflow** of stakeholders.
Needs to be easy and **convenient** as single-use but in a better way.

Outcome

To accelerate the switch to reusable packaging in the takeaway meal market.
Promote product reuse over material recycling and other waste management methods.

Target User

Same target group - Restaurants and consumers of takeaway food that are willing to reduce negative environmental impact.

Inspired by Loop

Loop is an e-commerce platform for reuse. They try to convince consumer product companies to create reusable versions of their product to combat single-use packaging waste. In 2 short years, they have about 120 major consumer companies involved.

In an interview with Tom Szaky, the founder and CEO of TerraCycle about *Reusability*, he shared some very good pointers about how to present social change to the user and stakeholders in the value chain.

Tom mentioned that for a system like Loop to achieve transformation and scale:
He needed to make the **consumer company** whose business is filling products into containers feel everything is the same except the plastic bottle is now reusable (glass/metal)

The **retailer's** business is putting the filled bottle on the shelf so he needed to make them feel everything is the same except its now a reusable container

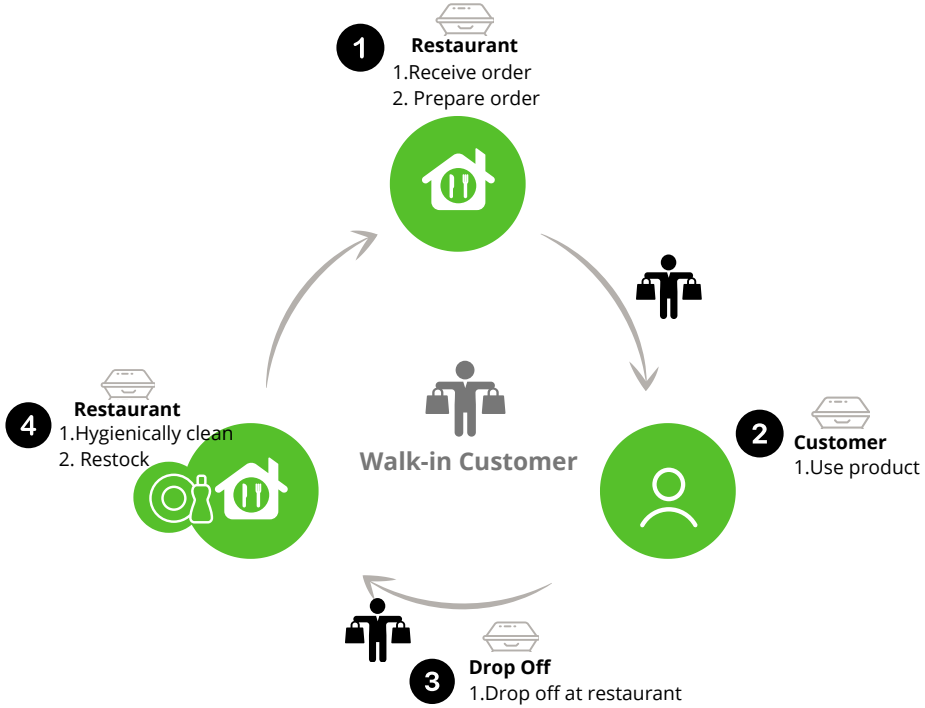
And finally, the **consumer** who is used to throwaway convenience. He had to make it feel the same for them except its now a reusable bin instead of a garbage/recycle bin

My takeaway from Tom's interview is...

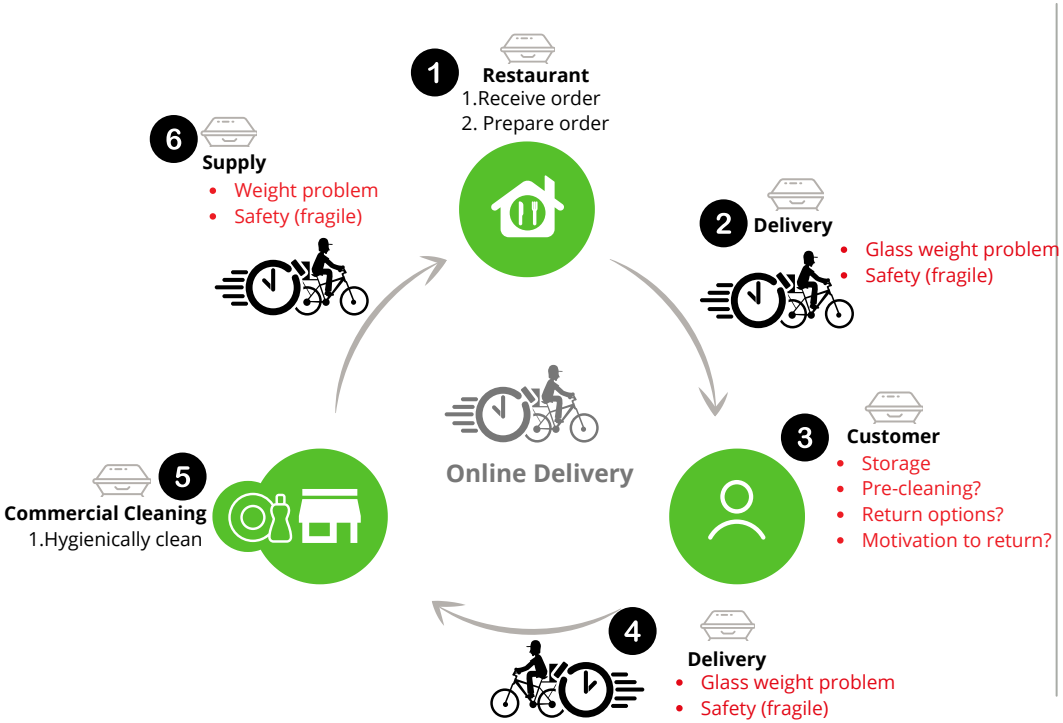
- To create systems change, we need the system to **feel** as if there is the **least amount of change** occurring.
- In social business, when we try to **change too much at once**, the **slower** the idea can scale.
- You have to deeply honor the idea of making it **feel as traditional** as possible while creating that systems change.

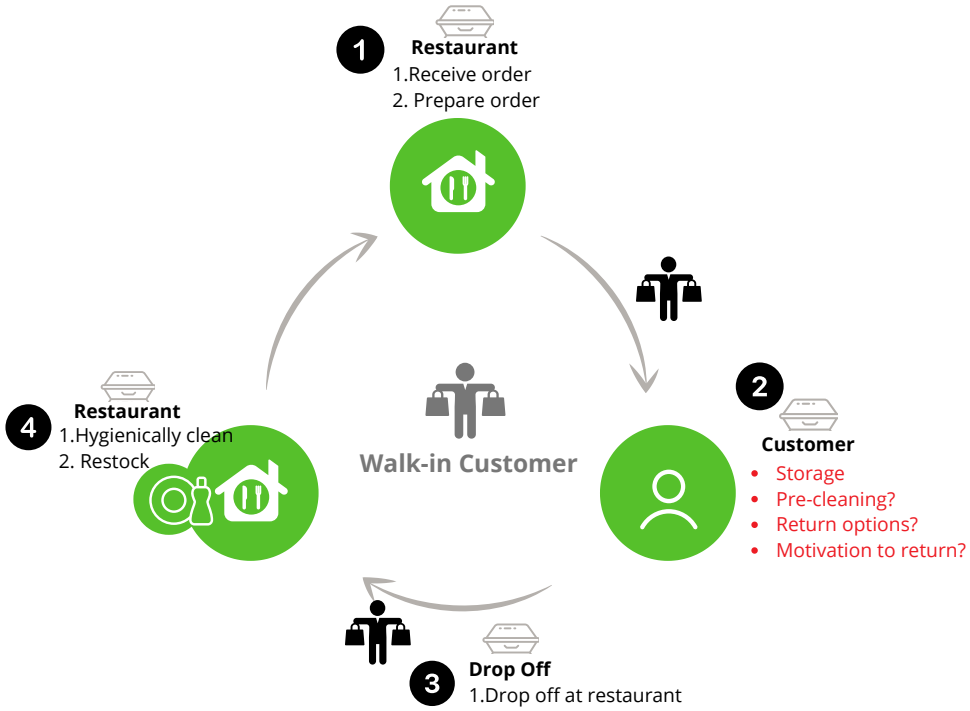
Defining the problem: linear

Defining the solution through user journey: circularity



User journey: pain points





Finding possible solutions to pain points

I did this through internet research, surveys, observations and interviews

Ideation on the **weight issue** of glass

Ideation on the **safety of glass** during transportation

A possible solution for glass?

Rental moving box

Dish partition

I found this dish partition to make packing and transporting dishes easier and more secure than ever. They are used by movers and it's a very good fit for my solution.
I can put a couple of these crates with dividers in a cargo bike and pick up glass containers from customers. The dividers can be adjusted to accommodate thicker bowls and plates. The pre-slotted compartments fit most standard-size dishes (up to 16) and the thickness of the dividers is 4mm.

It can hold up to 18 plates and can be easily adjusted to accommodate my glass containers as well. Just place each container in one of the 16 sections of the divider and I am done packing before you know it. These are reusable rental items and are made from corrugated plastic.

Product Specification:
Overall Dimensions: 23.5”L x 13.7”W x 10.8”H
Compartment Dimensions: 11.8”L x 1.1”W x 10.8”H

Environmental Consideration:
Reusable, 100% recyclable

Storage house

Using deposit-return system as motivation

I interviewed eight people on their experience with the pant system in Sweden. The goal is to find pain and gain points and relate the behaviors towards my reusable containers. The response was just the same only in different expressions. Six respondents were students and the remaining two were workers.

Pantamera!

Question: ***How do you store your pant bottles?***
Respondents keep their bottles and cans in a bag, box, under the sink, and cupboard usually in the kitchen until they get a lot to send out for a refund.
Question: ***What motivates you to pant?***
All the respondents think it's a good way to reduce their environmental footprint by participating in the recycling of waste. Secondly, they can get their deposit back. "It's money", they said.

Question: ***How often do you send your bottles for a refund?***
The average response is at least twice a month. The reason is they don't want to go to the pant machine for only a few kronor. They prefer to collect a lot before going to the machine whilst they shop for groceries.

At the same time, the majority of the respondents don't feel like carrying a lot of stuff when going to the shop. They feel they can always pant another time.

Question: ***How about a service that picks up your pant bottle?***
All the respondents think it's a perfect idea because it's very convenient. One respondent said *this service is much needed in the winter when I don't want to go outside.*

Question: ***Think about a reusable container that you will have to rinse before sending it out. How do you feel about that?***
I did not get any respondent that did not want to do that. They thought it was not a problem rinsing out first. It would have been interesting to hear why someone won't rinse.

Conclusion: From the inquiry, consumers often look out for the *convenient option*. Even though they are willing to rinse, they often need the *motivation* to perform tasks. In the case of the pant bottle, the *financial incentive* is the main driver in addition to the willingness to contribute to a better cause.

The potential pitfalls

Taxation: The tax system in Sweden poses a problem for this logistics service in terms of paying wages for the labor involved in running such logistics. In terms of economic viability, the service will need a lot of money to keep the show running for a few kronas in return for using the service.

Legislation: Legislation will be needed to prohibit people from using disposable containers. By that being enforced, people do not have a choice but are required by law to reuse.

Consumer Behavior / Convenience: In as much as people are willing to reduce their environmental footprint, circumstances and situations make it a bit difficult sometimes. Busy schedules or what may be called laziness is an obvious pitfall for this reusable solution.

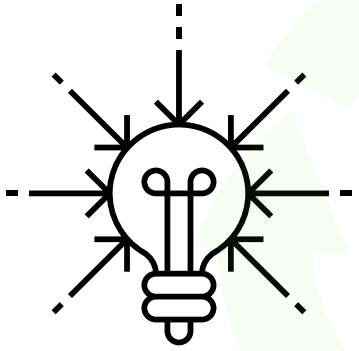
The possibilities

Dabbawala: The dabbawalas in India constitute a lunchbox delivery and return system that delivers hot lunches from homes and restaurants to people at work in India, especially in Mumbai. The lunchboxes are picked up in the late morning, delivered mostly using bicycles and railway trains, and returned empty in the afternoon. This delivery service is also used by meal suppliers in Mumbai, who pay the carriers to ferry lunchboxes with ready-cooked meals from central kitchens to customers and back each and every day. This circular system delivers over 200,000 meals a day without using any modern technology for about 130 years. The system employs over 5000 people which many of whom have little to no education.

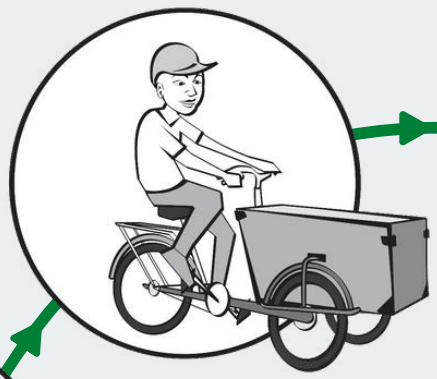
UK - the milkman concept: Milkmen seemed like a dying breed but could they make a comeback? As Londoners reduce the plastic they use, one milk company says it's seen a rise in people asking for glass bottle deliveries. Milk & More is the company that is leading the shift back to reusable glass bottles in London and beyond. McQueens Dairies is another company expanding in the area of Glasgow to meet demand, creating new jobs.

Moving forward as a concept for Sweden

Sweden is already at the forefront of the sustainability movement and is working hard to convert the whole of the country to run on a circular model where resources are used as many times possible without going to waste. It has been very successful with the pant system, waste sorting, the soda stream bottle, the reusable shopping bags and therefore will soon come to a reusable takeout container for the takeout food industry. Therefore, this project is focusing on conceptualizing the solution for the near future in Sweden.



Concept



Delivery
To customer

Customer
Eats from container

Customer
Request for pickup

Delivery
To storage house

Storage
Storage of containers

Restaurant
Night dishwashing
by iTal at partner restaurant

Restaurant
Prepare order

Online Delivery

Concept

Customer
Eats out

Customer
Return container to restaurant using QR code.

Restaurant
Dishwashing during daytime

Restaurant
Customer borrows container by QR code.

Walk-in Customer

Concept

Download and register on the app with payment details.

Placing an order: How does it work?

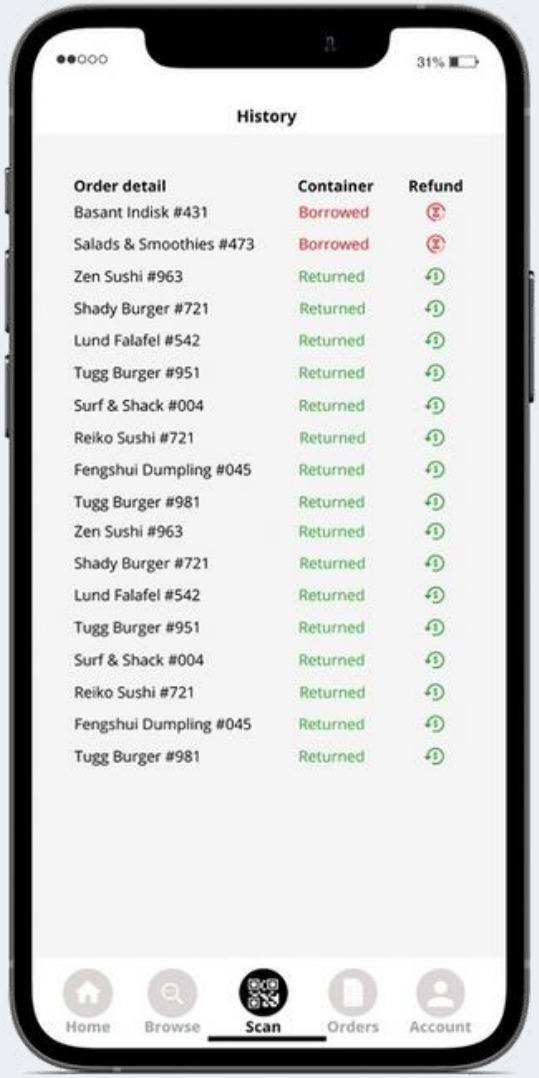
Choose between the option of **Delivery service** or **Pick-up** by self.

Scan through partner restaurants and place your order. The order automatically picks up a container

Concept

Returning container: How does it work?

Begin return process in the order history. Select order (container) to return.



Scan the restaurant's QR code during self drop-off.

Deposit is refunded.

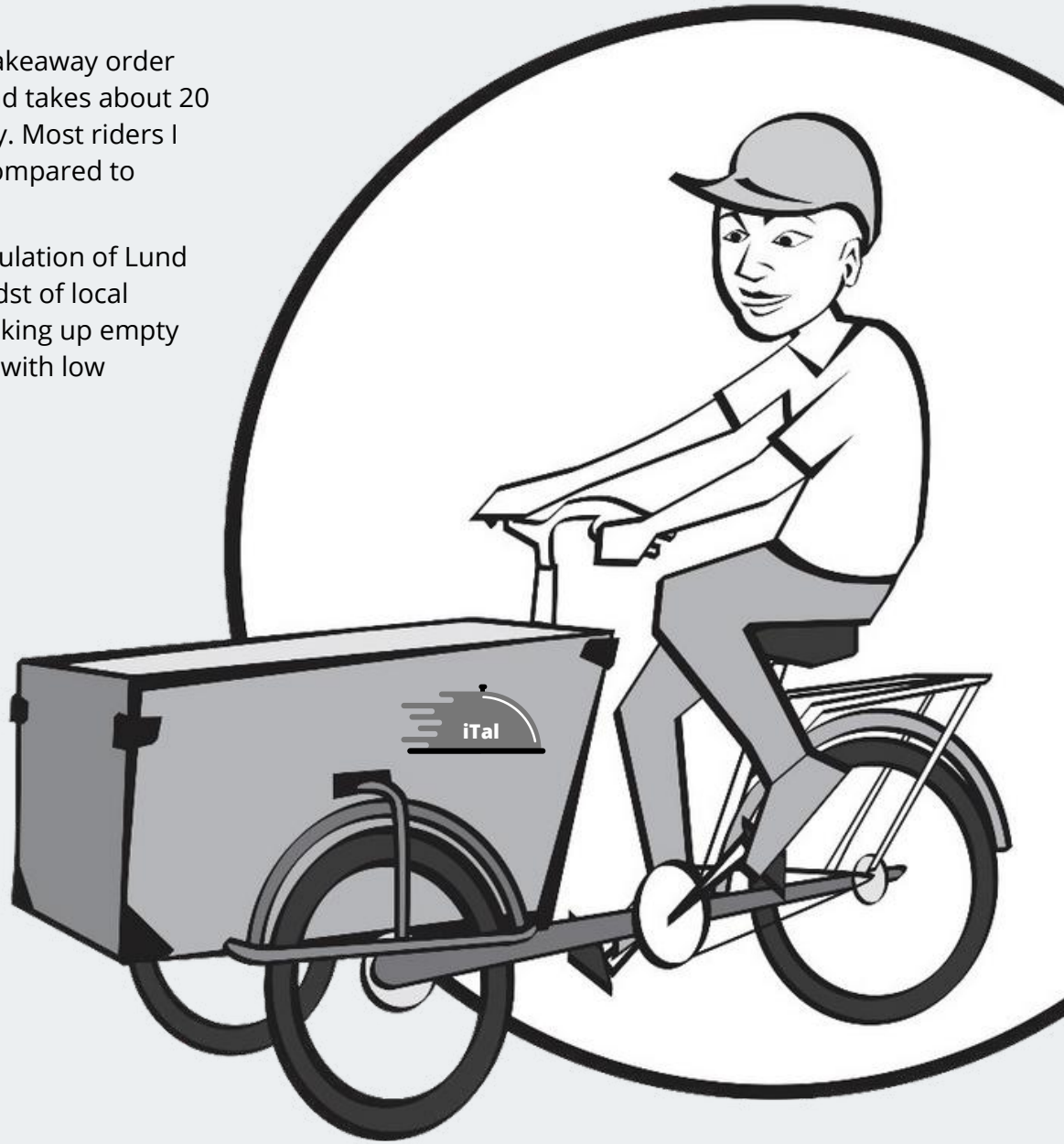
Biking distance in Lund

Almost all the restaurants are located in the city center. Sending a takeaway order from the city center on a bike to the farthest delivery location in Lund takes about 20 minutes. With an electric bike, delivery shouldn't be much of a worry. Most riders I know in Lund prefer to use e-bikes because of the hilly landscape compared to Malmo which is completely flat land.

On average, distances covered are short since about half of the population of Lund are students and live in student accommodations that are in the midst of local residence apartments that are not far from the city center. Thus, picking up empty containers with a cargo bike is perfect and environmentally friendly with low emission.

Benefits of using a bike:

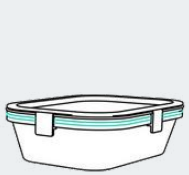
- Avoids the cost of gas
- Avoids parking
- Avoids insurance
- It's a low carbon



Partnership

Instead of setting up a commercial dishwashing facility, the project (iTal) will utilize a partnership with restaurants and use their dishwasher at night to wash containers riders collect at the storage house. Restaurants are closed by 10 pm in Lund. The dishwashing can be done between midnight and morning before restaurants begin operations. This will eliminate the cost of setting up a dishwasher and maintaining it. For a start-up, one big size kitchen with a commercial dishwasher can handle the job and later increase the washing partners as customer demand increases.
On the other hand, restaurants will wash the containers customers return to them as part of their in-house dish washing.
There could even be a negotiation whereby a partner restaurant will take full control of washing all containers at night (containers from customer drop-offs and rider pickups).

iTal Logistics



Role

1. Offer reusable takeout containers to partner restaurants.
2. Deliver food from restaurant to customers
3. Picks up empty containers from customers. Wash at night at cleaning partner and supply to partner restaurants.

Revenue stream

1. Pay per fill - restaurants pay 5 sek per container fill
2. Pay per deivery

Partner Restaurant

Role

1. Cleans customer returns and restock self.

Revenue stream

1. Discount for cleaning

Cleaning Partner

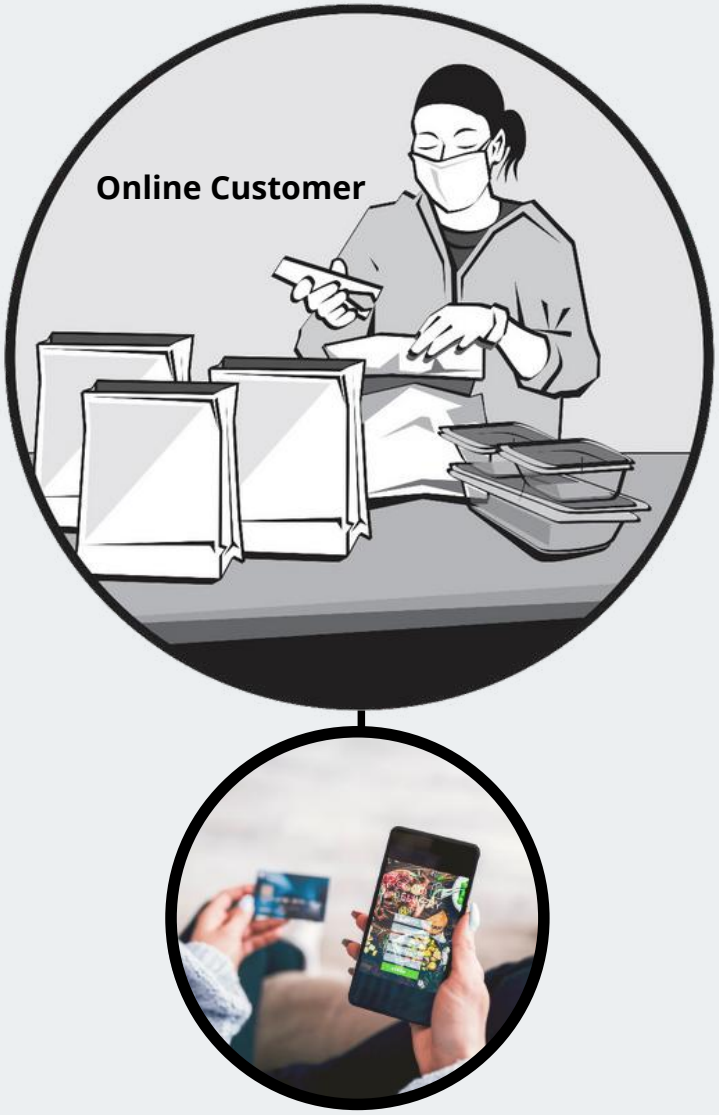
Role

1. Cleans customer returns and restock self.
2. **Offer dishwasher to logistics partner at night**

Revenue stream

1. Sharing of commercial dishwasher

Placing an order



Customer scans through partner restaurants and places orders. The order automatically picks up a container. Customer use app to arrange for container pickup after use.

Customer scans vendor's QR code and makes a deposit before pickup and repeat same during drop off.

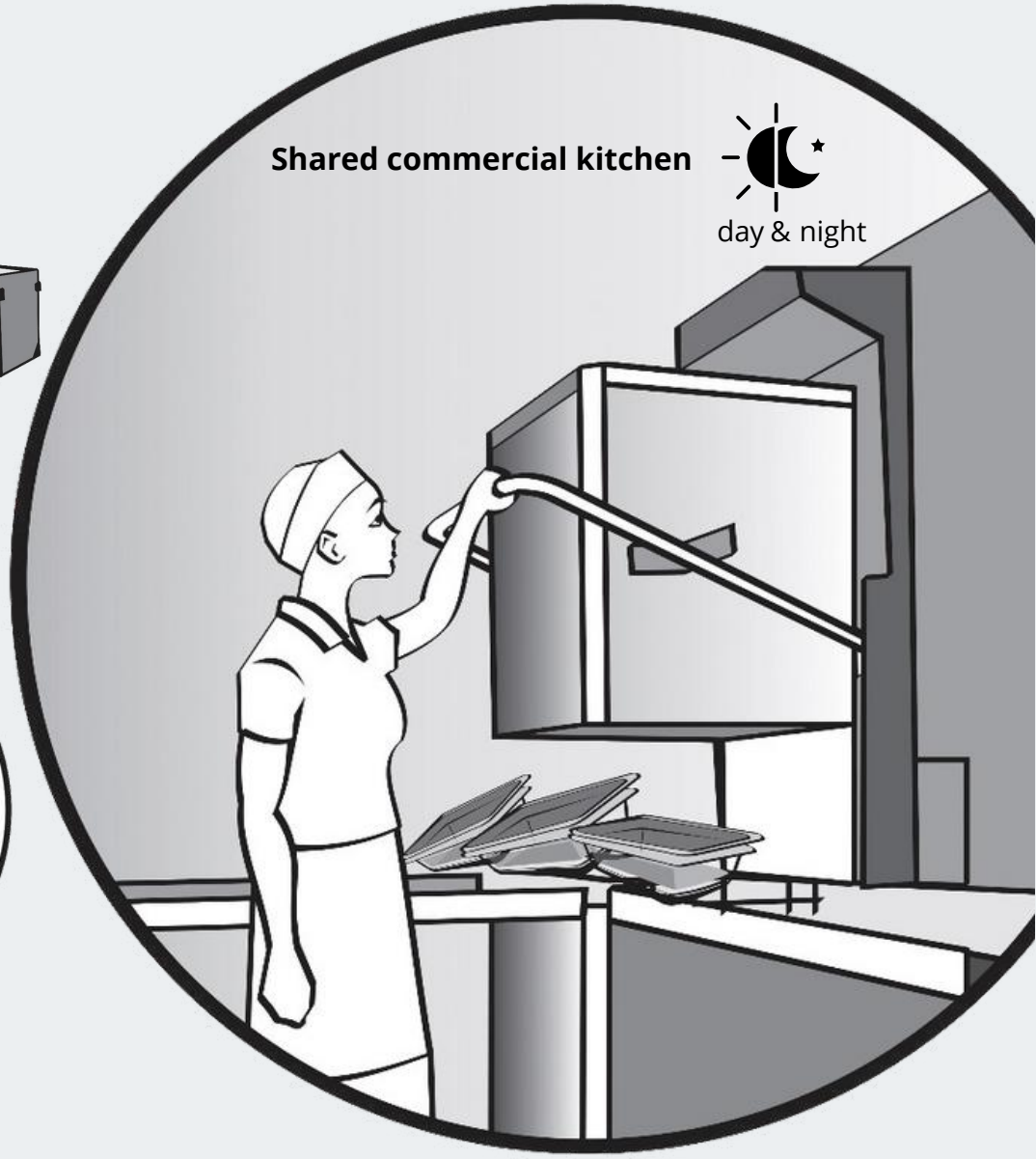
Returning containers for cleaning

Return from home model

Rider picks up empty containers from customer requests and sends them to iTal's storage house where containers are first dropped off before they are sent to partner restaurant for cleaning at night (when the restaurant is not operating). The night cleaning will reduce the pressure on the restaurant from receiving so many returns, washing and storage space.

Return on the go model

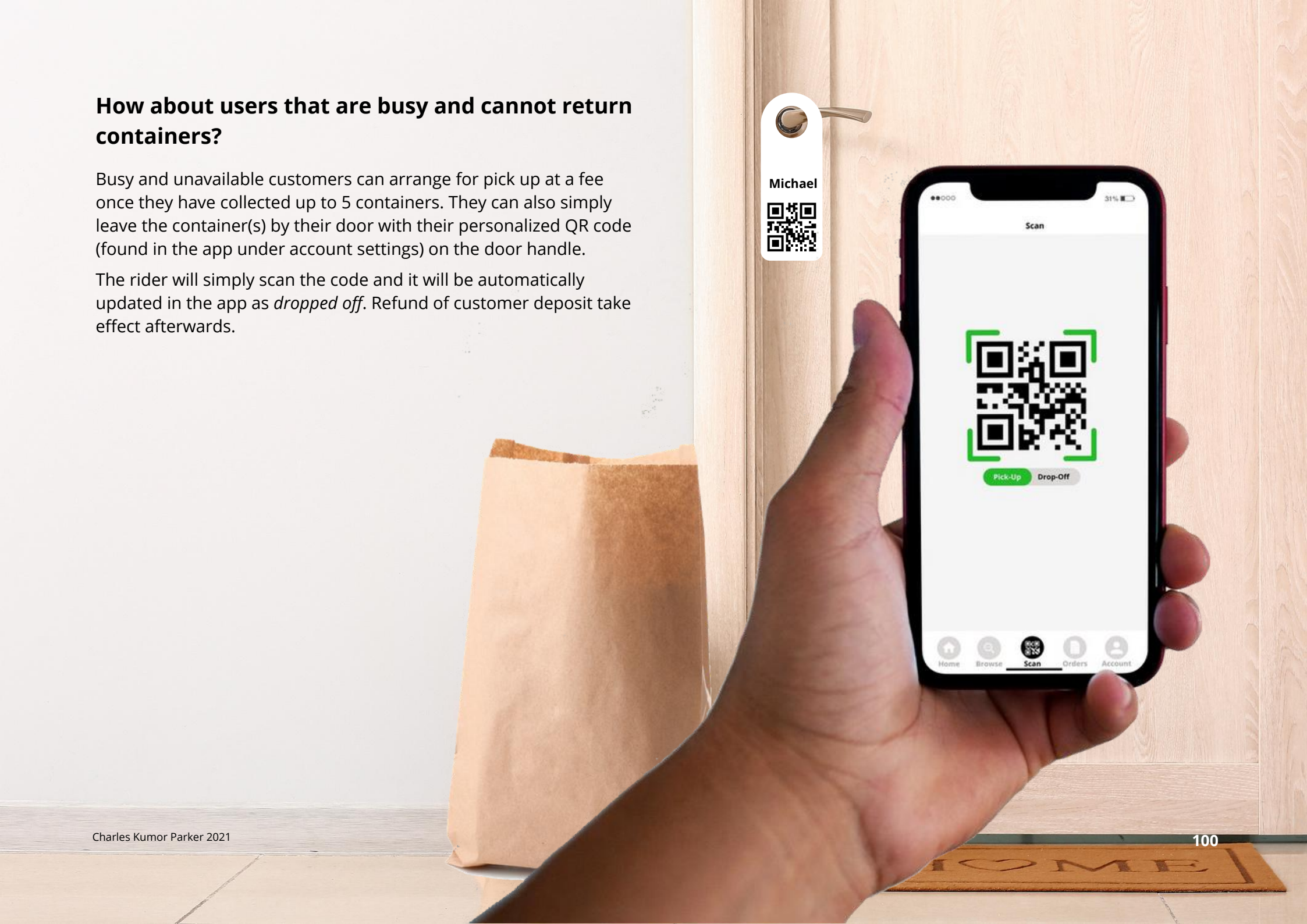
Customers can return containers to the vendor's location at no fee. They simply have to scan the vendor's QR code to drop off. Refund of deposit takes effect afterward. Vendors clean the containers during the day and restock to continue the loop. When they are in short of containers from circulation, they request for supply from the logistics partner.



How about users that are busy and cannot return containers?

Busy and unavailable customers can arrange for pick up at a fee once they have collected up to 5 containers. They can also simply leave the container(s) by their door with their personalized QR code (found in the app under account settings) on the door handle.

The rider will simply scan the code and it will be automatically updated in the app as *dropped off*. Refund of customer deposit take effect afterwards.



Charles Kumor Parker 2021

Storage of containers

iTal's storage house runs the logistics in the delivery and storage of containers. It sends containers to and from the commercial cleaning. It supplies when restaurants request containers. The storage house utilizes storage boxes for the safe transport of glass and storage.

The stackable design makes it easy for restaurants to store the containers they receive from customer returns and also from supplies. The shapes are designed to utilize storage space when packed next to each other. Restaurants can keep the stacked containers in storage boxes as well or keep them on storage racks.

Benefits of using iTAL

Subscription and pick-up services create brand loyalty and provide information about user needs.

All packaging is secured by a deposit that incentivizes return or creates a revenue stream if the packaging is not returned.

All products come in high-quality, durable packaging that improves the user experience.

It is convenient: busy customers can drop off containers whiles they are away

Reflections

When I started this two-year Master Program in Industrial Design, I was very excited to have this long-awaited dream finally come to reality. At the beginning of the course, I realized I needed to catch up on so many things that my colleagues already knew. I had a little Rhino basic training and many years of not practicing made me rusty. Since CAD is used in almost all projects, I began learning Rhino again at a very fast pace within the course and other rendering programs that I had only heard of but never tried. Now I believe I am at a level where I can easily build up on my developed skill coupled with the knowledge I have gained as an Industrial Designer.

Designing a reusable takeout food container is an interesting area for me being a person that is very conscious about health and sustainability. Researching into food packaging materials for this project has exposed me to quite a lot of health information about everyday products we use and consume. I have become more particular in selecting materials and processes with regard to health and the environment.

The things that makes me most happy about this project is that I have developed the skill to learn fast. I have learned the process that goes into developing products and services, how to do research, and conduct interviews in Industrial Design. I have also developed a mindset that I can do anything I set my mind to. I just have to learn, practice and talk to people that know. It brings different ideas and opportunities.

I have developed the ability to carry my ideas to production, making them tangible. It has been my passion to develop new products and services that make life more enjoyable and simpler, just as designers around the world have done and continue to do.

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