BINLY

The **bin** that won't hold you back!

Binly is determined to improve the experience of commuters while protecting the planet.

The **Cupply** is a simple yet elegant solution to **recycling your cups** and improving your morning coffee experience.



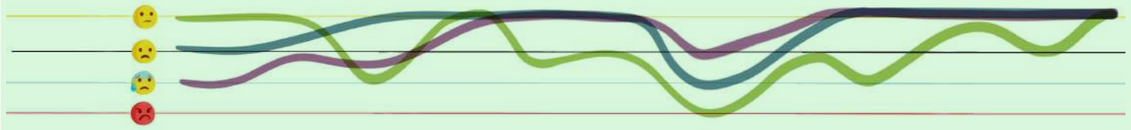
Team 22 - Freddie Nicholson, Maxim Weill, Qinxuan Li, Raphael Wang

Who and Why

Commuter Experience



Commuter experience map



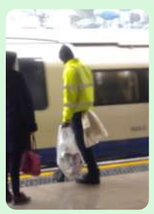
While commuters interact differently with their waste, their common difficulties related to holding onto and disposing of their waste lead us to try and tackle the primary waste they produce, **cups**.



Bins in Stratford Station

Not only does the large number of cups result in a substantial amount of wasted space in bins, but the difficulty to hold onto cups while in the tube results in cups being littered very often.

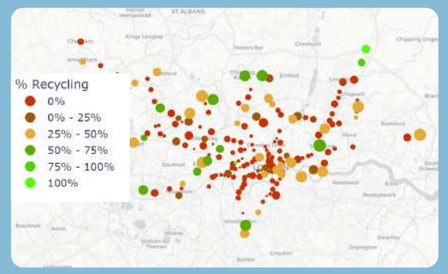




Stratford Janitors

Littering is so common that cleaners are constantly circling busy stations and need to go through every cabin each time the tube arrives at its terminals.

Trouble with contaminated bins



Recycling Bins in the Tube

The London Underground has implemented recycling bins with little success. This is primarily a result of commuters contaminating the recycling bins. This results in TFL having to hand filter the waste. Currently 70% of it is recycled.



London Underground Bins



Plasticly lined cups

In most cases coffee cups are not recyclable. This is as a result of their plastic lining that protects the paper shell from the liquids. This isn't common knowledge and often results in contamination of recycling bins.

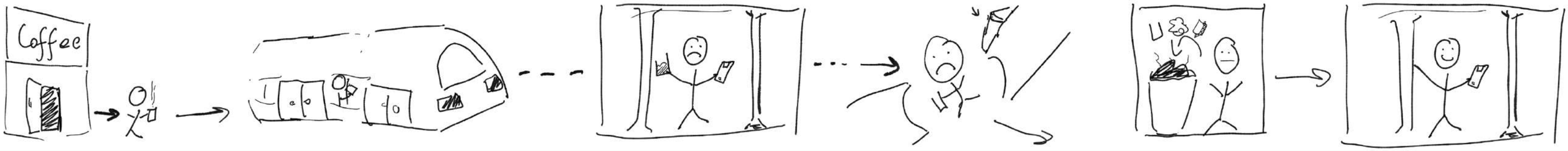


Biffa, a waste management company, has found that nearly a fifth of recycling goes to waste as a result of contamination.

None the less, paper cups can still be recycled and repurposed if correctly isolated.

Starting Point

User experience of drinking coffee in the tube



Bins take space and are hard to find

Carrying cups is inconvenient

People don’t recycle

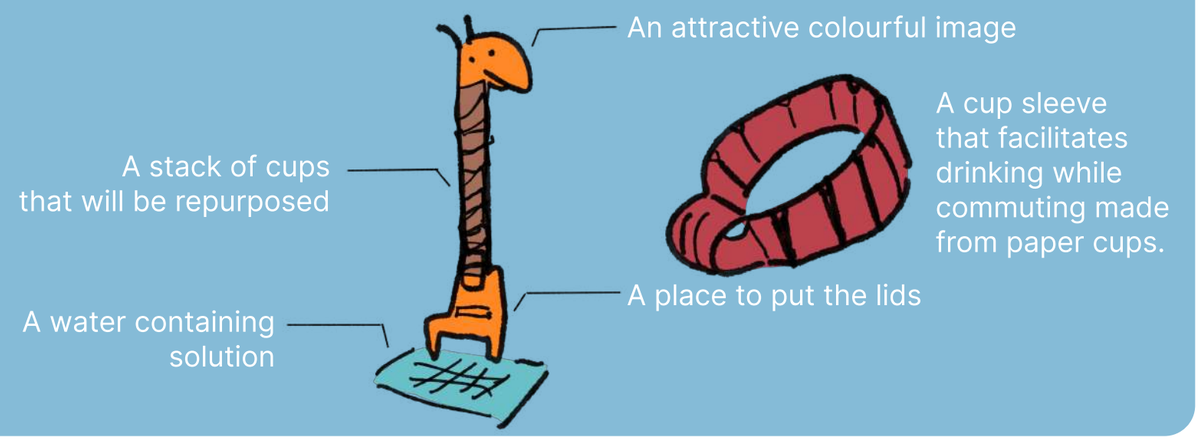
Objectives

- Facilitate using your hands even when you have a cup.
- Make a binning solution that is thinner and can be placed more strategically.
- Passively force users to recycle.
- Efficiently repurpose and recycle the cups.
- Make the bins more noticeable.

Inspiration

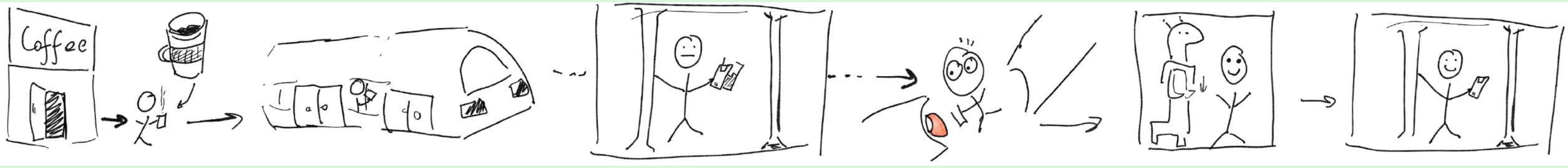


Concept Skeleton



Solution Storyboard

Eye-catching bin



Cup holding solution made from repurposed cups

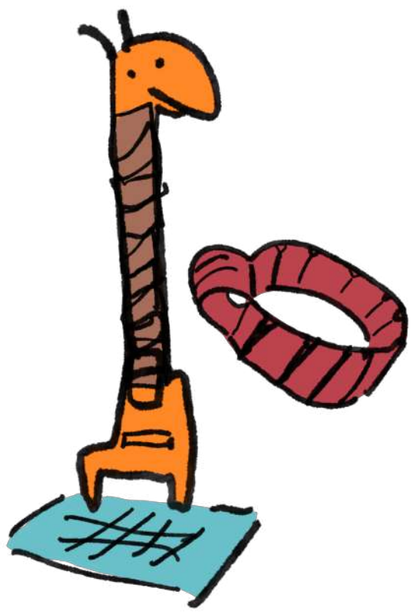
Cups that are easily held on one hand

No contamination

Design Process

As a result of time constraints, we adopted a parallel process which separated the process into three branches: Ideation down selection, repurposing validation, and getting direct user feedback.

Starting Point



Exploration

Generation of design variants



Survey

Getting user feedback on these variations

qualtrics.XM

Repurposing

The repurposing process will be refined and it's validity evaluated.



User Testing

Initial concept testing

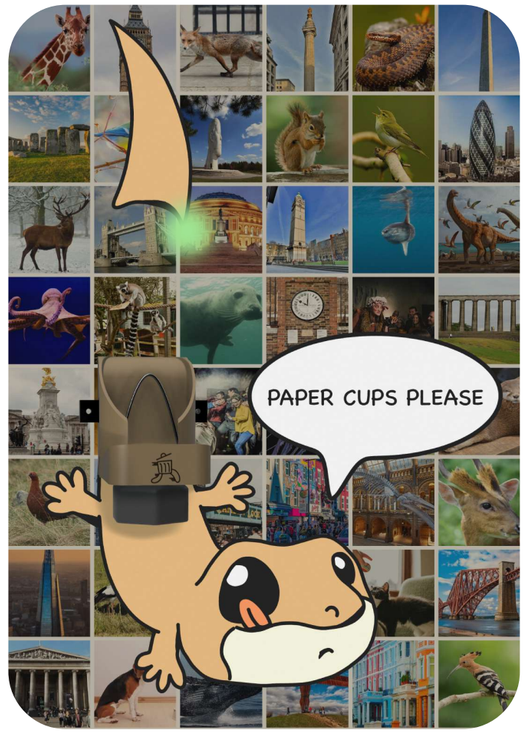


Second Prototype

Identifying improvements



Final Concept



Morphological Exploration

Functionality

Liquid

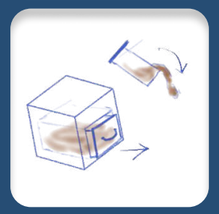
For commuters





For cleaners





Lid

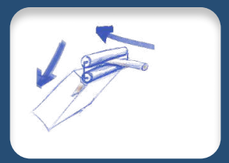




Straw







Cup













Display Form

2D Stickers

3D Models

Attractiveness

- The exterior of the bin designs can resemble animals with long necks, arms, tails, or tentacles, as well as instruments, paintings, or monuments.
- The appearance of the bins at each station will be inspired by nearby famous landmarks, resulting in a themed set of bins where each station has a unique look.

Hyde Park Corner, Hyde Park



Waterloo, London Dungeon



South Kensington, Natural history museum



South Kensington, Royal Albert Hall



Waterloo, Aquarium



Camden Town, Zoo



Waterloo, Aquarium



Camden Town, Zoo



Battersea Power



London Bridge, the Shad



Charing Cross, National Gallery



Arsenal Station, Emirate Stadium

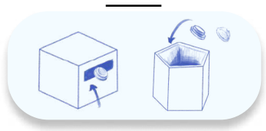


Coffee stains were added to the sketches to help people envision how the bins would actually look like.

User feedback

Functionality (Cleanest → Dirtiest)

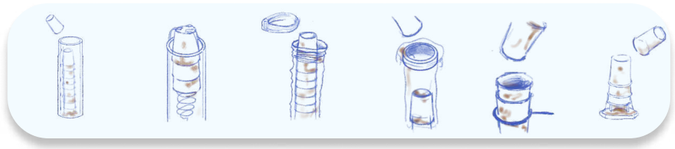
Lids



Straw



Cup

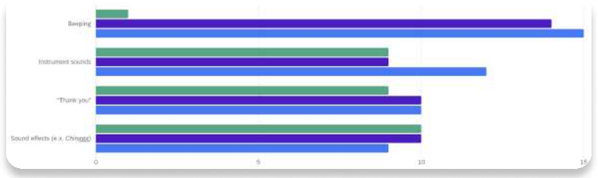


People's Preference:
Covered bin > Uncovered bin;
Solid tube > Bag > Pedestal cup holder.

"In my opinion, the most efficient units are those that provide ample space along with hard surfaces that can be easily and effectively cleaned by professional cleaners"

"the upside mugs will have left over fluid hence not soo clean, depending on bags used"

Sound Effects



No sound will be included in the final design due to the fact that "annoying" was chosen by roughly a third of the respondents in every survey question.

Interesting OK Annoying

Comments:

Suggestions on how to be clean:

"I do not like to see the contents of the bin"
(4 people (12.9%) claim that they need lids or bins that can fully close in order for the bin to feel clean.)

However, for TfL the bin units should not have a lid for security concerns.
→ Other ways to hide cups

Touches

4 people mentioned that they wish to have a bin which can be used without needing to touch it. Maybe using foot so it can open and close automatically.

Design Complexity

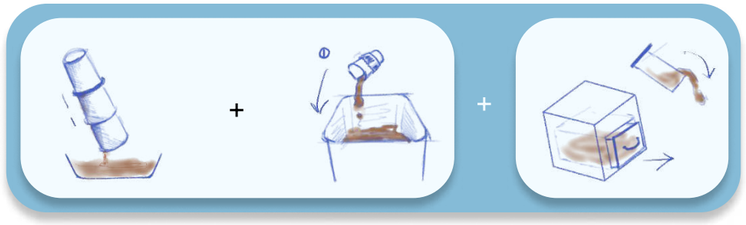
3 people have a clear preference to **simple** design they feel it's more comfortable.

Display form:

Unlike 3D models, a 2D image paired with a cup holder will be more accessible, economical, and inexpensive.

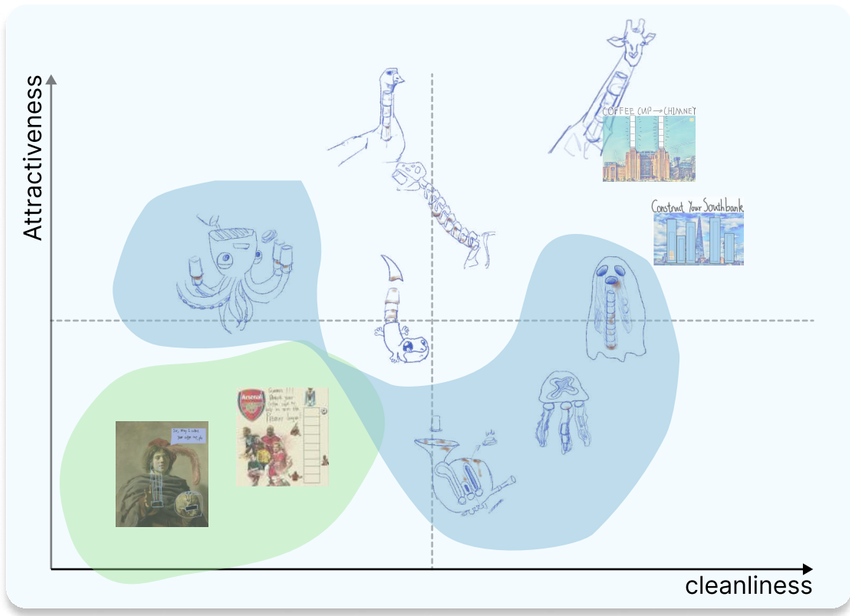
Liquid unit:

As this is not front ended, we didn't ask commuters to choose their favourite in the survey.
Based on the cleaning efficiency and user habits, we chose the following combination.



Visual Appeal

Aesthetic Preference: animals and monuments.
Cleanliness: While people tended to like the bins where the cups were hidden inside (giraffe, ghost), the interior of these designs would be hard to clean. Additionally, other forms of waste would most lightly be thrown in as well.



People prefer vertical and simple design. The bins which required them to separate their waste were generally lower.

No art!
No sports!

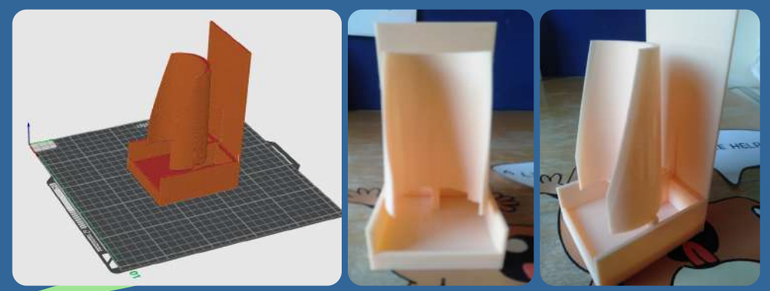
User Testing Preparation

Prototype making process

Concept Ideation



CAD modeling & 3D printing



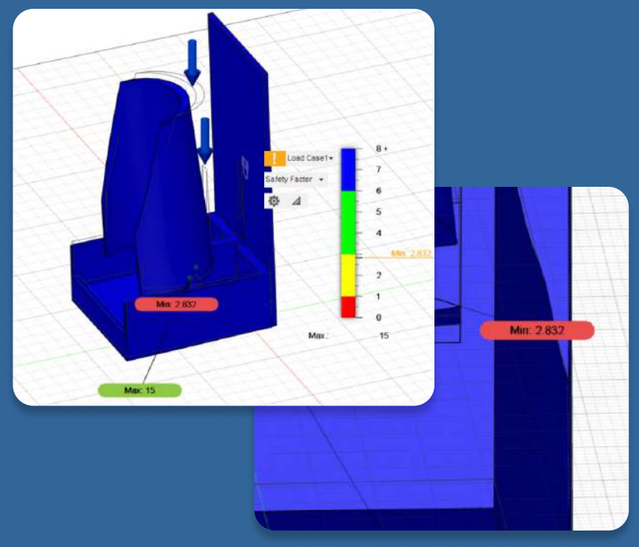
Prototyping



Structural Analysis

Before 3D printing, we conducted a structural analysis on the prototype to determine its weight-bearing capacity.

Considering a potential user miss use up to 10kg, we calculated stress concentrations at the cup holder-base connection. The safety factor was high enough that we felt confident moving forward.



Exploring User Interactions across Locations

Fusion cafe (Dyson Building)



Studio 2 (Dyson Building)



Starbucks (Common Room)





We left a marker with the prototype so that the users could write their suggestions on the board.

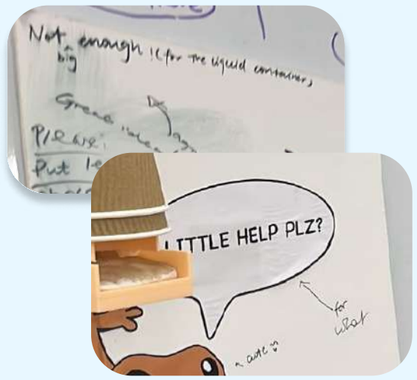
User Testing

Cleanliness

Stains and Leakage

In the initial prototype, we put a napkin on the bottom of the cup holder to absorb the liquid remain from the cups.





- Comments mentioned stains attributed to insufficient capacity, but our observation revealed it was due to the cup holder structure.
- An individuals was confused by the marked words, "A little help plz?".
- Users reacted positively to the image.

Observations



The model design does not create fluid paths for liquid to flow in to the tank. Some of the liquid flowed down the wall.



The cup holder had stains on the top, as a result of:

- Placing the prototype on a tilted whiteboard, causing liquid to directly drip onto the board.
- Users pouring some onto the wall when placing their cup.

Locations

The prototype, located in the Junior Common Room near Starbucks, didn't receive any coffee cups despite the high traffic. However, the display successfully collected numerous coffee cups in the fusion and studio 2 areas.



In the JCR, most users were in a hurry and had trouble stopping in front of the exit. However, in the fusion cafe, it was more noticeable as well as being beside the exit. This allow users to stop and recycle.



This suggests placing the Cupply in a tube station where it is directly in commuters' vision while important, it is also crucial to give them sufficient space. Areas such as at a corners, next to the pillars, and exits sides are well suited for bins.



Cup collection

The prototype collected both paper and plastic cups of various diameters. We had initially thought it was clear the the bin is meant for paper cups.





Repurposing validation

Repurposing process



Collect full stack of cups



Remove the rim of three cups



Detach the base to get the cup ring.



Pass a ring between the other two to make a grip.

Usability







Testing the cup holder showed it's effectiveness and sturdiness while also freeing your hand.

Process Limitations

The design requires the cups to be of similar diameter. This issue is less present with a larger implementation.

As a result of the liquids drying, certain cups were stock together.

To reduce the number of plastic cups being placed, we will replace the speech bubble with "Paper Cups Plz".

Certain cups had a large amount of coffee stains, which would significantly reduce their desirability.



Efficiency

Our findings on the quantity of cups this method enables to be repurposed means that we still need a way of handling the significant amount of scraps.

NATIONAL CUP RECYCLING SCHEME



Cup recycling

As of today, there are 5 large recycling plants in the UK that can recycle these plasticly lined cups. The scrapes and unusable cups will be sent to them to be repurposed.

Second Prototype

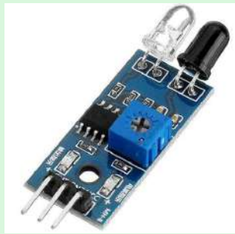
Variability

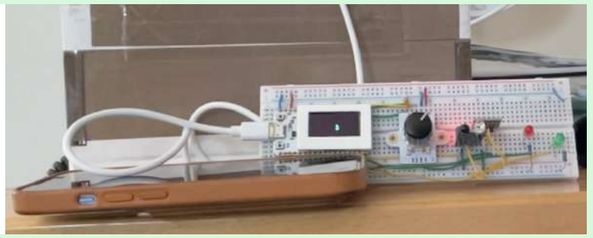
From our testing we found that there are large variations in it's use that are difficult to predict. This means that the possible locations must be accurately and quickly compared to find the best position.

Stratford station activity in 2015

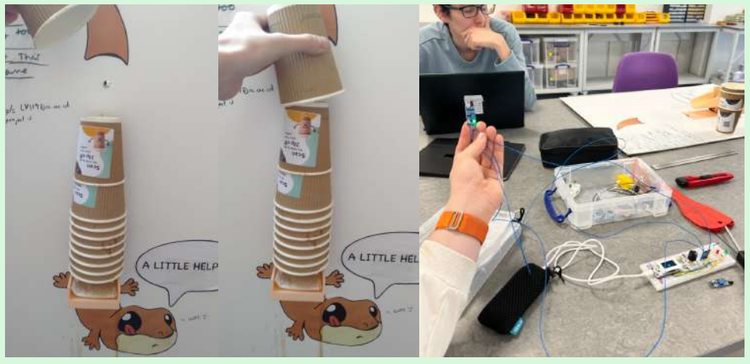


When comparing it's return rate it is important to take into account the large fluctuations in commuter flow during the day.



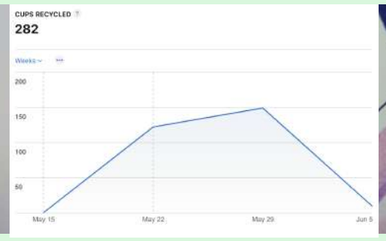


It should also be noted that with the change of time and environment in the optimisation process, the Infrared sensor needs to be recalibrated to match it's conditions.



With this in mind we built a circuit that counts every cup placed in the Cupply.







Metrics + Capacity Indication

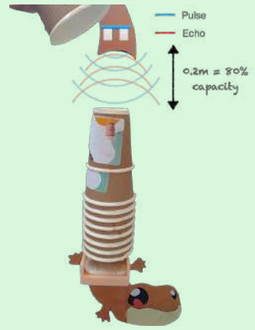
This data is then sent wirelessly to be analysed and evaluated. This should result in a quick localisation of recycling hotspots and what schedule cleaners should have for emptying the bin.

Ultrasonic Development



We found through testing that a proximity sensor would have false negatives.

To improve this an **ultrasonic** sensor could be used to calculate the capacity using the distance between the maximum amount and the actual amount of cups.



Stack Angle



Testing Method

We poured water onto the display at different angles while filming at a high frame rate to better understand the fluids motion.

We used AR measuring tools on our phones to calculate the angle of each test.





Conclusions

We found that the cups acted like a slide that would send the liquids outwards. The container would need to better funnel them to reduce staining of the wall and floor.

Additionally, an increase in stack angle results in a decrease of liquids hitting the wall.

While we initially gave the board an angle to prevent the cups from falling. Our test found that the angle could be steeper while keeping a sufficient stack stability.

Final Concept

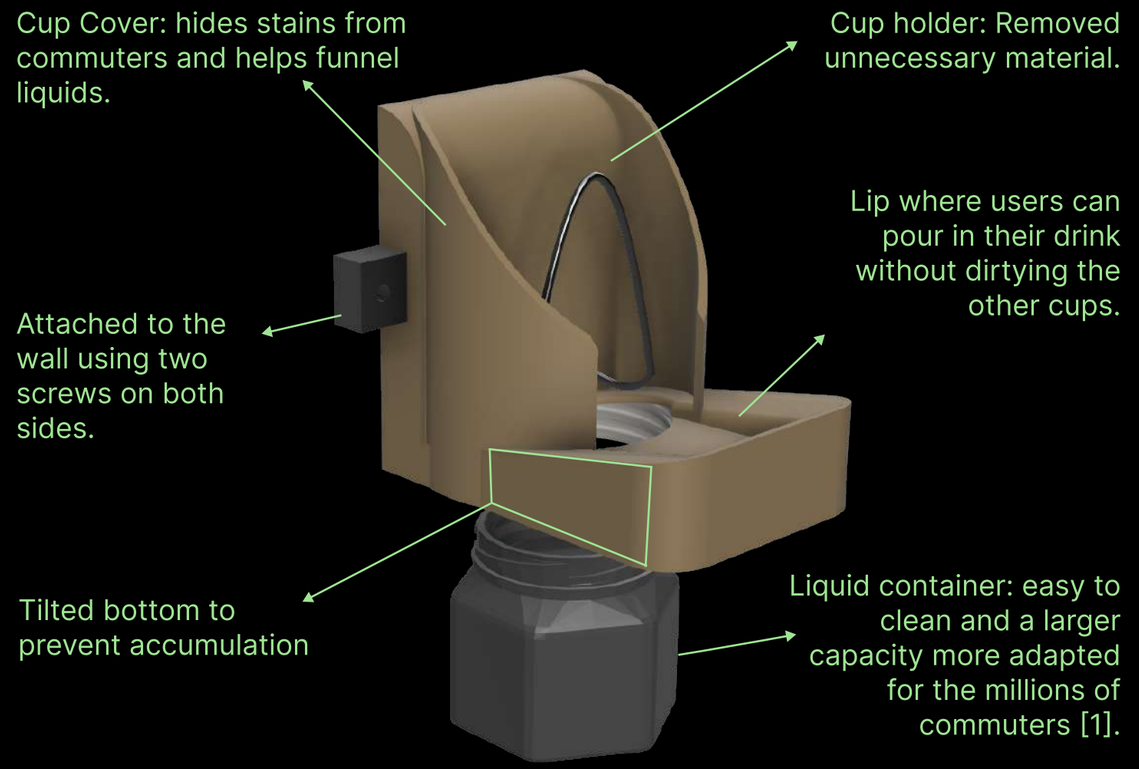
Design Guidelines:

1. Exclusive recycling of paper cups.
2. Our bin sticker feature a sleek, vertical design.
3. A sticker of an animal or iconic monument.
4. Designed to effectively conceal stains and liquids, ensuring a clean appearance.

Use of Sensor:

Cup Sensor

3D Models:





References

Page 1

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Meeting Minutes

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