DEP301 : Collaborative Design Project

Final Report

<Contactless Transactions>

team **avoda.co**

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This report summarizes the work that we have done and the progress that we have made regarding our Collaborative Design Project over the past five weeks (19/10/2020 - 27/11/2020). The main focus was to research and understand the problem that we were going ahead with.

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We would also love to thank Prof. B. K Chakrvarty, Prof. Ajanta Sen, Guruprasad Sir and Mr, Arbind Singh, NASVI for their constant guidance and support.

Week One

Hunting for our Area of Focus:

For the first couple of days, we had a hard time figuring out what we wanted to focus on, since almost everything is expected to come back to normal once the pandemic is over. The whole concept of 'new normal' according to the billion articles out there just involves the introduction of EdTech and Work From Home as an option and maybe the development of new technology. The

social distancing factor has started to die down in majority of places even the number of people infected are still on the rise. Hence we had to look for something that would actually be relevant and useful in a Post-Covid Scenario.

Thought Process

- **Time Table**
  A Time Table was of great importance since we had a fully packed timeline to follow and putting something off would mean that the whole schedule would have to be adjusted. So we made ourselves a time table for the week and tried our best to stick to it.

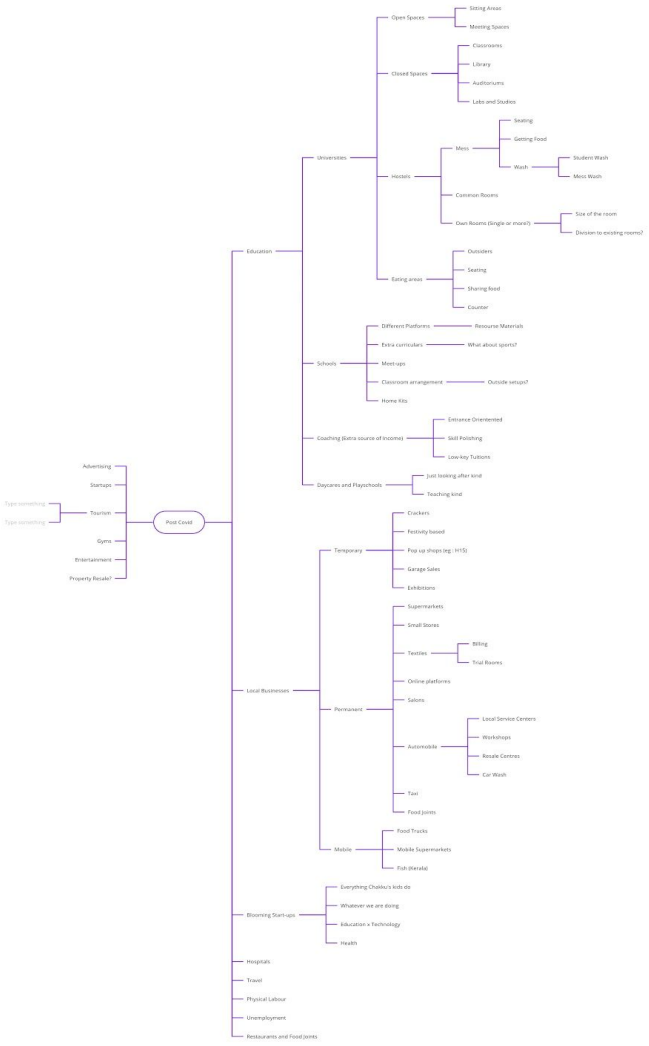
- **Mind Mapping**
  We thoroughly went through all the project descriptions that were shared with us and created mind maps on the five main keywords that we got from them : Post Corona, Safety, Health and WellBeing, Socialising, Play and Learn.

  We made a mistake of leaping before thinking and ignored a couple of keywords that we thought were irrelevant. But in the end we realised that they were actually quite important.

- **Brainstorming**
  From the mind maps that we had made, we imagined each main branch in a Post-Covid Scenario. We realised a while later that unknowingly our focus had slightly shifted to the current situation and we had to repeat our whole thought process again, making sure that we stuck to the ultimate keyword, ‘Post-Covid Scenario’.

- **Favourites!**
  To choose our final area of focus, the three of us decided to pick our top five favourite areas from the mind maps that we had created and decided to brainstorm more on them. We did have a couple of common favourites, which made our process slightly easier.

- **More Brainstorming!**
  We tried to expand our favorites and dig deeper to get an idea of what they would be like, in a Post-Covid Scenario. We gathered a lot of insights, which were slightly contradicting and got us confused.



Favourite Topics

(and how most of them turned out to be irrelevant)

- **Contactless Transactions**

  Key words : Currency, Card, Contact, Counter

  You never know where your currency notes have been before it reaches your hands. You also never know where the hands of the persons handing the money over to you have been, so in short, money is one everyday thing that we deal with, which houses the most number of germs. It stays in the top five of almost all lists published on the most germ infested things in everyday life. A Gol Gappa Seller, who serves food with the same hands that deal with money, gave rise this idea. Especially the world in the current situation is trying to survive a pandemic and even once it's gone, this issue is going to remain.

Although there seemed to be a good scope of this working out as a post covid cause, we weren't quite sure of the context, especially at that stage. We had a hard time understanding how it would work as a business outlet because a lot of people did not particularly consider hygiene an issue (in a non-covid situation). Not to mention we were quite sceptical about the fact that no product like this exists as of now.

- **Small Businesses**

  Key words : Contact, Safety, Loss, Reopen

  A lot of small business owners and workers have lost their jobs and are trying to get a job outside their skill sets these days because the available options that they have these days are quite numbered. A lot of Seasonal Shops, Salons, Food Stalls, Tourism related Stores and Agencies had to shut down or look for other methods to sustain their lives. Online shopping and the fact that the government encourages people to stay at home has caused a lot of loss for these people.

  We realised how this was such a big area to work on and we got quite lost trying to focus and streamline on a certain cause. We could have something that can help in somehow supporting the existing small businesses but it all seemed too vague and none of us actually had a proper idea as to how we could implement it.

- **Daycares and Play Schools**

  Key words : Contact, Safety, Loss, Reopen

  During the pandemic a lot of schools and workplaces got shut and everyone had to work from home. This was especially hard for those working parents with very young children who usually depend on small daycares and play schools to take care of their kids. With the pandemic on and everything shut, they can't just leave their two year old at home alone, nor were they comfortable bringing other people into their home to babysit them. Not to mention going anywhere outside that facilitates those services like daycares, was a no-no.

- **Entertainment**

  Key words : Movie theatres, amusement parks, closed spaces, loss

  The public Entertainment sector faced a huge downfall, thanks to the pandemic. Movie theatres and amusement parks had to completely shut down. They have almost no hopes of reopening anytime soon and even when they do, gaining the trust of the people back is going to be hard and will take time. The sudden popularity of Netflix and streaming websites was just icing on the top. Now they have to think about some innovative tactic to win their kingdom back.

To be honest we didn't actually think a lot on this region, we were quite biased in the beginning itself even though this field had a lot of scope. We were also wondering how the theatre business would go about as even the movie releases seem to be online and in the form of an app (the netflix era).

Initial Problem Statement

Has anyone ever rejected or declined money? Do people really think twice before dealing with it? Currency notes! One of the things that everyone wholeheartedly accepts without the slightest idea of how filthy it can be.
Cash transactions had a huge role in spreading the corona virus and people were ignorant of this important detail.

To confirm that we were heading in the right direction unlike last time, we questioned ourselves to identify the users, their environments, the context etc.

- **Why** *(Why is it being designed?)*
    - A complete shift to digital transactions is still very far from reality in a country like ours.
    - A precautionary measure to prevent a future spread of infection, (not just a second wave of Covid-19, but also other communicable diseases)

- **What** *(What is being designed?)*
    - A solution (maybe a product) for shop owners who manage food, which enables them to have zero contact transactions with their customers to avoid the contamination of food by the possibility of transmission of diseases through money.

- **How** *(What is the process for design?)*
    - Will be discussed as we progress

- **Whom** *(for whom is it being designed?)*
    - Food Stall Owners/workers handling money and food.
    - Snacks and Grocery shop workers

- **Where** *(what is the context/place/media for design?)*
    - Mostly, food stalls and mobile snack trucks.

- **When** *(How long will you take to design?)*

    Whatever extent we can throughout the 4-5 week design studio.

Re-Statement of the Design Problem

Cash Transactions are responsible for disease spreads (not just corona but million more existing diseases) and making physical cash transactions contactless would keep a check on hygiene to a certain extent.

Target Users:

Primary User Group : Shopowners/Workers handling food and money transactions.
Can be expanded to small business owners/workers.
Secondary User Group : Customers.

Market study (secondary research)

We then looked into all the existing products in the market which were remotely related to some of our basic keywords from once we streamlined our focus:

- Cash/ Transactions
- Contactless
- Money storage

Since there isn't a product that exists based on this particular focus we had to go through all of those for some basic inspiration and understanding of how it might exist. The multiple observations and common features are listed below in the miro board.

Research and Analysis

Contextual Inquiry

We conducted interviews with 9 people using a semi-structured contextual inquiry method. Most of the general questions were as follows :

- What is the average price that a person should pay for a meal for himself?
- What kind of customers visit your shop the most?
- How do they usually handle money?
- Which currency not do you get the most?
- Have you ever tried payment methods other than cash?
- Where do you usually keep your money in the shop?
- Has anything ever been stolen
- How has corona impacted you?
- Have you ever had to shut down before, other than due to corona? If yes, why?
- How long have you been in **business**?
- Any new side business that you have been doing recently?
- Have you ever thought of expanding? If yes, how do you want it to be?
- Do you have anyone else to take over/help?
- How do you handle peak hours?

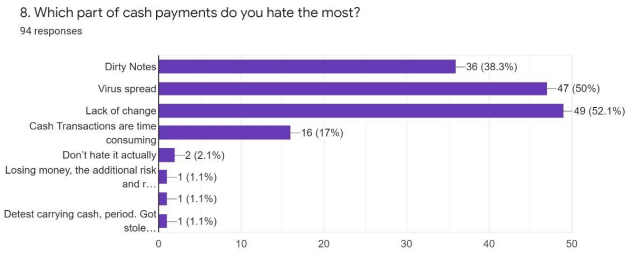
Observations :

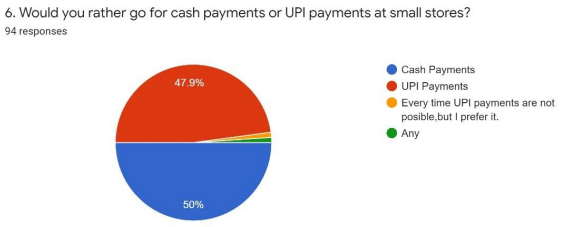
- How often do they wash hands?
- What are their methods of keeping their workspace clean?
- Have they ever used gloves?
- How do they handle their kitchen towels?
- What types of food do they make?
- How do they serve food? (plate (paper or steel), tissue)
- Basic **hygiene**

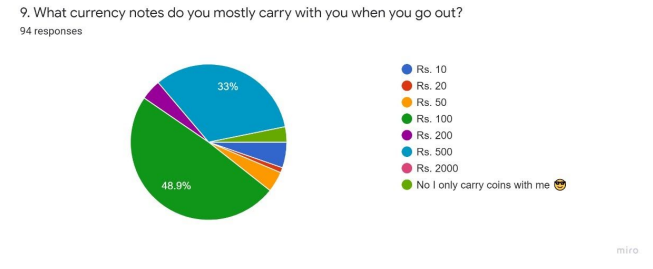
After the contextual inquiry, as a group, we interpreted each at every line of the conversation we had with the interviewees put down on a sheet. We marked our observations and gathered a lot of insights which later led to design ideas during the process.

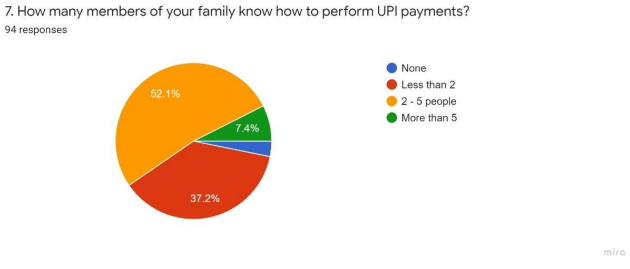
Survey : Google Forms

We conducted a survey through Google Forms which had important customer centric questions relevant to our topic. We got around 100 responses and a few of them were really good insights



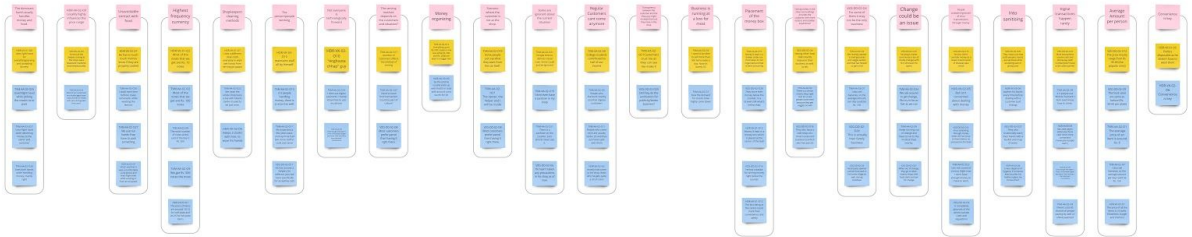


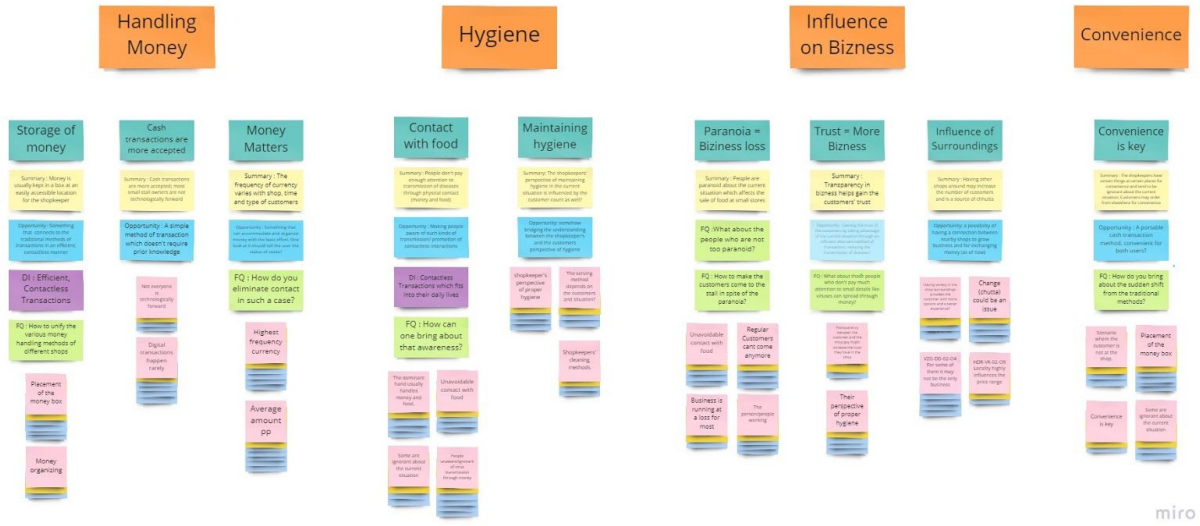




Affinity Mapping

Gathering all our insights from the contextual Inquiry and Forms Survey, we affinity mapped them. We grouped similar insights under a common summary and further grouped the summaries under relevant headings. We further grouped the heading under areas and thought of Opportunities, Design Ideas that we can use later and Questions if any.





Important findings from affinity

- The dominant hand usually handles money and food.
- Most of the street vendors don't have the privileges of digital transaction
- Most are unaware/ignorant of virus transmission through money
- The currency and frequency varies wrt to the shop and the locality.
- Transparency between the customer and the shopkeeper and the overall ambiance increases trust

Stage 3: Design opportunities

These are some areas where we felt like there was an opportunity for a design convention, hence giving us some basic directions:

1. Connection with the traditional methods of transactions in an efficient, contactless manner.
2. Organization of money with the least effort; One look at it should tell the user the status of notes.
3. A portable cash transaction method, convenient for both users.
4. A simple method of transaction which doesn't require prior knowledge.
5. Gains the trust of the customers by taking advantage of the current situation through an efficient alternate method of transaction.

Some social impacts:

1 .Making people aware of such kinds of transmission. (hence an opportunity to create awareness through marketing)

2. Somehow bridging the understanding between the shopkeeper's and the customers perspective of hygiene.

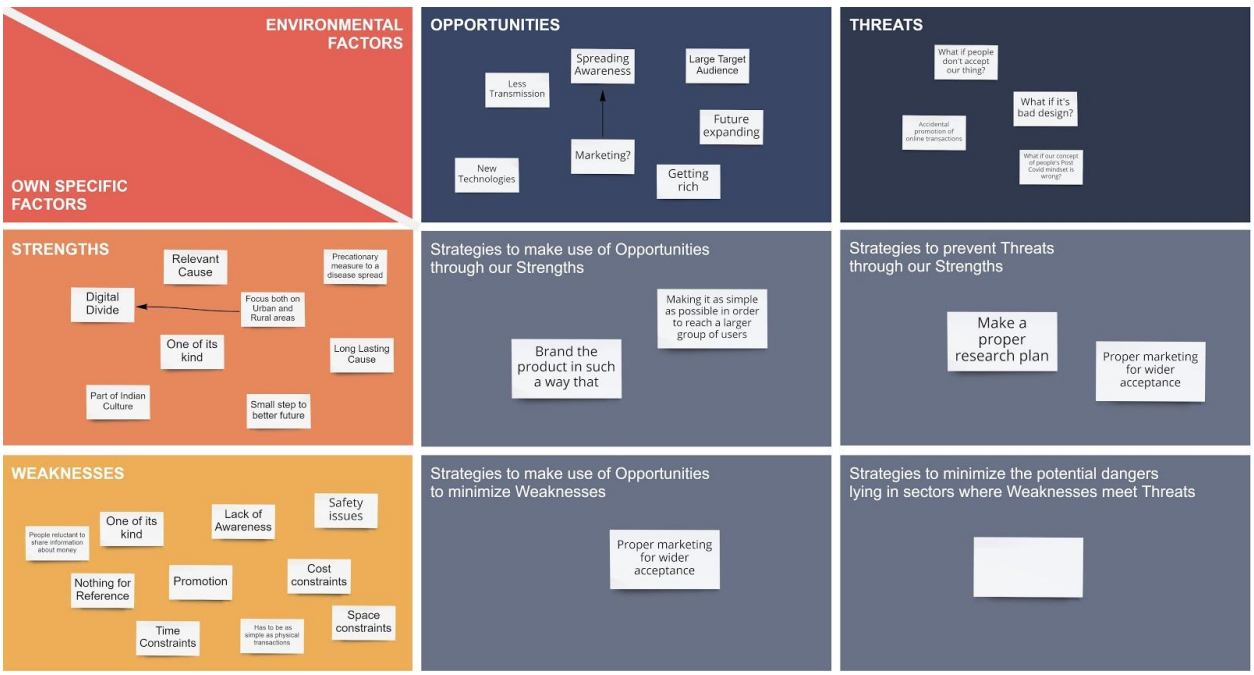
Week Two

Analysis of Our Problem

The feedback we received after our Week One Presentation was affirmative and we decided to go ahead with our problem statement. We started with a further analysis of our problem to make sure that we wouldn't miss any important detail. We conducted a SWOT analysis of our problem before we moved ahead.

SWOT Analysis

By Conducting our SWOT Analysis we identified our strengths, weaknesses, opportunities, and threats. In some cases, we even realized that some of our strengths and opportunities were also part of our weaknesses and threats. Once we were done identifying, we thought of strategies to put our opportunities in action, making use of our, and strategies to overcome our threats, and so on. Once we were done with it, we got a basic understanding of which areas we should focus on to



attain wide acceptance of our product and similarly, which areas could be a reason for failure. Our Analysis Sheet is as follows.

Idea Box

We created an Idea Box after all the analysis and all the keywords that we could think of, regarding our final product were put in there. We mainly divided and color-coded them into four main groups, namely - Physical features, Other features, Values, and Looks. We kept on adding more on the go.

Bonus!

We realised late that Vanshaj's Dad was a cashier and that we could have gotten good cash handling insights from him. But then its never too late!

- There are two cash counting machines - one, black and the other, white, out of which, the white ones detect fake notes.
- Real notes have a green strip shows blue color when tilted against the light
- In normal cases he uses touch as real notes are usually crisp or see through

- Regardless of how old the notes are, you can identify real ones even though they might not be accepted in market
- If the note is wrinkled keeping it between some weight helps or even a little tape in slightly torn note works

Understanding the user

First we'll look into where all does the shop owner comes in contact with money:

a)in the beginning of the day;

b) during all the money/cash transactions;

c) at the end of the day

Understanding the whole process and the issues faced in the current process + when a particular contactless thing is incorporated.The basic point is to avoid the mutual contact with money

Persona

Since we had already conducted eight interviews from three different cities, we kind of had an idea of the characteristics of our personas. We decided to make a Primary Persona and a Secondary Persona, the former being a shopkeeper and the latter a customer. We picked out the details that most interviews had in common and created our Primary Persona.

Primary Persona :

Name : Bittu Chandra
Age : 27
Education : Grade X
User Group : Stall Owner, Cook

Bittu has been selling Vada Pav in the heart of Haridwar for the past five years. He is well known for the food he prepares as he is said to be the most hygienic stall in the area and all classes of people enjoy his food. His stall is part of a food gully where other fast food is also available. He knows basic money calculations and is very quick at what he does. He has no helper and has to manage food preparation and money transactions at the same time. He keeps cash in a box that is either at the center of the deck or in his sling bag. On his deck, he has a bunch of bottles, each having a different chutney, and a small stove that he uses for most of his cooking. The cooked food is kept in trays and served on disposable plates. He also has parking facilities available. His working hours are usually from 07:00 to 09:00 in the morning and 04:00 to 09:00 in the afternoon. The peak hours are usually between 06:00 pm and 07:00 pm. The average amount earned per person is usually Rs. 25. He used to earn around Rs. 600 a day before Covid, but now it has come down to Rs 250 a day. The highest frequency of currency at the end of the day is that of Rs. 100.

Secondary Persona :

Name : Vjay Rane

Age : 54
Profession : govt. Clerk
User Group : Customer

Vijay is a Middle Class Government Clerk who loves paani puri and vada pav. Before the Pandemic he used to visit fast food stalls almost every day on his way back home from work. Sometimes he would even get some packed for his wife and children. But after the lockdown, he is very skeptical of the hygiene at such stores and is very scared of catching the virus. He barely goes out once a week to get groceries and other necessities for the household. He really misses Vada Paav. Even though he is scared of catching viruses from anywhere outside, he is unaware of the fact that viruses can spread through cash. Even though he knows how to use UPI payments, he finds the process too confusing. So he prefers to pay such stalls in cash. He was never really concerned about hygiene factors before the Pandemic, but now he pays attention to detail.

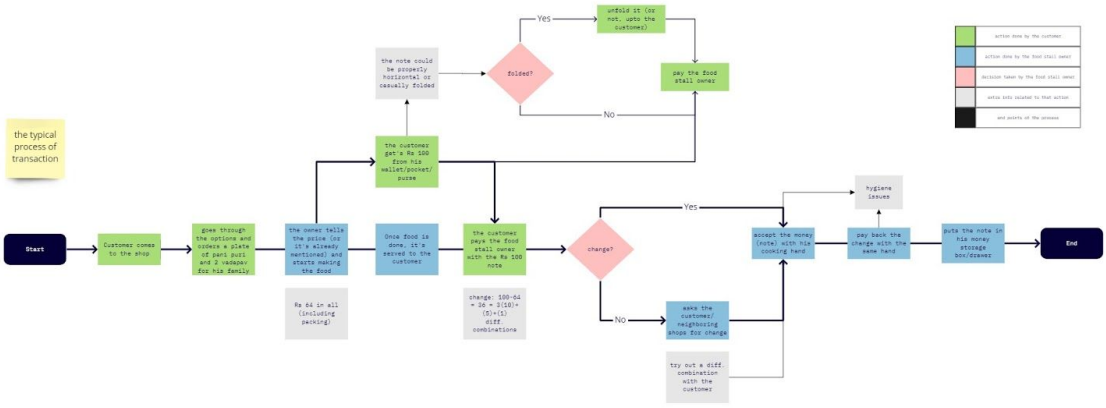
Scenario : Right after the Pandemic

People have almost become used to the whole ‘pandemic situation’. Not everyone pays attention to precautions. Traffic is back to normal and there are no restrictions on crowded places anymore. Rajesh is on his way back home from his office and is planning to stop by a fast food stall after a year of being skeptical about such places. He wants to have Paani Puri at the shop and wants to take Vada Pav home for his wife and children. He visits Vijay’s shop. As usual, Rajesh orders Paani Puri and tells Vijay to pack four Vada Pavs for his family. Vijay packs the Pavs while Rajesh is having his Puri and tells him that the total amount for the food was 64 including the parcel. Rajesh pays

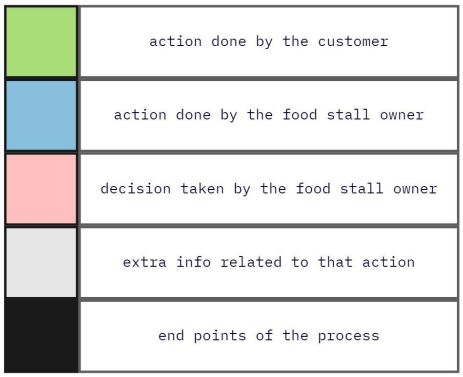
Vijay with a Rs. 100 note from his wallet. Vijay accepts the note and searches for change with his right hand. He finds Rs. 36 in notes and coins and returns them to Rajesh. Rajesh thanks Vijay and walks back home.

Workflow diagram

Assuming it's the typical process (is it post corona, our ideal situation)



okay so now that the process is determined, we look at the areas where our product/idea could be influenced (which is mostly the main cash transaction area):



How the customer handles and hands the money to the stall owner (the way he holds the notes; condition of the notes (folded, straight); how he pays with coins)

how money is stored with the owner (and how can it be further implemented, if necessary) (the owner coming in contact with money)

how can we incorporate a new product in the actual transaction to make it completely contactless (along with old and new issues catering to that)

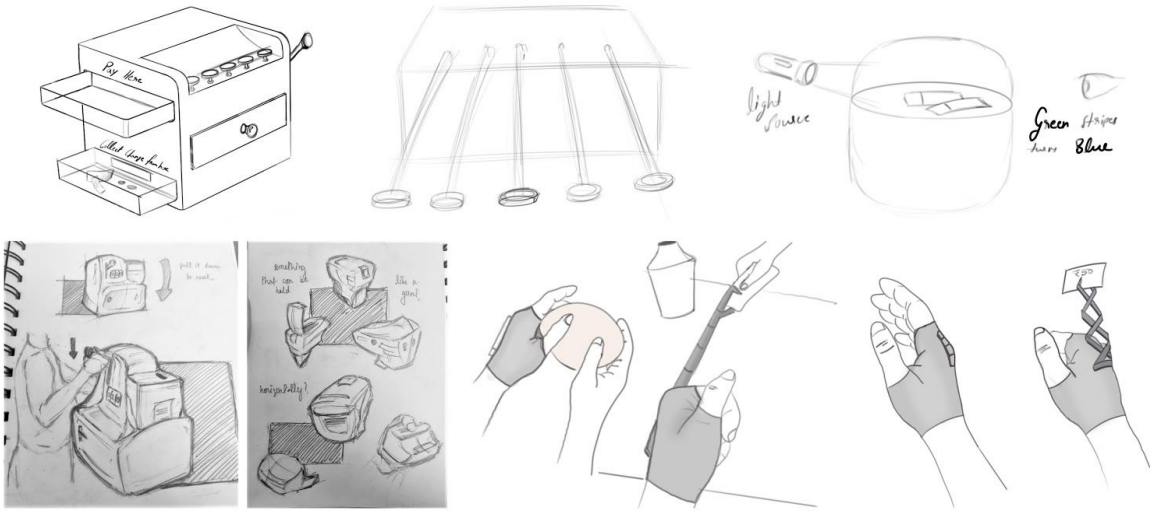
Design Goals

As this is going to be a completely new product, so as of now we didn't go overboard with too many design goals. Instead we went with very basic needs that will be very critical for this contactless transaction to happen.

- Quick, easy **money sorting, transaction** - Sorting of money and transaction should be a quick and easy process so it does not hinder cooking.
- **Confirmation** before returning chutta - There should be some sort of confirmation before the shopkeeper returns chutta to the customer. For example in case of a mechanical box with multiple buttons for different notes and coins there are chances of accidentally pressing a button more than required while returning the chutta. So in order to assure the exact amount, that money should go in a transparent chamber where the shopkeeper can look and confirm before sending it forward.
- **Fake money** detection/confirmation - we figured out that this contactless transaction can also give rise to fake money usage. so the product should let the user use the visuals to confirm the real money.
- Considering the condition of the notes - the notes can be super old and wrinkled, they can also be slightly torn and can have some tape hiding that torn. And what we have noticed is, there is a certain level of acceptance for such notes and the public in general usually rejects very old and slightly torned notes.

Ideation

Before this ideation process we looked over the internet and found some very interesting methods and mechanisms of coins sorting in cash dispensers.



In our ideation process we created a few basic ideas of our non-existing product, which included a money box that has two different chambers for accepting and returning money and also specific buttons for different values of notes and coins. We also thought of a few portable ideas like a retractable Glove that can grab money on your behalf, but it also came with many flaws like no proper retractable mechanism, and also lack of control. We also thought of reflecting light through notes so that you will be able to see the green metal strip of notes change to colour blue, but this also came with flaws like that metal strip being present only on one side of the note. Then we also thought of having a glowing base on the money chamber so that we will be able to use see-through money confirmation technique and this will also help us detect a few torn cracks if present.

Additional Research

Before rushing into the Ideation Process, we thought of conducting a little extra research on existing mechanisms. We looked at a wide range of mechanisms; from automated high-end machines to DIY crafts.

- We discovered denomination sorting machines which cost around Rs. 2lakhs. This gave us a little inspiration on the segregation of notes in our product.
- Cash counting machines gave us the idea of a feedback mechanism which keeps the users well aware of the transactions.
- Money guns were something we laughed off in the beginning, but later we realised that the note releasing mechanism could be manualized and incorporated into our product.

- We discovered a wide range of DIY crafts out of which, the most important one was a coin sorting technique based on the diameter of the coins. **But then we realised that in India, different generations of the same coin have different diameters.**

    - We also came across a coin counting technique which quickly counts money using a small DC motor.
    - Number gears were used in a few cases for counting. All the mechanisms were very simple and regular everyday items were used to create them.

Week Three

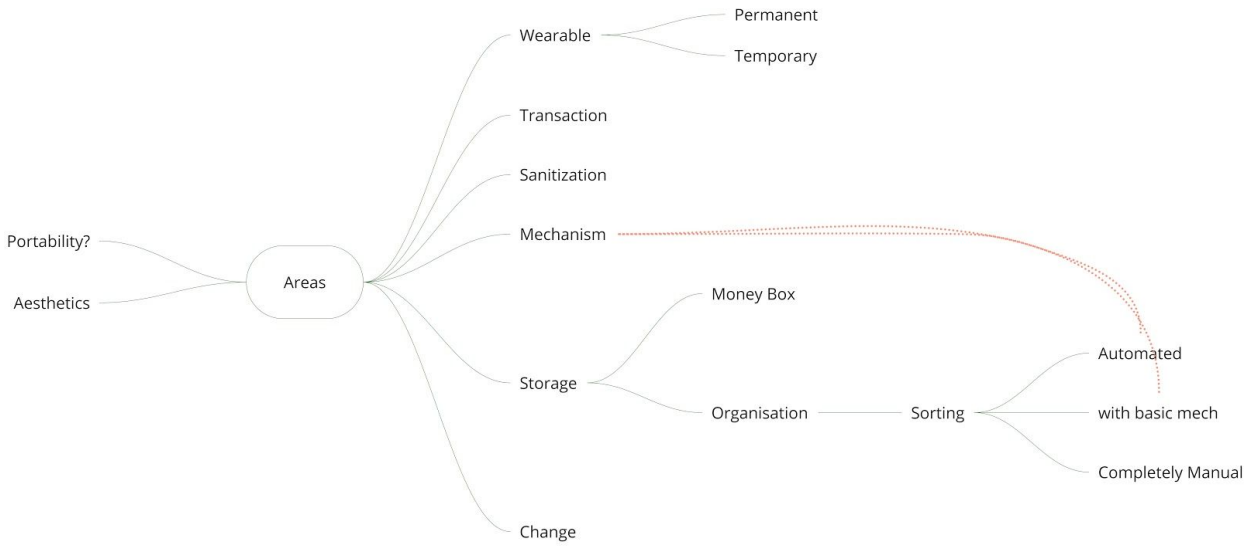
Before further Ideation

Taking the feedback from our last presentation into consideration, we decided to look more into the working mechanisms of already existing products before focusing on outward appearances and other features.

We decided to make a plan for the week and stick to it. Our plan is as follows :

- Make a Mindmap of the broadest possible areas for Ideation
- Pick branches for the group to work on, individually
- Ideate on a particular Area
- Cluster Ideas depending on the context.
- Create Concepts using the Clusters.

New Mind Map



This Mind Map summarises the areas that we could work on regarding our topic. The right side deals with the type of product and the issue to deal with while the left side deals with a few features that would be great if the product was equipped with.

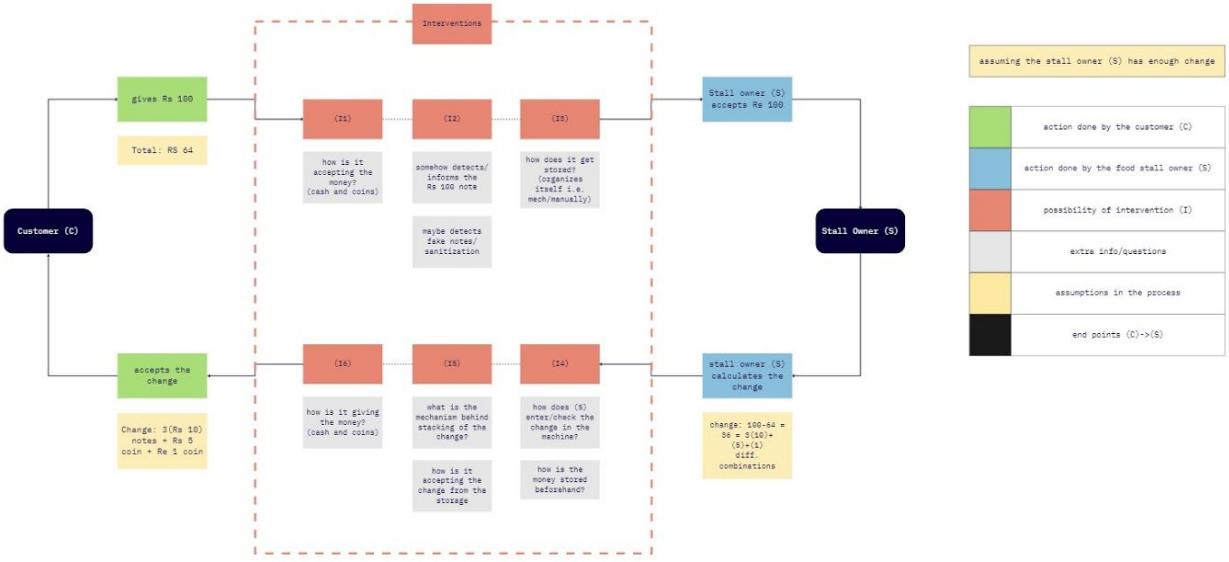
Inspiration Board

The official definition of the term "**cash register**" is "a business machine that usually has a money **drawer**, indicates the amount of each sale, and records the amount of money received." A **cash register** logs transactions that occur in your store, creating a record of the money coming in and going out. Jul 6, 2020

Areas and Related Ideas

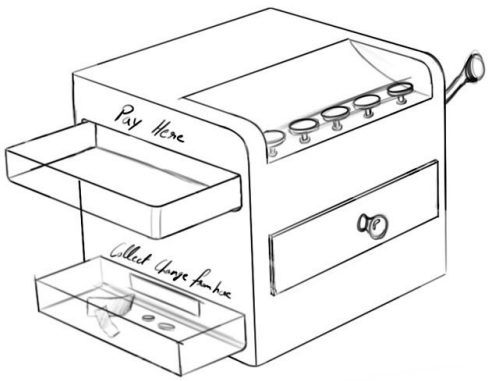
1. Money Box

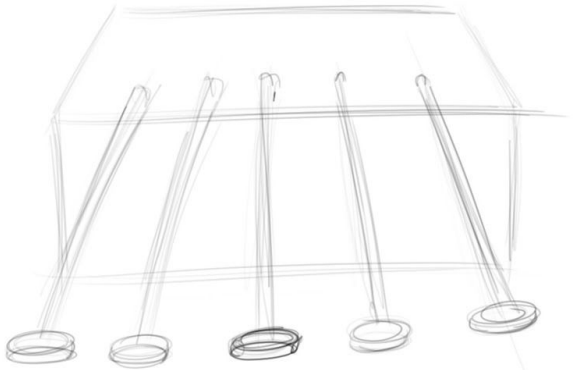
We came up with multiple ideas for Money Boxes. We were initially just looking at a fully manual system, but now we realized that even semi-operated ones would work as almost all shops have access to electricity. And even if they don't we are thinking of having a manual-operated or battery run, version of the same if we get to proceed in this direction.



We decided to create a basic flowchart to understand the interaction between the customer (C) and the stall owner (S) with the money box incorporated. We realised that we would have at least 6 more interventions i.e. six more issues that we would need to focus on while incorporating a money box.

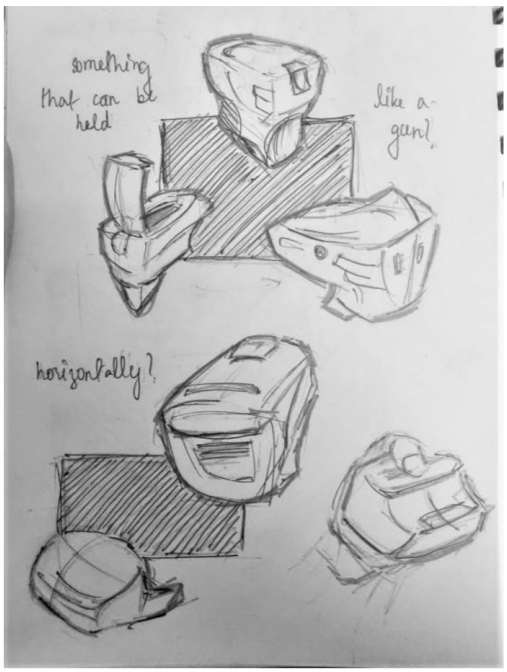
Idea 1 : Buttons and Levers





This money box idea has two different compartments, one for money acceptance and one for change return. There are different buttons for different values of notes and the stall owner presses those buttons accordingly to give the exact change amount. After he's done pressing those buttons, he can pull the lever to confirm change in return.

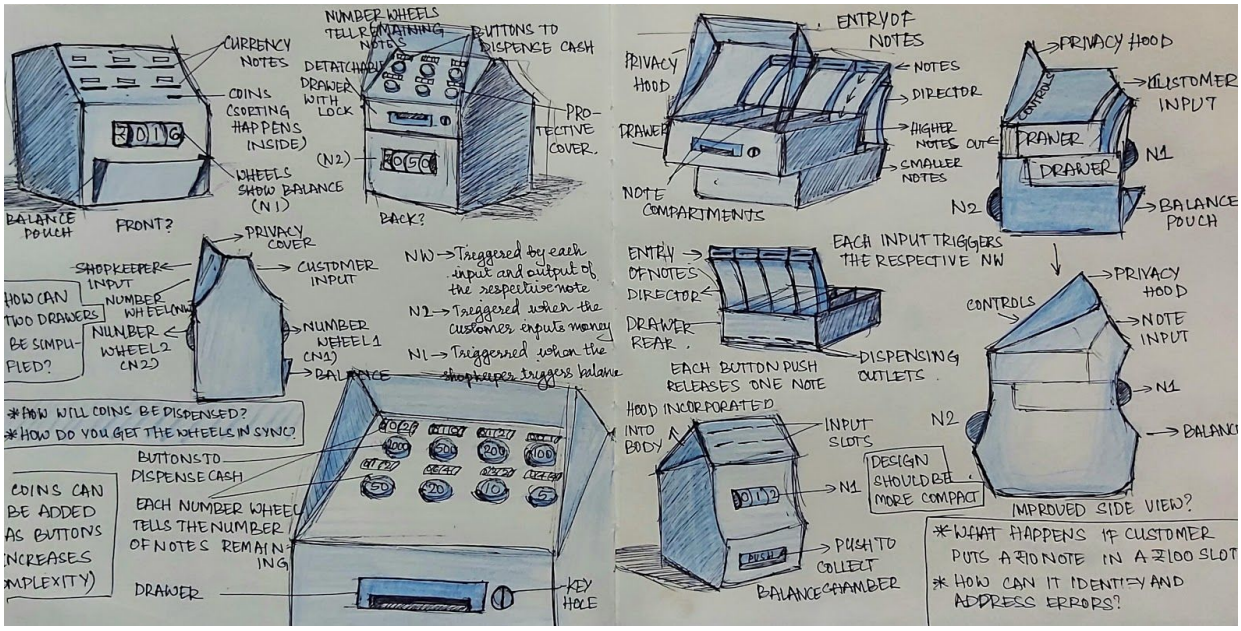
Idea 2 : Lever box



This is one of our initial ideas where we were looking into basic mechanisms on how the stall owner would interact with the money box. This one looked into how tactile the interaction would be, hence we went with a lever mech, and the old fashioned number display. It has a box on one side that accepts money and on the side it counts and accepts money. We were actually at a stage where the mechanism was mostly a haze so we looked into outer aesthetics based on how it would work.

The other idea mostly revolved around havimething small and portable that does the job of accepting and giving back the money. The form is actually inspired by that of a money gun (which is actually a fun toy) but does the job of being contactless.

Idea 3 : Number Gears



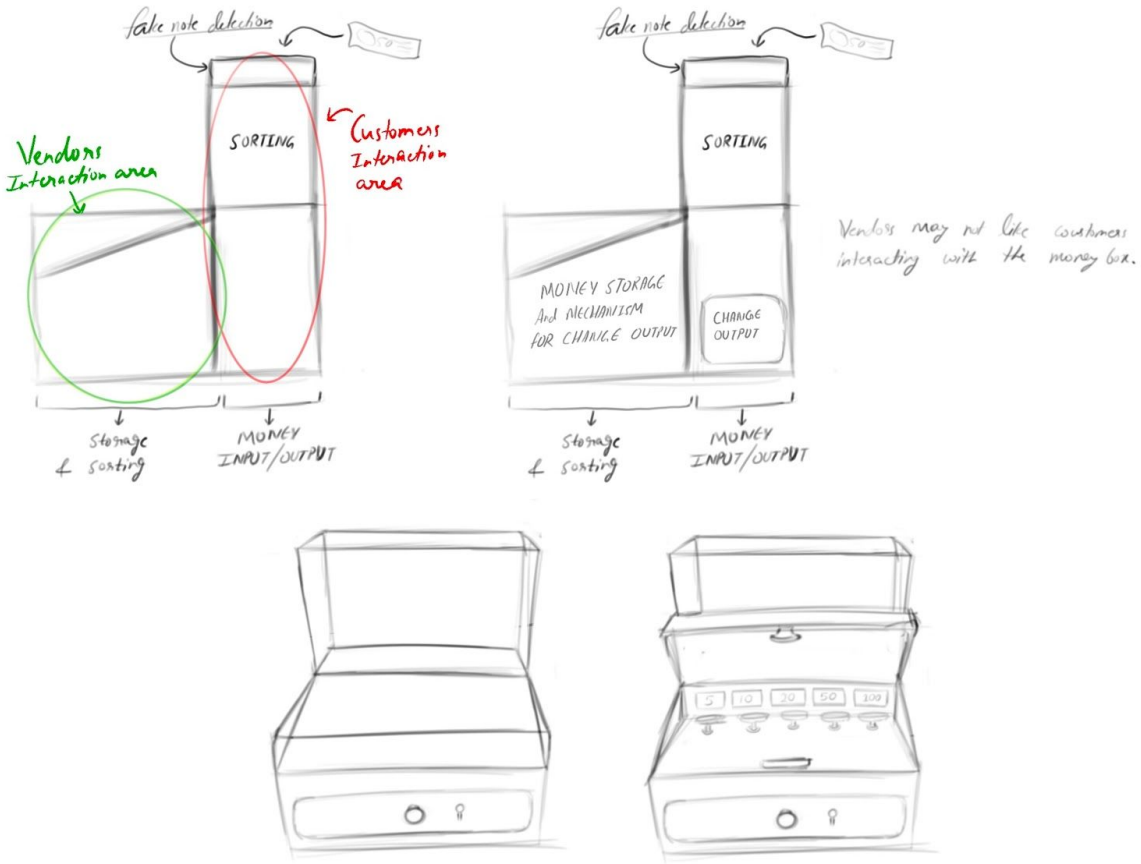
This is very similar to Idea 1. This one is also a Money Box of sorts but works with the help of Number Gears and Buttons. The Shopkeeper's side and the Customer's side have different interfaces. Each currency has a different slot and the customer has to input money accordingly. The shopkeeper's side has number wheels for each denomination keeping him aware of the number of each denomination left at any given time. For every input the number wheel of the respective denomination is triggered, increasing it by one, and for every balance output from the shopkeeper's side will trigger the number wheel of that

denomination to reduce by one. Whenever money is input, it falls into the respective compartments of the detachable drawers inside the box. The Number Wheel (N2 in the diagram) tells the shopkeeper the amount input by the customer and the Number Wheel (N1) in the diagram) tells the customer the balance amount returned by the shopkeeper through the balance pocket.

Additional features : Privacy hood for the shopkeeper
Drawbacks :

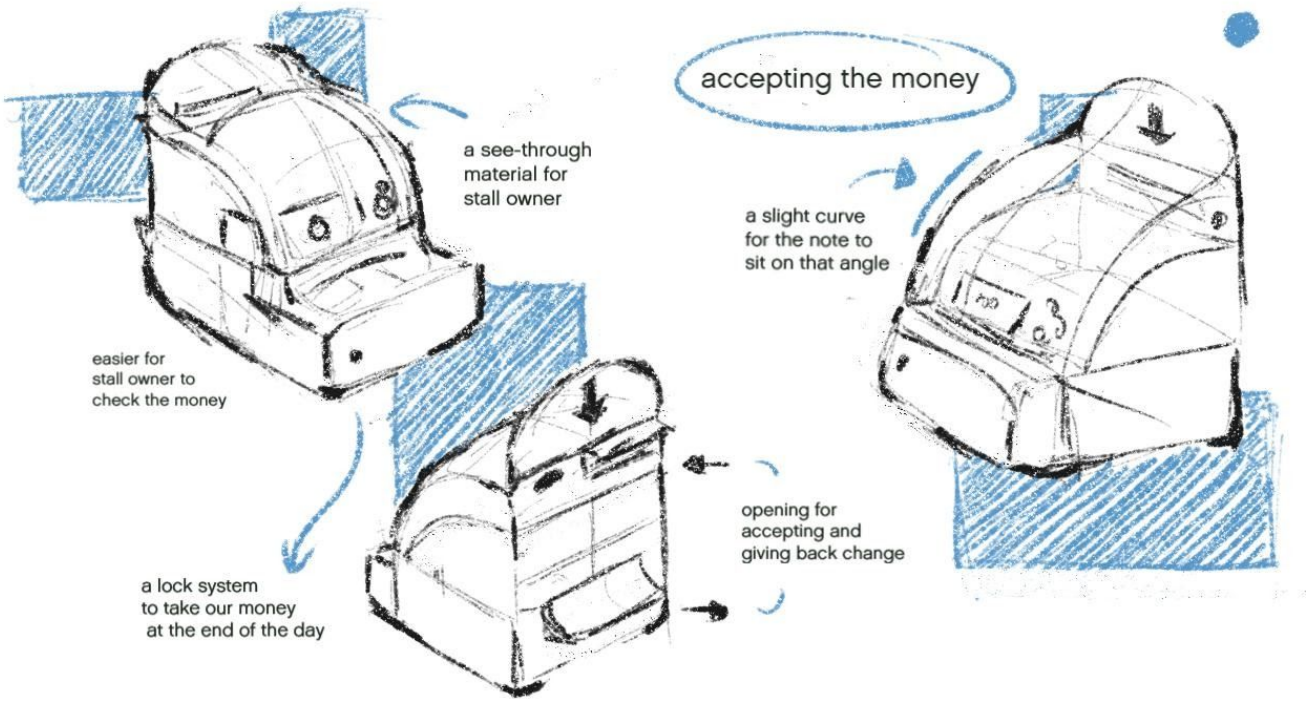
- Coin Sorting will make the experience more complicated. Has not been added as of now.
- Possibility of the customer putting in a wrong/fake note in a slot by accident or on purpose.

Idea 4 : Dividing Interactions?



This idea arises with the issue that the shopkeeper might not be comfortable with customers touching his money box. So we divided this money box into different sections. Venders interaction area and customers interaction area. In the customer's interaction area we added a fake note identifier, money sorting mechanism and change output compartment. On the vendor side, there is money storage and a mechanism for the change output. The whole concept was to make the vendor feel secure of his money box. Even though both customers and vendors are connected, the form should make it feel separated and secure and should be convenient for both sides.

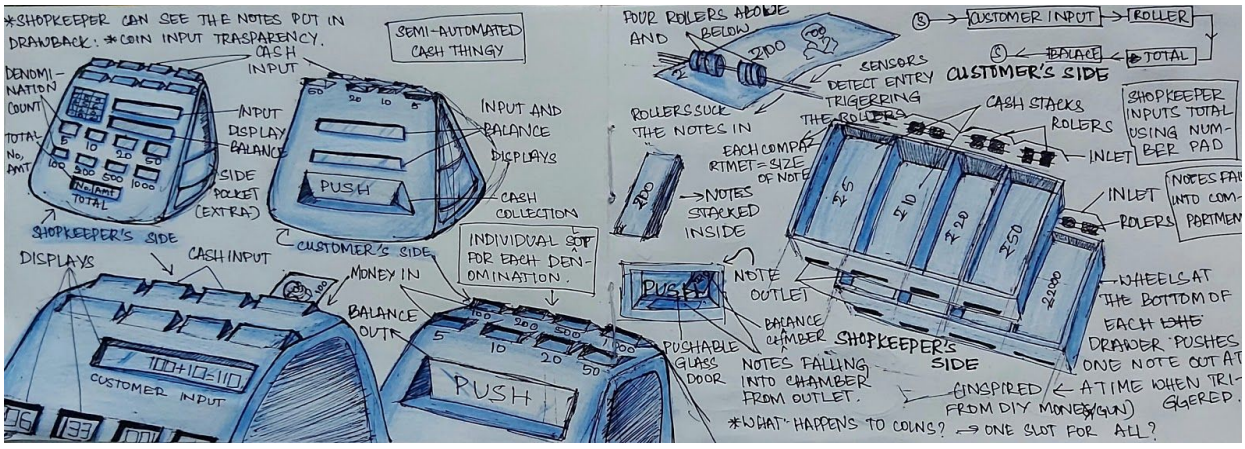
Idea 5 : Curvy slope



This idea is mostly based on the first half of the flow interaction diagram between the customer and the stall owner, which mostly deals with accepting the money. It has two basic openings on the front side, one is for accepting the money (and coins), and the bottom part so the customer can collect the money at the end of the transaction.
Once the customer places his money through the slip it kind of slips down just so it sits in that level so the stall owner on the other side can have a good look at the money before making it enter his money box. This can be achieved with the dome ish curve which makes sure the note and coins reside in that angle.

While this part doesn't involve any sort of mechanism (yet) as it is just the first half, if we were to think realistically it would be hard to install this in a place with such space restrictions, not to mention the maintenance cost for something this simple. Again, it did not seem very realistic, the stall owner might as well ask the customer to show the money.

Idea 6 : Idea 3 extension



This, again, is very similar to Idea 3, but without Number Wheels. This one is semi-automated and requires power to run. The money input will be pulled in instantly with the help of rollers linked with sensors just like in a printer or a vending machine. The money output is triggered after the shopkeeper types in the total amount and the customer inputs a note in the respective slot. The balance amount falls into the output chamber right below the input area on the customer's side from where it can be collected by the customer. In this case, the shopkeeper can see what the customer is inserting, where. So it is safer than Idea 3.
Drawbacks :

- Coin Input

- Transparency, if coin input is a feature

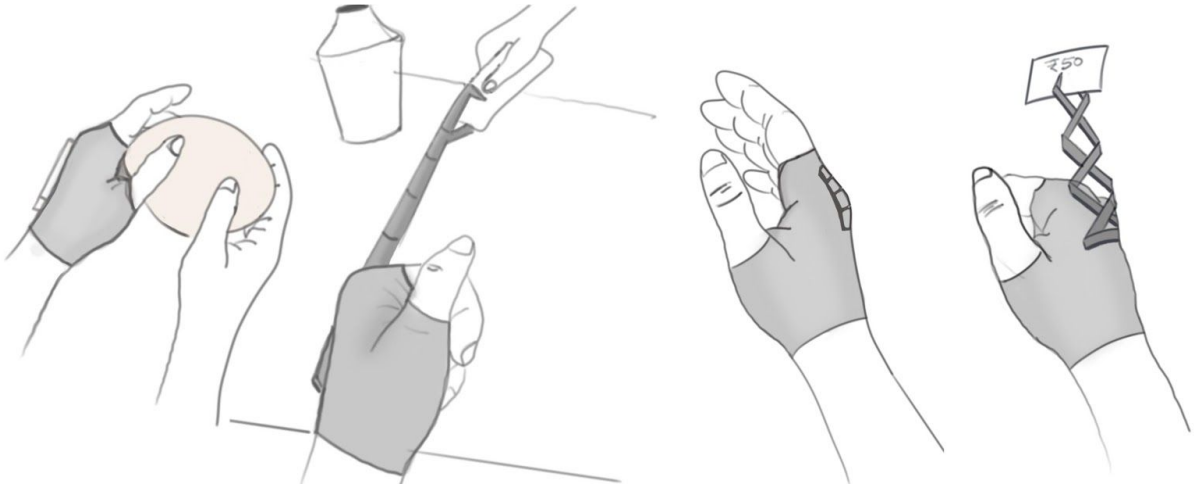
Idea 6 : Fake note identification

After our interview with the cashier, we got insights on what technique he uses to recognise fake money. He told us that the metal strip on the note changes its colour from green to blue when seen at particular lighting. Also how light can show some of the hidden visuals of the note. He even gave us some insights on how just touch can be enough to recognise money, but the sense of touch is useless in our case as we are going for a contactless transaction.
For this idea, we added a light that has a flexible movement so that the vendor can optimise its angle for his eyes height.
Another idea was to have a glowy base that will allow the vendor to see those hidden visuals as well as some tears if present.

2. Wearable

We put some thought into figuring out a mechanism that would eliminate contact between the shopkeeper's hands and money rather than changing the whole transaction system itself.

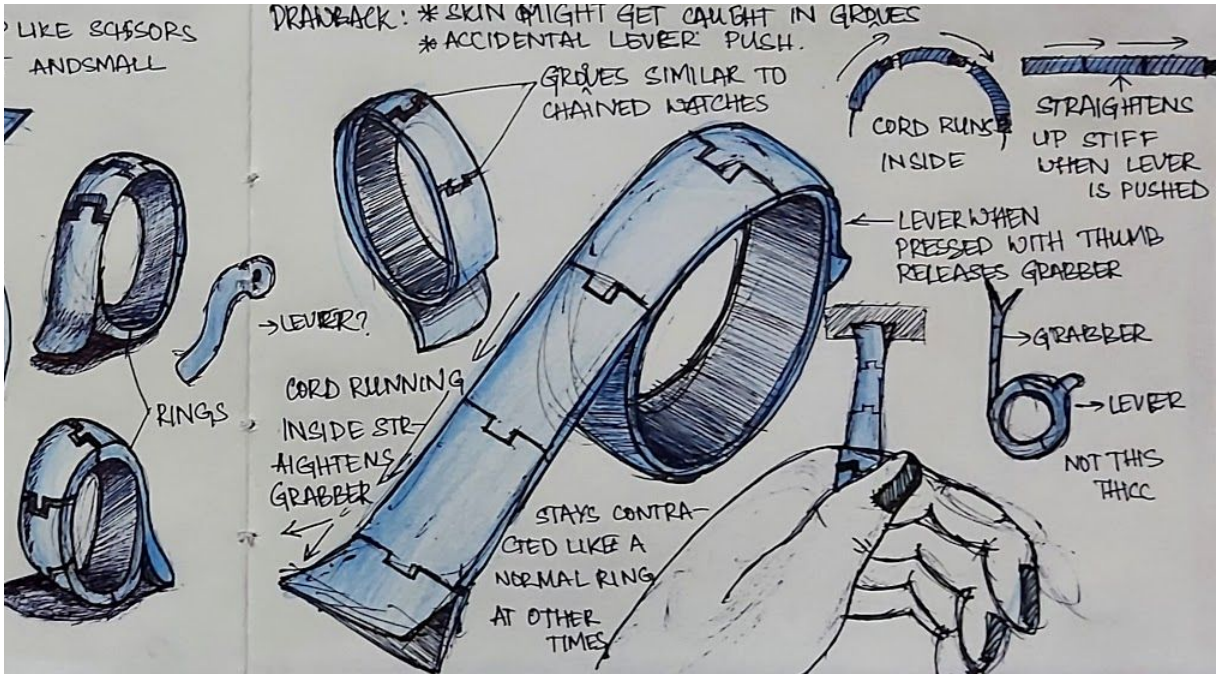
Idea 1 : Palm Gloves with Retractable Grabber



A hand grabber gave rise to this idea. This is a glove that is equipped with a retractable grabber, which when triggered by pressing the inside of your pal (glove), unleashes a small grabber of sorts that can be used to accept and return the money. This can be worn throughout and not for transactions alone. Magnets can be added at tips for easy picking up of coins. The claws and the mechanism haven't been worked on yet.

Advantage : Fingers are free, unlike normal Gloves.
Drawback : The glove will hinder certain activities like rolling dough into balls.

Idea 2 : Rings aren't just accessories

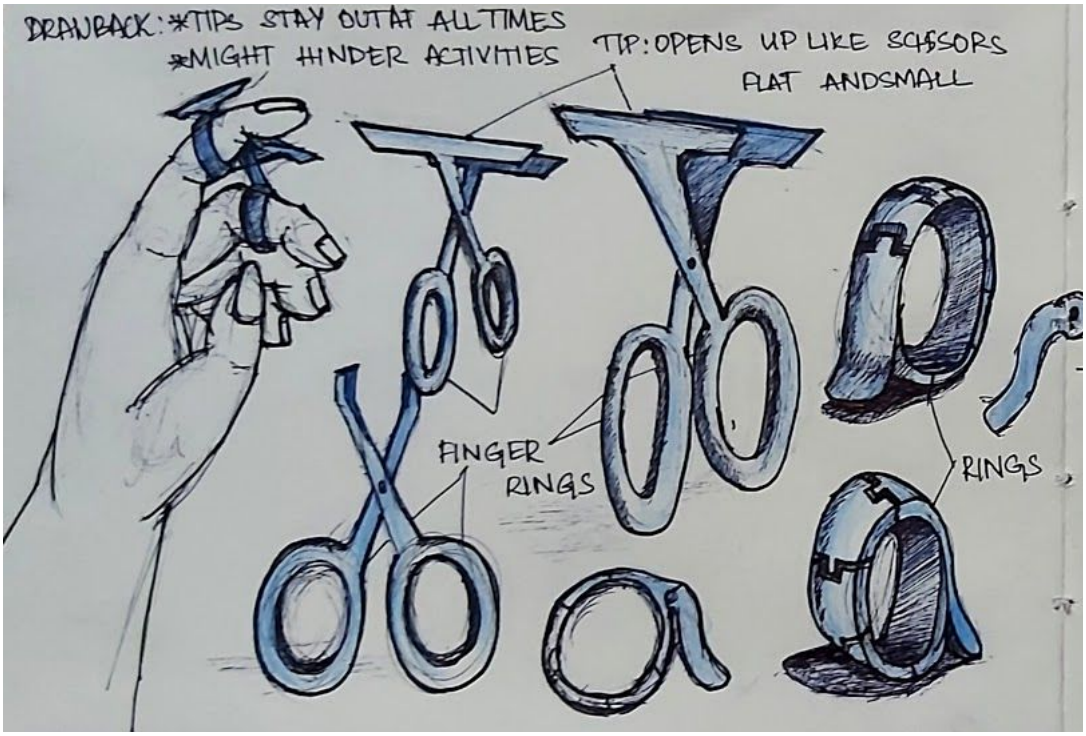


This uses the same principle as that of Idea 1 of wearables but is slightly better and more practical. This is just a small ring with a lever that is to be worn on the index finger and the lever is to be pushed by the thumb during the transaction process. Segments are laid down on the ring, with a cord passing through them. The lever when pushed, tightens the cord, stretching the segments out into a stiff straight grabber. This can be worn throughout and not for transactions alone. Magnets can be added at tips for easy picking up of coins. The grabbing mechanism is yet to be worked on.

Drawbacks :

- The skin might get caught in between the segments.
- The lever might accidentally get pushed triggering the grabber

Idea 3 : Baby Scissors

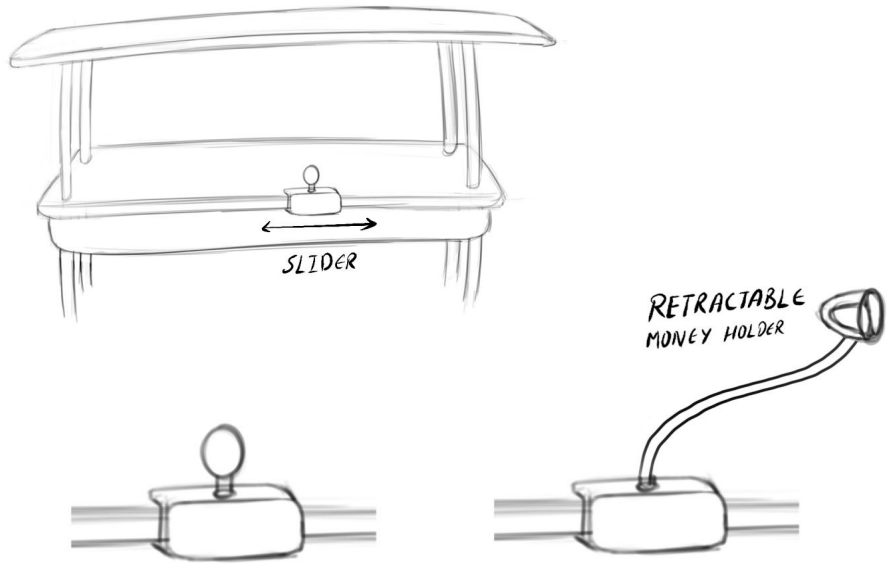


This is another wearable that can be worn throughout the day. We realized that the index finger and the middle finger only have restricted motion. The heads of the scissors thing fit on the index finger and the middle finger but goes only halfway through. This does not further restrict the motion of those fingers and other activities can also be carried out. One arm can be made extendable for extra freedom of movement. At the time of the transaction, the user can just reach out and carry it out like a normal transaction but using these instead of using hands. Magnets can be added at tips for easy picking up of coins. The structure of the claws hasn't been worked out yet.

Drawbacks :

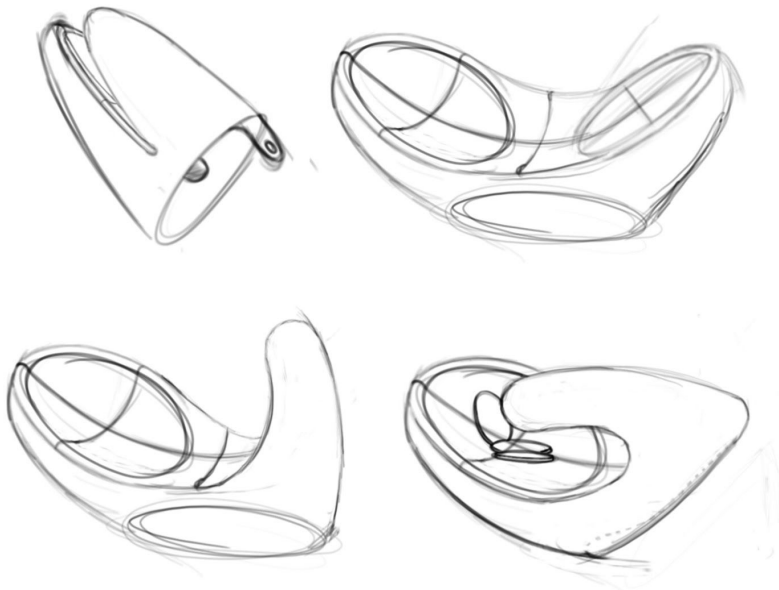
- The user won't feel comfortable unless the rings are carefully designed
- The arms stick out which could hurt someone

Idea 4 : Attachable coil



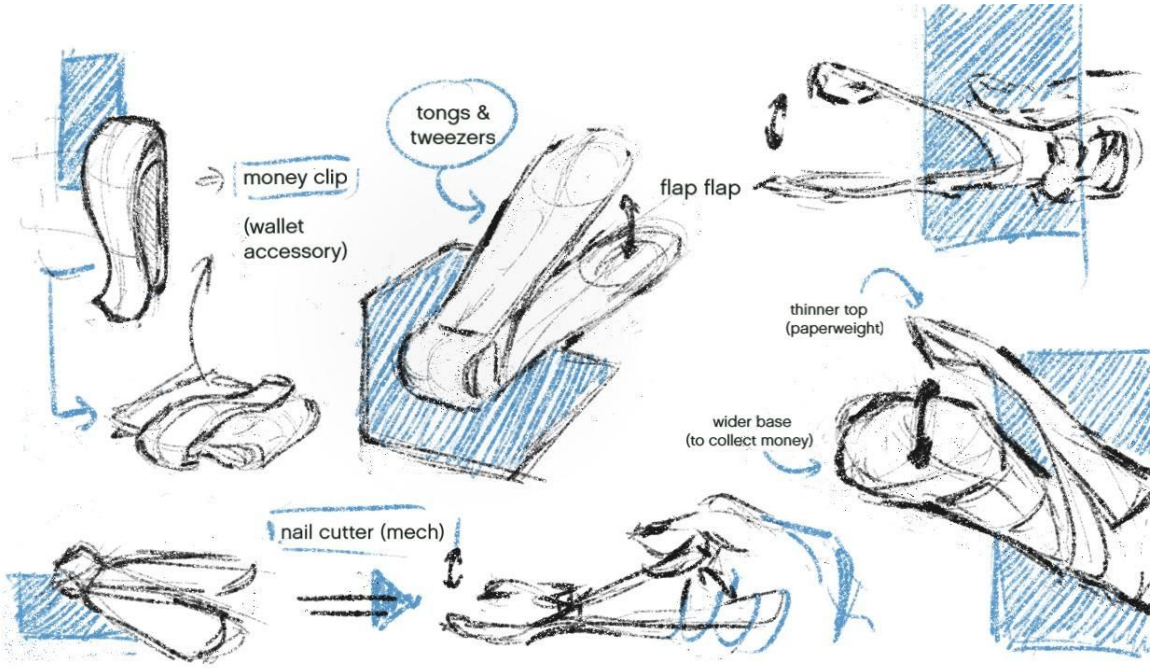
This idea has a slider that can be attached to any cart so that the vendor can use it on any side of the customers. It has a retractable money holder that is meant to be used only while doing money transactions so after each usage it comes back to its own location. The plus point about this idea is that the money holder comes back to its own location after each use. And a minus point can be as it is a completely separate product, the vendor might forget or will not want to use this.

Idea 5: removable glove



This idea came from a very basic glove but more optimised for money holding/counting. The whole idea was to have something that can be easily removable so it does not hinder the real cooking process. A few down points were that food gravy or moisture might easily get inside and may create some hygiene issues.

Idea 6: Tongs



This idea has a similar mechanism as that of tongs and tweezers. Although the main inspiration came from the money clip, which is actually a wallet accessory (so simple yet has a huge part for making it easier for people to keep money in wallets. With that we were also looking into other simple mechanisms, like a nail cutter, which essentially does the job of holding and picking up money. With the final design, we have a top which is narrow and acts as a paperweight while the bottom is wide and caved inwards to collect the money.

While this does the job of a simple mechanism and does not take up too much space, some would argue that it looked more like a kitchen utensil rather than a cash accepting object. Hence the visual cues which makes it relate to money is missing.

3. **Sanitization**

   "If something is not clean, we clean it rather than avoiding contact with it", said Vanshaj out of the blue and that's when it hit us.

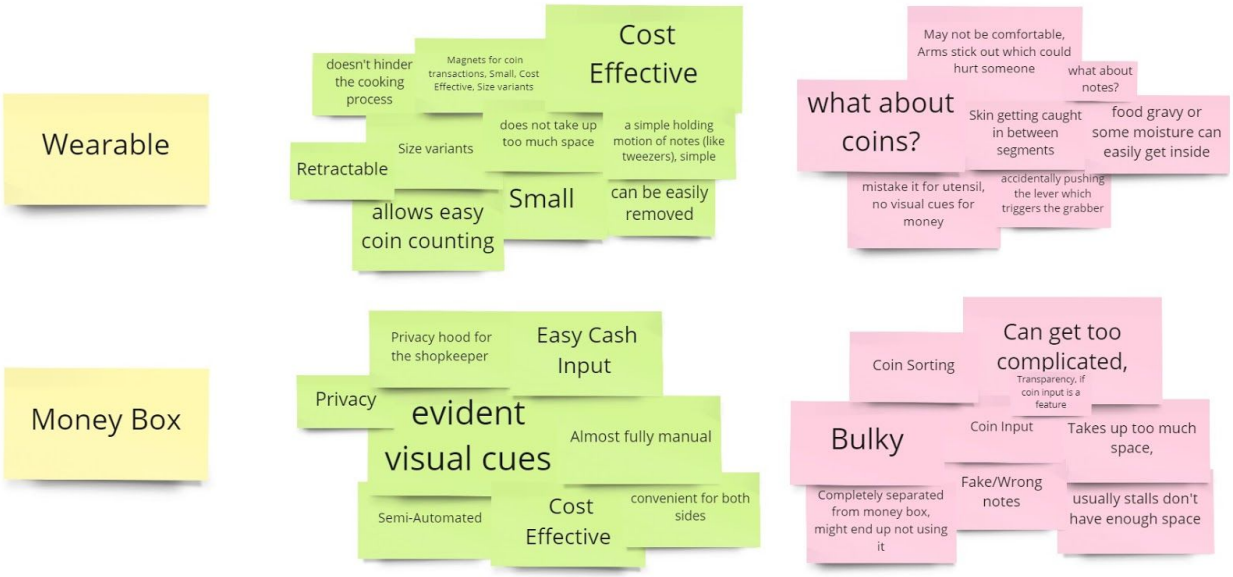
   Money is something that is under constant circulation throughout the country; in fact, all across the world. It just suddenly made so much sense to sanitize money in the easiest, cheapest, and fastest manner possible.

Role Play

We did a role play where we pretended to be the user, customer and product in multiple scenarios and we realized that

- People would only use this alternative if it is as **simple** as hand transactions.
- People adapt to new methods only if it makes their life **easier** or it brings them **profit**.
- Something that's **connected** with the money box rather than something entirely different might increase the probability of usage.

Comparison



The major advantages of the wearables were

- their size and the fact that
- they could fit in anyone's budget.
- They could also come in various sizes.

The downside was that

- people may not find them comfortable unless carefully designed.
- Food and other particles may get stuck in it causing hygiene issues.

The major advantage of the money boxes was

- the easy cash input feature and
- the fact that they could be cost-effective.

The downsides heavily complemented the advantages.

- The working could get too complicated and people might end up not using them.
- Fake note detection and the bulkiness would also add to the downsides.

Week Four

We did some very basic ideation of what we understood of sanitization, which led us to next step,

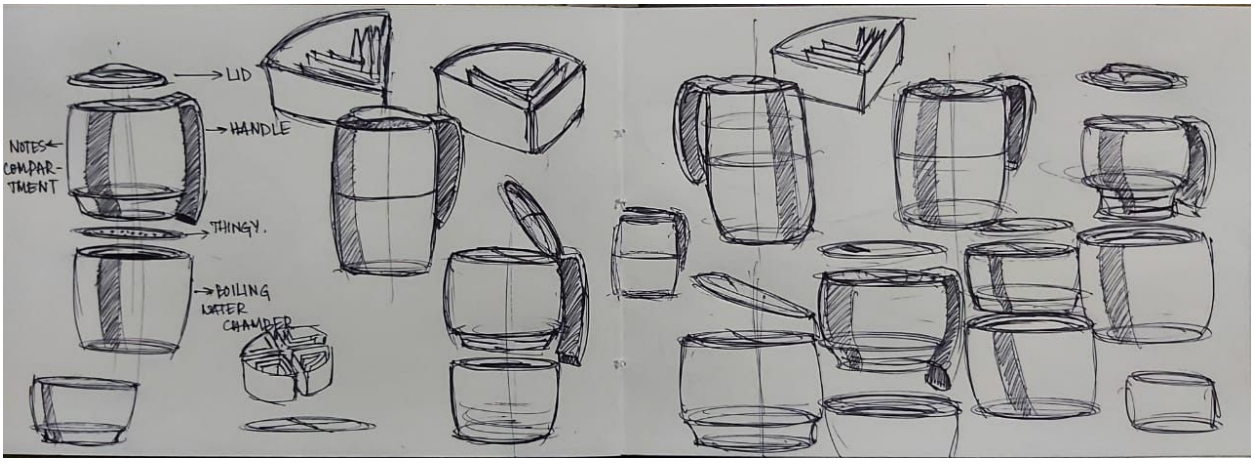
Research about sanitization

We did a bit more research on the sanitization area, to see if we could do something that might make more sense, as Vanshaj quoted *"If something is not clean, we clean it rather than avoiding contact with it"*.
With that we looked into different types of sanitization, which actually involves two steps: Cleaning and Sterilization. The Cleaning step is actually quite crucial because if there were dirt remains on the notes, it is most likely to absorb radiation, or cover the virus surface in some way so that area isn't exposed to any sterilization method, hence it won't be entirely effective. With that, there are three main kinds of sterilization: heat, radiation and chemicals.

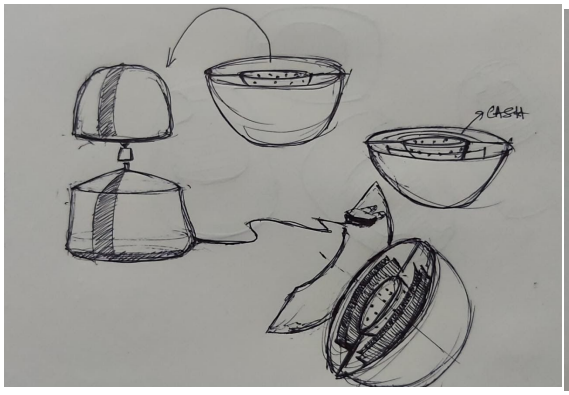
Heat would mostly involve solutions like, steam, hot air, or a hot metal surface. Since heat is something that they are mostly exposed with in a cooking environment, hence relevant to our context and is easily available (or so we thought) we decided to look for solutions based on this area. For on the other two, Radiation had solutions like UV which was widely known but we made sure we'd steer clear of Chemicals (which is mostly sanitizing solutions like the alcohol based hand sanitizer or spray) as they could be highly volatile when used near fire and could not be good for human body when accidentally mixed with the food.

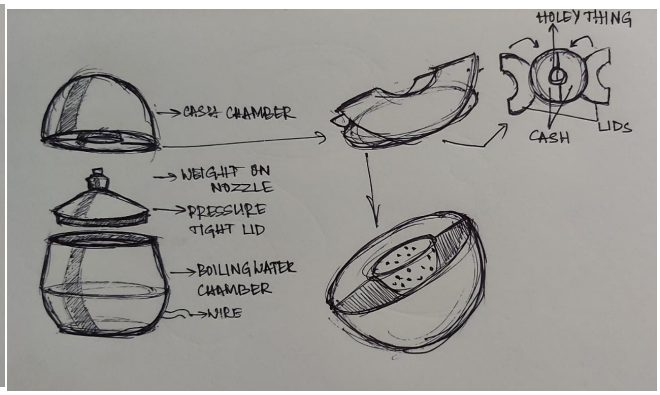
Heat/Steam Sterilisation

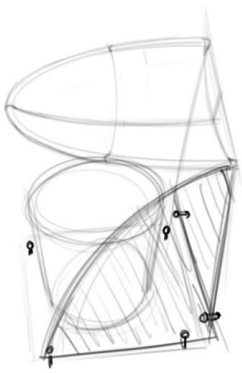
Under heat sterilization, we suddenly thought of a pressure cooker and how the steam that comes out of it is extremely hot and can be used to sterilize the notes. We then looked into how the pressure cooker works and searched for similar items in the market. Anagha had then mentioned how they could puttu (a part of kerala cuisine) using something which uses a very similar concept to what we were thinking i.e. a puttu maker. With that we could visualize the form better and looked into other steam rand hot air elated products, like rice cooker, momo maker, hair dryer etc, and other steam sterilization methods used in different context and did some basic ideation on that.



Further ideation board







Main Concerns

- **Complicated Process**
  The process, even though serves its purpose, is going to be a gargantuan shift from a regular transaction. The process could be divided into two main halves - the first being the cash input by the customer and the second being the sterilization and cash output. The first part involves the shopkeeper to confirm what he has gotten is the right amount and trigger it to fall into the katori below. In this case, he has to keep an eye on making sure to shift it when it's full. Then he has to transfer it to the heating chamber for sterilization and wait for the process to be completed (3 seconds, but it is an added activity to his normally busy schedule). Once done, the notes have to be transferred into his regular money box from where he provides the user with the balance amount.

QS: *What happens if the customer is too lazy and doesn't end up using it, even if he owns one? How can the customer be sure that whatever he is returning from the money box is actually heat sterilized?*

- **Commitment**

  There are chances that the shopkeeper might leave the notes in for way too long that they will get exposed to too much steam/heat, damaging the money inside. This would not only be a loss to him but also would make him not want to use the product anymore or be skeptical about using it. This also requires additional care while handling, since the water inside is boiling hot.

  QS: *Could there be a feedback mechanism that tells the shopkeeper that the notes have been in there for the desired amount of time?*

- **Pre-occupation of the Stove**

  Most small food stall owners usually have only one stove which is constantly in use. When he has to sterilize a bunch of notes, he will have to move the vessel in use to a different place, (maybe his counter). Later when that is done, he will have to move it back.

  QS : *How convenient would it be for a stall owner who has a heavy tub full of boiling oil to keep switching with the sterilizing product each time he wants to sterilize the notes?*

- **Condition of Notes**

  Steam is moisture and since the currency notes are basically paper, the notes will definitely absorb this moisture during the process. Even though the first few sterilizations would work fine on the notes, there is a possibility that the condition of the notes might deteriorate faster due to constant exposure to heat and the journey of a note over time is quite indefinite and unpredictable.

  QS : *Would anyone, say the Government, want their notes to be constantly subject to heat if that affects its quality?*

- **Acceptance of the Product**

  Even though hygiene is *our* concern, would it be of the same importance to the rest out there, considering the fact that most people are still unaware of the fact that money is an extremely common and significant carrier or germs and viruses?

  QS : *How do you market the product in such a way that the target users are convinced?*

Unfamiliar Concept: Peltier effect

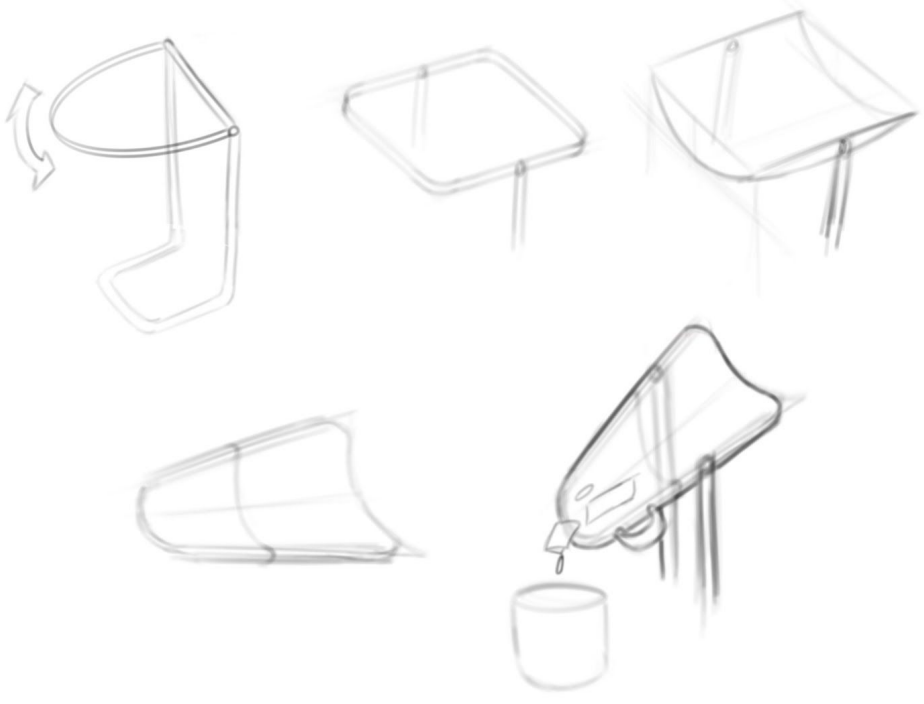
We found out about something called a peltier effect when in an impromptu meet with Prof. Avinash in the morning of the presentation. He introduced us to this concept which uses something called a thermoelectric effect, which is basically the conversion of electric energy to thermal energy based on the difference in temperature of two surfaces, and vice versa. In this case we use two metal sheets and we connect it to two wires which connect to a current source. So, once electricity is passed, as a way of creating temperature difference between two plates (metal sheets) one side becomes very cold and one side becomes very hot.

We thought that maybe we could incorporate the extremely hot side in our design to create a heating box (hence a way to sterilize the notes)

With that we also looked into different kinds of current sources we could go for. We suddenly realised that solar energy is be something that could be further explored as an energy source. But since this is not a continuous source, we decided we could go ahead with a DC battery anyway (which is kind of a necessity for all the mobile stall owners)
(a battery similar to that of two wheelers)

So in this current new thought process of ours, we divided transaction in two parts:

1. **Accepting the money**
   This was our first challenge where we had to figure out a way in which customers can pay the exact amount of money without coming in contact with the vendor. We came up with a



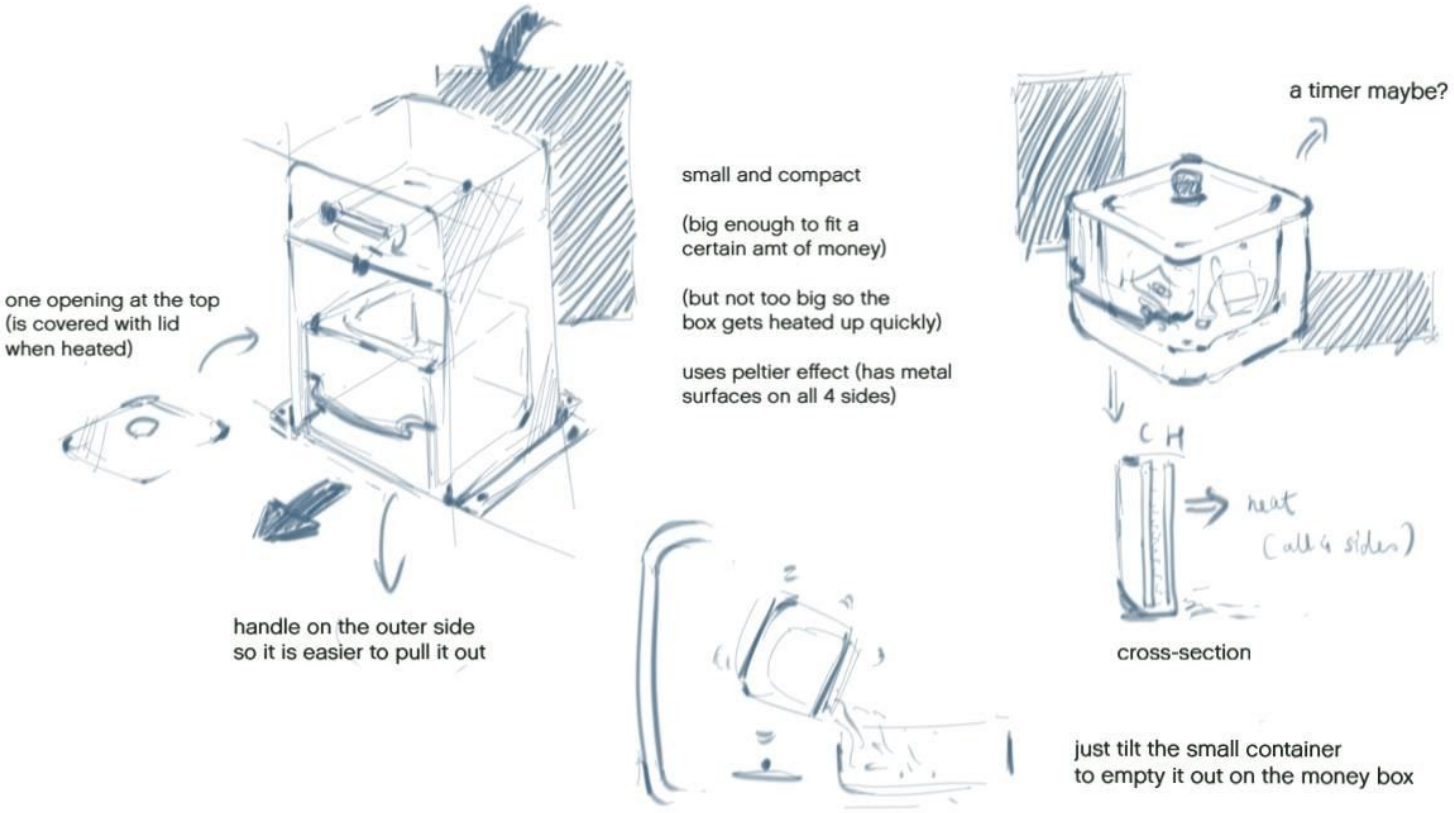
few ideas like having some sort of plate where the customer will put in his money and after the vendor confirms that the money amount is accurate he can push down the plate and the money will then drop into the money sanitisation box.

We also thought of how just plates won't be enough as all these stalls are quite open and wind will be quite common in there so we came up with a four sided closed design with only two cavities, one for input by customer and other for output by vendor.
We also considered the privacy of the vendor's money box so we gave our money collector three sides so that customers will not be able to see where that money is getting stored.

2. **Sterilisation box**

The form starts with the basic form similar to the one at the top. The sterilization box is something that would be placed under the top tray. Different mech and forms are illustrated for the top are above. (the one in the sketch below is a basic form)

The box would itself be small and compact. As mentioned it should be big enough to collect enough money to be sterilized at once (maybe every 1-2 hours) but it shouldn't be too big or it'll take longer for the cabin/box to heat up. Based on the Peltier effect, the temperature that it would go up to, based on the voltage range that it would be exposed to



(which is 12V - 24V) would be around 70-80 degrees celsius. This temperature is enough to kill most of the germs, (the higher the temp, the more germs get killed).

Since this box uses Peltier effect it would require the box to be covered with hot metal on all four sides (and cold metal on the other sides) which is covered with an insulation of certain thickness (cross-section)
It also has a lid at the top which is not put when collecting money from the top, and once filled, the lid is to be put to capture the heat inside. Once the heating is done (which should take around 15 mins), we pull it out using the handle and then just tilt it to empty it out on their own money box/drawer.

The Other Half

Okay, so by now the first half of the transaction is done which was getting money from the customer and now the other half would be the shopkeeper arranging the notes and giving the change to the customers. And it will be nice if this part can also become contactless but it will come with a lot of complications and expensive mechanisms.

- So here we decided to assume that as he is not coming in contact with dirty money and whatever money he got is now sterilised, he can do the other half of the transaction which is giving the change to the customer by himself.

Summary of Week 4
We unknowingly took a slight detour and researched and ideated on how sterilization of money could be a solution to our problem. We came up with a few concepts but we later realized that even though the direction we were following had a good possibility, it wouldn't make sense for food vendors and small stalls due to various reasons.

The feedback we received also reflected the same and we were told that the wearable concepts that we had initially could have more potential if taken ahead with proper thought and understanding.

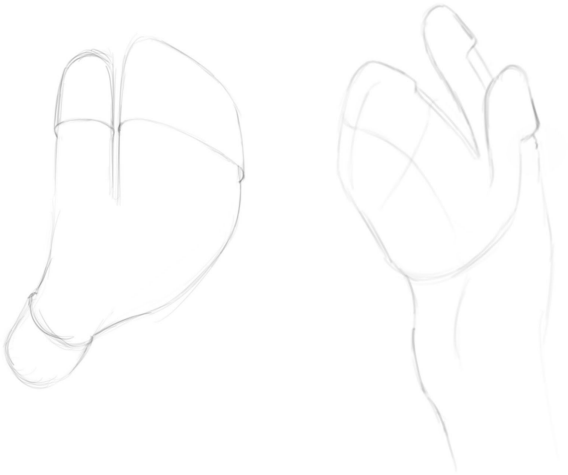
Week Five

Coming back to the Wearables
We had a few initial concepts put down already and we did more in-depth research on existing products that had mechanisms that could be incorporated into something like a wearable or a hand-held tool. The main features that the product was expected to have were :

- Should be easy to wear and take off
- Should not hinder or cause delay during the transaction at any cost
- The customer should want to use it without any hesitation
- Counting of notes with the wearable or tool should be as easy as counting without.
- The product should not cause any hindrance while handling coins
- The product should last long
- It should be something that is easy to clean
- The vendor should have the privilege of deciding where and how to store the wearable while in use

Ideation 4.0

- **Idea 4.1**

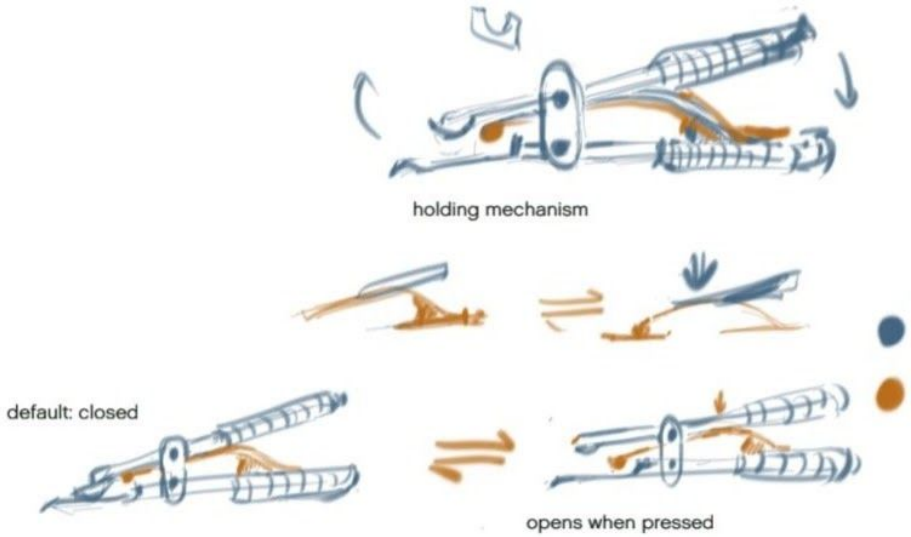


This is a modified glove optimized for quick wearing and removal. Unlike a normal glove, this one has three divisions, one for the thumb, one for the index finger, and one for the last three fingers. The bigger division mainly helps in holding coins/counting purposes.

- **Idea 4.2**

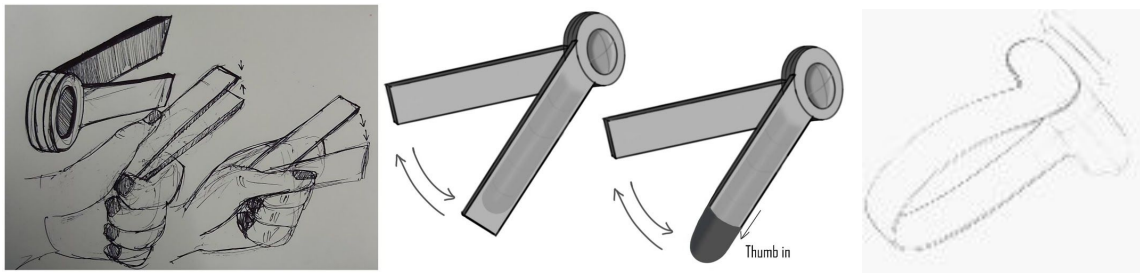
This one again is a glove. The main factor that differentiates it from other gloves is that it stays flat on the surface and covers only the inner palm and the tips of the fingers, which are the main parts of the hand that comes into contact with money. The base (inner part) of the glove would be made of some non-slippery material so that the vendor can just slide his hands in whenever required. Whenever he is done, he can just put his hands down and pull them out while the glove stays on the surface of his counter or money box.

- **Idea 4.3**



This idea involved developing an instrument involving different mechanisms to be used (with both hands) while accepting, holding, and counting money. The main point was to avoid contact completely hence here were some design decisions based on that. It has two rods connected in a see saw mechanism to a pulley in the middle. While experimenting we realised how holding the money while counting is a huge challenge hence we have something called a bending metal right at the bottom of the top rod. A bending metal is essentially a strong metal attached in a bending curved position, and when pressure is put, it bends to an extent. In this case a paper-weight ish object is to be attached at the end which will hold the money in when the mouth is open (hence it won't fall off). While this is to be used in the dominant hand, the non- dominant hand would have a similar but much simpler version of this but would also have a sliding motion at the top rod (which again aids in the whole counting process). Hence, this piece is to be sold as a pair and would even work for ambidextrous people.

- **Idea 4.4**

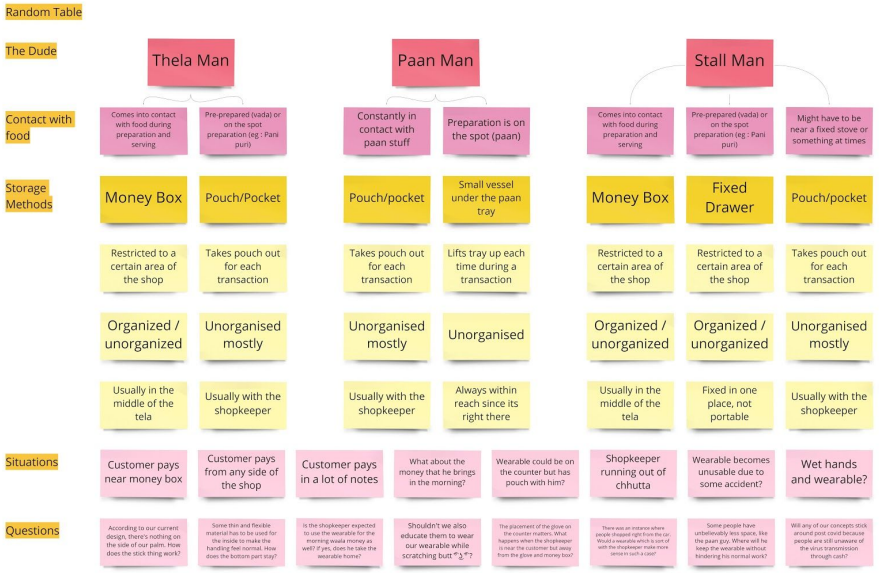


This is also a tool that is meant to be kept on the counter and is to be used during a transaction. It mainly sports the motion of the index finger and the thumb but the major drawback that this idea had was that contact would somehow happen since the product itself is small, leaving our intervention void.

Additions

Even though the glove could do the job of eliminating contact, another main purpose was not served. Here we came across the easy wearing and removing factor before and after a transaction respectively. Something that is simply lying on the counter would not be convenient and the user might not even end up using the product if, by any chance, it hinders any activity even once.

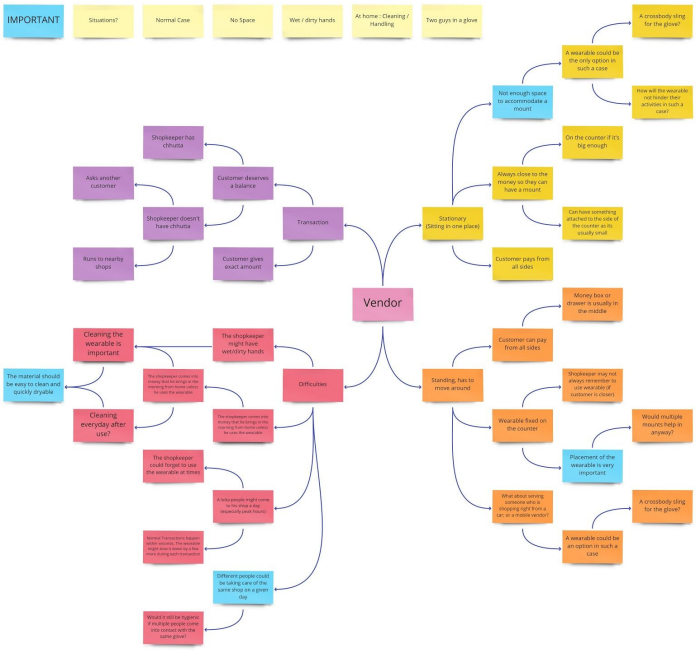
To understand how the user would use our product, we looked at different existing ways the food vendors store money.



Derivations :

- People have very varied methods of storage ranging from shirt pockets to money boxes.
- People don't always have a whole counter/thela in front of them (eg: paan wala)
- Not everyone is always standing and serving food
- Most vendors don't have enough space to accommodate another object onto their counters

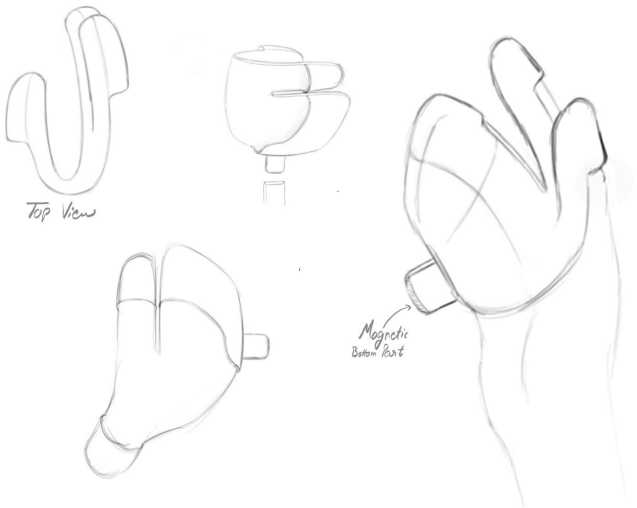
We further mapped these out and identified the difficulties that we faced thoroughly.



Key Points :

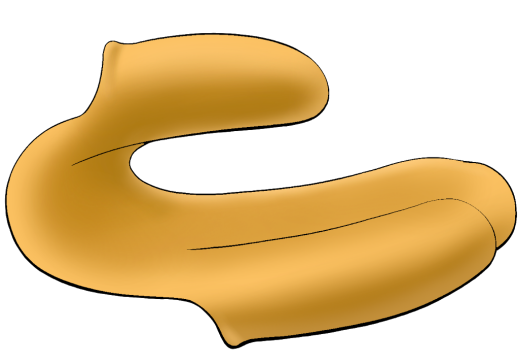
- The shopkeeper might have wet/dirty hands
- Different people could be taking care of the same shop on a given day
- Normal Transactions happen within seconds. The wearable might slow it down by a few more during each transaction
- Cleaning the wearable is important
- The placement of the glove on the counter matters. What happens when the shopkeeper is near the customer but away from the glove and money box?

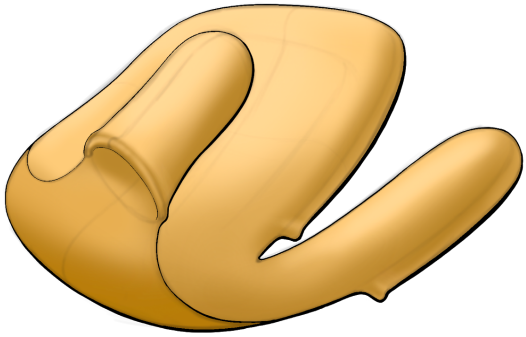
Ideation 4.1

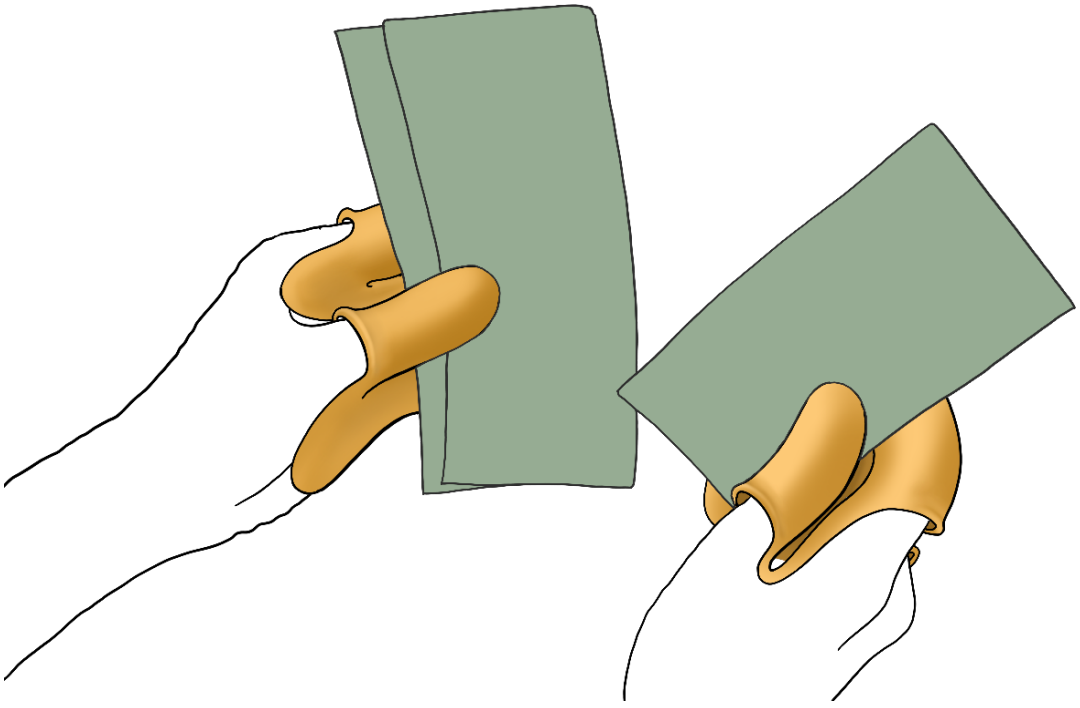


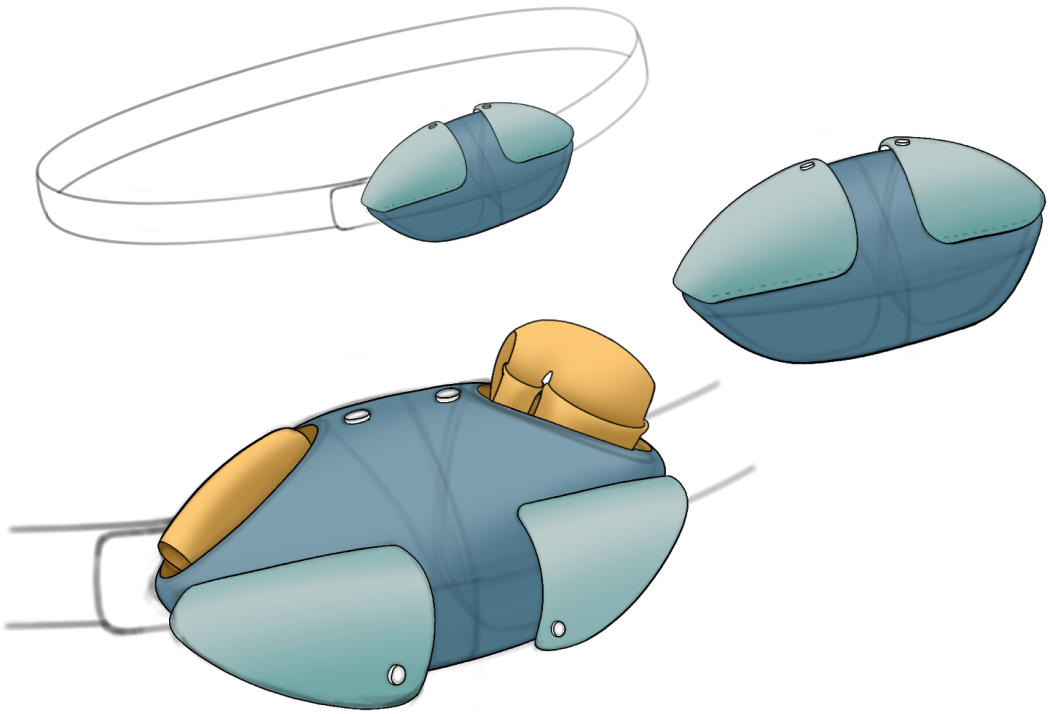
After understanding their workspace and lifestyle, we looked at how we could incorporate our wearable into it without hindering any of their usual chores. We initially thought of providing them with a small mount that can either be attached to their money box or their thela according to their convenience. The mount could either be screwed in somewhere or attached using strong double-sided tape or small vacuum suction cups. Vacuum Suction cups also provide the user with an added advantage of easy portability but come with a major drawback. They only work on smooth surfaces. Initially, we thought of adding magnets for the quick and easy snapping of the wearable to the glove whenever required.

Final Concept









Our final product is a wearable, which is soft to touch for easy money holding and money counting and it also has thicker and sturdier rims to maintain its posture, which further helps in quick wearing and removal. To further make the wearing of the variable easier we merged the last three fingers of it, As the index finger and thumb are primarily responsible for counting money, and the other three works as a whole (mainly to hold coins).

Now, designing a wearable was just the first part, the bigger issues were **where do you store that wearable** and **how do you wear it again without using your other hand**. Because if after use we place it near the Wenders vendors area, then the whole concept of the contactless transaction will become pointless. That way the wearable instead will become the carrier of germs and viruses to vendors' workspace.
So we came up with a solution of having the wearable around your body with the use of a simple velcro belt.

Why a belt? Because when something is attached or connected to our body, it almost becomes a part of our body. For example the pocket of our pants. We never look down or aim to put our hands in. Instead, our hands smoothly go inside because we know where exactly in those pockets are.

We want to bring the same experience to our product. Where the vendor will not think twice about the location of the variable. Instead, he will be wearing the variable without even thinking about it.

Key Features

- **Ease of use**
  The user can simply reach in for accessing the wearable right before the transaction and can quickly put it back as soon as it is done. The process is as simple as reaching for the wallet in your pocket.

- **Customizable Usability**
  The packaging and the storage pouch help the user use the product at his own convenience. It has a provision of using it as a waist pouch or keeping it on the counter or even hang it at a comfortable area for quick reach.

- **Easy to clean, quick-dry**
  The material of the pouch can be cleaned whenever required without causing any wear and tear and will even dry quickly.

- **Highly Affordable**
  The total cost of the product once in the market is estimated to be around Rs.120. Disposable Gloves cost Rs. 5 per use and they cannot even be used again.

- **One-time Purchase and Local availability of individual units**
  Once purchased the wearable is expected to last for a few years and in case something happens to any part, individual replacements would be locally available.

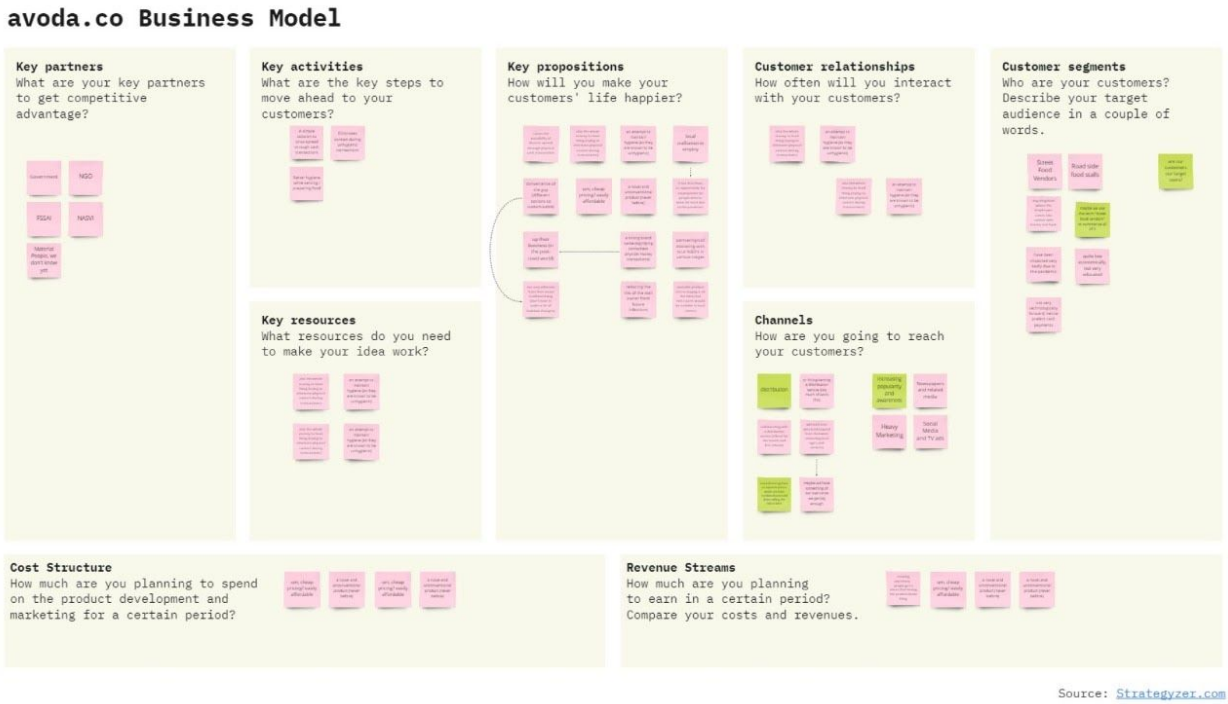
Quick, Dirty Mockup

Before we proceeded with our final concept, we made a few dirty materials with the immediate materials that we had. We also bought a few gloves of different materials from outside like (rubber, woolen, oven mitts, plastic, surgical, and heat resistant gloves).

Prototyping

Our prototyping phase mostly involved us working with blender 2.81 and creating multiple 3D models so we (and the novice audience) get a basic spatial understanding of how the product looks and works.

Business Model:



Source: Strategyzer.com

There were multiple stages to us exacting our business model canvas after multiple discussions and research among ourselves.

Value proposition

We first looked into the product's and company's unique value propositions to our customers i.e. street food vendors. We mainly came across six.

1. Safety of the customer: It helps prevent the food vendors coming into contact with money and food at the same time. Hence prioritizing the safety of the food vendors as they would come across multiple customers in a day.
2. Affordability: Since it comes at a low cost (considering the average income of our target users, which is quite less) and with low maintenance hence open to all at the end of the day.
3. Convenience: Prioritizing the convenience of the stall owner as it doesn't alter the traditional hand to hand physical money transaction.
4. Reusability: It isn't disposable like the regular medical gloves, and can be used again by just cleaning it, hence doesn't devote a lot of wastage.
5. Hygiene: This is in some sense a step towards maintaining a more hygienic environment around the stall owner. Of course there are other factors that would also influence this.
6. Money to food: Finally, it keeps check on the money to food transmission of other possible future disease spread.

Competitive advantages

There were also multiple stages where we had a good advantage over other products in the market, as listed below

1. **cost- focus**: Us focusing on cost was more of a necessity because our target users mostly had low income, hence extreme cost constraints. But this also gave us a slight advantage, especially from the perspective of expansion, considering how our first users have the most constraints, whatever we do after that would just get better from all aspects.
2. **Differentiation**: our product was indeed novel yet had quite a simple approach. The area that we tackled is also something that hasn't been explored in the recent market, hence more the reason how this could be an advantage. Also, we would be marketing it not as a glove, but a wearable pouch.

Channels

This would mainly involve two parts: distribution and networking,

1. **Distribution channels** would mostly involve distribution of the product, hence it would go from the manufacturer to the wholesaler/retailer to the customer.

Although our initial distribution would be done directly to the customers along with local NGOs.

2. **Networking channels** are mostly for creating awareness about our whole venture, hence it would involve social media, advertisements and maybe, creating our own website. We would also have online platforms like amazon for selling our product.

Revenue streams

We would mainly have three major revenue streams:

1. **Direct sale**: which is selling our product directly, through local stores and retailers and other ecommerce websites like amazon.
2. **Collaboration**: we would also collaborate/partner with huge fast food chains like laddu gopal and sweet india.
3. **Funds**: Our final source would rely on funds, either from individuals, or relevant companies who would like to invest in us, and of course, government funds.

Cost and Expenses

Finally our cost expenses would mostly rely on things like raw materials(regular and surplus), local manufacturers (small and big), local artisans, marketing, packaging, warehouse renting, labour, mass distribution and even shareholders/collaborators.

Future plans

Our future plans would henceforth involve this,

1. We get to our final product stage but building it along with a local artisan, hence looking into possible mistakes and respective feedback.
2. Once done with that, we get to our product development stage as we prepare for around 50 pieces while collaborating with a local manufacturing company. With that we distribute it to our local street food vendors along with NGOs and hence observe them for a month for insightful feedback on our form and implementation.
3. We would also be simultaneously consulting experts in this field to make sure we're on the right track.
4. Once we hopefully get past that stage successfully, we start preparing for pilot production (around 100-500 pieces) and hence have a more detailed and sturdy production plan.
5. Everything after Pilot production can't really be determined, so we have decided everything up to this stage.

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