

DEP 301  
Collaborative Design Project

Final report

# MAGANS

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# LAPCRATE

A takeout box designed to eat comfortably in vehicles.

## **Abstract**

For many of us, cars are like our second home. They're our essential transportation for work, dropping the kids off at school, or a set of wheels for a weekend road trip.

Pandemic has created a fear in the people about the safety of dine-in.

The number of takeouts in restaurants is increasing, which calls for a safer space to eat food.

The Lap Crate is a sustainable takeout box given with the food from restaurants, ensuring a comfortable and clean eating environment inside the user's vehicles.

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To get a wider set of problems we decided to conduct a survey among our family and friends.

## Questions for survey

What new habits have you started after covid?

What habits have you stopped after covid?

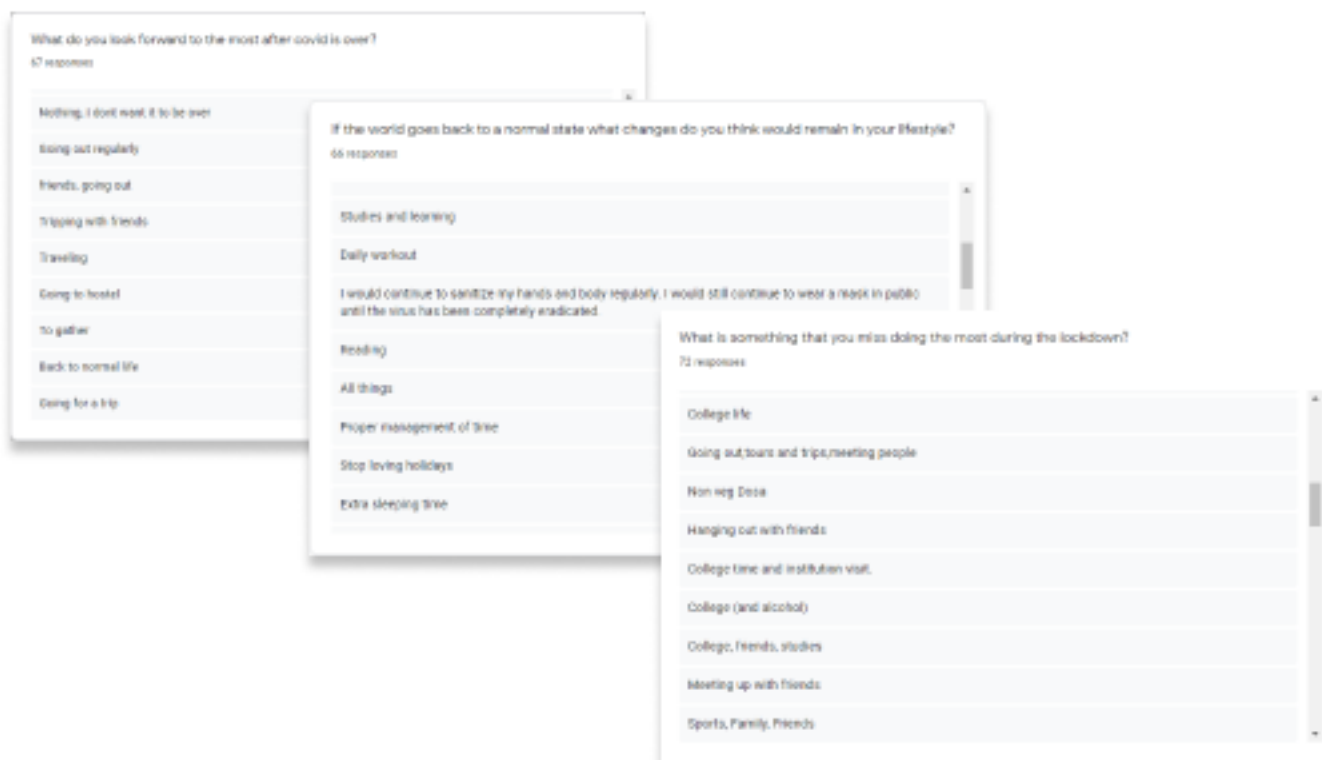
If the world goes back to a normal state, what changes do you think would remain in your lifestyle.

What is something that you miss doing the most during lockdown?

What do you look forward to the most after covid is over?

Name one instance where covid didn't let you do something that you wanted to do

If services you depended on stopped, how did you deal with it? What kind of services were they?



## Survey Results

<https://docs.google.com/spreadsheets/d/1c6FWJ0okgSMkQIXQVu5Led sx1-O-VkYJ4TuRcnOeVno/edit?usp=sharing>

## Initial ideas from Survey

Cannot meet with friends and family

Cannot play any sports or go running or walking.

Eating at restaurants.

Depression and lack of motivation to do things.

Scared of meeting in groups because of pandemic trauma

Services to repair household problems are not available

Cannot plan day properly, gets lost of time and days.

The sleep cycle is messed up

Cannot meet at a public space

Post covid trauma rehabilitation.

## Ideas of Interest

Cannot meet with friends and family

Cannot play any sports or go running or walking.

Eating at restaurants.

Depression and lack of motivation to do things.

Scared of meeting in groups because of pandemic trauma

Services to repair household problems are not available

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Post covid trauma rehabilitation.

## Research on the ideas

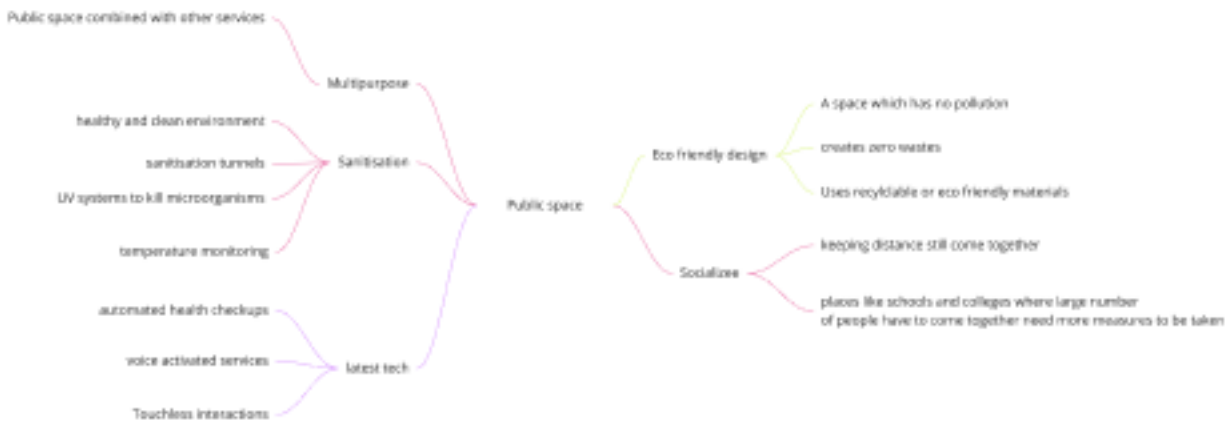
Each of the selected three ideas was further researched, beginning by creating mind maps, finding details on the topic and existing solutions on the internet, and, finally, user interviews.

# Home services

During our research we found a number of companies including Just Dial which were already in this space and tried to solve the problem



# Public spaces



# Restaurants







We looked at various products and services that were already available currently to have food in cars. we found a few products that were not very popular due to size constraints and inconveniences in its usage.



We also looked at services like drive throughs and drive ins which currently are not widely available in India to understand how we could incorporate the advantages of these services in our product.

## Ranking them

All the possible factors that could affect the problems we chose were selected and the problems were graded on a scale of 1 to 10.

	Public Spaces	Home Services	Restaurant
Demand	9	4	7
Current Availability*	8	3	7
Need after covid	10	9	8
Implementation Time*	1	6	9
Design Oppurtunity	6	3	8
Feasibility	1	8	9
Dependency on covid*	3	3	5
Profit	7	7	9
Investment*	1	9	6
Deployment speed	1	9	8
	47	61	76
* Indicates lower was better so for convenice (10 - value) was taken			

## Redefined problem statement

Based on the ranking, we chose to focus on :

*To make eating in your car a more enjoyable and comfortable experience*

## User interviews (Survey II)

We selected two of our stakeholders, the customers, and hotel owners, and made two sets of questions and interviewed them to get their perspective about their experience with restaurants, eating in their cars, how it has changed with covid and about after covid.

## Questions for the hotel eaters

1. How often did you eat at a restaurant before covid?
2. Do you go to a restaurant only if you are already out or do you make a trip just to eat at a restaurant?
3. How much money do you normally spend for one person in a restaurant

4. Do you prefer to dine in or take out?
5. Do you get food delivered or do you get takeout? Has Covid affected this?
6. Other than the food, what are the features that attract you to a restaurant?
7. What changes would you like to come to the restaurants for a better environment?
8. During the pandemic were you ever unable to have a meal or had to eat in your car because you were outside?
9. If you had a meal in the car, what was the experience like? What situations prompted you do to do it? (No time, Family Road trip etc)
10. Have you heard of Drive-through restaurants? If so, What is your opinion of them?

The image shows three sticky notes with handwritten survey questions and responses. The first sticky note on the left has the question 'Other than the food, what are the features that attract you to a restaurant?' and lists 'Ambience', 'Parking', 'Atmosphere', 'Hygiene, location, ambience, service', 'Air service', and 'Spent time with family'. The middle sticky note asks 'What changes would you like to come to the restaurants for a better environment?' and lists 'Cleanliness', 'distance between two tables', 'Cleanliness', 'Talking in special', and 'Bottle service'. The right sticky note has the question 'I need to be able to trust the restaurants that they are cautious about the food. And ensure proper social distancing.' and lists 'Lighting and space design', 'Ensuring safety', 'Quick service consumer friendly. We should be able to get a sample of food as many times we want to taste different cuisines but do not know its taste.', 'Hygiene and proper service', and 'Automatic serving'.

## Questions for hotel owners

1. How did covid affect your business?
2. Do you offer delivery services or is your restaurant available on zomato, swiggy, or any service like that?
3. How did covid affect the delivery services?
4. What safety measures are you following now to run your restaurant?
5. What according to you is the major difference in the sale after before covid?

6. How did the preparation process change post covid?
7. What changes do you plan to implement to reopen dine-in or to increase the customer's post covid?
8. How much do factors like parking areas affect the business?
9. How did the prices change for the food items after the pandemic hit?
10. What is your view about the drive-through restaurants?
11. What changes would you like to make to the restaurants for a better environment?

## Insights II

These were the major insights we obtained from the second interview:

### About the restaurants

Users feel a restaurant needs ambience, cleanliness and privacy

Restaurants need to improve their cleanliness, safety standards with respect to Covid and the ambience

### About eating in the car

They found eating in the car messy because the food spilt while eating

It was inconvenient as there was no space to keep their food and uncomfortable in general

The lighting already in the car was often insufficient

Eating in a car saved them a lot of time

They had a lot of privacy when doing so

They could eat home made food and didn't have to search for a restaurant during trips

# Week 2

## Problem statement

*To find creative solutions to make eating in cars a better experience and enjoyable to the users*

## Brainstorming

We went back to discuss further on our problem statement and to understand the problems with the existing products and systems, the users and the possible design solutions.



We tried to understand why drive through restaurants aren't popular in India like they are outside. We found an article on why thi is. The major problem was that india doesn't have enough people travelling by car for it to be viable. In india people generally prefers to travel via public transportation over private vehicles. We also identified that truck drivers who spend long hours on road is a potential user for us since they are essentially living in the truck cabin while travelling.

## User interview

Hotel owners were one of our stakeholders and we interviewed an individual who owns three hotels in kerala.

Dining was stopped when covid cases increased in the state and only online delivery existed. But now the restrictions are lifted and dining has restarted by cutting total seats to half and increasing the distance between tables.

Hotel owners have to keep a register of customers and also of all the workers. The customers and workers are checked using a thermal scanner and hand sanitiser is provided.

Waiters and chefs have to wear gloves and masks all the time.

Their hotel only provides Self-delivery services in 200m radius and other delivery services like Zomato and Swiggy also work with the hotel.

They have kept a watchman in the parking area to keep social distancing and for proper parking.

Covid has not affected the price of the food and it has reduced in online delivery services.

Once covid is over they look forward to restoring the seats and follow other instructions by health officers.

Drive through would be a nice option if the licenses in dinings get hard to get

Even though no one prefers dining nowadays and everyone prefers takeout and home delivery he doubts if people will accept these kinds of restaurants.

Won't make his hotel a drive-through or drive-in unless the customers only prefer that

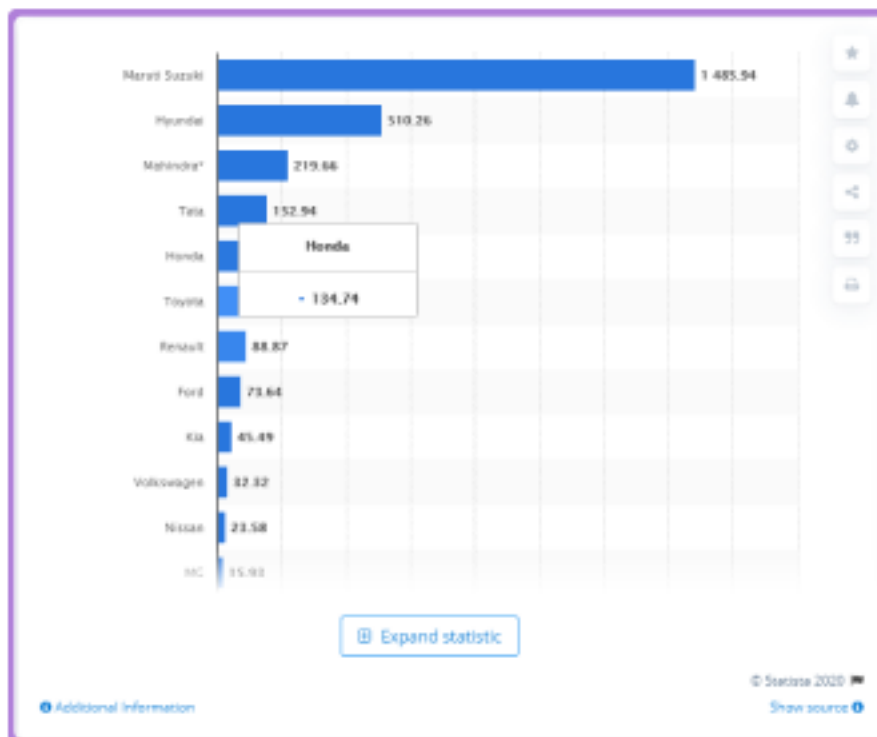
## Major factors for product detailing

1. Most popular food preferences in india
2. cars dimensions
3. cars and interior dimensions and designs
4. customisable tables
5. where all can we store things in car

6. boot cover convertible to table
7. different types of hooks and clips to attach table in car
8. where all can we attach the table
9. the weight capacity of cardboard and other sustainable material
10. food packaging to table convertible
11. statistics of car preferences in india

## Cars

Most sold cars in India were mostly just maruti suzuki, and the top 3 models have a very similar interior which could prove useful for our final product.



Rank	Model	August 2020 Sales
1	Maruti Swift	14,880
2	Maruti Alto	14,207
3	Maruti Wagon R	13,779
4	Maruti Celerio	13,629
5	Hyundai i20	11,758
6	Maruti Baleno	10,740
7	Kia Seltos	9,855
8	Hyundai Grand i10	10,100
9	Maruti Ertiga	8,880
10	Maruti Brezza	8,174

Model	No. of Units Sold
1. Maruti Suzuki Datsun	2,09,657
2. Maruti Suzuki Alto	2,08,087
3. Maruti Suzuki Swift	1,91,900
4. Maruti Suzuki Baleno	1,80,863
5. Maruti Suzuki Wagon R	1,55,987
6. Maruti Suzuki Vitara Brezza	1,31,732
7. Hyundai Elite i20	1,23,181
8. Maruti Suzuki Eeco	1,14,105
9. Hyundai Grand i10	1,02,693
10. Hyundai Creta	99,736

These are the statistics for 2019, even after 6 months in August 2020, the top selling cars remain the same. And since all of these are Maruti Suzuki cars, they share a lot of similarities in terms of their interiors and dimensions,

## Food

Swiggys had a report called StatEATistics listing various information regarding their services. From this report, the top 10 most ordered food india was this

Chicken Biryani

Masala Dosa

Paneer Butter Masala

Chicken Fried Rice

Mutton Biryani

Chicken Dum Biryani

Veg Fried Rice

Veg Biryani

Tandoori Chicken

Dal Makhani

Health Kick

Indian food options come with two or more side dishes most of the time and this was one of the major points we had to focus on and add as a cluster in the ideating process.

## Tables

We looked at the most selling car desks in the market to understand their pros and cons to help us in our design process. We analysed the top 4 desks available on the market.

### Cutequeen car desk - ₹ 1200

The cutequeen desks were the most simple ones which can only be attached to the steering wheel and are a very good option only when you drive alone. The desk angle is very low and the user has to rotate the steering wheel upside down and lock it before attaching it. If the food you buy has a heavy cup of drinks the desk tends to bend towards on side and becomes unstable.



**Gripmaster auto exec car desk - ₹ 38,286.00**

Gripmaster is a work desk. It is kept on one seat and is a perfect work table but occupies a seat and is not at all an option for group trips.

**Elfant car steering wheel desk - ₹ 1,299.00**

Elfant is the only customizable desk in the list. It can be attachable on the back seat and steering wheel. Storage is a problem as you have to keep it under your seat where your feet go and comprises different parts which users have to fit together before using.

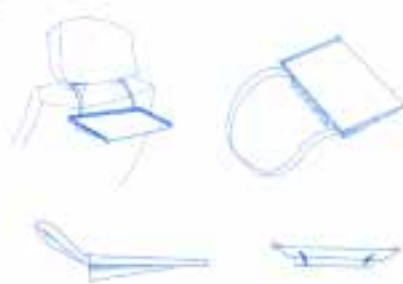
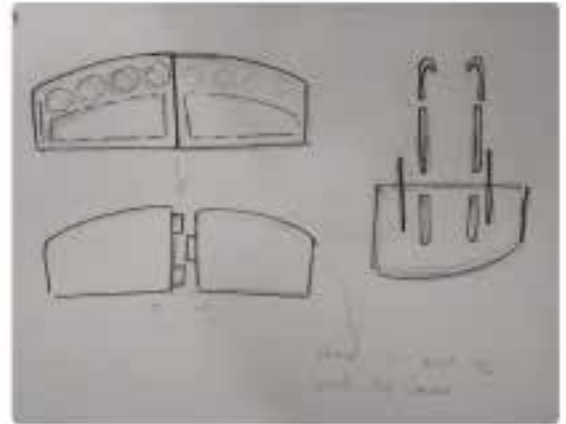
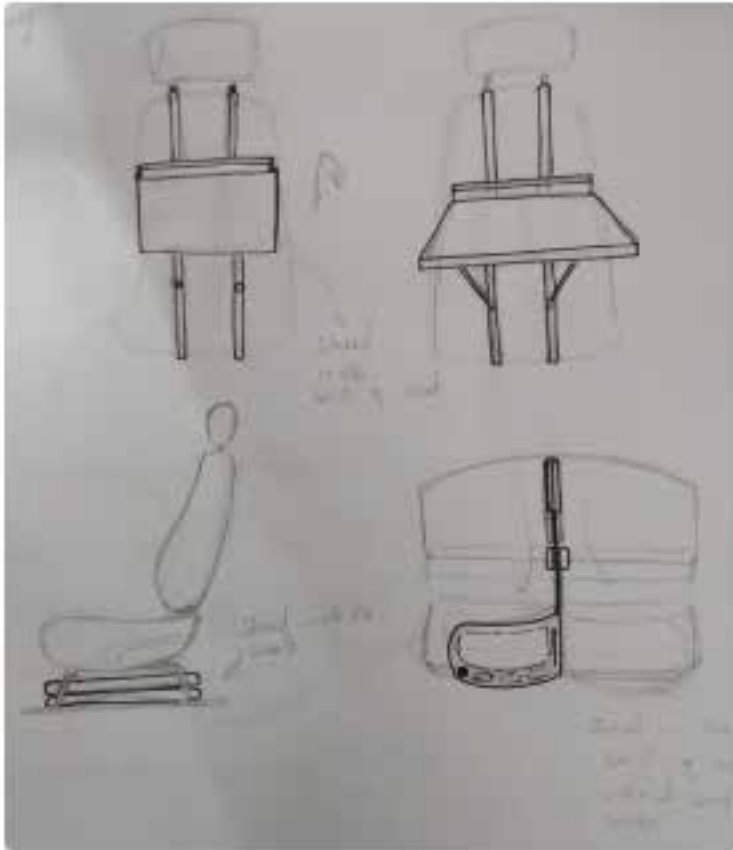
**OSHOTTO Car Tray Food Stand - ₹ 787.00**

Oshotto car tray is a small tray or table which goes behind the seats and can be closed after use. But the size is very small and is not suitable for the indian foods and cannot be used as a worktable.



# Ideation

We focussed on the factors storage, Attachability and the food type while creating rough ideation sketches to help make clusters of ideas and a well rounded concept down the road



# Week 3

## Exploring cars

To better understand what we were working with in terms of the car's interiors, we explored a car from inside and noted down all the possible places to attach and store the desk. We took photos of a rough approximation of the table in various car positions using a cardboard sheet of 35 cm by 40 cm dimension. This would help us understand the different positions of the table relative to the user.



# Brainstorming

We went back to the drawing board to discuss our possible target users, materials, other uses, product placement, storage, and attachability.

The target users were majorly, middle-class families. This included people who drive to work, schools and colleges, truck drivers, taxi drivers, families on trips, pilgrimage trips, workers with day and night shifts in works, etc.

The product had many options to make it multipurpose, like making it a writing pad, seat cover, sunshade, boot cover, window shade, and so on, along with an eating table.

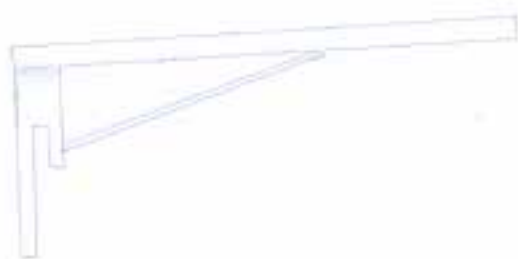


# Ideation 2

Based on the insights we got from our study of the interiors of the car and our brainstorming, we ideated afresh.

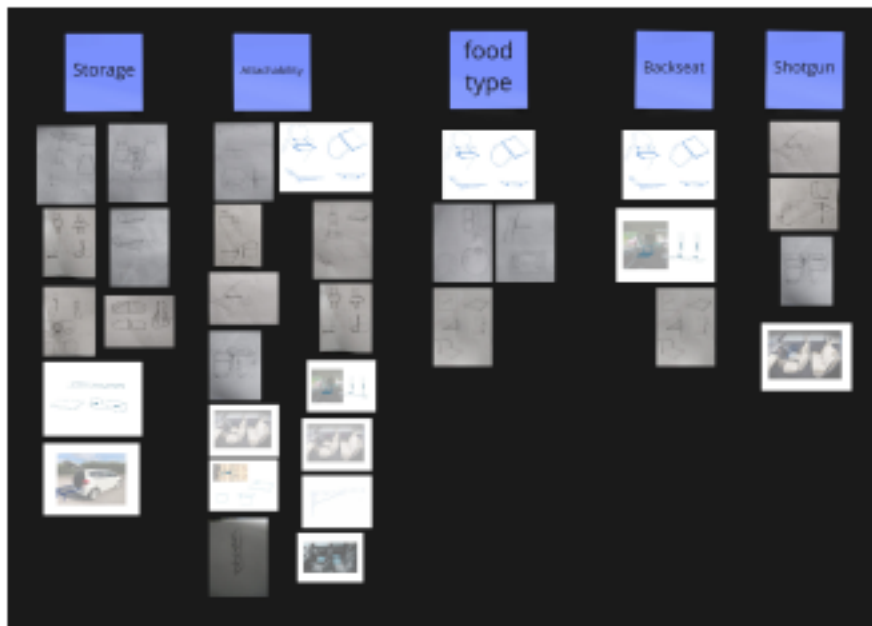
A method of rolling the table to store, a central attachment to attach tables of desired dimensions on front and back, food packaging converted into light load holding desks, a table to attach on the car doors with the help of a separate holder to attach on the car doors, and a simple wall clock like attachment behind the seat were all the ideas we explored.





# Making clusters

We divided all our ideas into clusters based on factors like, storage , attachability, food type, and the seat they are meant for to help combine some of the ideas.



# Analysis 1

Next we grouped similar ideas and listed all the unique ones from each cluster to discuss major pros and cons for each. We were looking at things like storage and compatibility for a large number of cars during this.

After analysing each group, we chose the ones whose pros outweighed the cons and ones with cons that were of minimal concern.



## Analysis 2

This focused the concepts down to four. We discussed about these four in depth trying to narrow down further or possible combine the ideas. We had already decided on a few factors to consider from our user research that the concept needs to include, these were, a simple connecting mechanism, suitability for indian food, modular design, cost, maintenance and storage. we had also decided that we shouldn't need permanent altering to the car for the concept to work.

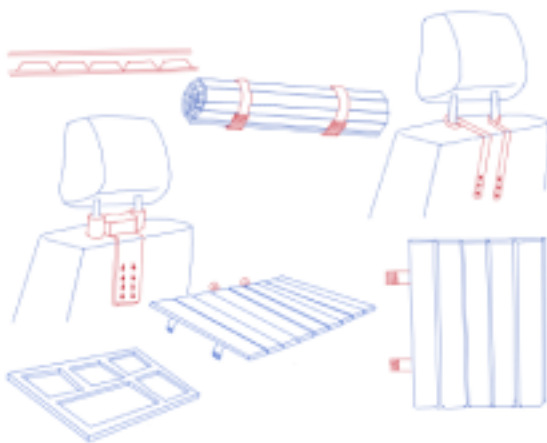
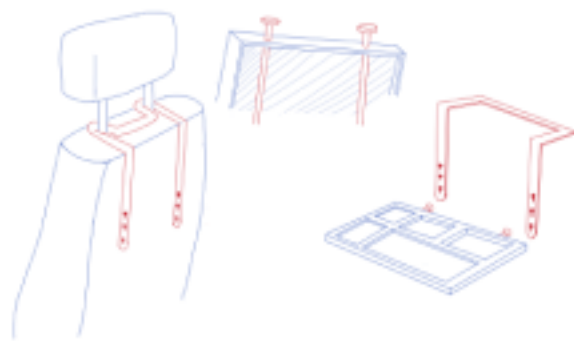


Here we have listed the important points that we came up with during our discussions for each of the concepts. We were able to eliminate two of the ideas after discussing. The sidewinder concept needed a way to attach itself to the door, we didn't want to screw it in since that leaves permanent damage, and glue might not work as intended since there would be a lot of force being attached sideways. It also seemed like a hassle to connect and remove. The capitol concept required a central cup holder which not all cars have, moreover during research we had found that the trend of having a handrest in the center was growing to the budget cars as well which would pose compatibility issues for future cars.

Out of the remaining two, one was a rolling mechanism and the other was a connecting mechanism, we decided to combine these to provide more choice and modularity for the product.

## Final Concept

Our final concept revolves around this connecting mechanism which uses the conventional screw head connector that is used for hanging clocks and painting, we will have a part that hangs from the seats permanently to which a table can be attached when needed, this allows us to have various types of tables that the user can use depending on their need. like a tray with compartments for side dishes, a flat table to keep laptops or play games, which can be rollable for easier storage.

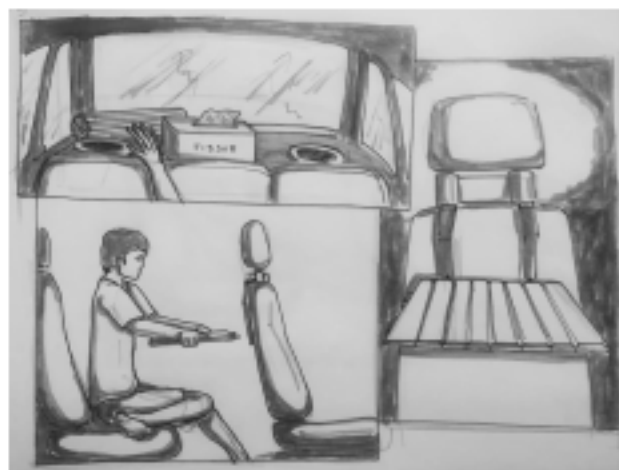


This can also work in tandem with a restaurant where if the user has the product, the restaurant can just bring their food in a tray which can be attached to this mechanism or if the user doesn't have this the restaurant can provide one while they are eating. We have not fully finalized the connections for the front seats, at the moment we are looking into strong adhesives for the passenger side and an attachment to the steering wheel, we plan to meet with Prof. Chakravarthy to discuss more possibilities.



## Scenario 1

Raghu aged 40 is an employee at the bank, his wife Seema is a house wife and he has two children. It is Saturday and his children Ajith aged 5 and Vijay aged 7 want to go see the newest Marvel Film, So he books tickets for the evening show at the nearby mall. The movie ends at 8 pm and the children are hungry. Ajith wants to eat at McDonalds to get the toy he saw on an ad on TV. So they buy the food there but raghu doesn't want to eat the food there because he is afraid for the safety of his family owing to the pandemic. So he decides to get it as takeaway to eat it in the car, his Ajith and Vijay both get their favourite burgers. They reach the car and they both can't wait to eat their burgers. They start unwrapping it and Ajith has already managed to spill some of the sauce in the car he gets scolded by his mother. And as they continue to finish it both of them spill a lot of veggies which are stuffed inside into the car. He'll have to clean the whole car later, reminding himself to never let them eat in the car again he drives home grumbling.



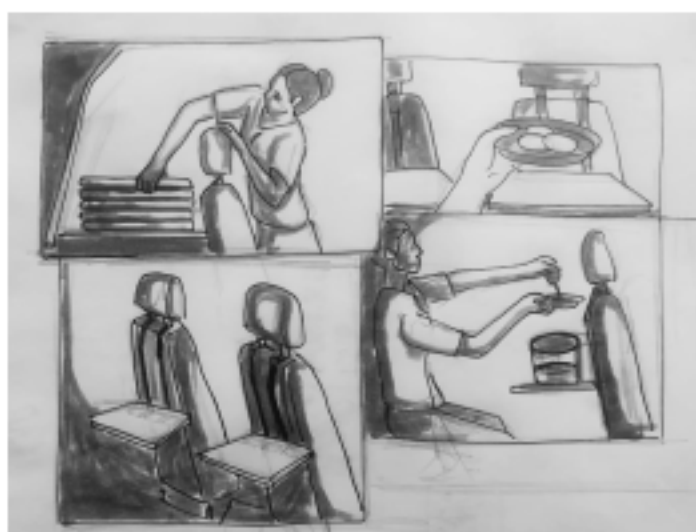
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## Scenario 2

Raghu decides to go on a temple trip in his SUV with his family, and cousins, they leave after eating breakfast at home and pack lunch because there are no restaurants in the route. They have packed idli and chutney for the whole family to eat. They stop the car and take out the areca leaves plate for all of them to eat. There isn't enough space and half of them get out to eat in the hot sun. a breeze blows dust into their face. They finish eating with some difficulty and then go on their way.



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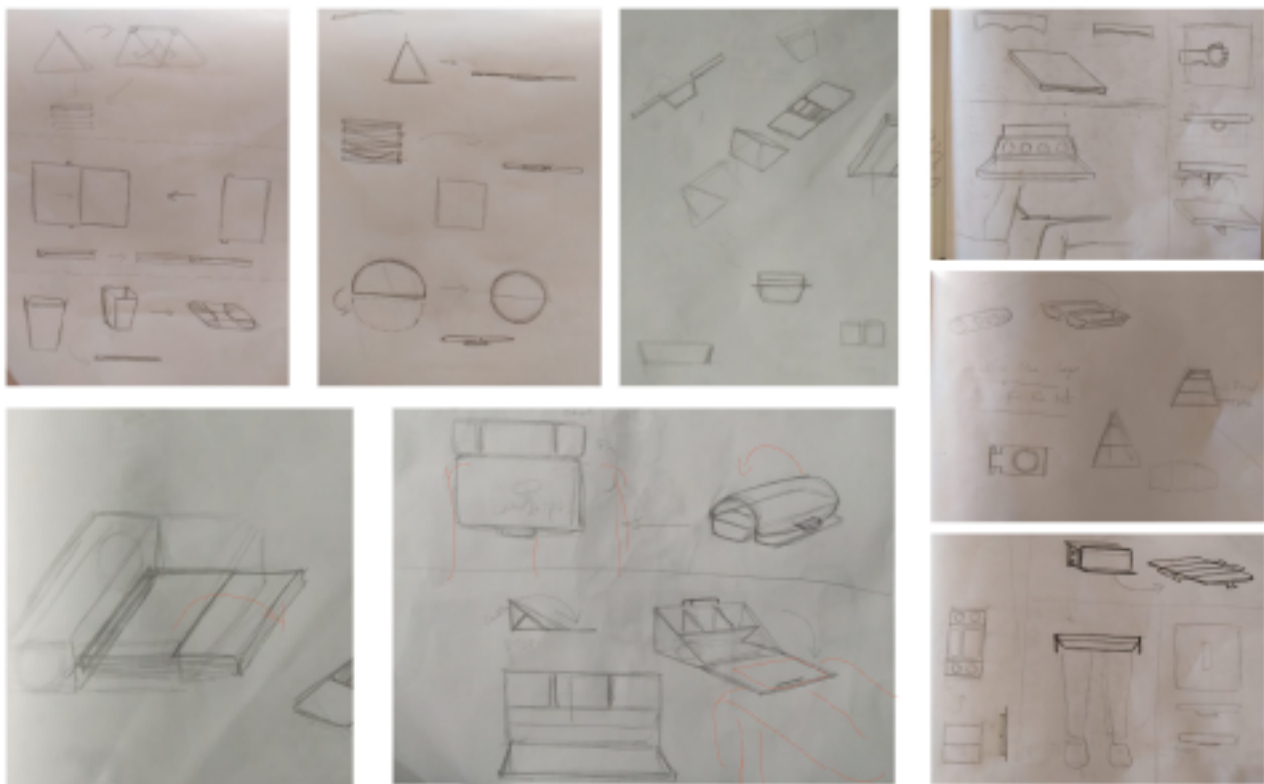


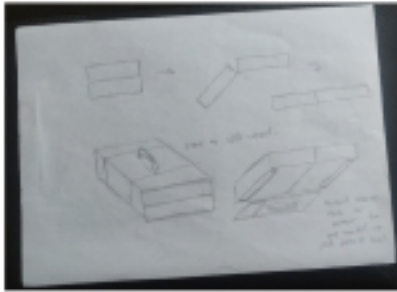
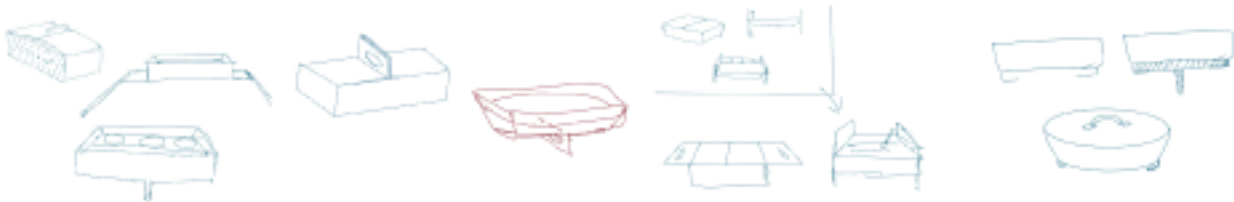




### Ideation III

With all this information we did another set of ideation where we made clusters of ideas for opening techniques and placing the desk of lap and palm for the roll type and rice type food groups.





# Analysis

We selected unique champion ideas from the list and did a pro and con analysis to understand the problems we have to solve for each of them and to try and merge the ideas to come up with a champion idea.



## Understanding users and food dimensions

Before finalizing on one concept we met with Avinash sir to discuss our ideas,

he gave us really helpful feedback on each idea and helped us to narrow down, but more importantly, he advised us to extensively research anthropometry and insulating the heat transfer from the food to the lap since takeout food will be very hot from the restaurant.

Since most of our ideas were based on eating with the food on the lap, we figured that we need to use anthropometric data to decide the dimensions of the box, along with that we also had to take the size required by food into consideration, for making a mockup we decided to take dosa as the example since it would require the largest size. These are the values that we needed to do it.

### Anthropometric data

Body dimensions	Mean	5th %	50th %	95th %
Thigh - thigh length	28.9	22.9	28.7	34.1
Thigh clearance height	12.4	9.7	12.3	15.0
Femoral width	9.6	7.8	9.7	11.2
Upper leg length male	40.8	35.6	40.8	45.9
Upper leg length female	36.7	31.2	36.9	41.8

Measurements are in centimeter

### Food dimensions

Dosa diameter - 305mm

dosa rolled diameter - 60mm

we used the 50th percentile of all values to accommodate the largest user group, thigh to thigh length and the diameter of dosa gave us the required length and the upper leg length gave us the breadth. we chose to use the female data for upper leg length since it is shorter than in males because it's harder to balance a wider box on a short leg than the other way around. We needed the thigh clearance to figure out how much space we could use in between the thighs.

For the dosa dimensions, we used the standard diameter of dosa tawas.

## Insulation solutions

The next problem we needed to address was the heat transfer. Since the box is meant to be placed on the lap, there is a need to consider how we insulate the heat from the food and the lap. we came up with a few different ways to try and solve this issue, like using an aluminum foil inside to shield the heat or trying to introduce an air gap between the food and thigh.

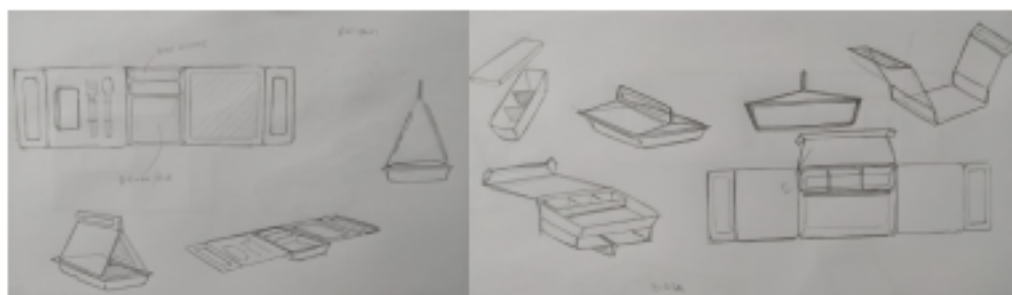
We decided to use corrugated sheets as the outermost layer to solve this issue since the corrugated sheet has a gap in it, it restricts heat transfer through it, so along with the material of the box, introducing an extra layer of the corrugated sheet will help in reducing the heat.

## Champion ideas

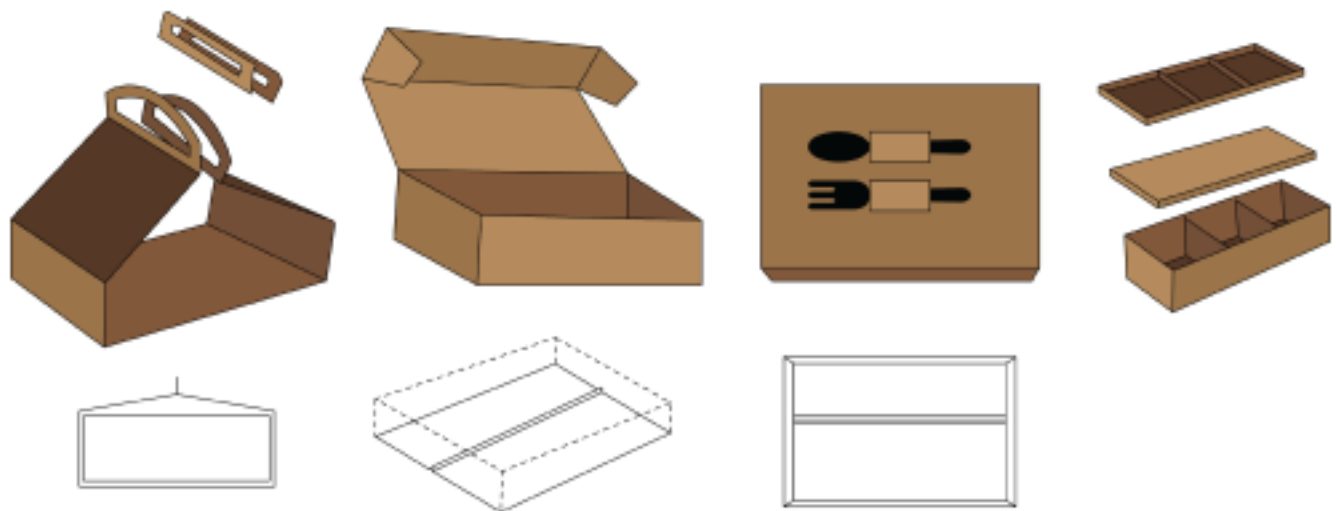
From the list of ideas, we selected two based on ease of use and functionality. We tried to detail these a bit to help fix on one idea.

The first one is a concept where the food is packed in a prism-shaped cardboard container that has flaps that can be used as an eating surface. This idea involves tightly packing the food in a central compartment which will stay in between the legs when in use. But the problem with this idea was that we were not able to maintain its balance and open state since most of the weight is in the center which makes it bend downward.

so we chose to focus on the other concept



The next concept involved a container with a lot of space to eat in to reduce spilling of food into the car, it also had a side dish tray which can be customized to suit the food that is being served. we also left an empty slot in the side dish tray to be used as a waste compartment to help eat comfortably. the side dish tray could also come with a compartment that can be used as a cup holder to hold a cup of chai or a can of soda. The concept also has two flaps which are folded down while eating to form a handle on the bottom. this serves two functions, it works as a handle to facilitate eating with the tray on one hand for people who find eating from the lap uncomfortable or if the user wants to eat standing up out of the car. it also enables the user to hold it with their thighs in the car in case of an emergency braking situation.



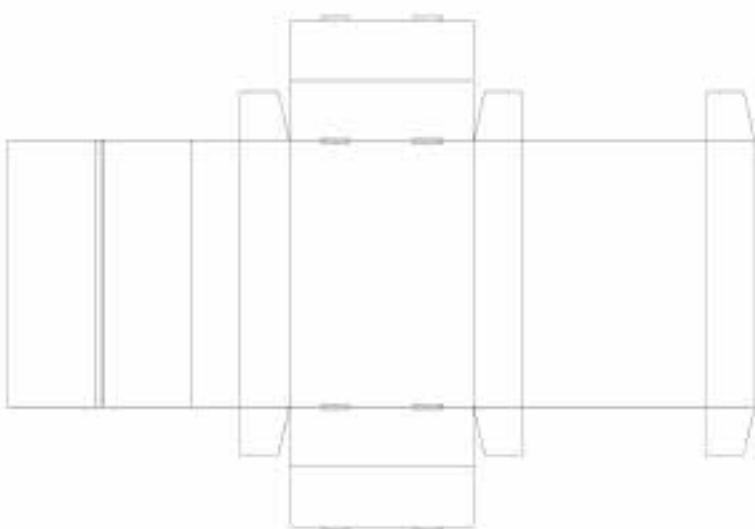
## Prototypes

We made a prototype from cardboard using the dimensions from the anthropometric study. We learned a lot of things while doing it. One of the major things we learned was that the actual product was too big when it was based on anthropometric measurements and we realized while doing the final thing that it was way bigger than what was necessary. Another thing we learned was that the flap for the handle needs to be as big as a box as we are using that for heat insulation. The next thing was that the side dish lid can be stored on the box's lid when in use. We didn't intend it to be so but we realized that it was and it turned out to be the solution for its storage.





## Developmental Drawings



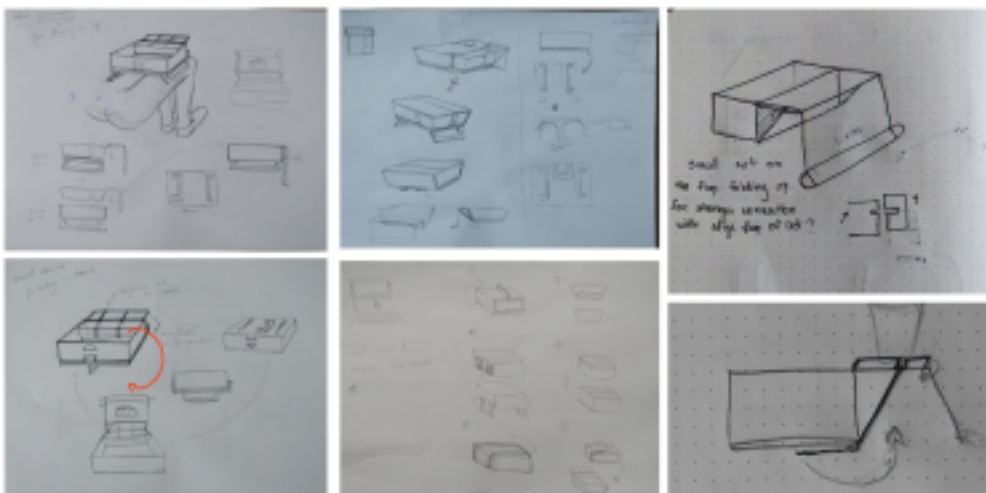
# Week 5

## Feedback Session

We met with Mr. Haresh Mehta, Managing Director of Jayna packaging, Mumbai. He suggested that the flap we have currently implemented will not be strong enough to handle the box's weight with food and that its use will be misunderstood when it is folded down, causing discomfort. He also suggested that we make two sizes of the product since many people order light quantities of food, in which case our product might be too large and wasteful. Although we ideated about a smaller variant, we decided not to try and design both and focus on one given the time constraint.



## Ideation IV



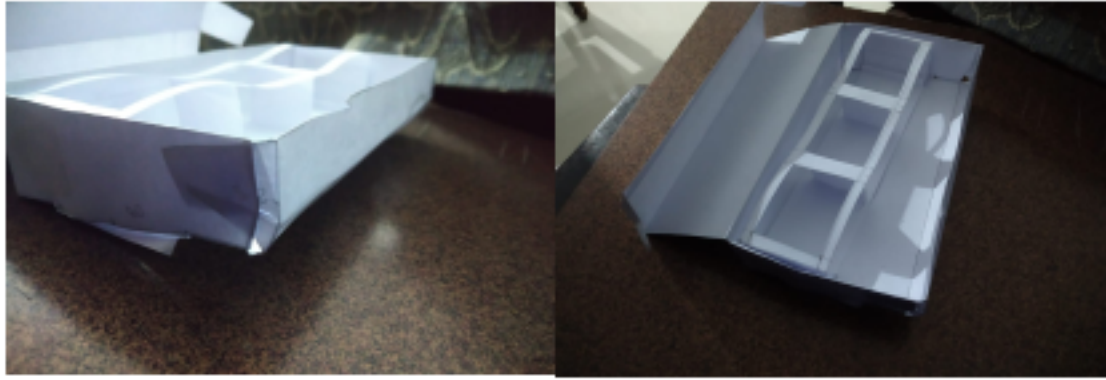


We went forward with another set of ideation by removing the handle flap. We tried new ways like a flap, which can be pulled down from the base to act as the side walls when placed on a lap, and one where at shape is pushed down, and it falls to form the side walls.

Going forward, we selected the t shape idea and did form exploration to make the box easy to construct from a single cardboard sheet and with all the features we decided on while ideating.

## Form exploration





With the limited resources we have at home we tried to experiment with paper and cardboard to study the form and folding techniques to make a design which can be folded to a box from a plane sheet of cardboard.

this makes it possible by the restaurant workers to construct the box from the hotel itself when in need and makes it easier to store and ship in large quantity.

## Final design

The Lap Crate is a sustainable takeout box given with the food from restaurants, ensuring a comfortable and clean eating environment inside the user's vehicles.



## Features

**Longer eating space** - A larger eating area for more comfortable eating experience and to reduce spilling inside the car



**Leakproof side dish compartments** - Its made of a different material to prevent spilling on to the cardboard or main dish



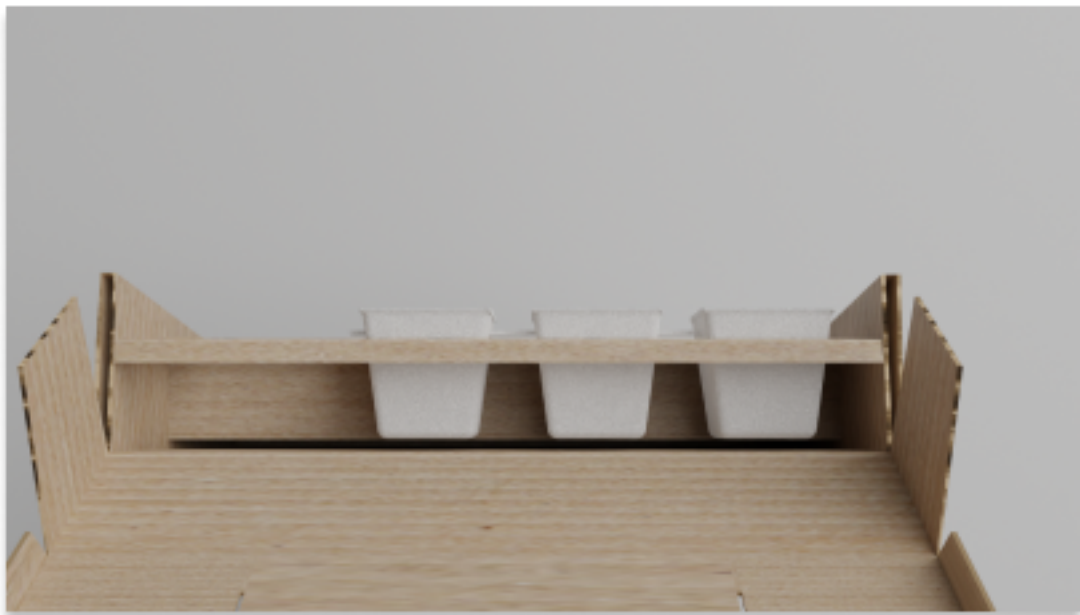
**Biodegradable and Recyclable Materials** - Made of bio - degradable and recyclable materials so perfect for one-time use.



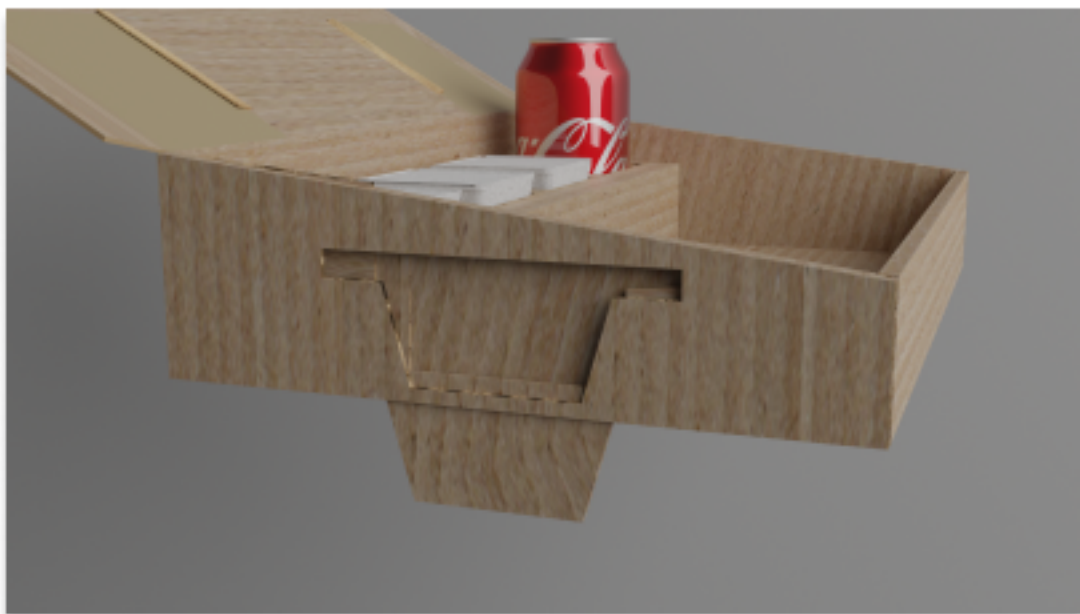
**Storage Sleeve** - Has a sleeve under the logo for storing cutlery, napkins, sauce sachets etc



**Heat insulated base** - The side compartments do not touch the base and are suspended so there is no heat transfer to the surface in contact with lap, the same goes for the main dish base as it too has a gap inbetween for heat insulation

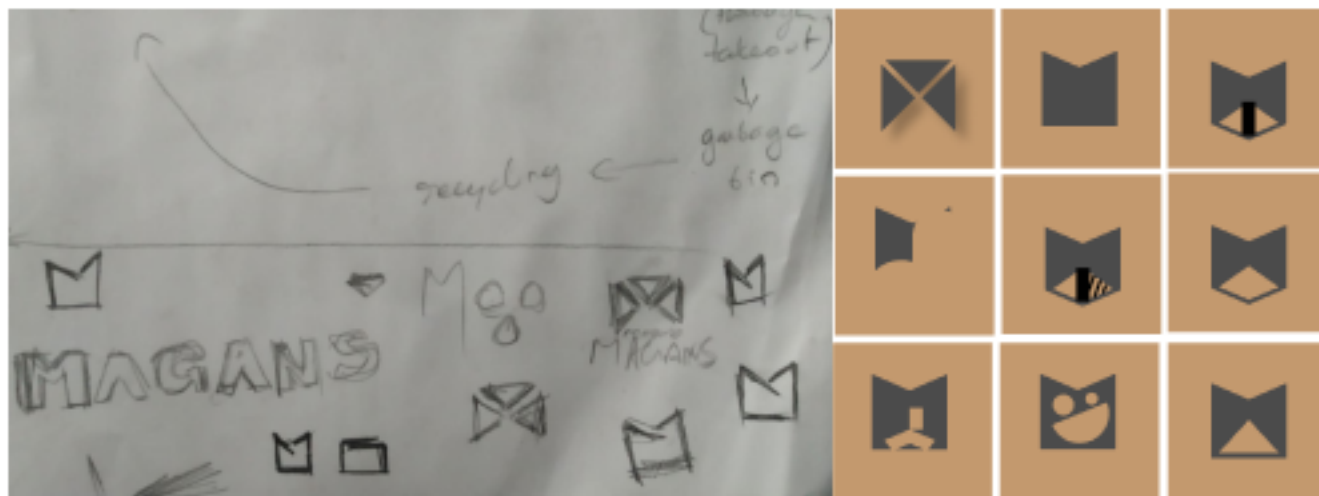


**Deployable side flaps** - You can punch a T - shaped perforation on the sides to get a side flap which will help in supporting the box on your lap



## Visual Design

We ideated for two logo one for magans the company and one for lapcrate the product



For magans we finalised on a 3 dimensional view of a box with a pyramid inside representing the food. the box was is also in the shape of M.

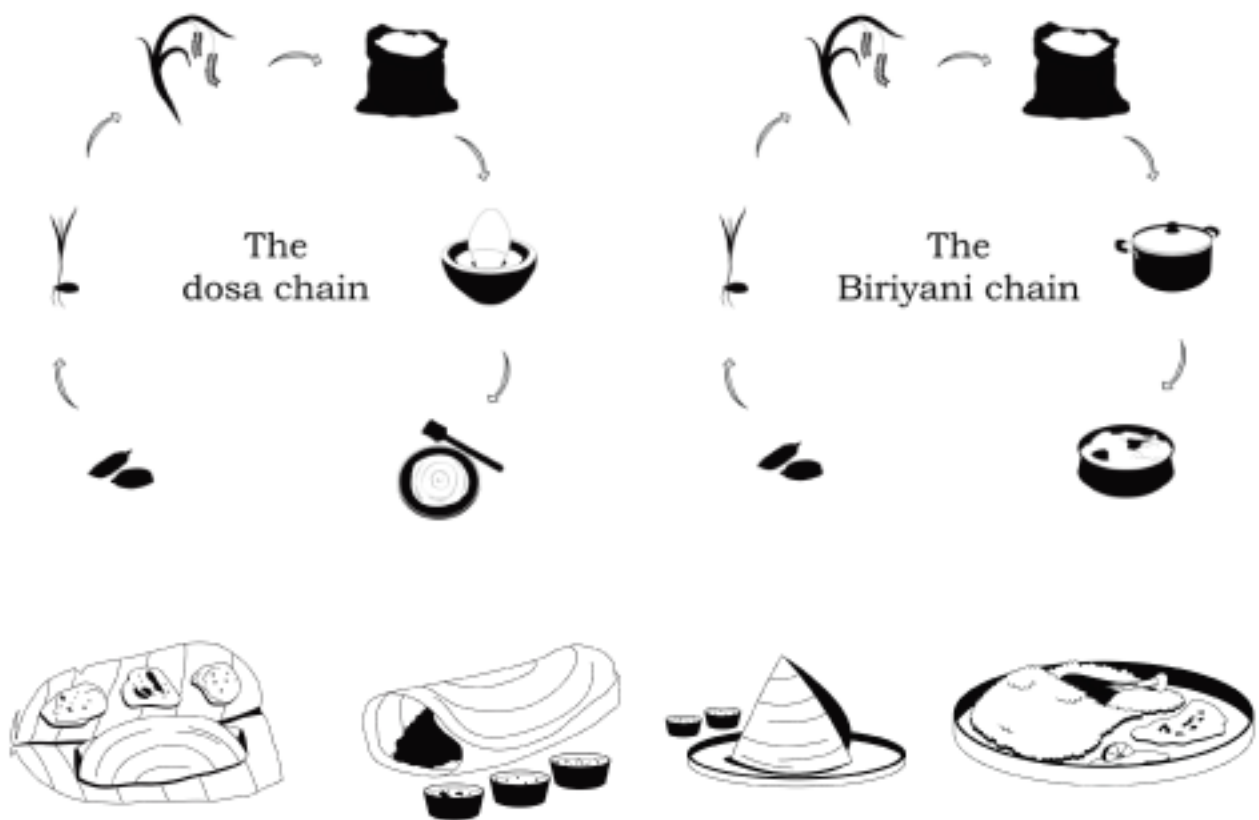


# LAPCRATE

For the product Lapcrate we decided on a wordmark using the font Lemon/Milk which gives a hungry vibe and convey the use through the name clearly.



We decided on infographics which represents the journey of how a food grain to becomes the food we eat and few different indian food illustrations which will go on the sides of the box.



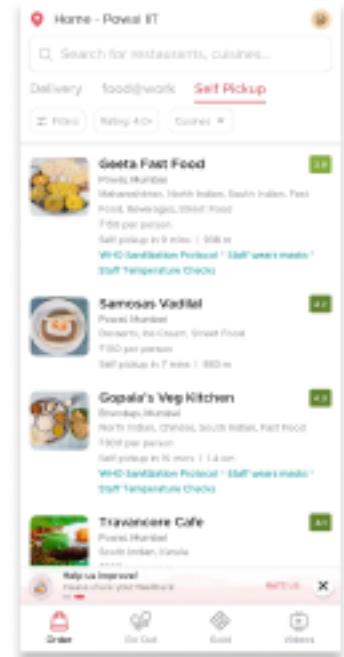
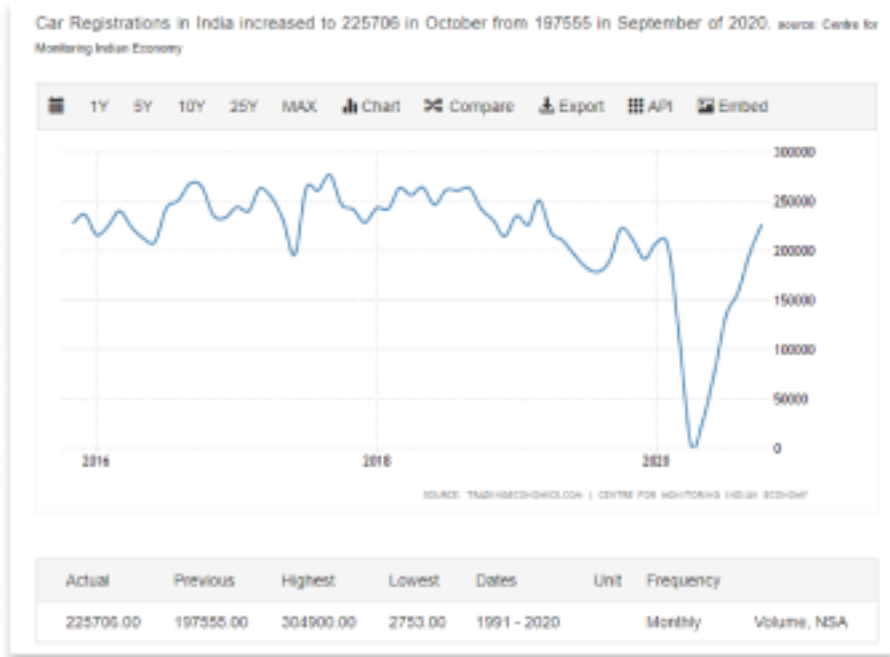
## Customer segment

Students, Drivers, Office workers during rush hours.  
Family and friends on trips.

## Market size

The vehicle sale in India is increasing faster than before after the pandemic.  
Restaurants are turning to food delivery and takeout instead of dine-in because of the pandemic

So the market is increasing everyday



## Channels

Hotels (menus and add boards)

Part of the takeaway section of every restaurant (different from the dine-in part)

Boards explaining that they have an option to eat in the car next to the takeaway

Part of the pick-up service of Swiggy/Zomato to include an option saying - "Eat in your car."

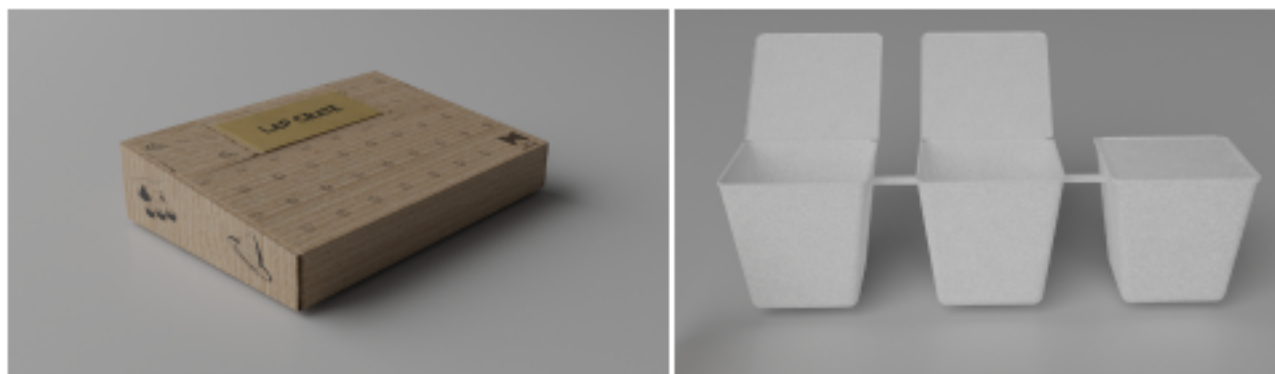
## Manufacture & Distribution

We plan to outsource manufacture to existing packaging units and distribute the box to restaurants ourselves.

Users can choose to get the food in the lap crate during takeout for a small packaging charge. We are also considering selling the boxes online or through retail stores for users to directly buy and pack food for their trips.

We will be sending cut creased sheets to restaurants where they can assemble it as needed per day. The side dish trays are molded as sets of six and the restaurant can break it into sets of 2 or 3 depending on the type of food being packed

## Costs



A manufacturer quoted the price of 500 boxes to be around Rs 20 per box and a begasse container of similar surface area costs Rs 5 on the market, from these We estimated the manufacturing cost to be Under 30 rupees, Which would be even lower when we mass manufacture.

## Acknowledgements

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Professor Avinash Shinde

Mr. Guruprasad Rao

Professor B K Chakravarthy

Mr. Haresh Mehta

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