

Compact Urban Mobility Solution for Generation-Z

Submitted in partial fulfillment of the requirements
of the degree of

Masters of Design

by

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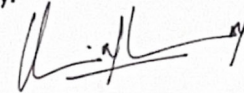


INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
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APPROVAL SHEET

This Mobility & Vehicle Design Project III titled 'Compact Urban Mobility solution for Generation Z' by Shubham is approved in partial fulfillment of the requirements for Master of Design Degree in Mobility & Vehicle Design, IIT Bombay.

Project Guide:



Chair person:



Internal Examiner:

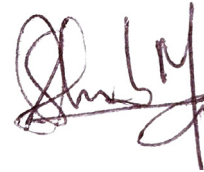


External Examiner



DECLARATION

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

A handwritten signature in dark ink, appearing to be 'Shubham', written in a cursive style.

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Date:
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ACKNOWLEDGMENT

My project Design of 'Compact Urban Mobility solution for Generation Z' has been a great experience overall. It has taught me how to look at the problems faced by people on day to day basis and how to design for them. All this wouldn't be possible without proper guidance so I would like to sincerely thank my guide, Prof. Unni Mohan for his valuable guidance throughout this project.

A big thank you to all the people who contributed to my project and my classmates for the valuable inputs and feedback throughout the project.

ABSTRACT

The MicroCar project targets Gen Z, a generation characterized by their expressiveness, individuality, and influential perspectives. Designed for urban commuting, the MicroCar offers customizable features, eco-friendly options, and advanced connectivity to align with Gen Z's values and lifestyle. As this generation emerges as the largest consumer group with significant market influence, the MicroCar meets their demand for authentic, sustainable, and technologically advanced solutions. This project underscores the importance of understanding Gen Z's unique characteristics and preferences, positioning the MicroCar as the ideal urban mobility solution for a forward-thinking, environmentally conscious generation.

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1. INTRODUCTION

In our lives, a significant amount of time is spent traveling in our vehicles. We travel distances ranging from 100-200 meters to much longer journeys. For the average person, most travel distances are moderate, typically within or just between cities.

When it comes to intercity and intracity travel, we perform basic tasks such as going for a haircut, buying batteries for a remote, commuting to work, going to the gym, or meeting a friend for lunch. We use our vehicles for these commutes. In India, the majority of vehicles used for this category of travel are two-wheelers. Additionally, India's congested urban landscapes and often inadequate public transportation systems make two-wheelers a practical choice for maneuvering through traffic and reaching destinations swiftly. They offer agility and flexibility, allowing riders to navigate narrow streets and congested roads with ease.

While two-wheelers are enjoyable and practical, they come with their own set of issues. Some of these issues are minor and can be ignored, such as a hairstyle getting messed up. However, some issues can be severe, including the risk of serious injury in minor accidents, which cannot be overlooked.

When seeking alternative solutions to these issues, people often find that available options are not ideal. There is gear for two-wheelers, but it is often cumbersome and inconvenient. There are cars, but many people find them unsuitable for their needs or personality, or they consider entry-level cars to be a hassle.

Currently, there is a gap in the Indian market for a solution that addresses the issues faced in daily commutes. This design project aims to bridge that gap by creating an urban mobility solution tailored for the upcoming and earning Generation-Z.

2. RESEARCH

Problems Faced by Two-Wheeler Riders

Health and Safety Issues

1. Pollution: Riders are constantly exposed to air pollution, leading to respiratory and vision issues.
2. Increased injury risk: Two-wheelers offer less protection, increasing the chances of injury in accidents.
3. Wrist pain in traffic: Prolonged periods in traffic can cause wrist discomfort and pain.
4. Posture issues: The riding posture can lead to back and neck pain.
5. Helmet discomfort with glasses: Helmets can be uncomfortable for riders who wear glasses.
6. Helmet discomfort on long distances: Wearing helmets for extended periods can become uncomfortable.
7. Hair loss from improper helmets: Using improperly fitting helmets can cause hair loss.
8. Unsafe for kids and infants: It is highly unsafe to travel with young children or infants.
9. Fatigue on long travels: Long journeys on two-wheelers can cause significant fatigue.
10. Bugs: Encounters with insects while riding can be both annoying and hazardous.

<https://www.hairmindia.com/blog/how-helmet-causes-hair-loss/>

<https://vedix.com/blogs/articles/helmet-hair-loss>

Environmental and External Factors

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8834466/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4776742/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7838324/>

1. Zero weather protection: Riders are exposed to harsh weather conditions without adequate protection.
2. Traffic noise: The sound of other vehicles in traffic can be overwhelming.
3. Low visibility to larger vehicles: Riders are less visible to larger vehicles, increasing the risk of accidents.
4. Vision issues from pollution: Pollution can cause significant vision problems. Increasing number of studies have indicated that air pollutants such as PM2.5 are associated with allergic conjunctivitis and glaucoma. Age-related macular degeneration (AMD) is related to exposure to traffic-related air pollutants.
5. Respiratory issues from pollution: Constant exposure to polluted air can lead to respiratory issues.
Air pollution continues to be associated with reduced lung function and enhanced airway reactivity in children suffering from asthma. Short-term episodes of air pollution in children can heighten respiratory infection symptoms and the frequency of emergency room visits
6. Skin issues from sun exposure: Prolonged sun exposure can lead to skin issues.
7. Skin issues from dirt: Riders are exposed to dirt, leading to skin problems.

Practical and Convenience Issues

1. Limited storage space: Two-wheelers have minimal storage capacity.
2. Uncomfortable protective gear: Wearing protective gear can be cumbersome and uncomfortable.
3. Inability to attend calls: Riders cannot easily attend phone calls while on the move.
4. Not suited for partner travel: Riding with a partner can be uncomfortable and unsafe.
5. Unsuitable for older people: Older individuals may find it difficult to ride two-wheelers.

Challenges Faced by Four-Wheeler (4W) Riders

Infrastructure and Space Issues

1. Parking space crunch: Limited availability of parking spots.
2. Traffic congestion: Difficulty navigating through congested roads.

Maintenance and Repair Challenges:

1. Difficulty in tire repair: Complex process for fixing tires.
2. High maintenance: Regular and costly upkeep required.
3. Low mileage: Poor fuel efficiency leading to higher costs.

Safety Concerns:

1. Blind spots: Limited visibility areas around the vehicle.

Financial Considerations:

1. High purchase cost: Substantial initial investment.

Maneuverability Constraints

1. Maneuverability: Limited agility, especially in tight spaces.

Benefits of Two-Wheeled Vehicles:

Maneuverability and Efficiency

1. Easier to manage in traffic
2. Easier to navigate through traffic
3. Low maintenance requirements
4. Ease of parking

5. Suitable for single or two-person mobility needs
6. Good mileage

Recreational and Cost-Effective

1. Recreational riding opportunities
2. Cheaper to operate, with lower fuel or electricity costs
3. Lower initial purchase cost
4. Easier maneuverability in narrow areas

Benefits of Four-Wheeled Vehicles

Comfort and Convenience

1. Comfortable for long journeys
2. Well-suited for family needs
3. Protection from weather elements
4. Protection from pollution (air and sound)
5. Convenient for traveling with infants and kids
6. Provides a sense of safety and security
7. Ample storage capacity for luggage
8. Reduces physical strain on back, neck, and feet

Utility and Practicality

1. Useful in emergency situations
 2. Enhances sense of pride
 3. Offers privacy while traveling
- From the above points, we can infer that users prioritize safety, convenience, and practicality. They seek the advantages of protection from weather and pollution, which four-wheelers offer, while also desiring the practicality and ease of use associated with two-wheelers.

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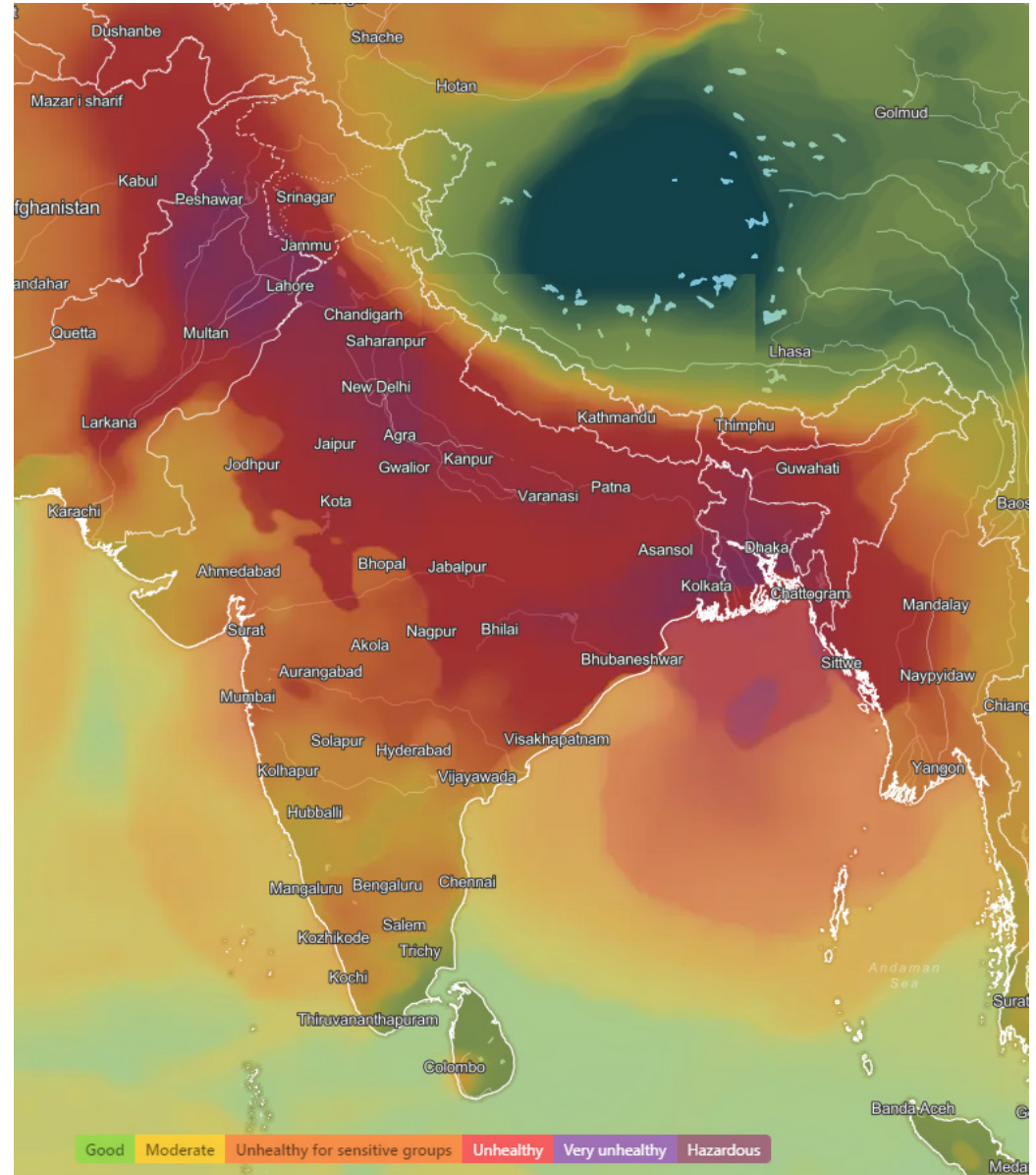
Aqi Map Of India (Dynamic In Nature)

This AQI map illustrates that nearly half or more of India's population lives in air that ranges from unhealthy to hazardous. While traveling, many Indians are exposed to this pollution since two-wheelers are commonly used for daily tasks.

Exposure to such polluted air can lead to various health issues, including vision problems, respiratory conditions, and skin-related issues.

Image source:

<https://www.iqair.com/in-en/air-quality-map>



How It Feels Like To Travel On 2w



How People Are Mitigating Their Issues

<https://mavox.com/>

Helmets with Activated Carbon Filter



Activated charcoal dust masks



<https://zeenews.india.com/hindi/web-stories/health/government-issued-heat-wave-advisory-do-not-make-these-mistakes/2187771>

Hankerchief to protect from dust and heat



For protection from bugs
Helmets
Googles



for better posture and preventing back issues



weather protection





protection from injury
due to accidents



storage



Honda CB400x

2MM thickness
Aluminum Magnesium Alloy



<https://www.amazon.in/Urban-Tribe-Fifth-Gear-Saddle/>



Why We Need To Move Away From Bikes To Other Options?

From the above points, we can infer that:

People need safety, convenience, and practicality.

They seek the advantages of protection from weather and pollution, which four-wheelers offer, while also desiring the practicality and ease of use associated with two-wheelers.

Advantages offered by 2W vehicles are outweighed by their disadvantages (be it health related or safety related).

This calls for an urgent need to have product in the market that sits right between the two wheelers and four wheelers. It doesnt have to replace bikes or cars but be an option that provides the practicality and convinience of a 2W and safety and benefits of 4W vehicles.

3. VARIOUS PRODUCTS LAUNCHED ALL OVER THE WORLD

BMW C1

<https://www.moteurnature.com>



heavy

top heavy

pillion outside the protection

Quasar

<https://www.motorcyclenews.com/news/2022/march/last-quasar-restored-for-sale/>



very unconventional design

reliance on rider to balance

Peraves MonoTracer

<https://www.flickr.com/photos/mechanicman87/50378098516>



too expensive

very limited production
at 100 pieces

Lit Motors C1

<https://www.coroflot.com/tjvaninetti/Lit-Motors-C-1>

Final Design



only one can sit
comfortably

tandem seating

16 | Lit Motors C-1

Yamaha MWC4

https://global.yamaha-motor.com/design_technology/design/concept/mwc4/



Vespa 400

https://upload.wikimedia.org/wikipedia/commons/b/b0/Piaggio_Vespa_400_1957-1961_frontleft_2008-08-17_U.jpg



Vanderhall Venice

<https://vanderhallusa.com/venice-gts-2023/>



Not very compact

Two people sit too close to each other

Renault Twizy

<https://www.renaultgroup.com/en/news-on-air/news/all-there-is-to-know-about-renault-twizy/>



Tandem Seating
Passenger not comfortably seated

PMV Electric Ease

<https://www.cardekho.com/pmv/eas-e>



Looks very like a traditional Car

Bajaj Qute

<https://www.bajajauto.com/three-wheelers/qute>



Microlino

<https://www.electrive.com/2022/05/25/micro-presents-variants-for-the-compact-microlino/>



Fiat topolino

<https://niwwrd.in/the-fiat-topolino/>



Wuling Mini EV

<https://niwwrd.in/the-fiat-topolino/>



Toyota BEV

<https://www.topgear.com/car-news/electric/toyota-has-built-diddy-two-seat-electric-car-elderly>



Targeted at elderly population of Japan

MG Comet

<https://www.zigwheels.com/mg-motor-cars/comet-ev>



4. USER INTERVIEWS

User Interview 1

Question	Response		
how often do you ride bike?	rides mostly bike		
how often do you ride bike?	home errands 10-12km 20-22kg wheat flour 4-5kg other items in backpack	work related 30km backpack	leisure 30-40km backpack or nothing
	pick and drop 10km one person		
where do you keep your luggage	if on scooty, mostly in front and helmet space under seat front- 25kg under seat- 15kg	some of it on back seat, if pillion is there that is gone too 20kg	hang some of it on handle bar itself 3-5kg although when on handle bar it becomes a bit difficult to take turns
do you wear helmet?	no! if I can avoid wearing a helmet, I will!	only to avoid police	

Question	Response		
why not bike?	only in rare case i don't have some luggage	comfort is not there	bumps are the worst
	in mud it's worst	in modern bikes, as a pillion it feels i'll fall down on the very next bump	stray animals can lead to accidents
	no sense of companionship....cant even talk to rider.	speed bumps	RAIN!!!
	as a pillion also, rides are very boring		Sun and Heat
	Rain has a different set of problems:		
	no visibility of road	feet get wet.	get wet in sudden rain
	bumps in rain	In scooty, our legs are atleast protected	
	odometer fogged or not clearly visible	very very poor visibility from helmet	
		rain drops and fog on specs and visor	
	Sun has a different set of problems:		
	extreme degree of uncomfort while sitting on a bike parked in Sun!	hand grips are so hot	helmets on bike get hot too

Question	Response		
what about safety?	in my city, only riding bike makes sense because of narrow streets and very very sharp turns somewhere	helmet at max	it's unsafe
when do you feel that car is better?	long distance travel for some it maybe for status quo.... but I don't care	in rain family trips	in summer
three incidents when you thought bike is worst	fell as i couldn't see ditch on the road due to water logging	in rainy season this feeling is kind of constant	two person one bike. one bike I am single. 'my journey was boring at best'
what do you want in a vehicle that will replace your bike ?	enclosed good conversation with pillion no helmet	luggage space 1-2 passengers ability to give some personal touch like in cars	not a bumpy ride good maneuverability

User Interview 2

Question	Response		
how often do you ride bike?	never, only car		
what is it you like about driving around in car?	everything comfort weather protection better companionship		
what is it that you don't like about driving around in cars?	take around 20mins of time buffer before going anywhere stress of unexpected failures in car	plan before going anywhere	traffic jams are worst. big cars -worst small cars- worse or okayish 2w- good in traffic
why not bikes ?	have seen serious accidents in family	it feels very unsafe	
why bikes?	they look macho		

User Interview 3

Question	Response		
how often do you ride bike?	To and fro to my workshop	twice a day	
where do you ride mostly?	only to our workshop otherwise its car	groceries etc once a week or online	
why not bike for other household tasks?	I recently got into an accident, a dog came up suddenly and there was loose gravel and my bike skid. Got hospitalized and badly injured		
what difference do you think there is in daily driving a Car and a Bike?	what took 30mins now takes 40-50mins but I've gotten used to it and day is generally well planned	unplanned tasks is unplanned for both bike and car user, it didn't matte much to me earlier also	and its better in car, no sun, dust, bugs anything at all and AC on top of it.
when you used Bike how did you managed with issue of weather and pollution?	helmet, and when going some place where how presentable you looked mattered, i used car	and when going in some dusty area, took car	
do you prefer bikes in any case?	going for hairCut, grocery maybe, very small chores, or going to a friend's house nearby		or when car is gone for maintenance

Question	Response		
do you feel any issue while daily driving a car?	sometimes when lanes are narrow or when other people don't drive properly in traffic, but still you're safe atleast		
what would be an ideal vehicle to you for your daily use?	protects from pollution and supports my daily commute. Nothing fancy. i can have fancy things seperately.		

User Interview 4

Question	Response		
how often do you ride bike?	3-4 times a day		
purpose for those rides?	grocery shopping 2-10km backpack work related 100km backpack	recreational riding 10km nothing	visiting friends and family 20km backpack
when do you use car?	in case of bringing rice sacks, wheat flour, etc. heavy grocery only when bringing cow fodder	if there is more than one friend with us	if travelling with parents
do you feel like there is any compromise in bikes?	in terms of safety	comforts such as AC, music during journey, etc	
how do you make up for these compromises?	i use protective gear if possible. such as good quality helmet. and Jacket. also i find the riding posture of my bike to be comfortable	nothing, when you miss something, you get else being in a car is like being an audience to a play, while 2W is like being in the play.	I ride very responsibly

Question	Response		
are there any instances where you feel like car would have been a better choice?	yes, my alienware laptop got ruined in rain	visibility is OK clean it with a hand and then it is fine for some time	dust issues, but it is only when there is some road construction etc going on
what would you say is the pollution level in your area	it is not that polluted. not like Delhi etc.		
what would you are the benefits of having a bike?	everywhere ready to go maneuverability in traffic is much better	ease of parking	ease of going through narrow lanes
what issues do you think there are with bike?	I don't face have any issue with my bike		
what would you are the benefits of cars?	ride feels safer	traveling with family	
what would you say are the issues with cars?	parking and finding space in parking and parking in tight spaces	turning in traffic maneuverability	getting stuck in traffic
how do you feel when riding your bike?	relaxed, feel like being part of play	more in touch with nature more engaging	
how do you feel when riding in your car?	when will this ride get over. i dont like driving cars	other than recreational purpose with friends, a big NO! to cars	

User Interview 5

Question	Response		
how often do you ride bike?	2-3 times a day		
for what purpose do you take your bike ?	groceries 15-20km backpack ~10kg pick and drop someone from station if only one person is there 7-10km	meeting friends 15-20km nothing ~0kg	when in college, used to take it to play football 10-15km backpack ~5-7kg
for what purpose do you take your car ?	pick and drop family members from station, if more than person is there football match in another area with friends	to carry luggage. sometimes have to transport music instruments	heavy luggage if more amount of grocery is there
do you feel pollution or weather affects you when riding 2W?	there isn't much pollution where I live	in traffic I feel smoke and heat from other vehicles	
do you wear helmet?	No. Most of the time I don't	No. safety isn't much of an issue for me	
why don't you wear helmet?	hair get messed up	there will be hair loss due to helmet	

Question	Response		
what are the benefits of having a 2W?	quick reach anywhere even though in traffic	can park it anywhere	
what are the disadvantages while riding 2W?	in rain if you are not prepared then its a hassle, you have to stop mid journey road bumps are not visible in rain	during rain, other vehicles splash water on you uncomfortable in long rides	for me saddle height of 2W is a bit high, its not perfect for me. Have to be cautious about about undulations in road when in traffic
what are the benefits of having a 4W?	carry more people in car	car is comfortable in long routes	protected from weather
what are the disadvantages while riding 4W?	finding parking space is an issue fear of damaging car while driving on bad roads have to guess a lot where another wheels is	needs to be parked at a distance and then walk to the destination	fear someone else will scratch it, damage panel, etc maintenance is costly
if you are given reign to design a vehicle for yourself? what would it have?	have some space to keep luggage definitely compact	maybe ability to seat three people	open vehicle feels better but cold be covered in rain

User Interview 6

Question	Response		
how often do you ride bike?	3-4 times a day	almost daily around 3hrs/day	
where do you ride mostly?	one is mostly in locality	then one is long distance covering the Faridabad city	
How much would you estimate total average distance?	one is mostly in locality		
Can you categorize your commutes?	home to station then using public transpor	within city due to workshop (CNC, Lathe) work mostly	scooty for home chores and errands
	GYM !	meetup with friends and family	
what do you carry with yourselves?	helmet	scarf for pollution	backpack
	handbag kind of thing for other stuff	sometimes gloves	
do you actually wear helmet?	never wears a helmet in locality	wears helmet when going out of locality reason is Police & Pollution	safety is never the reason
how to you decide btw a car and 2W while going out ?	if you have well planned plan then take the car	but for impromptu rides 2W is best	

Question	Response		
what are the issues you	<p>sweat in summers, especially inside helmet</p> <p>your whole style is damaged</p> <p>after a ride it looks like you've struggled with</p> <p>also have to prepare for weather, in summers you have to be covered, in winters you have to carry extra jacket and gloves, rain</p>	<p>have to cover myself fully for protection from sun like wear a jacket or</p> <p>have to be more alert</p> <p>sometimes where your getup matters, you are</p> <p>riding a bike regularly makes me carry extra stuff with me</p>	<p>sitting on bike parked in</p> <p>hairstyle is damaged</p> <p>i myself have to prepare a lot before a ride to look presentable if it</p> <p>traffic in summers is</p>
what are the issues you face in 4W rides?	plan the jourey	if all trips are not planned then parking and taking out again and again is a hassle for	sometimes finding space to park is an issue
you have so many issues with bike then	like many people, i like 2W riding as a sport,	i can make unplanned trips and parking is	
why do you prefer car?	if time is not a n issue during journey, traffics	<p>I look presentable after</p> <p>when going to a dusty area it is just so much better in car</p>	portable private space in car,

Question	Response		
Can you summarize your issue with cars in brief?	home to highway, is the biggest challenge	but lately i have been choosing car for certain very specific reasons	
Can you summarize your issue with cars in brief?	Faridabad is very polluted and Dusty car parking is an issue but not greather than health issues that come with riding on bikes being exposed to pollution	I feel very irritated after rides sometimes i have been health conscious lately and i noticed it has affected my health, skin issues, hair issues throat infection, cough lasts for way too long	dust in hair and eyes, itching in eyes after few kilometres, etc. and it gets worse in summers pollution is a big deal to me
you are given free reign to make our vehicle how would it be?	character must be of bike covered	compact 2 seater is enough Air Conditioned	short turning radius atleast 1 backpack space

5. DERIVING INSIGHTS FROM RESPONSES

how often do you ride bike?

almost daily
around
3hrs/day

twice a day

3-4 times a day

2-3 times a day

3-4 times a day

rides mostly bike

Insight

people don't think much before going out on 2W

where do you keep your luggage?

some of it on back seat, if pillion is there that is gone too

although when on handle bar it becomes a bit difficult to take turns

hang some of it on handle bar itself

if on scooty, mostly in front and helmet space under seat

every possible space is space for luggage and can become a safety issue

if possible people will bear discomfort to carry bit more luggage on 2W

for what purpose do you ride bikes?

To and fro to my workshop

only to our workshop

work related travelling

meeting friends

meetup with friends and family

work related

within city due to workshop (CNC, Lathe) work mostly

then one is long distance covering the Faridabad city

visiting friends and family

home errands

groceries etc once a week or online

grocery shopping

recreational riding

leisure

for groceries

scooty for home chores and errands

when in college, used to take it to play football

GYM !

for what purpose do
you ride bikes?

home to station
then using
public transport

pick and drop

one is mostly
in locality

pick and drop
someone from
station if only
one person is
there

going for hairCut, grocery
maybe, very small chores,
or going to a friend's house
nearby

or when car is gone for
maintenance

Insight

2W are thought of
as short distance
commuting vehicles

2W considered as a
Backup vehicle or an
extra

2W serve well as a last
mile vehicle

what do you carry?

nothing

backpack
or nothing

backpack

helmet

scarf for
pollution

20-22kg wheat
flour
4-5kg maybe
at back

one person

handbag kind
of thing for
other stuff

sometimes
gloves

Insight

people notice extra
things when they carry
it on 2W and aware of it

why bikes?

they look macho

like many people, i like 2W riding as a sport
It is so much fun

relaxed, feel like being part of play

Insight

people like sensory rich experience of the 2W -fun and thrill

being in a car is like being an audience to a play, while 2W is like being in the play.

more in touch with nature
more engaging

i can make unplanned trips and parking is almost never an issue

everywhere ready to go

but for impromptu rides 2W is best.

2W is smartphone
4w is laptop

ease of parking

quick reach anywhere even though in traffic

ease of going through narrow lanes

maneuverability in traffic is much better

2W are take anywhere accessory for people

can park it anywhere

in my city, only riding bike makes sense because of narrow streets and very very sharp turns somewhere

why not bikes?

although when luggage on handle bar it becomes a bit difficult to take turns

riding a bike regularly makes me carry extra stuff with me

only in rare case i don't have some luggage

also have to prepare for weather
in summers you have to be covered, in winters you have to carry extra jacket and gloves, rain me rain coat, etc etc

i myself have to prepare a lot before a ride to look presentable if it matters

your whole style is damaged after a ride it looks like you've struggled with weather

sometimes where your getup matters
you are no longer presentable

i have been health conscious lately and i noticed it has affected my health

skin issues
hair issues
throat infection, cough lasts for way too long

Faridabad is very polluted and Dusty

car parking is an issue but not greather than health issues that come with riding on bikes being exposed to pollution

pollution is a big deal to me

dust in hair and eyes, itching in eyes after few kilometres, etc. and it gets worse in summers

Insight

people notice the extra things the carry more on 2W as it takes their attention and focus and time

people care about how they are perceived at certain places

being more health conscious is changing the choice of vehicle from 2w to 4W

why not bikes?

road bumps are not visible in rain

visibility is OK
clean it with a hand and then it is fine for some time

no visibility of road bumps in rain

very very poor visibility from helmet

rain drops and fog on specs and visor

odometer fogged or not clearly visible

get wet in sudden rain

feet get wet.
In scooty, our legs are atleast protected

in mud it's worst

during rain, other vehicles splash water on you

traffic in summers is almost equal to burning

sweat in summers especially inside helmet

→ have to cover myself fully for protection from sun like wear a jacket or shirt but then I sweat.

Insight

helmet and specs create diff issues in diff seasons

reliance on rider for balance is hazardous in many situations

senses are overwhelmed in extreme weather

why not bikes?

helmets on bike get hot too

hand grips are so hot

sitting on bike parked in sun is worst

extreme degree of uncomfort while sitting on a bike parked in Sun!

have to be more alert while riding Bike

it feels very unsafe

stray animals can lead to accidents

have seen serious accidents in family

I recently got into an accident, a dog came up suddenly and there was loose gravel and my bike skid. Got hospitalized and badly injured

compromise in terms of safety

it's unsafe

fell as i couldn't see ditch on the road due to water logging

Insight

NO way of protecting the rider-contacting surface from weather on bike itself

active and passive safety is not there

why not bikes?

in modern
bikes, as a
pillion it feels i'll
fall down on the
very next bump

speed bumps

bumps are
the worst

uncomfortable
in long rides

comfort is
not there

I feel very
irritated
after rides
sometimes

Insight

people accept ride
is uncomfortable yet
choose 2W

do you wear helmets?

reason is
Police
& Pollution

only to avoid
police

no!
if I can avoid
wearing a
helmet, I will!

Insight

people don't want to wear helmet

No. Most of
the time I
don't

helmet at
max

never wears
a helmet in
locality

safety is
never a
concern

safety is
never the
reason

being in their locality automatically makes them feel safe but factually they are unsafe

No. safety
isn't much of
an issue for
me

helmet, and when going
some place where how
presentable you looked
mattered, i used car

hairstyle is
damaged

no, hair get
messed up
due to
helmet

there will be
hair loss due
to helmet

worries that wearing helmet will cause hairfall

do you wear helmets?

Kerela

there isn't
much
pollution
where I live

dust issues, but it
is only when there
is some road
construction etc
going on

Pune

it is not that
polluted. not
like Delhi etc.

in traffic I feel
smoke and
heat from
other vehicles

Delhi NCR

car parking is an issue but
not greather than health
issues that come with riding
on bikes being exposed to
pollution

pollution is a big deal to
me

Insight

people willing to accept
some compromises
to be protected from
pollution

health seems to be a
priority

when do you feel that car is better?

and when going in some dusty area, took car

and its better in car, no sun, dust, bugs anything at all and AC on top of it.

Insight

In Delhi NCR, if time is not a n issue during journey, traffics are better in cars

when going to a dusty area it is just so impossible of a task on a bike

everything

comfort
weather protection
better companionship

if you have well planned plan then take the car

protected from weather

in rain

in summer

closed walls and protection from weather instills sense of safety and comfort

to carry luggage. sometimes have to transport music instruments

heavy luggage
if more amount of grocery is there

when bringing cow fodder

in case of bringing rice sacks, wheat flour, etc.
heavy grocery only

right now, cars are only way to carry more luggage

when do you feel that car is better?

no sense of companionship on bikecant even talk to rider.
as a pillion also, rides are very boring

everything
comfort
weather protection
better companionship

portable private space in car
talk, eat, do whatever

two person one bike
one bike I am single
my journey was boring at best

if there is more than one friend with us

family trips

travelling with family

carry more people in car

pick and drop family members from station, if more than person is there

I look presentable after a ride

Insight

lack of private space and companionship in motorcycles

personal looks always matter

why not car?

needs to be parked at a distance and then walk to the destination

finding parking space is an issue

sometimes finding space to park is an issue
ex- gym

Insight

finding parking space is a common problem

parking

finding space in parking and parking in tight spaces

plan the jourey beforehand

if all trips are not planned then parking and taking out again and again is a hassle for me

take around 20mins of time buffer before going anywhere

maneuverability affects total the time of jorney and need for planning

what took 30mins now takes 40-50mins but I've gotten used to it and day is generally well planned

plan before going anywhere

parking

finding space in parking and parking in tight spaces

car parking is an issue but not greather than health issues that come with riding on bikes being exposed to pollution

health consciousness is there among people

stress of
unexpected
failures in car

fear of damaging car
while driving on bad
roads

have to guess a lot
where another
wheels is

fear someone else
will scratch it,
damage panel, etc

maintenance is
costly

sometimes when lanes are
narrow or when other people
don't drive properly in traffic,
but still you're safe atleast

Insight

stress related to cost of
damage repair

what do you want in a vehicle that will replace your bike ?

atleast 1 backpack space

luggage space

have some space to keep luggage

2 seater is enough

maybe ability to seat three people

1-2 passengers

short turning radius

definitely compact

protects from pollution and supports my daily commute. Nothing fancy.
i can have fancy things seperately.

enclosed

compact

good maneuverability

covered

no helmet

open vehicle feels better but cold be covered in rain

Insight

people want benefits of of bikes sans discomfort with benefit, comfort and protection of car

i.e. something that bridges bikes and cars

6. AFFINITY MAPPING AND DERIVING KEYINSIGHTS FROM INTERVIEW

people don't think much before out on 2W

2W is like a smartphone
4W is like a laptop.
Can we bridge that gap.

every possible space is luggage space and compromises safety

2W are just easier but not suitable for the various scenarios they are used in

people don't think of short distance commutes as UNSAFE.

people bear discomfort to carry but more luggage on 2W

2W are thought of/ considered as short distance commute vehicles (~15-20km)

for most of their life they drive in a small zone. (~10-25km radius)

people tend to notice extra things they carry more on a 2W (bags, phone, etc.)

people don't want to have helmet.

In case, there is stress related to cost of damage repair

health conscious people tend to choose cars in cities in spite of the issues

manoeuvrability adds to needs for planning ahead with cars when used in small zone distances

manoeuvrability adds to needs for planning with cars when used in place of bikes or

parking cars is itself a very cognitive task

finding parking space for cars is a problem.

Experience on 2W is more sensory. It can be good or bad depending on situation

they have to carry extra things on them ~~for~~ on 2W (for protection and etc.)

worry that wearing helmet will cause hairfall

wearing space is a problem with helmet.

people willing to accept compromise to be protected from pollution / weather.

when looks matter, Cars are the way to go.

during rain / sunburns riding experience is impacted and ~~impacts~~ there are disadvantages for the rider

reliance on sides on 2W is disadvantageous in many situations.

Senses are overwhelmed in Extreme weather.

MORE Exposed to crime on 2W

being exposed makes people feel vulnerable to accidents and unwanted glances

Cars provide you your own personal, private, cozy, space

personal space and safety is second best thing or a car
FIRST is comfort and being able to lay back

lack of private space in motorbikes make accompanied friends choose car.

few qualities of bikes make people choose it.
~~car~~ - car
- manoeuvrability
- sometimes the sensory experience.

→ Hot Seat / Wind Blast
→ Hot grips
→ Hot helmets
→ noise of electronics.

people don't think much before ^{put} out on 2W

2W is like a smartphone
4W is like a laptop.
Can we bridge that gap.

2W are just easier but not suitable for the various scenarios they are used in

even though there are compromises on safety and luggage space, people choose 2w because they are EASY like smartphones.

every possible space is luggage space and compromises safety

people have discomfort to carry but more luggage on 2W

maneuverability adds to needs for planning ahead with cars when used in small zone distances

2W are thought of / considered as short distance commutes (15-20km)

for most of their life they drive in a small zone. (20-25km radius)

during rain / sunburn riding experience is impacted and safety there are disadvantages for the rider

people tend to notice extra things they carry on a 2W (bags, ...)

we worry about our extra things on car more when on 2W or 2W carry extra things away from the focus and attention

Instead of cars, 2w drive to the last mile more because of maneuverability

Experience on 2w is more sensory. It can be good or bad depending on situation

they have carry extra on them (after protection)

At the end, LOOKS MATTER!

people don't think of short distance commutes as UNSAFE

people like sensory experience of 2w, but senses get overwhelmed in extreme weather.

see me involved in sun weather.

being exposed when people feel vulnerable to accidents

when does people choose comfort over safety. with good ones, they choose safety

Safety is second best thing. First is comfort.

cars provide you your own personal, private, cozy, space

lack of space in motorcycles make accompanied travel choose car.

choose city but for comfort, and isolation from outside world.

people willing to accept compromises to be protected from pollution / weather.

what looks matter, cars are the way to go.

reliance on rider a 2w is disadvantageous in many situations.

→ flat tires / Wind bent
→ flat grips
→ flat helmets
→ failure of electronics.

women were worried about safety and unwarmed gloves on 2w than men.

They feel exposed on 2w and vulnerable.

people don't want to wear helmet. They are uncomfortable in many situations and people worry about their hair.

people don't want to wear helmet.

wearing space is a problem with helmet.

worries that wearing helmet will cause hairfall and damage hairstyle

health conscious people leaving cars in cities.

In case, there is stress related to cost of damage repair

finding parking space for cars is a problem.

parking space is problem but even bigger problem is parking a car properly

maneuverability adds to needs for planning with cars when used in place of bikes or

parking is a cognitive task for many

low quality of bikes when people choose it. - cost, maneuverability - sometimes the sensory experience.

7. KEY INSIGHTS

they carry more on 2W as it takes their attention and focus and time

2W are take anywhere accessory for people like their smartphone

every possible space is space for luggage and can become a safety issue

being exposed make people feel vulnerable to accidents, crimes, unwanted glances, etc and is unsafe

2W are thought of as short distance commuting vehicles, last mile, extra vehicle

people like sensory rich experience of the 2W -fun and thrill

during rain focus and riding experience is impacted

lack of infrastructure to accomodate large vehicles

people want characater of bike with comfort and protection of car

being in their locality automatically makes them feel safe and don't feel the need of safety gear

reliance on rider for balance is disadvantageous in many situations and is dangerous in certain scenarios

people willing to accept some compromises to be protected from pollution

8. DERIVING ACTIONABLE KEY INSIGHTS

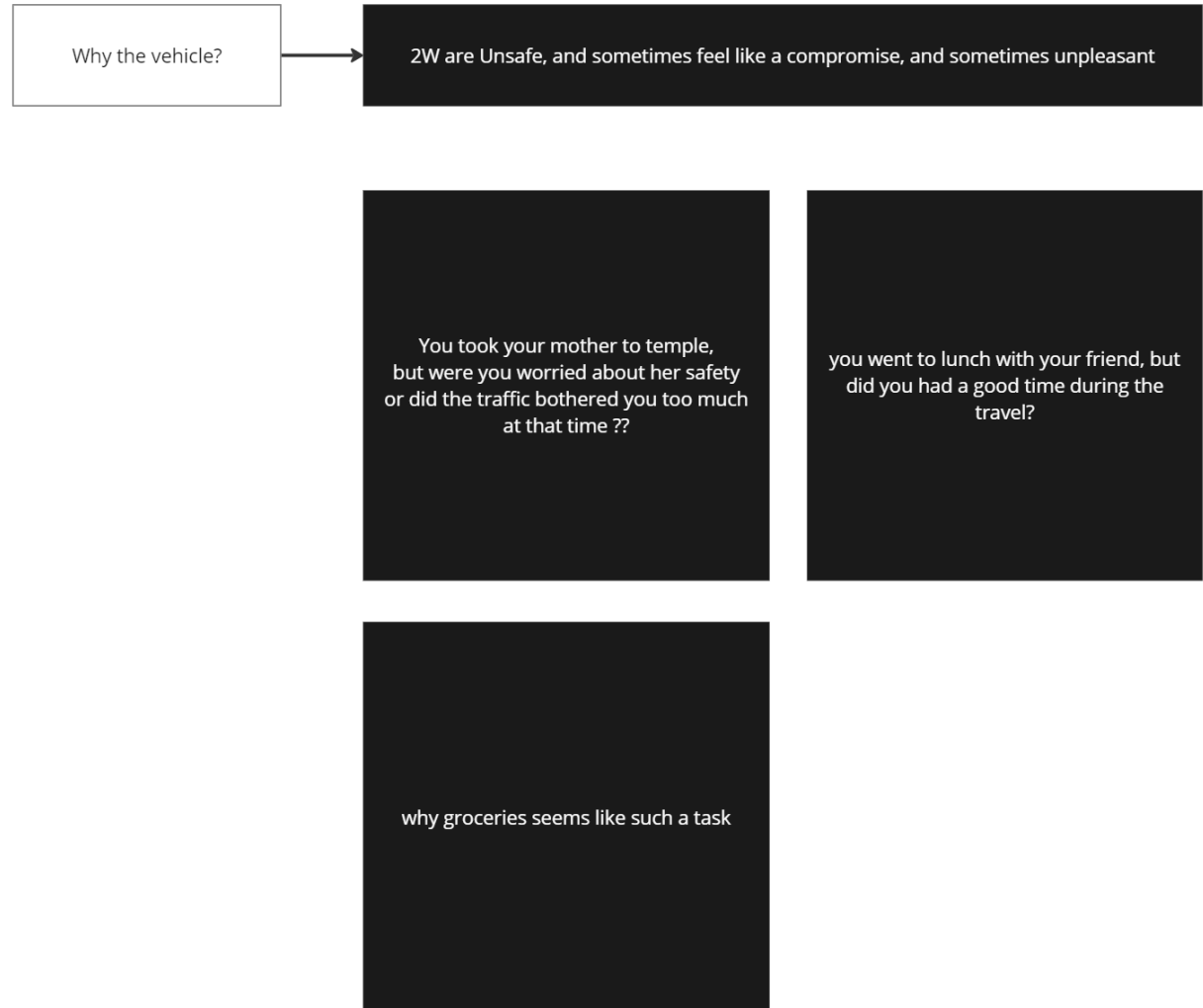
PROBLEM	DESIRED EXPERIENCE	BARRIER TO DESIRED EXPERIENCE	MITIGATING THE BARRIE
we worry about and notice all the small extra things we carry with us on 2W and it distracts and takes away from the focus and attention needed	not having to worry at all about the things we carry with us	don't have dedicated good space for storing our belongings	have a space to keep our small belongings safely with very good accessibility
people don't think of short distance commutes as unsafe and dont use safety gears such as helmets and shoes	have a safe journey	2W	make vehicle the first point point of contact in an accident
instead of cars, though unsafe mostly 2W are used for personal last mile needs, because of maneuverability	have a safer alternative, which doesnt compromises much on maneuverability	no other option in market	give a compact and safer alternative to 2W

PROBLEM	DESIRED EXPERIENCE	BARRIER TO DESIRED EXPERIENCE	MITIGATING THE BARRIE
even though there are compromises on safety and luggage space, people choose 2W over Cars because they are just EASY.	Improve maneuverability, have ample luggage storage space that doesn't affect dynamics of vehicle	Cars have compromised visibility than 2W and their size is big	Improve visibility, have dedicated storage space and have a shorter wheelbase
people like sensory experience of 2W but senses get overwhelmed in weather	having a sensory pleasing experience to our likes	exposure of seats and occupant zone to weather having a fixed configuration of vehicle, not having options to customize to our mood	give options to change the occupant space and have it to the liking and mood
People don't want to wear helmet. They are Uncomfortable for the most part. And People worry about their Hair.	Not wearing a Helmet	Safety Regulations for 2W	Having an Enclosed Vehicle Space
Reliance on rider for balancing on a 2W becomes dangerous in certain situation	Not having to balance at all	2W don't self balance	Eliminate the need to balance by having more than 2 Wheels

	PROBLEM	DESIRED EXPERIENCE	BARRIER TO DESIRED EXPERIENCE	MITIGATING THE BARRIE
	<p>less sense of companionship during 2W rides</p> <p>When with their loved ones, people prioritize safety and typical 2W by nature cant provide it</p> <p>AND especially women want a private</p>	<p>Safety, privacy and sense of safety for both driver/rider and passenger</p>	<p>2W are open, make people feel exposed and vulnerable to accidents</p>	<p>Enclosing the occupants space, while also working out with the other aspects which affect the sense and feeling of safety and comfort.</p>
	<p>People choose cars even in single person travel due to pollution and weather, despite the compromises on maneuverability.</p> <p>And this adds up to</p>	<p>Weather protection and ease of Maneuverability</p>	<p>2W don't offer weather protection and Cars are big</p>	<p>Make the vehicle compact</p>
	<p>parking space is an Issue for 4W but frustration is magnified when parking the vehicle itself due to poor visibility</p> <p>For many, parking is a very cognitive tasktraffic on roads</p>	<p>Excellent visibility of vehicle from inside</p>	<p>Large size and not able to asses the positioning in space</p>	<p>Increase visibility from inside and have shortest possible overhangs of vehicle</p>

9. WHY GENERATION Z ?

A different way of looking at things



How can the experience of all of this be changed?

Not so obvious Why the vehicle?

for a long time, travel has been mostly a necessity for majority
A -----> B

but things have changed for better but not for all
we have things like road trip, leisure travel, etc

enthusiast's thing

for many it still is necessity or analogous terms ----> technical
lacks humanity aspect

How do we change it through whom?

	GenX	Millenials	GenZ
Acceptance to Change	Generally adaptable but may resist sudden or drastic changes Value stability and predictability	Open to change and embrace new experiences View change as an opportunity for growth and development	Highly comfortable with change and thrive in dynamic environments Value innovation and flexibility
Trying Something New	Cautious but willing to try new things within boundaries of reason and comfort Value research and preparation before diving in	Adventurous and eager to try new things , often driven by experiences and personal growth . Open to diverse and unconventional options	Naturally curious and seek out new experiences , often motivated by social impact and entrepreneurial opportunities . Comfortable with risks and uncertainty
Tolerance for Change	Can be frustrated by rapid or disruptive change , but ultimately adjust and adapt . Value finding solutions and making change work	Generally tolerant of change as long as it's meaningful and inclusive . May resist change perceived as unfair or harmful .	Expect change and are comfortable with ambiguity . More likely to advocate for change they believe in, even if disruptive.
Openness/ Conservatism	Can be pragmatic and skeptical , but also open-minded to new ideas and perspectives. Balance tradition with innovation	Generally open-minded and accepting of diversity . Value inclusivity and social justice . May challenge traditional norms and institutions	Highly progressive and advocate for social change . Value individualism and fluid identities . Question traditional structures and authority figures .

About GenZ

Being more practical and realistic than Millennials

While focused on achievable goals and financial security, They value "YOLO" moments, **prioritizing meaningful experiences alongside responsible planning.**

More pragmatic than Millennials

they are more likely to be concerned with what is achievable and what works in the real world than with abstract ideas, their pragmatism often fuels **entrepreneurial spirit** and **innovative solutions**. They **challenge traditional norms** and question authority, seeking positive change

Gen Z is more focused on savings and practical products

Gen Z might be more financially cautious than previous generations, but it's not about being stingy, It's about making informed choices and being **future-oriented**



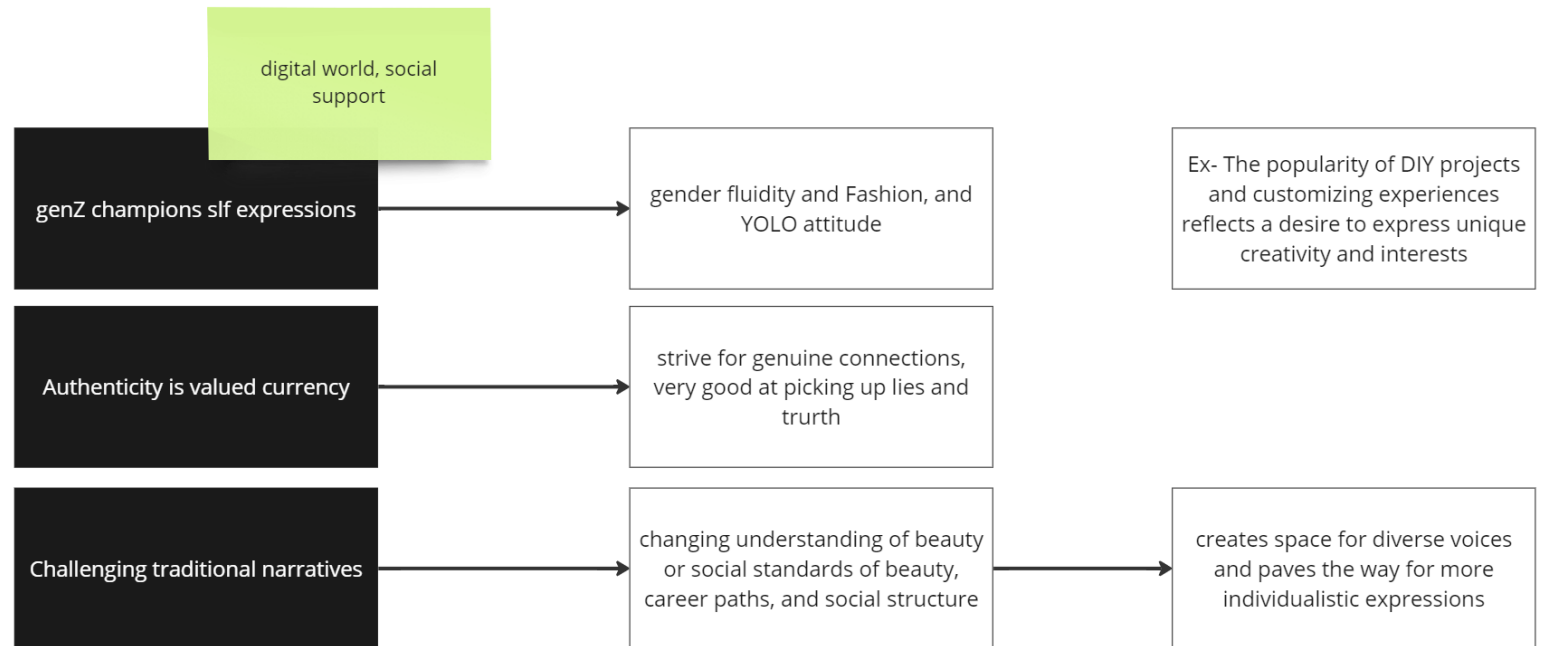
Growing up in the digital age, Gen Z has been constantly bombarded with new information, trends, and technologies.

more adaptable to change, high tolerance to change

With easy access to information and diverse online communities, Gen Z has a broader view of the world and different cultures
This exposure can make them more accepting of diverse perspectives

Gen Z values individuality and expressing themselves uniquely, stand out (they can think for themselves)

Celebrating Individuality

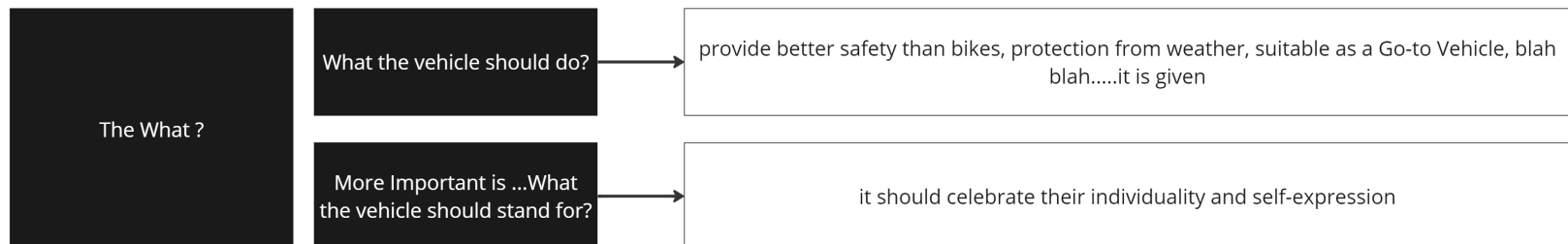


Gen Z is diverse, and both genuine expressions of individuality and performative acts likely coexist

Emphasis on self-expression, inclusivity, and challenging norms of social structure to emphasize stride towards a more individualistic and accepting society

As a brand we should encourage genuine self-exploration and expression

What the vehicle should stand for?



Typical commutes on 2W

Grocery

Gym

Bank Visits

Meet Relatives

Salon

Eating Out

Shopping Malls

Temples

Pick and Drop
Someone

Going to station

Movies

Work Purposes

Meet Friends

Commuting to
job/work

School/ College

Recreational Rides

Random household
chores

etc

2-15km average

What and How we Carry?

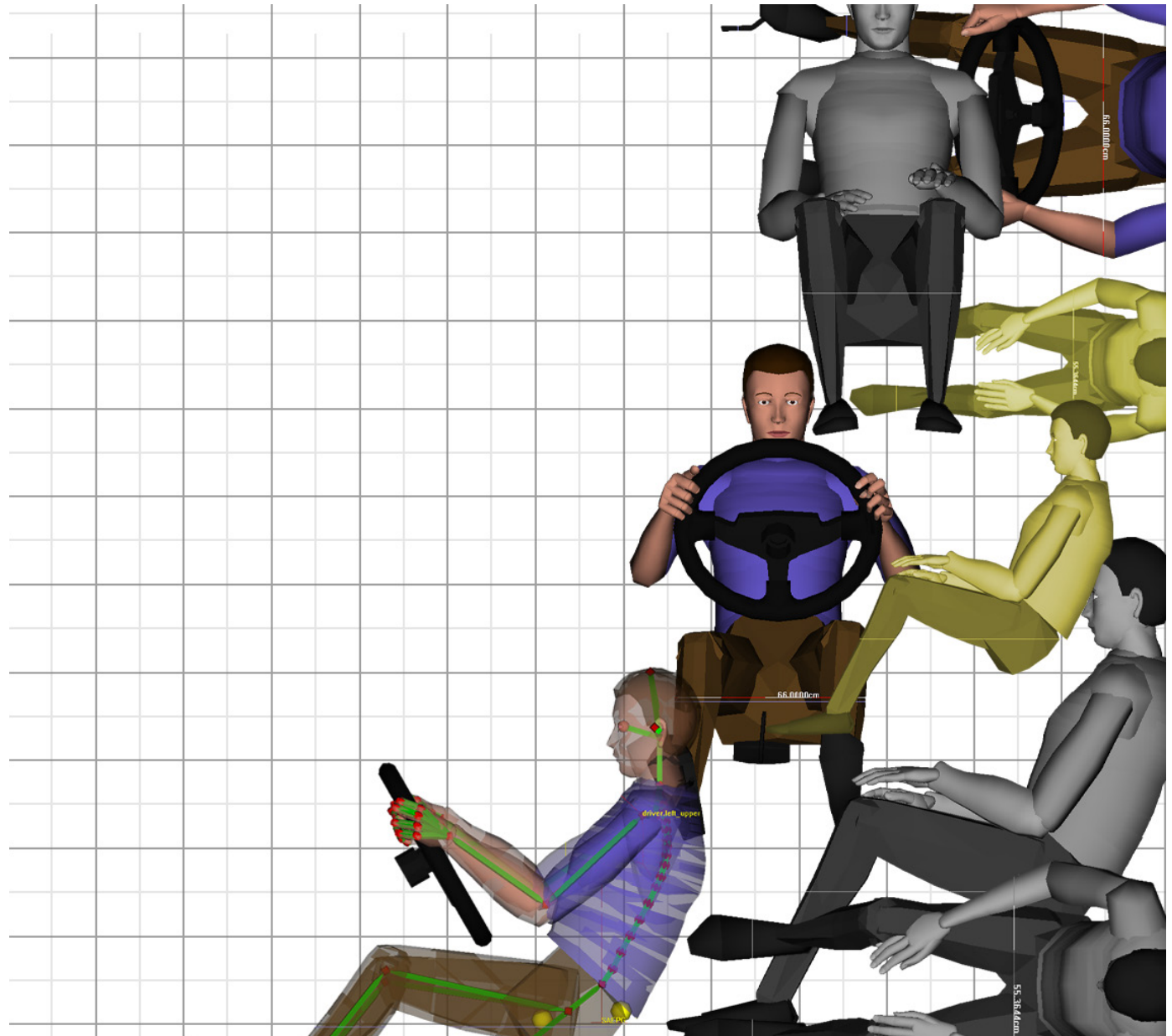
On Ourselves	backpack	Wallet	Grocery	Imp Docs
Backpack	Water Bottle	Cash Money	Dry ration	Vehicle Docs
Phone	Laptop	govt IDs	Fresh ration	Personal Docs
Keys	iPad	Debit, Credit Cards	dairy	Bills
Wallet	Imp Docs	Workplae IDs	Baked Goods	etc
Imp Docs	Headphones	etc	etc	
etc	Charger			
	etc			

Anytime we easily carry around **Rs1500 - Rs1.5 lakh** worth of goods on us

We carry it on
 our backs
 Side of the 2W
 Helmet storage space
 Handlebars

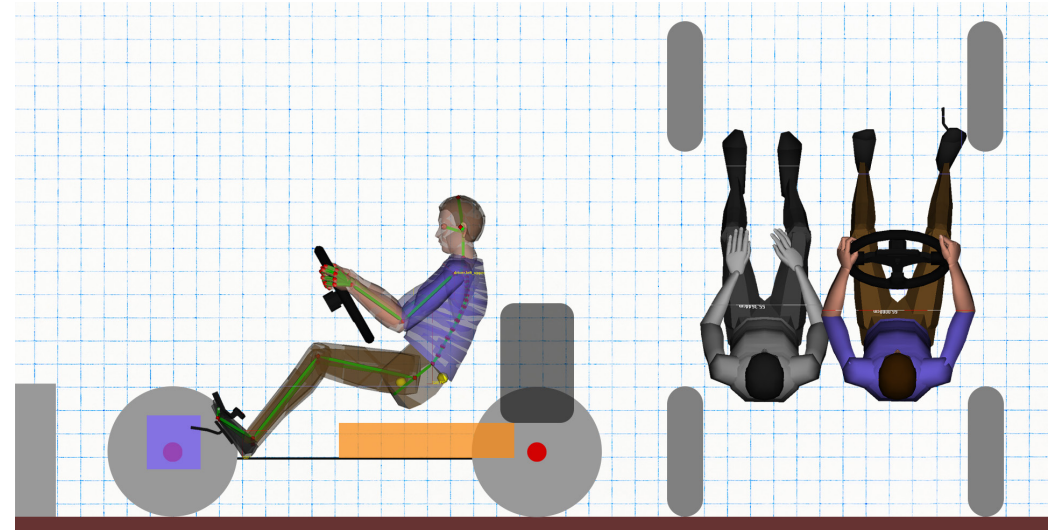
Around 15-30L of luggage

10. PACKAGING EXPLORATION



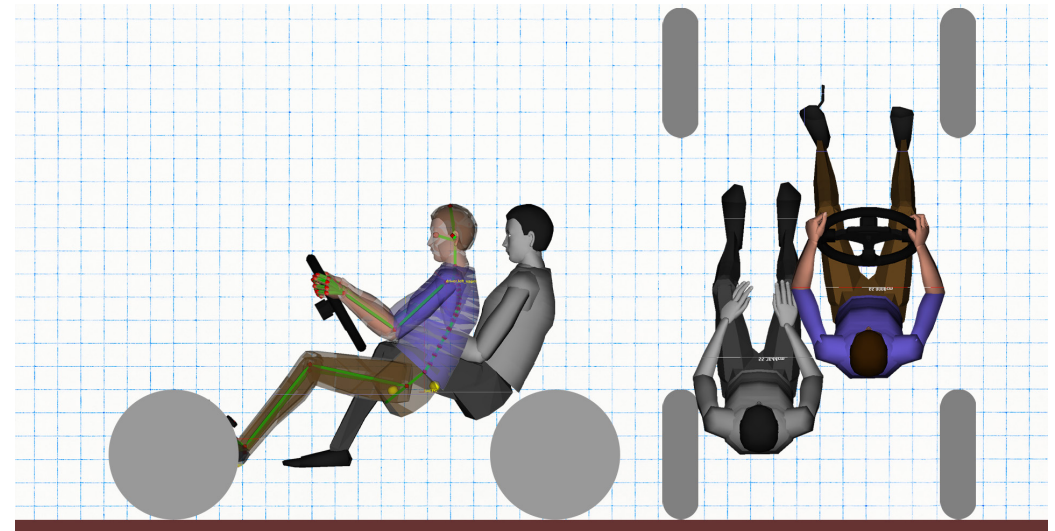
two people Iteration 1

side by side

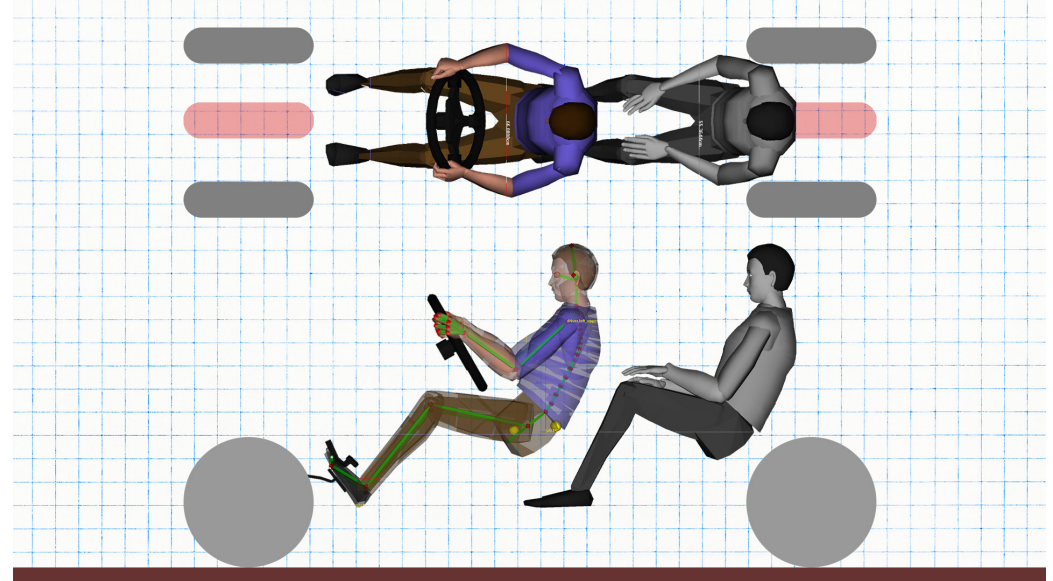


two people Iteration 2

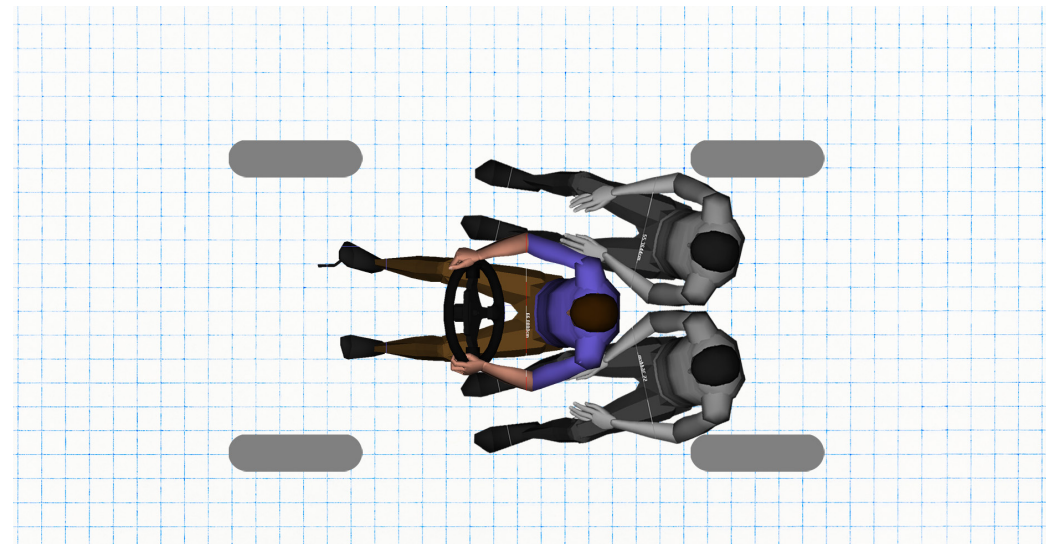
semi-tandem



two people Iteration 3
tandem seating

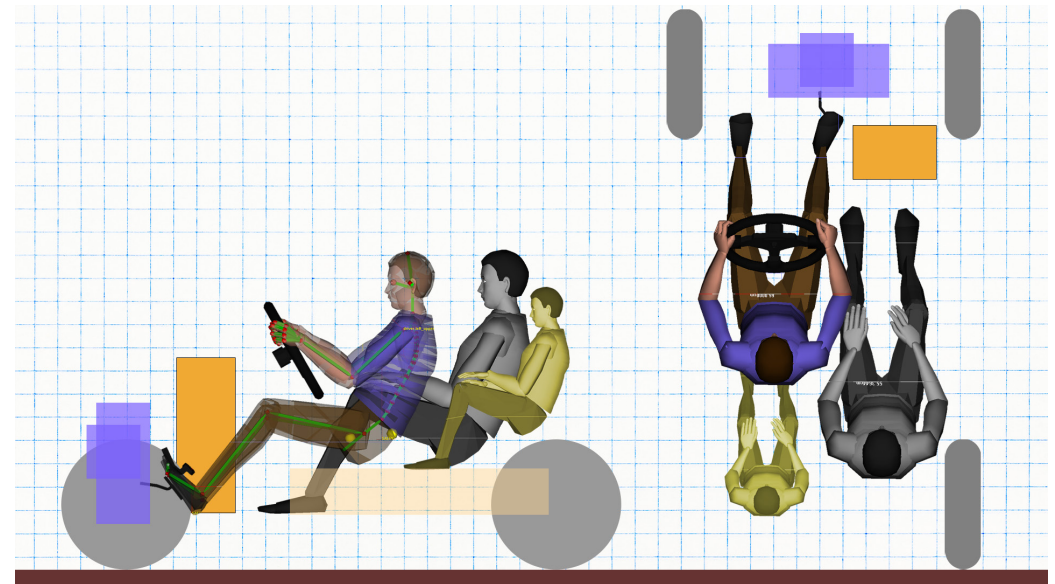


three people Iteration 1
dual semi-tandem



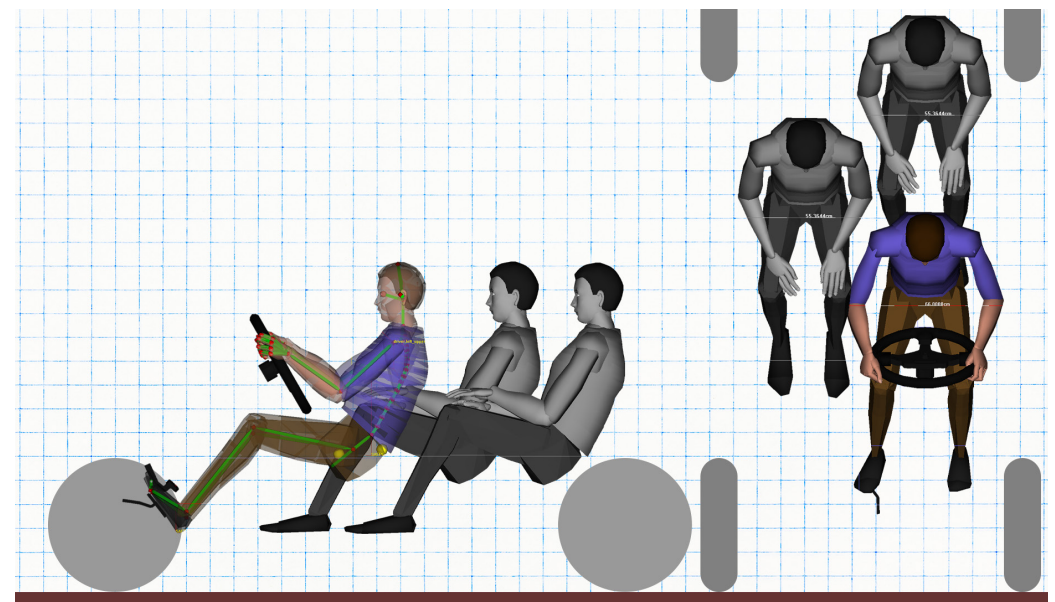
two+one people
Iteration

semi-tandem

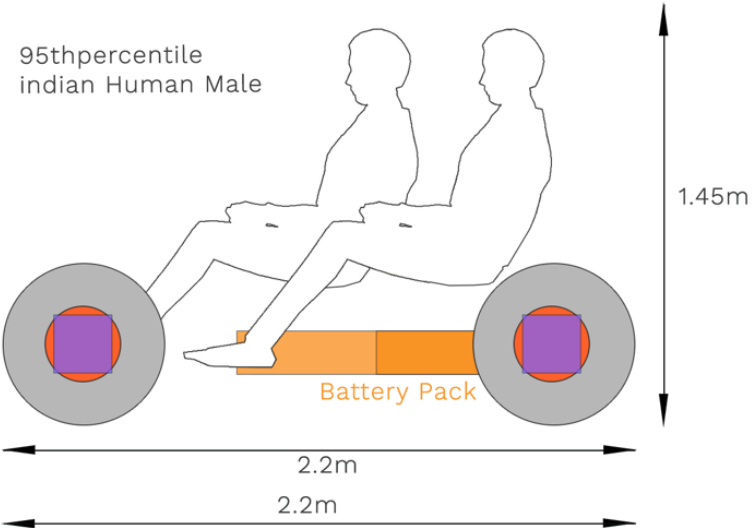
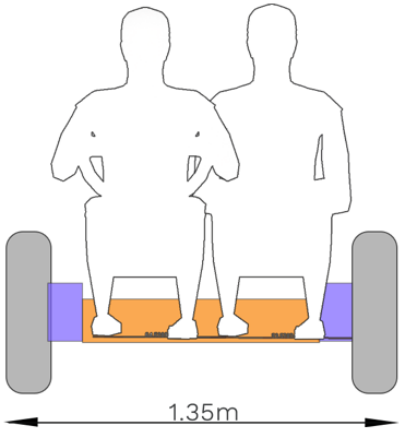


three people Iteration 2

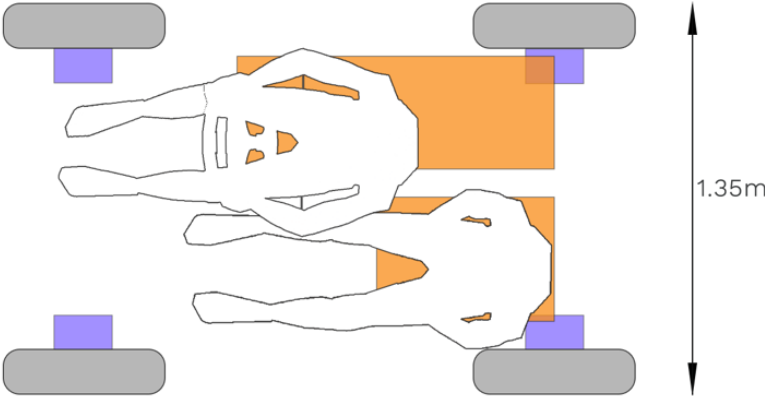
semi tandem+tandem



11. FINAL PACKAGING



Final Packaging



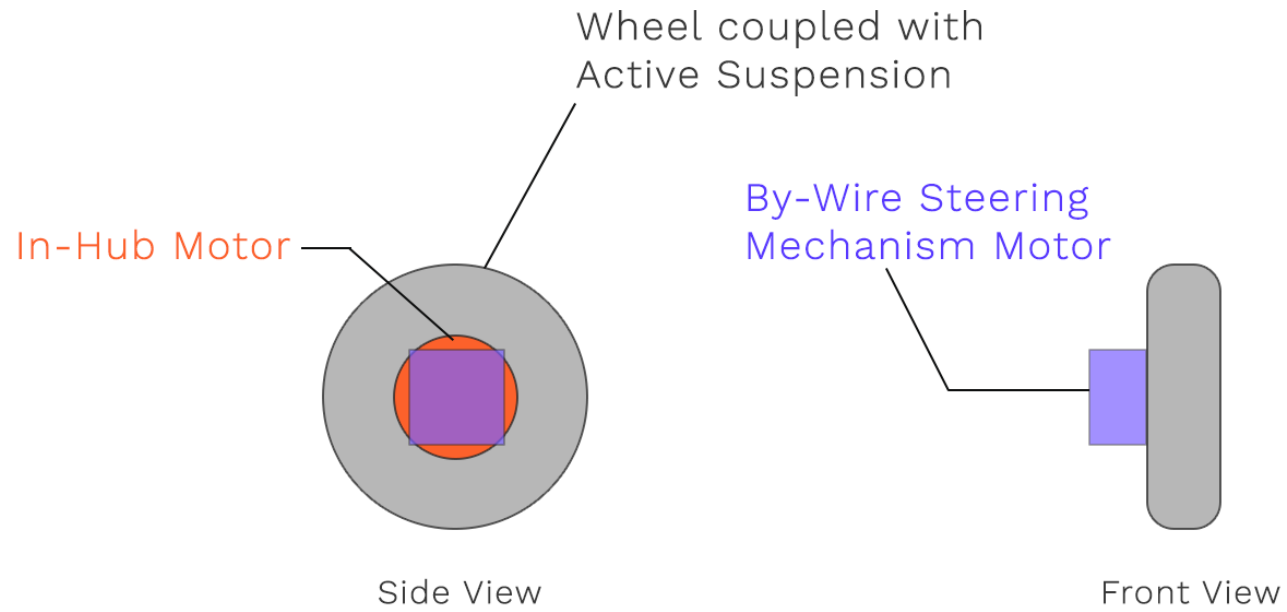
Benchmarking for Steering and Driving Mechanism



In-Hub Motor Design for
Wheels and Separate motor
for turning of each wheel



12. PROPOSED DRIVE AND STEERING MECHANISM



13. DESIGN BRIEF

To design an electric quadricycle for Generation Z (age 23 and above), which accommodates two passengers and meets their daily urban commuting needs, while ensuring a safer journey, protection from weather, and an enjoyable experience. The vehicle also offers modular interior accessories, allowing users to personalize their ride. It provides ample combined luggage storage for both the passenger and driver.

Features:

1. Easy-access luggage space
2. Ease of maneuverability with rear-wheel steering
3. Shortest possible overhangs
4. Luggage space: 50-60L

Specifications:

1. Steel space frame chassis
2. Length: 2.4m approx
3. Width: 1.35m approx
4. Height: 1.45m approx
5. Wheelbase: 1.64m
6. Ground clearance: 180mm
7. Battery: 20kWh
8. Motor output: 12hp
9. Range: 150km

14. UER PERSONA

Persona 1



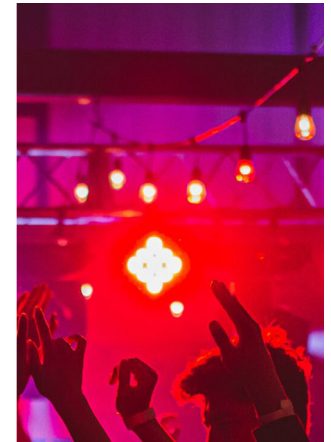
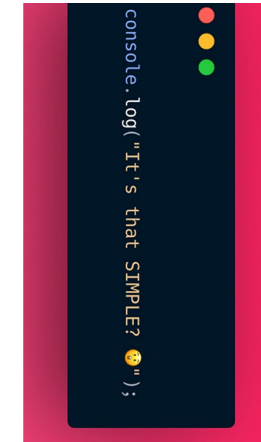
Prerna, 26
Software Engineer
New Delhi

Qualities

Creative
Social, Outgoing
Modern
Online and Active

Hobbies

Cafe Hopping
Exploring New
Food
Painting
Dancing





Needs

Avoid harsh weather in commutes
Commuting to and fro from workplace safely
Maintain a healthy worklife balance

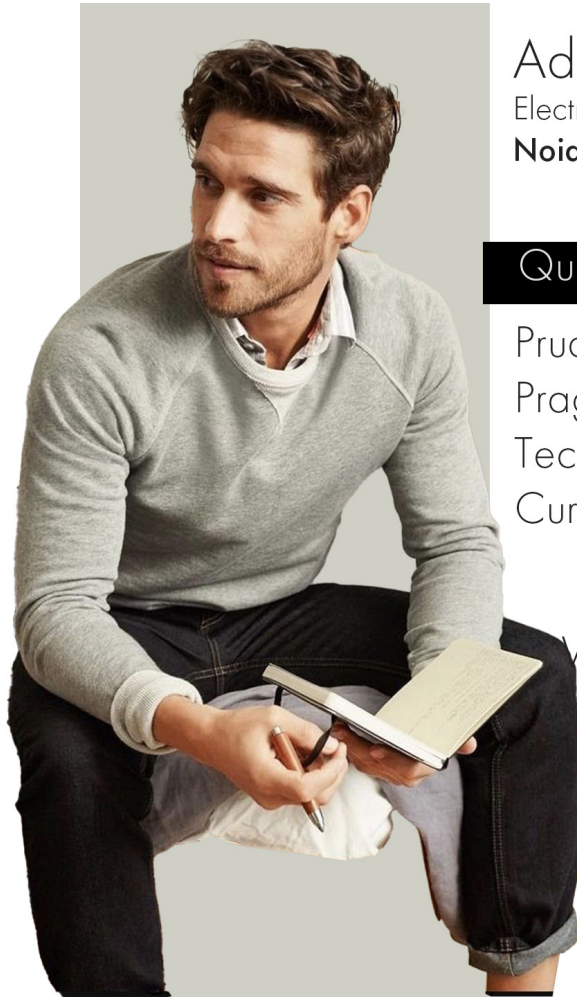
Frustration

Feels tired after daily commutes
Traffic feels frustrating on her scooter
Pollution and extreme weather drains energy and affects her health

Motivations

Career
Happening Life
Family

Persona 2



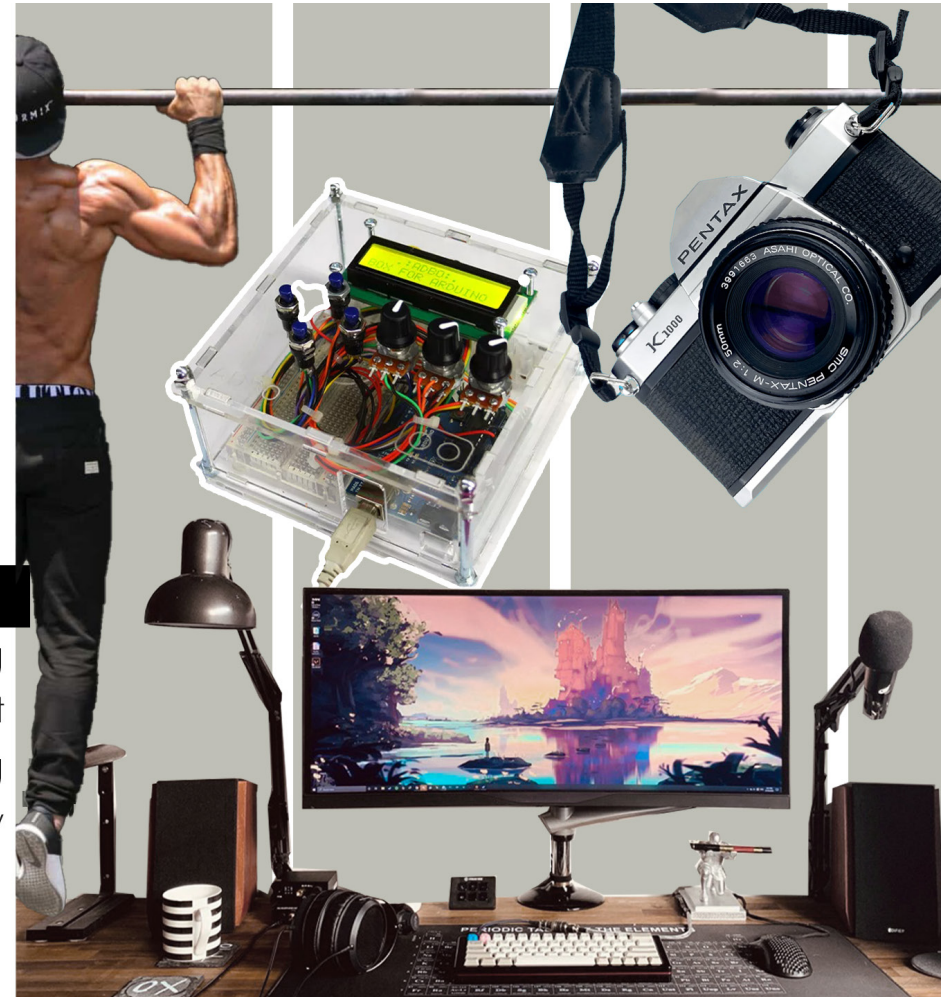
Adith, 26
Electronics Engineer
Noida

Qualities

Prudent
Pragmatic
Tech Savvy
Curious

Hobbies

Weight Training
Diy Project
Gaming
Photography





Needs

Professional Growth
Staying up to date with New Tech
Networking and Socializing

Frustration

Pollutions during commute to Nearest Metro Station
Getting stuck in traffic while commuting
In-sufficient parking spaces in his locality

Motivations

Career prospects
Healthy living
Financial Security

Persona 3



Parul, 27
Animator (Freelancer)
Mumbai

Qualities

Introvert
Artistic
Frugal
Digital Native

Hobbies

Sketching
Painting
Story Writing
Cultural Exploration





Needs

Maintain her online art presence
Constantly evolve herself as an artist
Travel to new unexplored places for inspiration

Frustration

Public transport feels too overwhelming and tiring
Have to plan before going out
Feels uncomfortable in crowd

Motivations

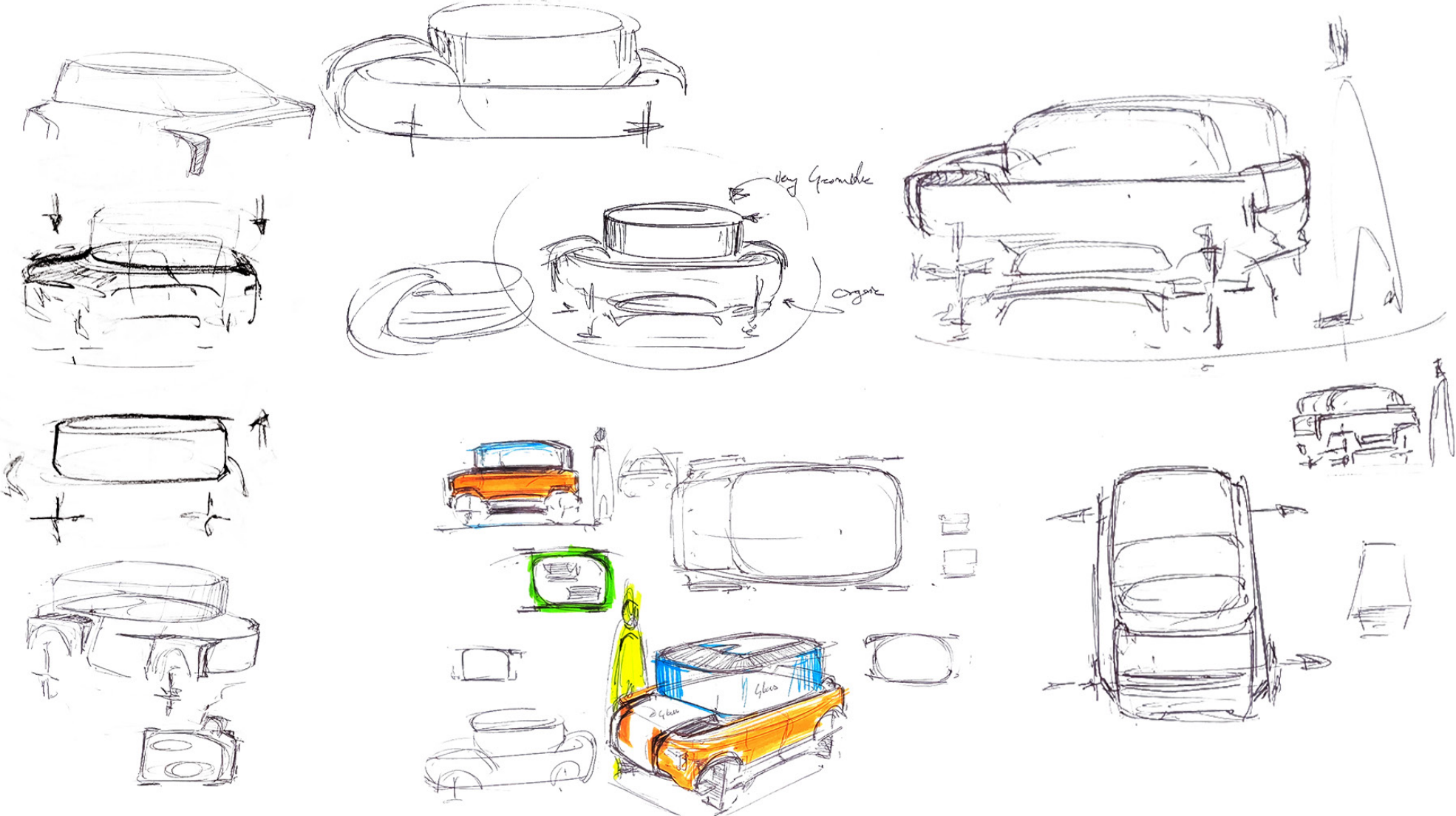
Passion for art
Get recognition for her work as an Artist

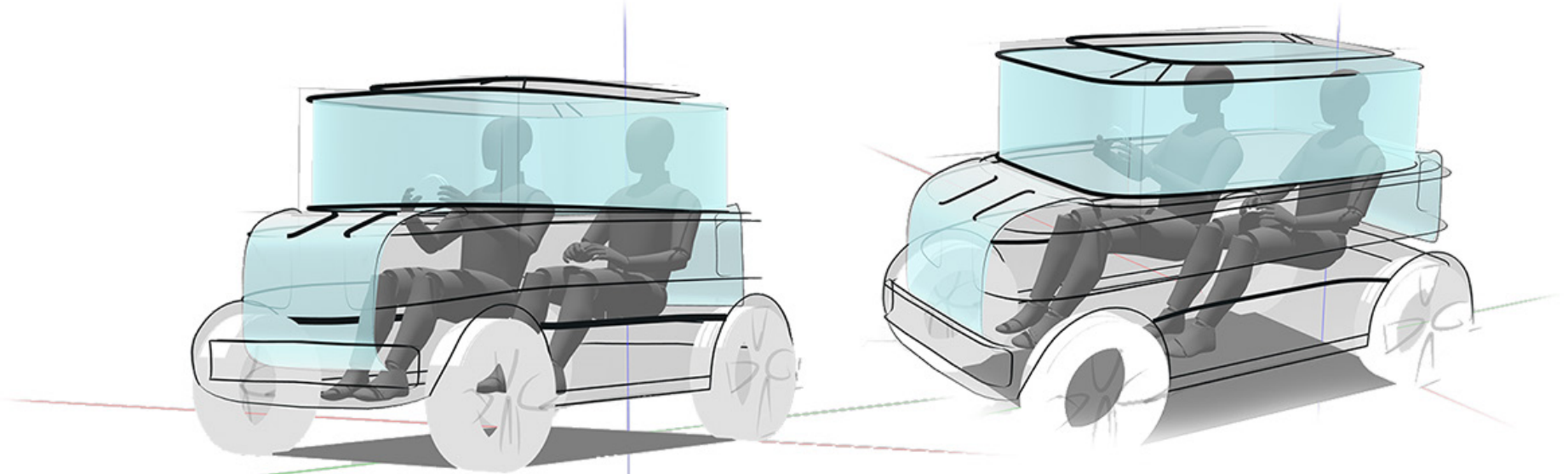
16. THEME BOARD



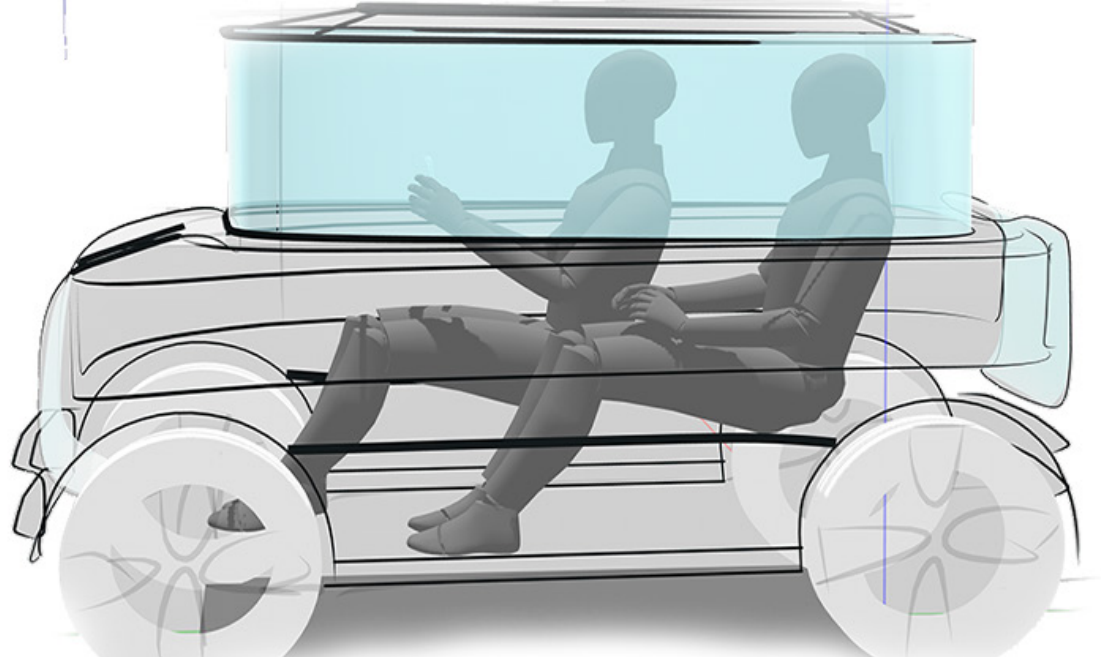
17. SKETCHES AND DESIGN DIRECTION

Design Direction 1



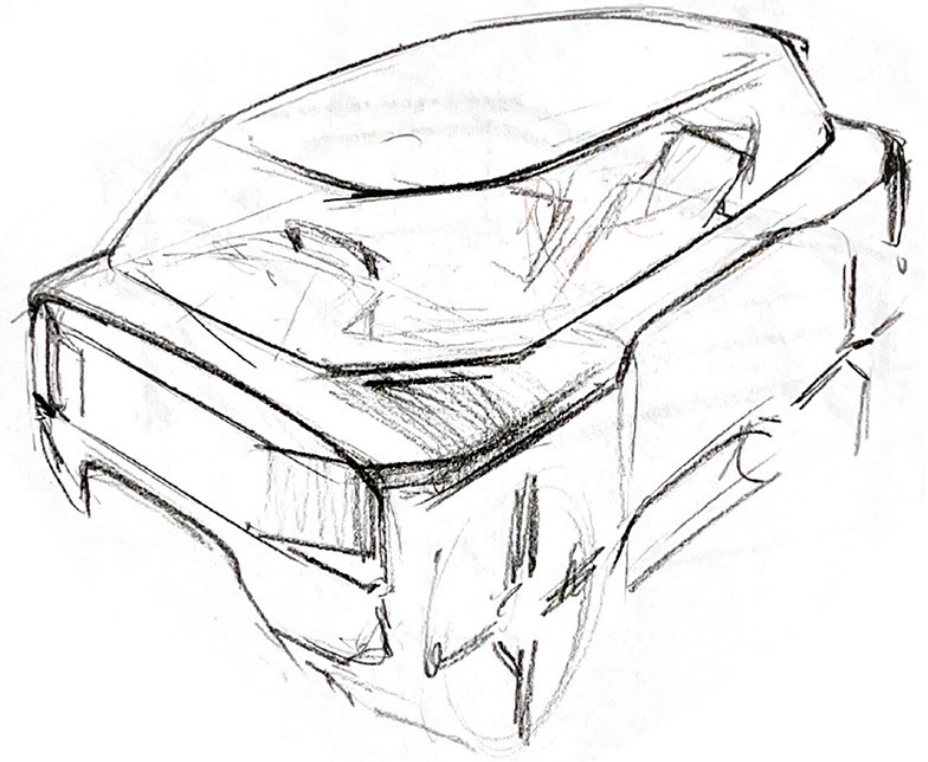
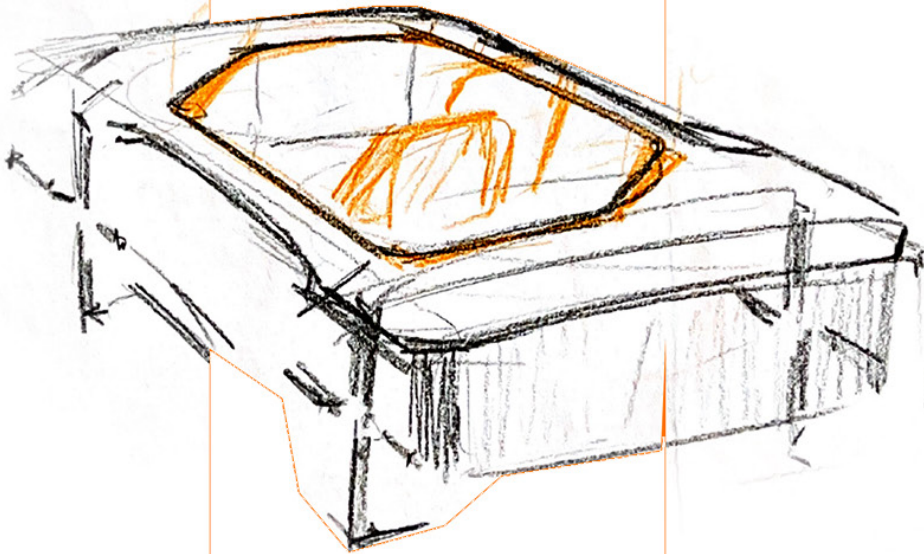
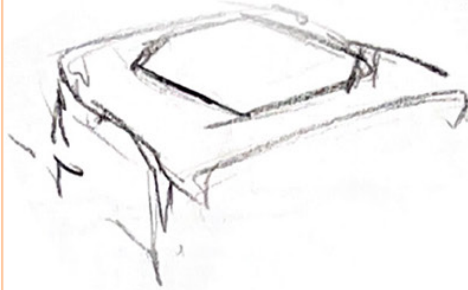
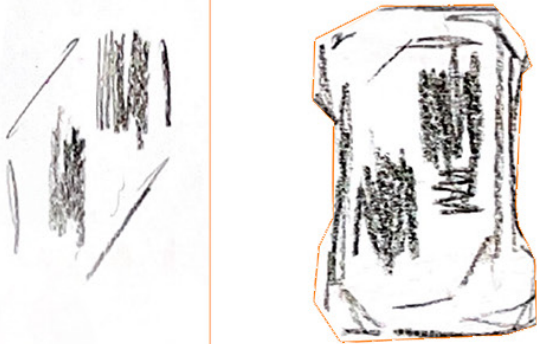


Design Direction1
Mock-Up in
Gravity Sketch

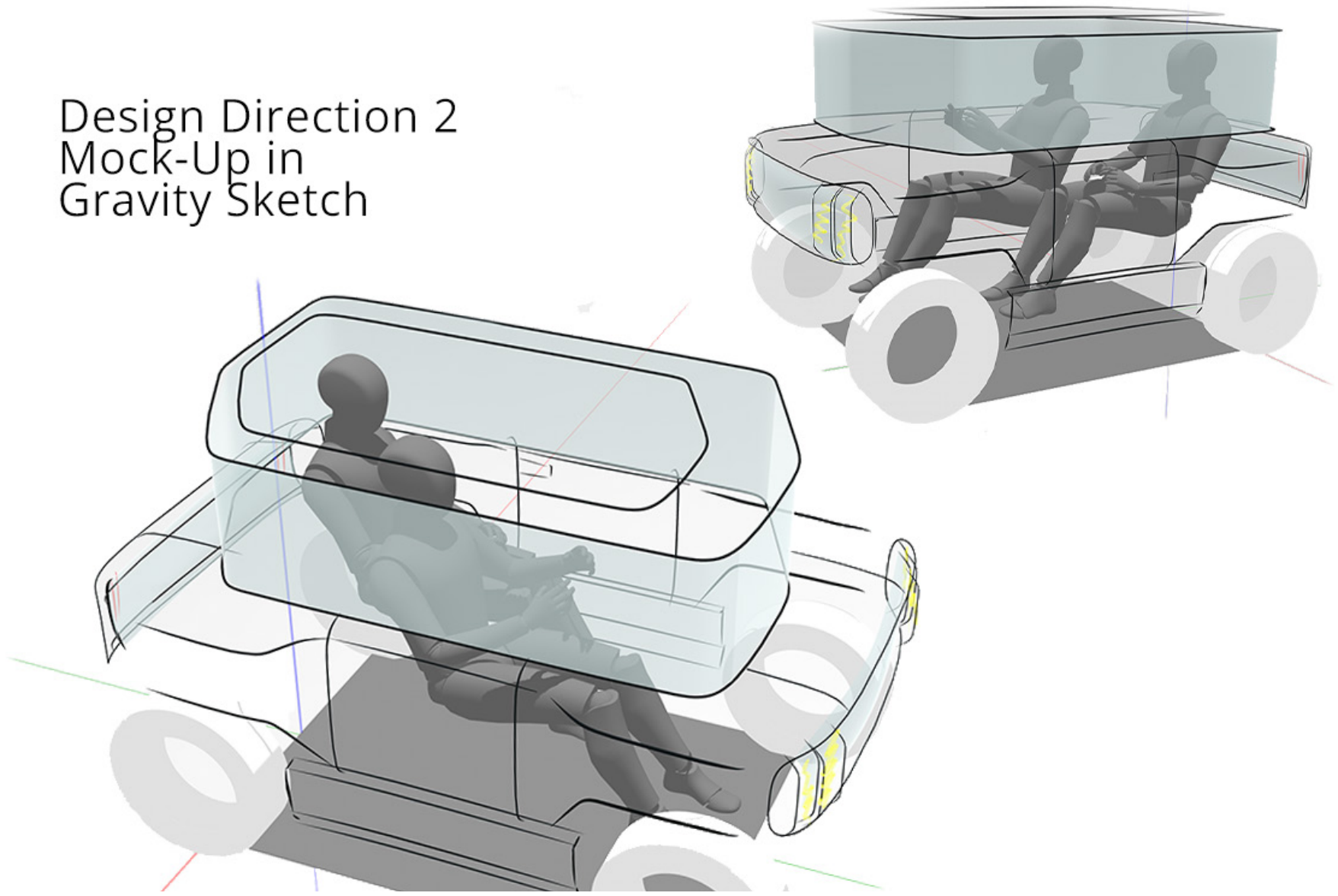


Design Direction 2

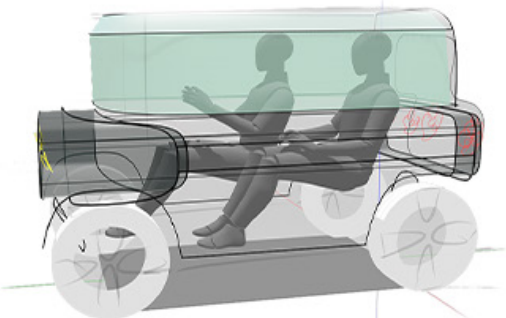
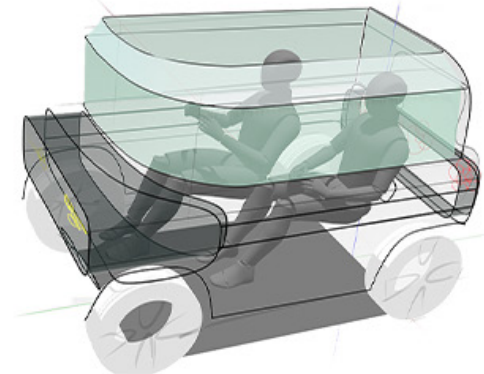
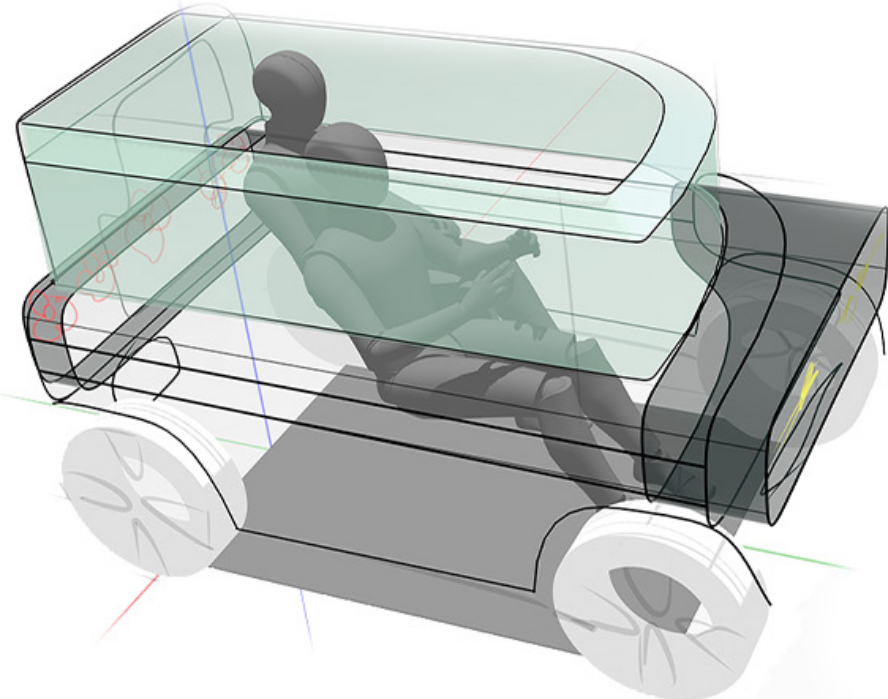
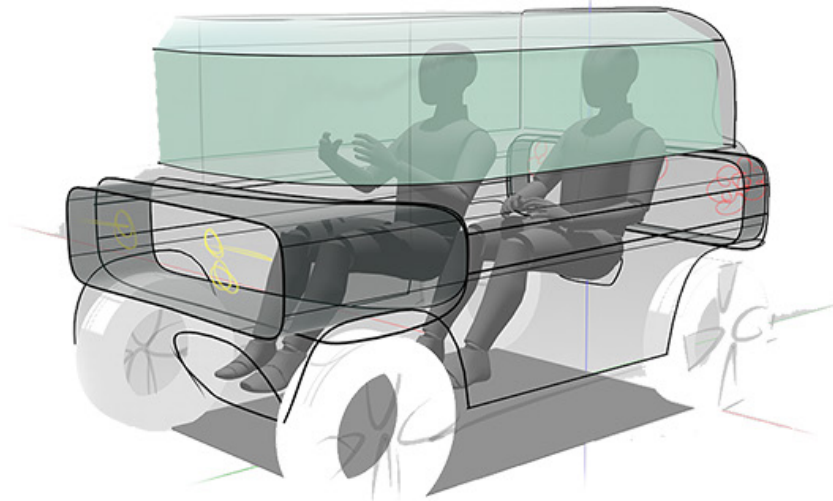
Deriving the form from the Inner Asymmetry



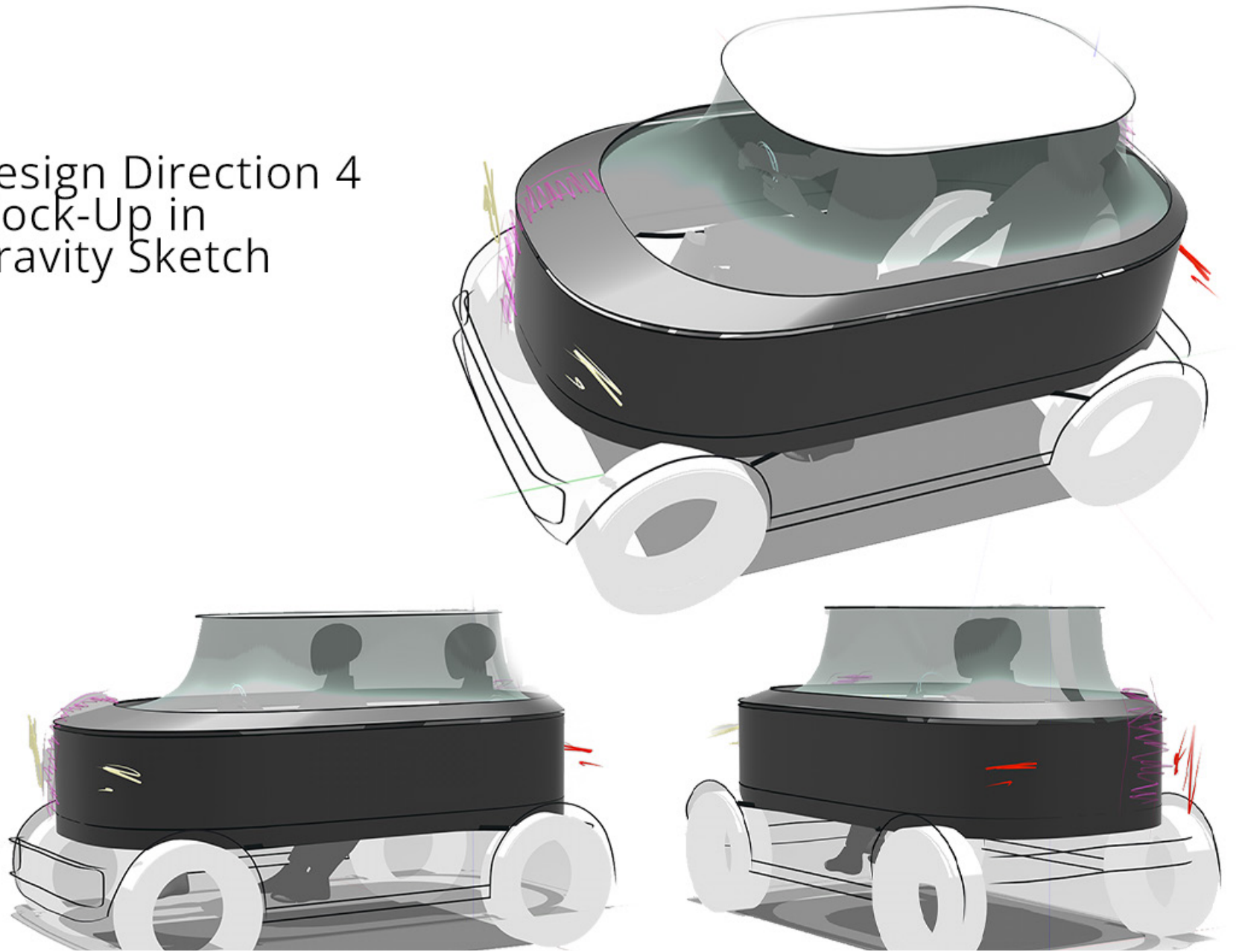
Design Direction 2
Mock-Up in
Gravity Sketch



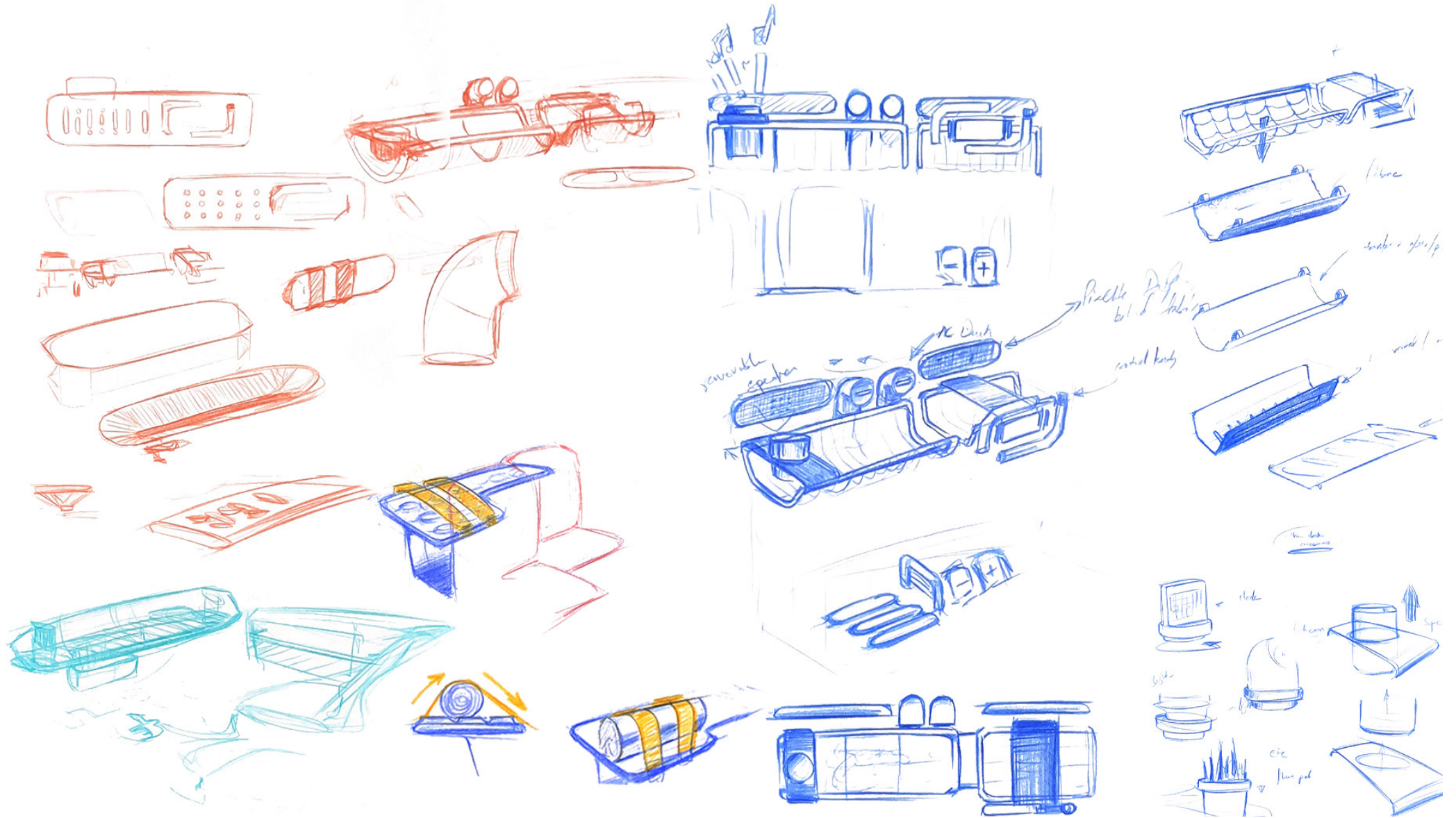
Design Direction 3
Mock-Up in
Gravity Sketch



Design Direction 4
Mock-Up in
Gravity Sketch



Interior Sketches

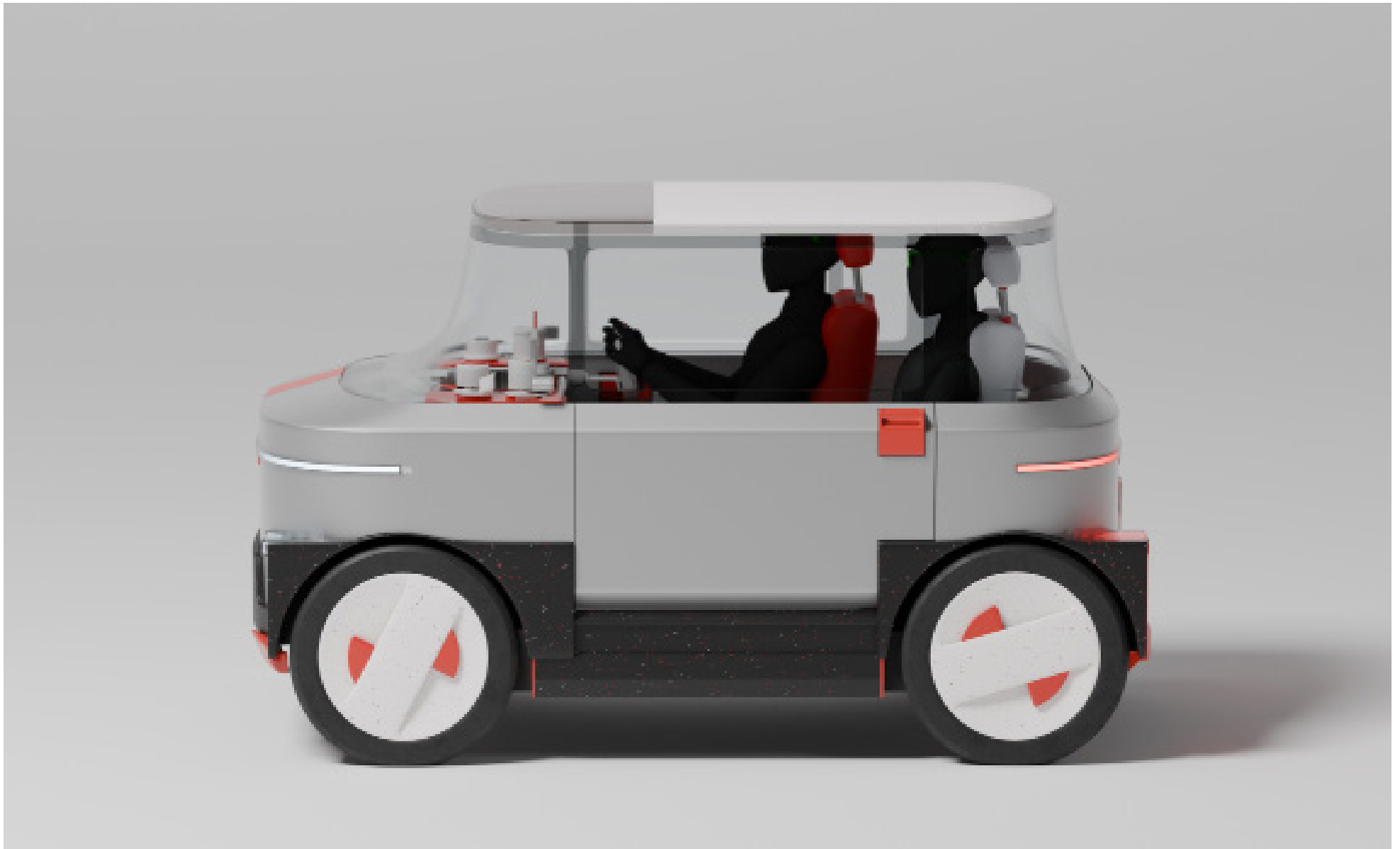


18. TAKING REVIEW FROM GEN Z



While few talked about concepts that looked spacious, many were interested in designs that looked fresh to them. Users tend to like the designs that stood out to them.

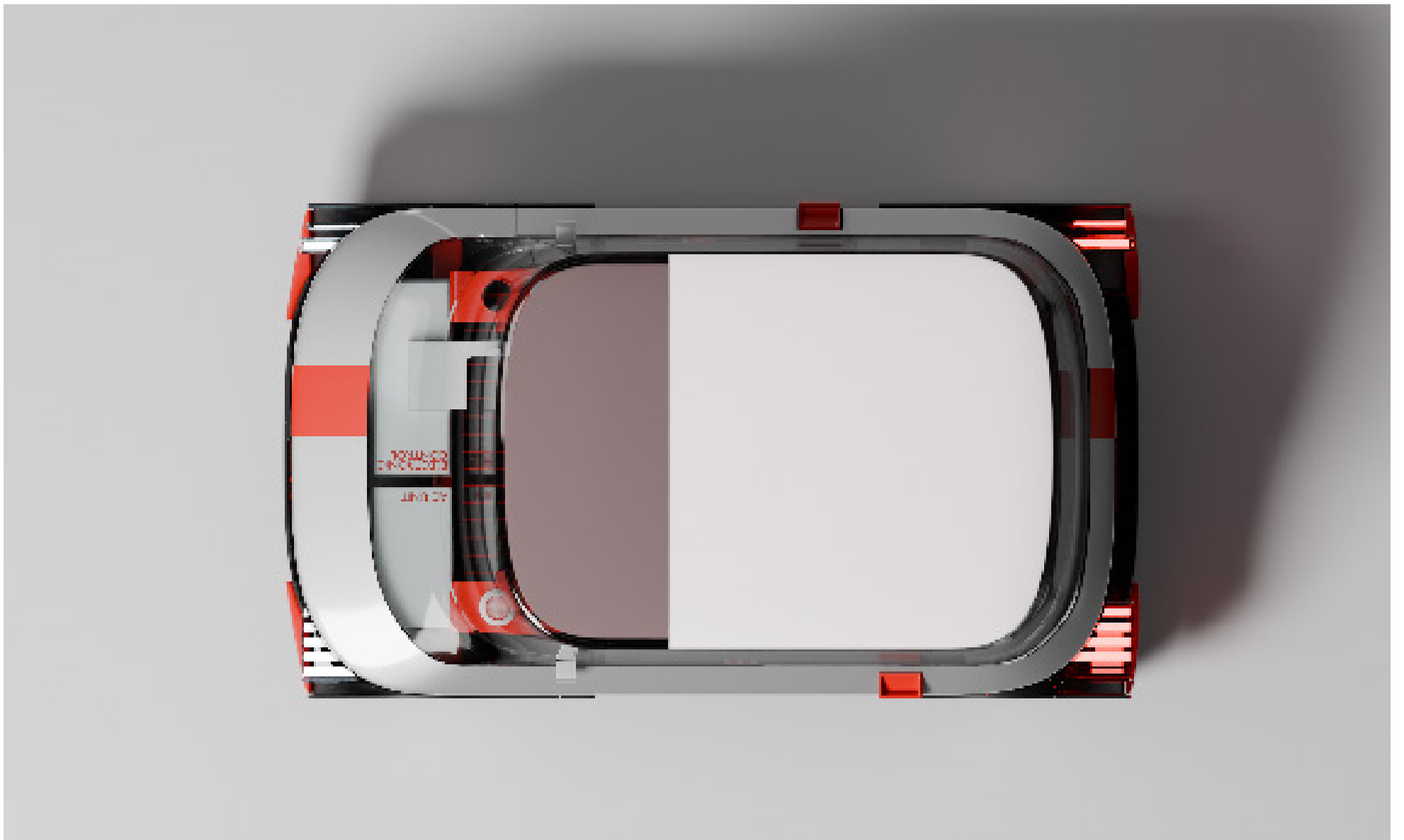
19. RENDERS

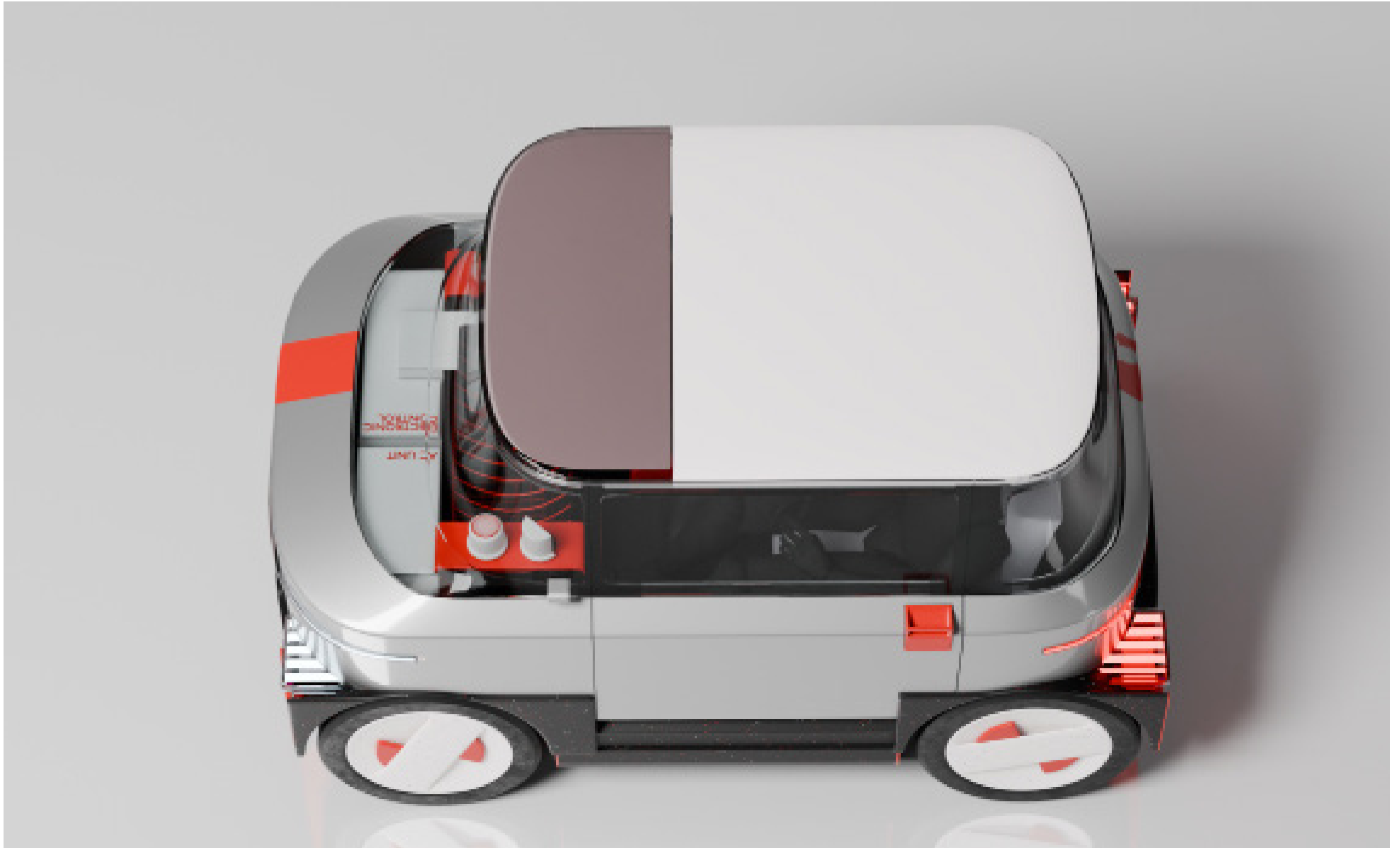




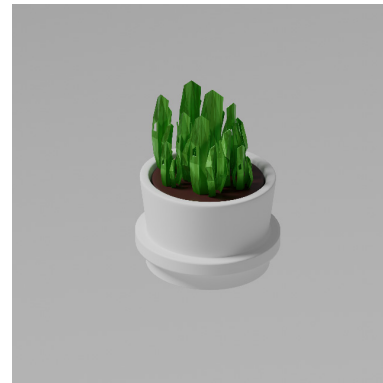
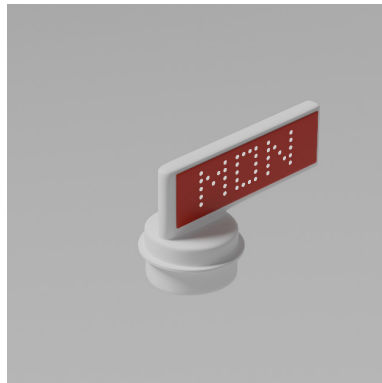
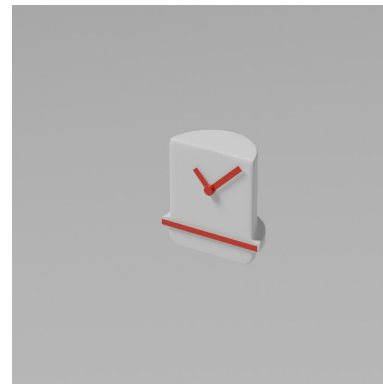
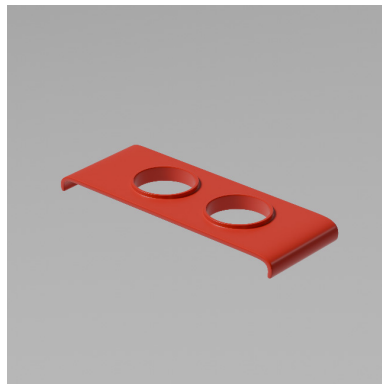
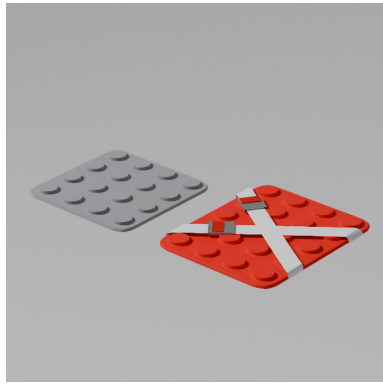
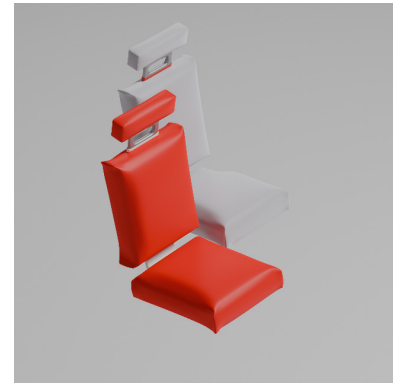
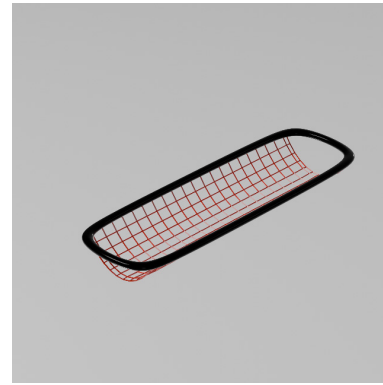
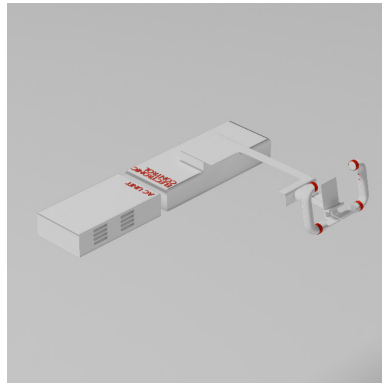




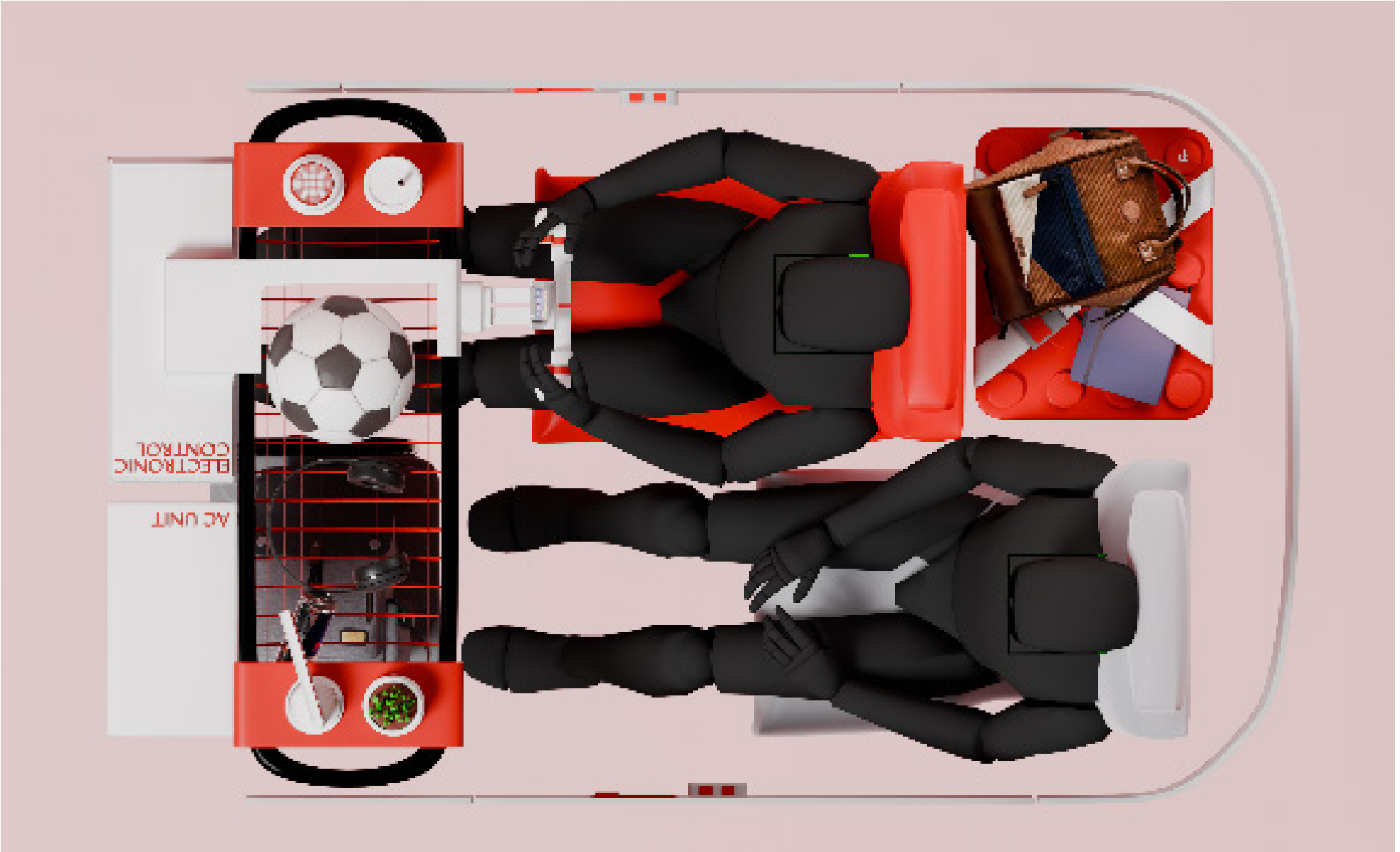












20. SCALE MODEL











