

PROJECT 2

DESIGN OF URBAN COMMUTER

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156390006

MOBILITY AND VEHICLE DESIGN

GUIDED BY : Prof. NISHANT SHARMA

ACKNOWLEDGEMENT

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I would like to express our sincere thank all people who provided much needed information and insights during the research phase of this project, including all users with whom I had the great opportunity to interact Nevertheless, I express our gratitude toward my family and colleagues for their kind co-operation and encouragement which help us in completion of this project.

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CONTENT

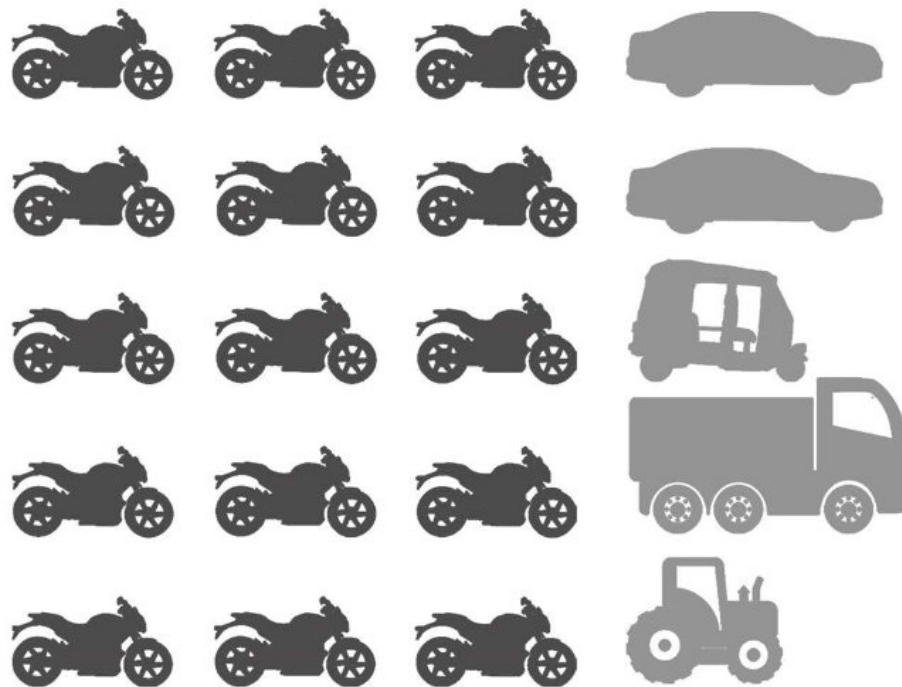
01 Pre-research on automobile industry	3
02 Secondary market survey	8
03 Observational research	13
04 User Research	21
05 Ergonomic study	31
06 Design Brief	36
07 Ideation	37
08 Vehicle packaging	48
09 Concepts	58

SCOPE OF THE PROJECT

The Project aims to bridge the gap between the motorcycle world and the car. Each type of vehicle has its own advantages and disadvantages. Motorcycles have the advantage of being a single track vehicle and being able to zip through urban city traffic making it ideal for urban conditions. Cars has the advantage of being safe and stable owing to its four wheels and whole array of safety features like frontal crumple zone, air bags etc. But each of these vehicles have certain disadvantages which calls for a serious alternative to these modes of transport. Motorcycles, due to their exposed to the elements design, offers least protection to the rider against rain,dust or other foreign objects. It also is highly unstable in the event of a crash and can be fatal. Whereas the car is the main contributor to the traffic congestions in the urban cities of today owing to its wide body.

All these issues calls for an alternative mode of transportation that addresses to the disadvantages of the motorcycle and the car as well as provide a safe and exciting means of day to day commuting for the urban citizen

1 PRE RESEARCH ON AUTOMOTIVE INDUSTRY IN INDIA

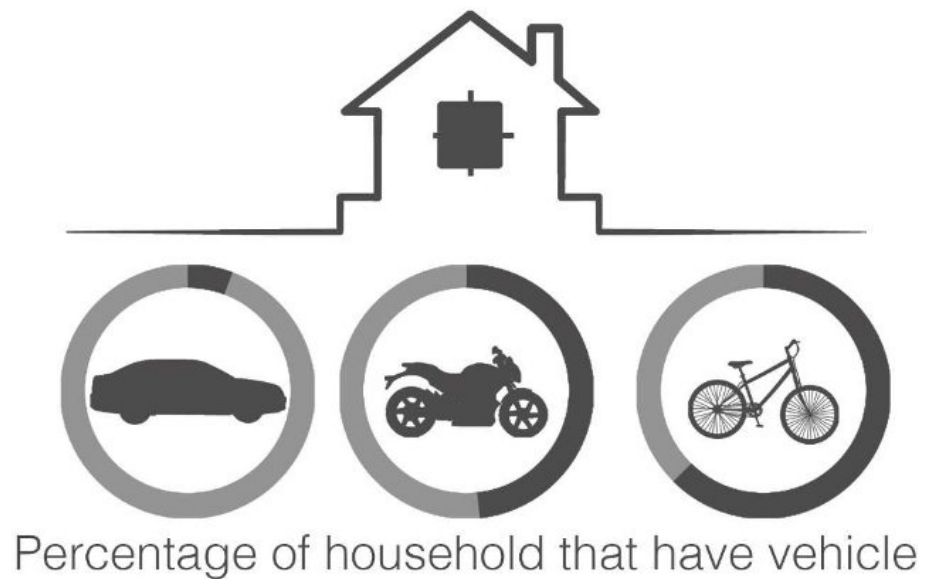


[Reference- Automobile domestic sale trend SIAM India]

Two wheeler cover 80% market share

The Indian 2-wheeler market has grown 18-fold in the last 3 decades. Experts believe that factors like utility, price, low maintenance, fuel efficiency and the condition of Indian roads, apart from rising fuel prices are responsible for this humongous increase.

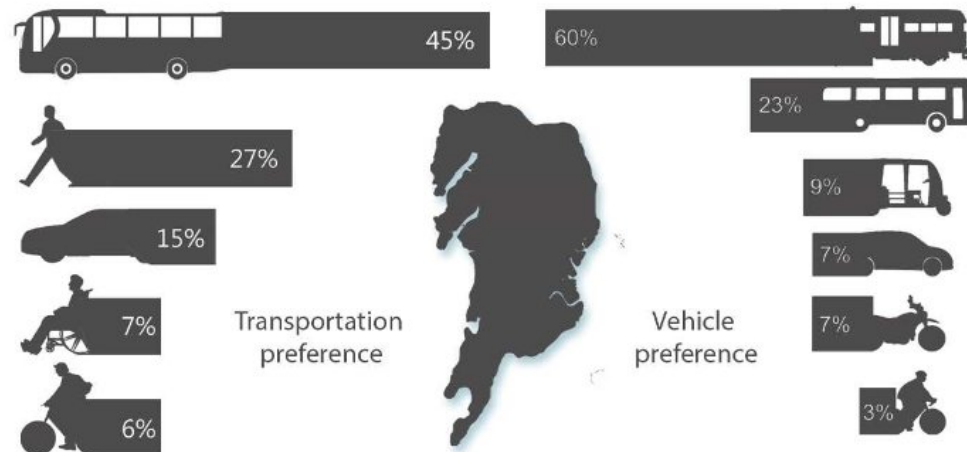
[Reference- icicilombard two-Wheeler insurance info]



Majority of household have two wheelers

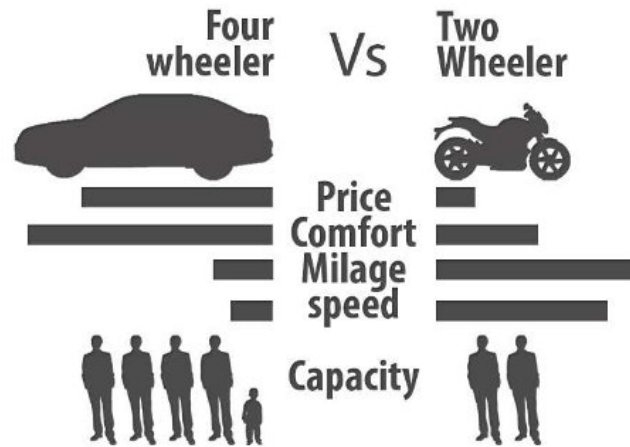
The primary demand for motorcycles (entry-level) still comes from the rural sector. So even though the demand for cars might be more on the lines of luxury, the driving force behind a 2-wheeler sale is utility.

[Reference- icicilombard two-Wheeler insurance info]



How people commute in Mumbai

In Mumbai like city scenario people prefer public transport over personal vehicle. It's just because mass public transport like suburban railway is much economical and quick compared to personal vehicle in peak hours. [Reference- mrvic.indianrailways.gov.in]



Four wheelers are costlier, safe and comfortable compared to two wheelers. Whereas two wheelers give cost advantage, more mileage, and better speed in congestions.

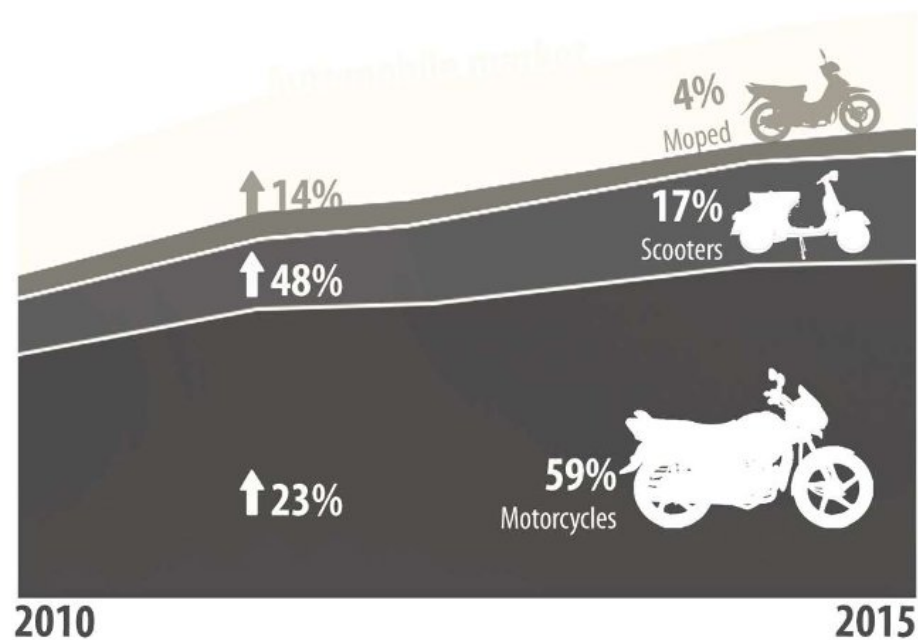


430 Vehicle / km in Mumbai

**INDIA LOSES ₹60,000 CR
DUE TO TRAFFIC CONGESTION**

The country loses Rs 60,000 crore a year due to congestion (including fuel wastage), slow speed of freight vehicles and waiting time at toll plazas and checking points, a study on operational efficiencies of freight transportation by roads has claimed. [Reference-Times of India]

2 SECONDARY MARKET SURVEY



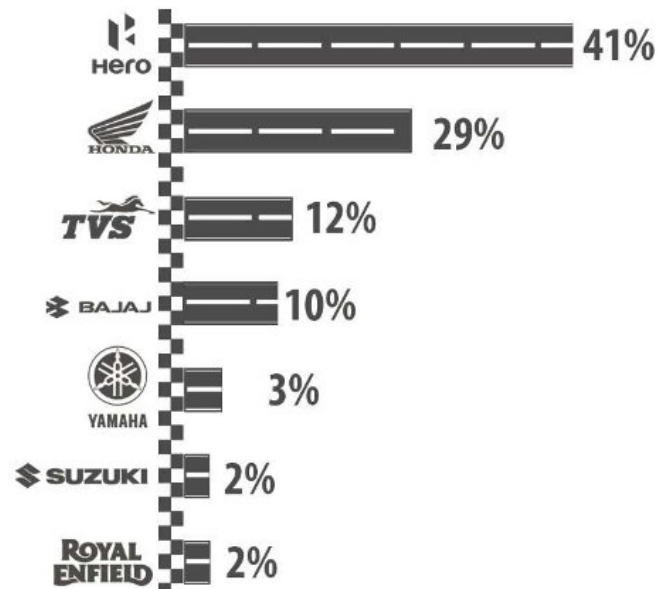
2.1 INDIAN TWO WHEELER

Motorcycles are preferred choice of Indian consumer

Scooter penetration lower than motorcycles

Scooters expected to lead growth on the back of a wider acceptability and addressable market

[Reference- Allegro Capital Advisors Pvt Ltd]



2.2 Two wheeler market analysis

Hero MotoCorp has many motorcycles for various price segments. That makes the company the market leader.

Whereas Honda jumped to second position after decade long success of Honda Active and it's still best selling scooter in India.

[Reference- ACMA India]



2,26,668 units

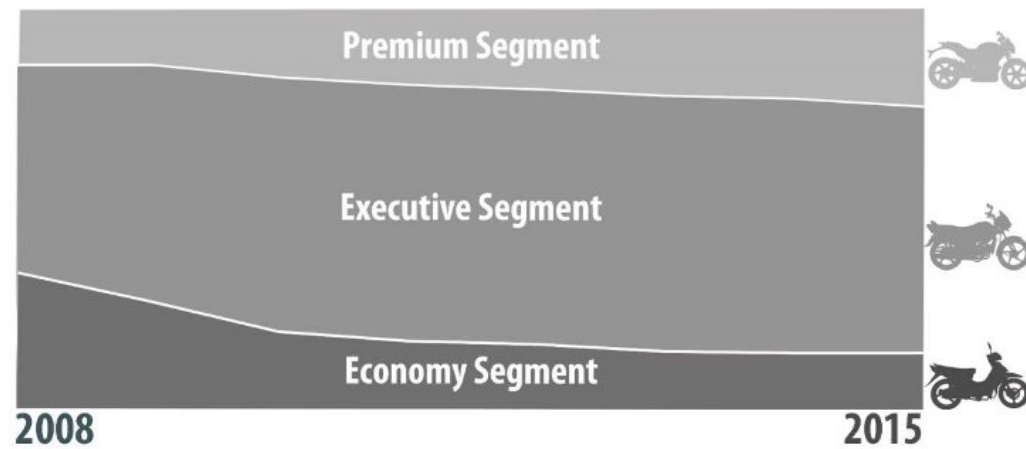


2,04,609 units



76,693 units

June 2016 Sales



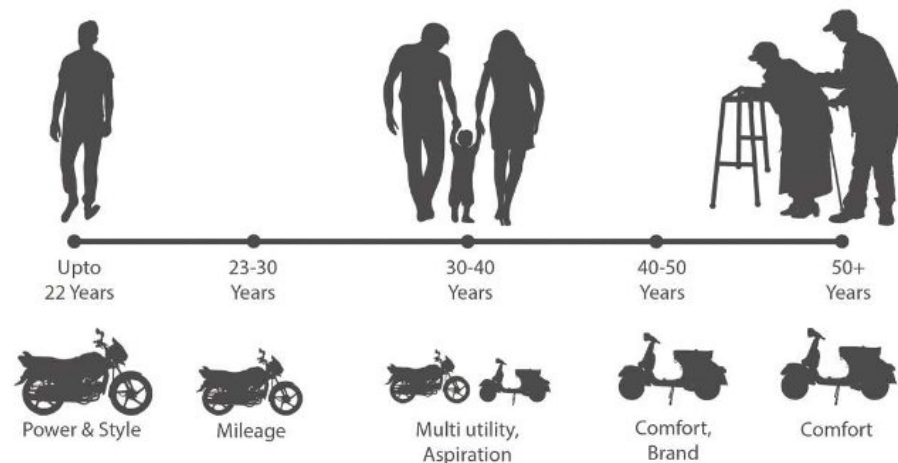
2.3 IMPACT OF AFFORDABILITY

Due to affordability on the rise with increasing per capita GDP that's why Premium motorcycles to see fastest growth – command larger share of motorcycles.

[Reference- Allegro Capital Advisors Pvt Ltd]

2.4 Buying Behaviour Analysis

As buyer age increases his decision changes from raw power to the mileage and multi utility vehicle and finally to the comfort. That because at young age user tendency is to show his personality through his vehicle. Mid age people look for mileage and multi utility vehicle as many people are going to use same vehicle. As people getting older, they have disposable income and due to their physical condition they prefer comfort and brand over anything.



[Reference- The Automotive Industry Evolving Dynamics KPMG India]

3 OBSERVATIONAL RESEARCH



CHILDRENS ON TWO WHEELER

Tendency of minor passenger travel pattern observed Most of the parents keep their children in front of them. Although it's much inconvenient to ride in that manner.



EXPRESSIONS

People like to customize their vehicle to express their feelings To do that they often print shayari (small poem) to give unique identity to the vehicle.



CUSTOMIZING VEHICLE

Owner tries to depict their own identity in their vehicle. This behaviour can be observed here, people are showing their identity by showing their political beliefs, their job designation and religious beliefs.



INDIAN WOMEN ON TWO WHEELER

Observation is to show how Indian women travel in their traditional wear In pillion seat women with saree prefer to sit sidewise posture which seemingly uncomfortable posture.



LUGGAGE ON TWO WHEELER

By the very nature of two wheelers carrying moderate or heavy luggage is critical. Although Indian citizens never stop inventing new ways to solve this issue.



OVERSEATING

Indian people want to get most of the value out of their investments Though two wheelers is designed for two people but they carry 3+ people in small family



WEATHER PROOFING

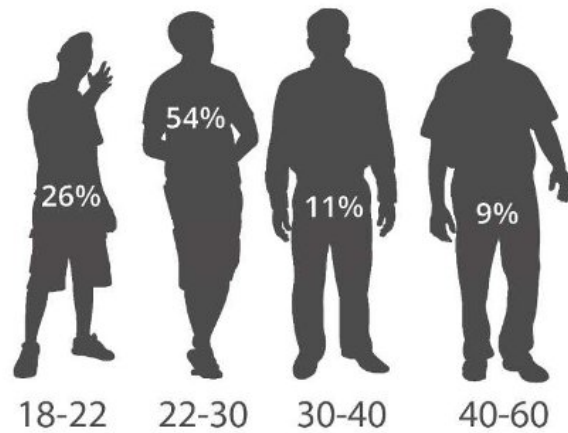
Weather proofing of use is done by using rain coats or using helmet and masks
Second type of weather proofing is for vehicle itself. People generally cover instrument cluster with plastic cover up.

4 USER RESEARCH

69 USERS



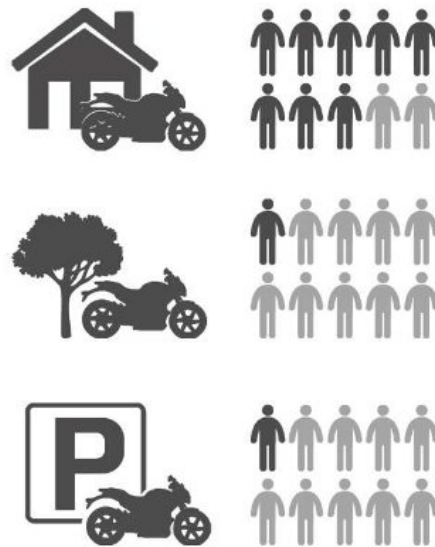
60 Male 9 Female



User study consist of 69 users out of which 25 users were interviewed personally and rest users interviewed using Google forms. More than half interviews were taken from mid age group

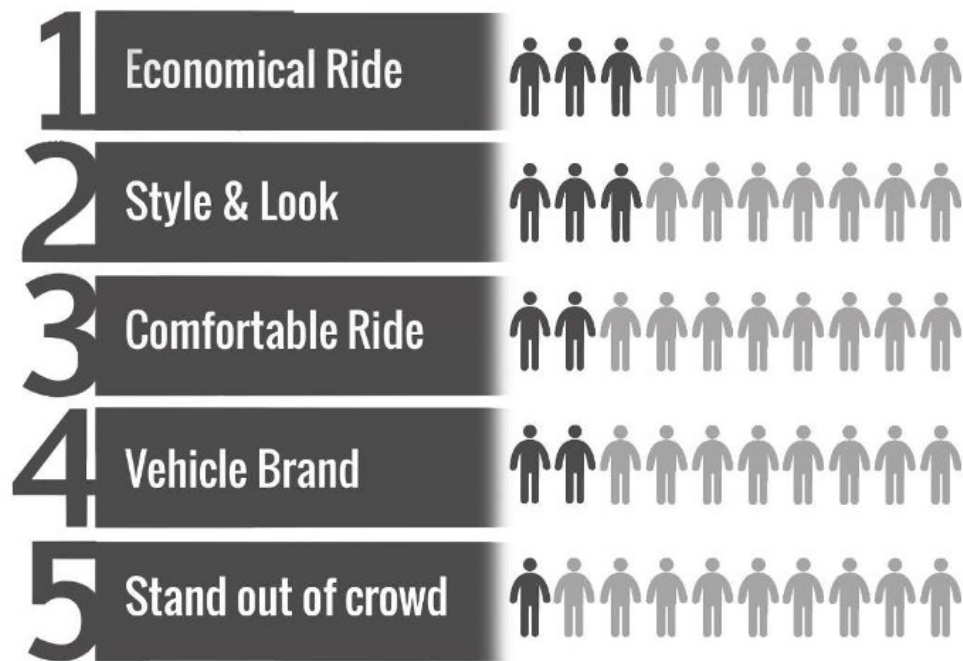


Over 30% people use mobile phones while riding for listening music, taking calls and for navigation purpose



MOST OF THE PEOPLE PREFER
PARK THEIR VEHICLE NEAR HOME

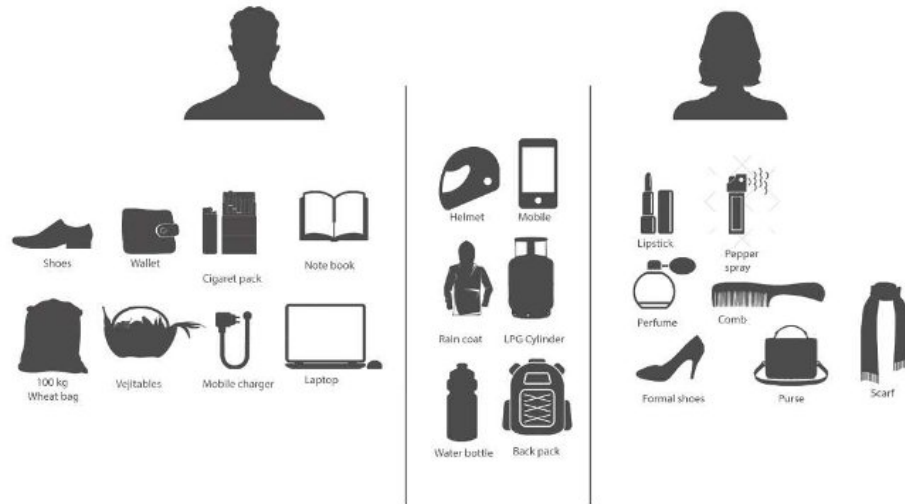
Nearly 80 % people prefer to park their vehicle near their residential area just to assure vehicle safety as vehicle is costly possession of middle class family



BUYING DECISION

India has most mid age population that's why people prefer to have mileage and style and look as their priority buying decision.

Second most influencing factor is ride quality and vehicle brand mostly this behaviour observed from 45+ year users as they have surplus income to spend.



What do people carry stuff while riding?

Daily office going commuter carry common stuff regardless genders such as mobile phone, helmet, water bottle and backpack. Occasionally they carry LPG cylinder. Most of the executive male carries electronic stuff and occasionally they carry household stuff. Whereas women carry grooming kit with them.

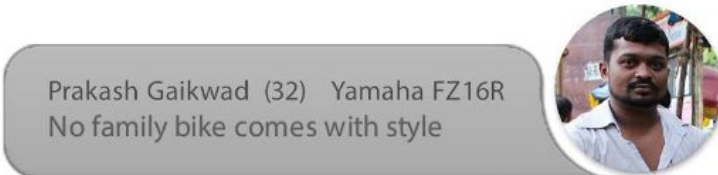
Voice of customer



Amol (25) Honda Dazzler
Parking issue, Helmet got stolen



Kale (42) HONDA ACTIVA
Bike should be skidproof



Prakash Gaikwad (32) Yamaha FZ16R
No family bike comes with style



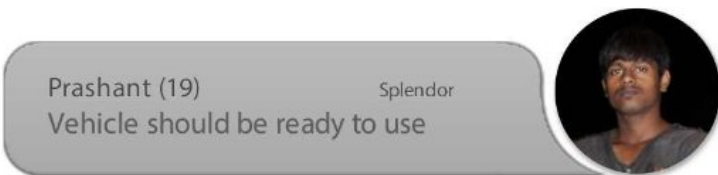
Sanket Chavan (21) Bajaj Pulsar 220
Inbuild speaker & Cruiser bike sitting



Mohit Shirsath (22) Honda Dio
Need onboard Mobile charging



Sagar (24) CBR 250
More heat is thrown out in traffic



Prashant (19) Splendor
Vehicle should be ready to use



Manoj Gupta (34) Honda Activa
Need more luggage space

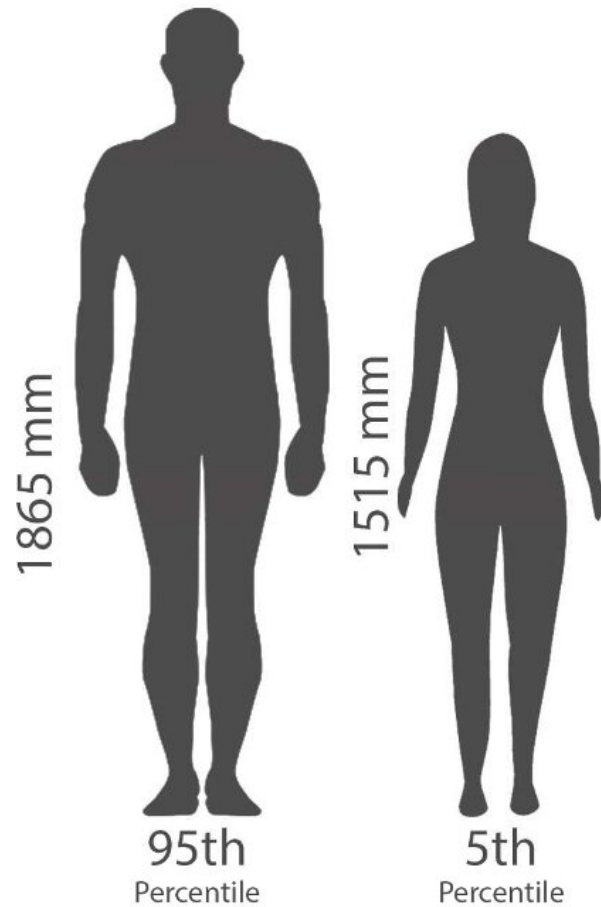
5

ERGONOMIC
STUDY



Sitting posture

Attack posture induces strain in back and it's not comfortable for long run. Whereas resting position gives optimum comfort to person. As this vehicle does not require any foot control thus relax position is being chosen. This is alert position good for maundering in city.

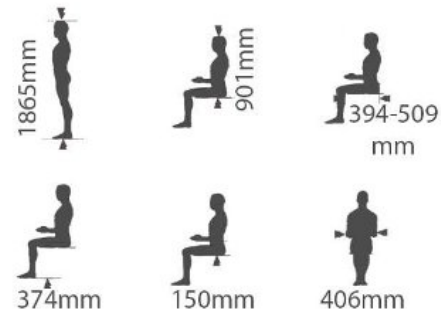


[Reference: Formulae anthropometric reference data 5th percentile female & 95th percentile male]

INDIAN ANTHROPOMETRIC DATA

Measurements (in mm)	5th	50th	95th	SD	MIN.	MAX.
Sitting height	738	824	901	51	679	983
Cervical trunk	531	605	667	46	489	887
Mid shoulder	499	566	630	42	408	691
Shoulder breadth	349	417	479	41	276	672
Hip breadth	269	326	406	45	209	550
Buttock to popliteal	394	451	509	35	340	595
Popliteal	374	419	466	33	305	540
Elbow height	150	210	268	36	102	335

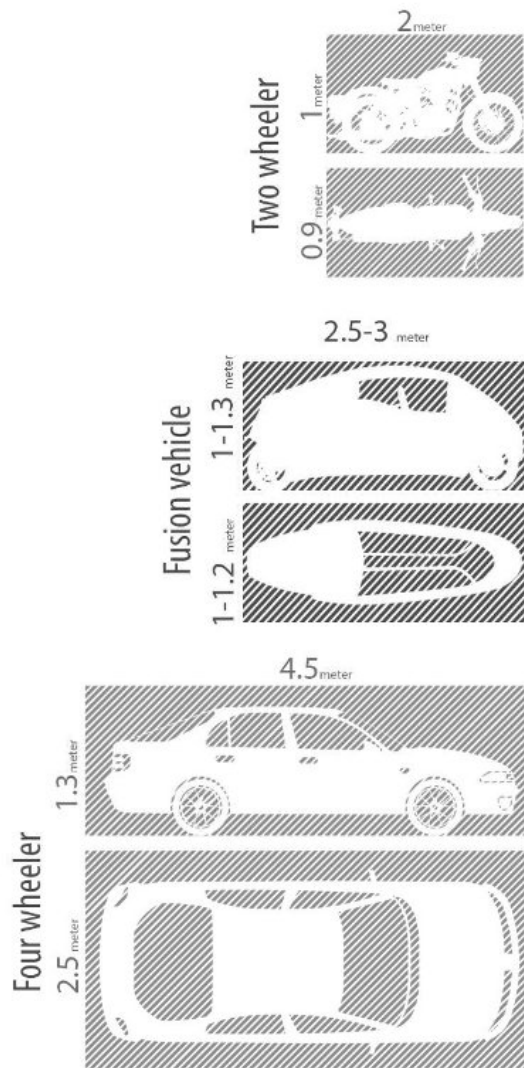
[Reference: Indian Anthropometric Dimensions (For Ergonomic Design Practice) by Debkumar Chakrabarti]



Seat Dimensions

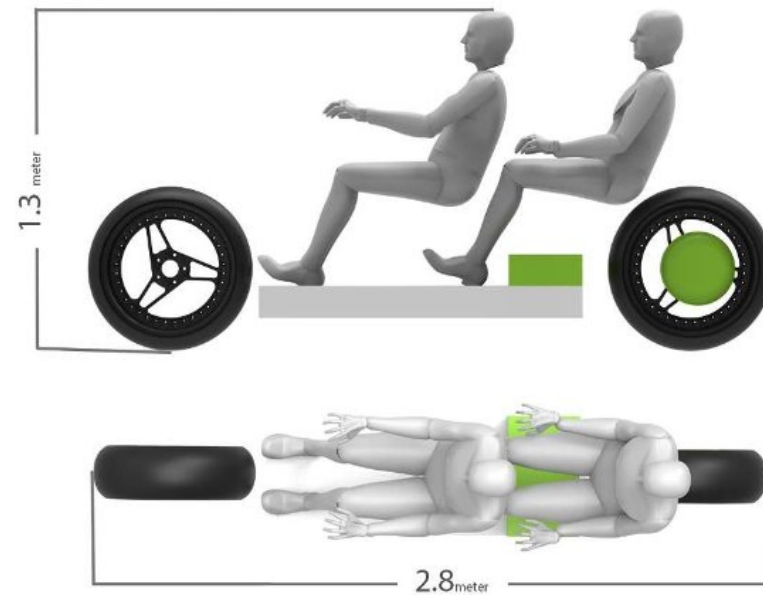
Indian anthropometric data being taken from reference book from that using 5th percentile of female and 95th percentile of male data seat is being designed.

[Reference: Formula sae anthropometric reference data 5th percentile female & 95th percentile male]



[Reference- IS 11432 : 2002]

Dimension study



Desired vehicle dimensions are decided such as to maintain the foot print of two wheeler and comfort of four wheeler.

Design of Urban Commuter

to bridge gap between two wheeler and four wheeler

Vehicle must have maneuverability of two wheeler and comfort of four wheeler.

To design a new segment which takes into consideration the following requirement

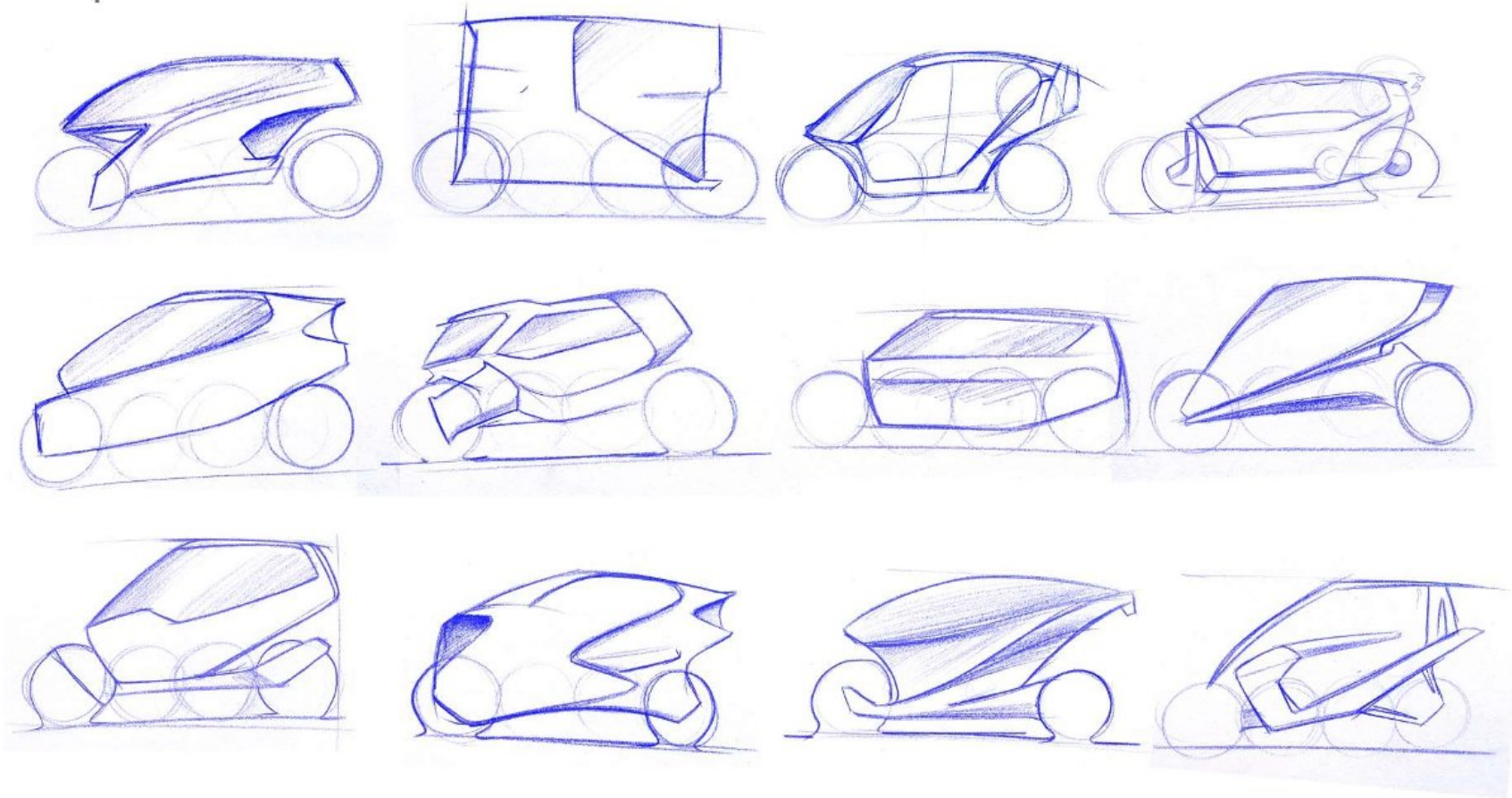
- i) Exterior
 - Should show high perceived value
 - Should exhibit extension of owners personality.
 - Vehicle must have new identity in its class
 - Vehicle should be covered either hard top or convertible
 - Dimension: 2800mm Length X 1300mm Height X 900mm Width

- ii) Interior
 - Should provide good climate protection
 - Capacity: 2 adults with bags.
 - Vehicle should allow easy ingress egress even in tight parking

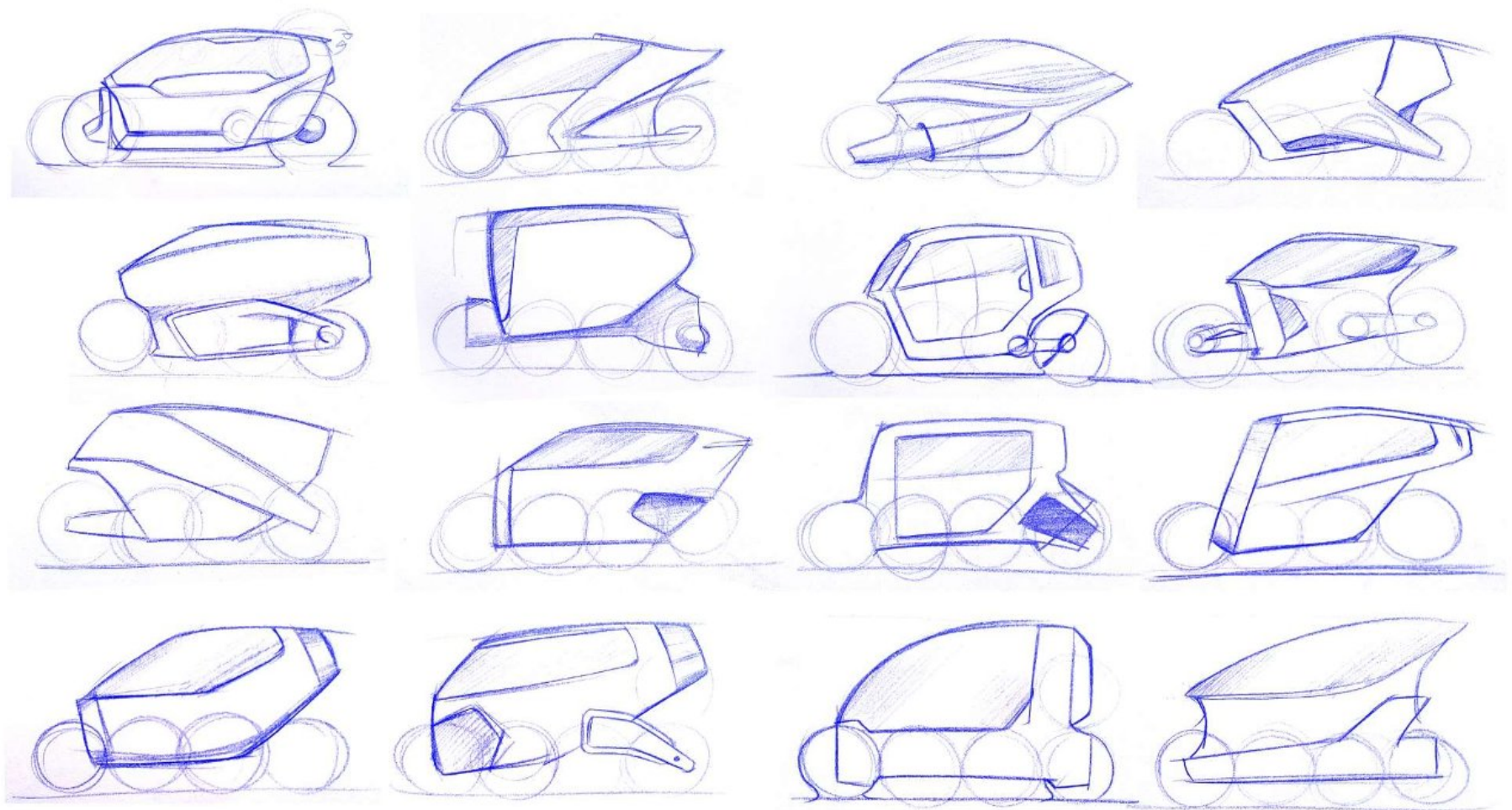
- iii) Cost: below 1 lakh

7 IDEATION

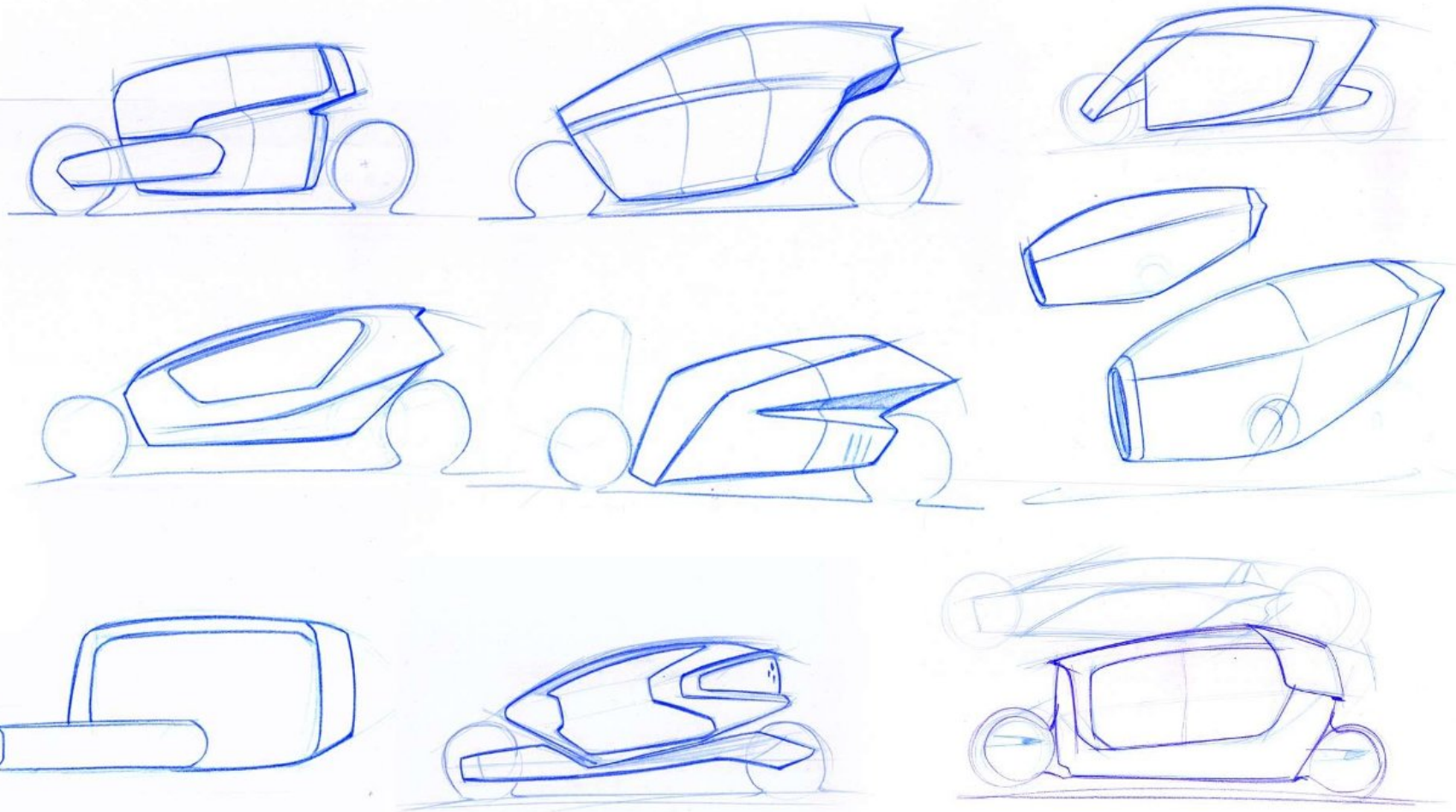
Explorations



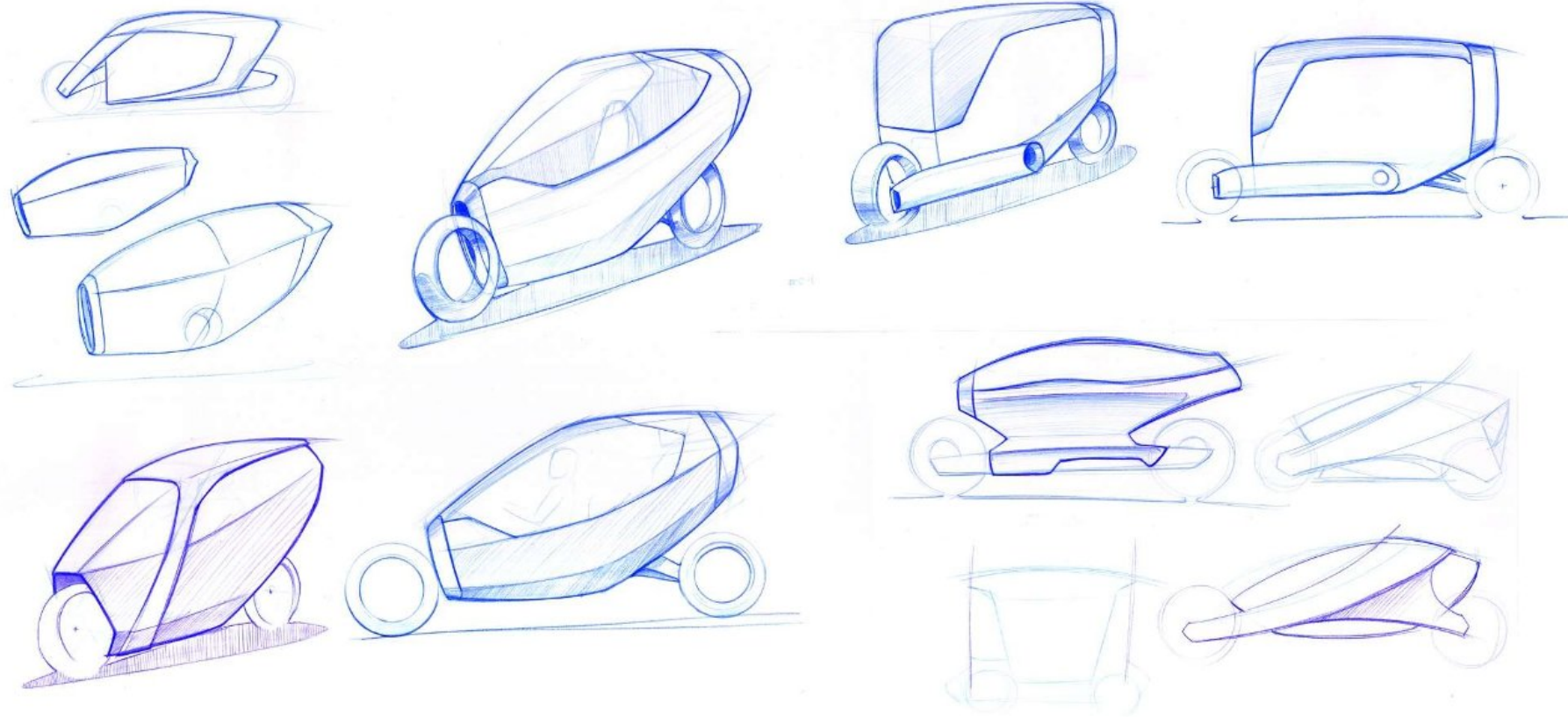
Explorations



Explorations



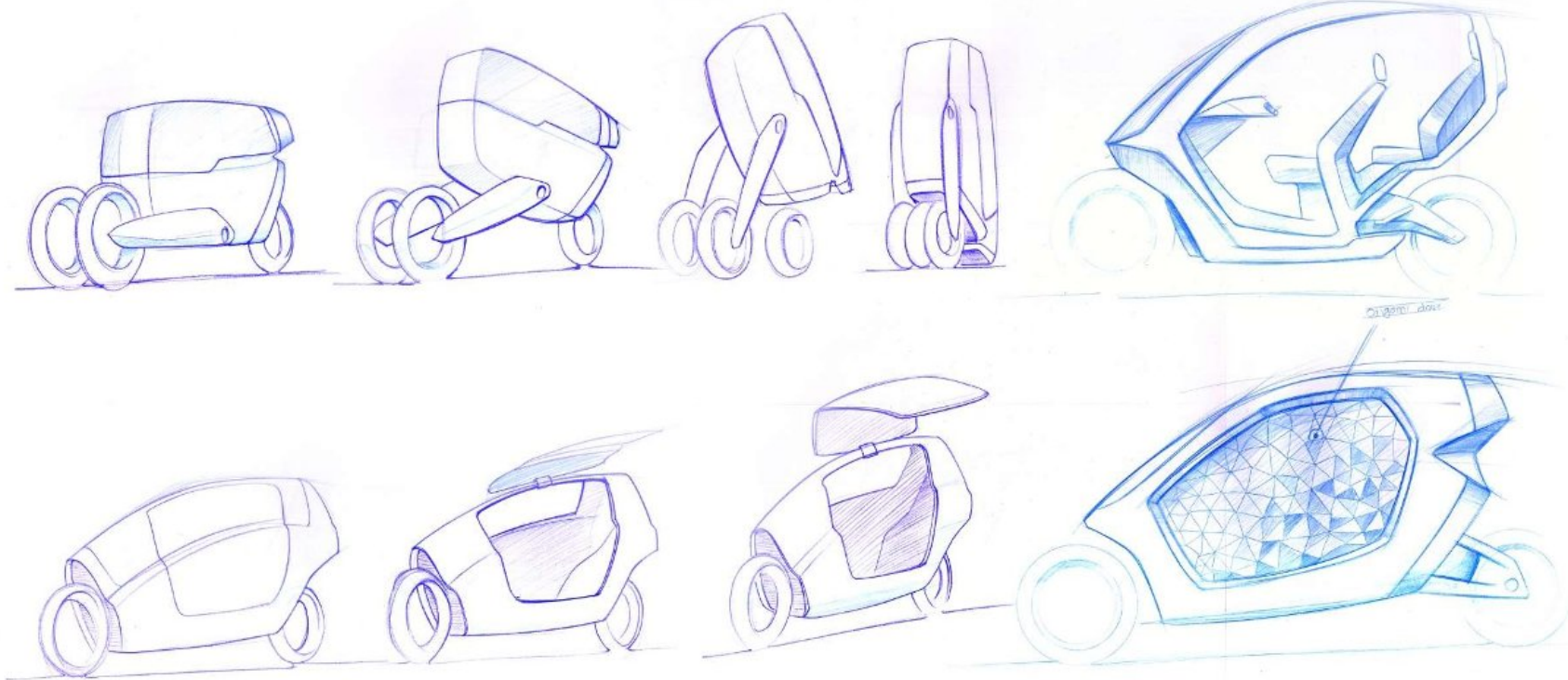
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Explorations

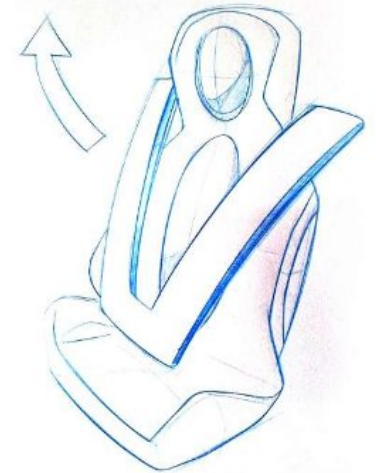
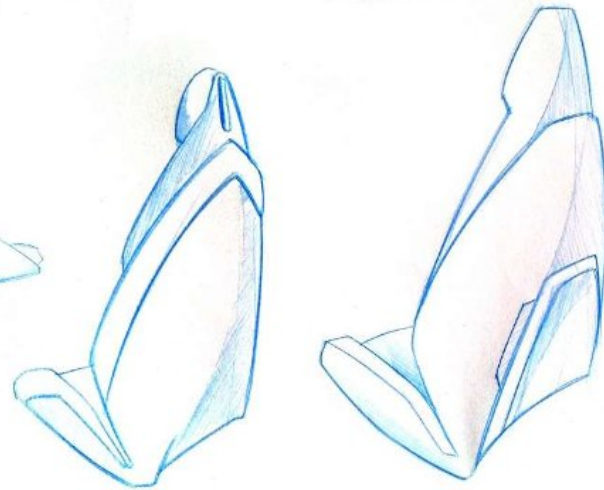
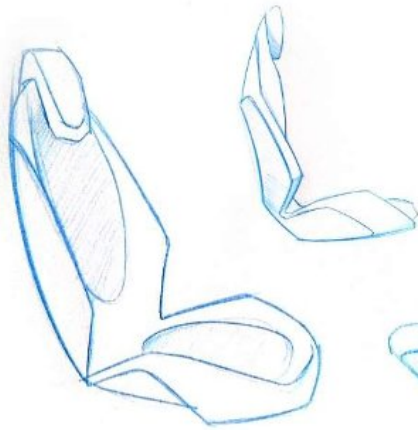
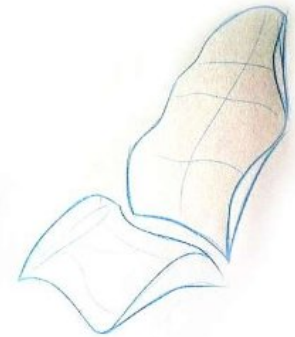
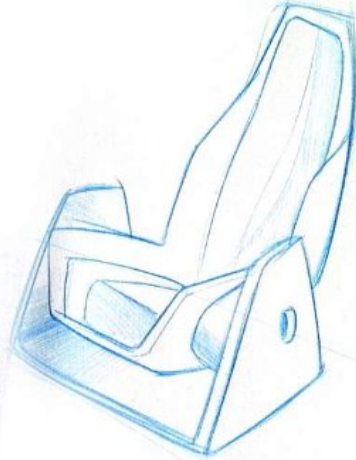
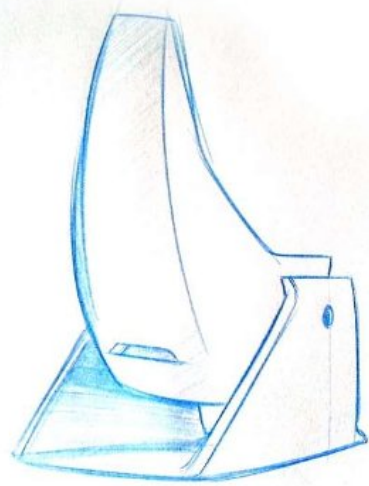


Parking in small space



Falcon Wing Door

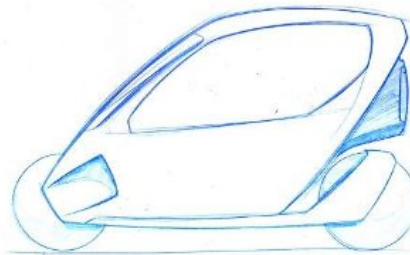
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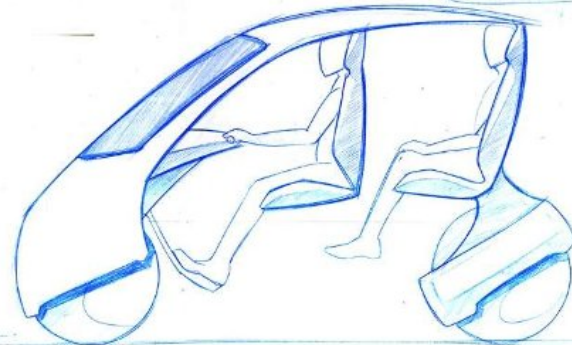
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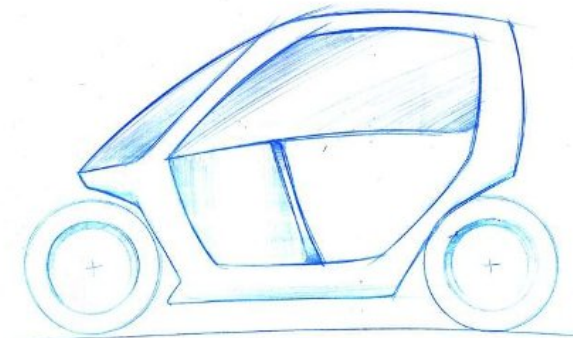
Spherical wheels



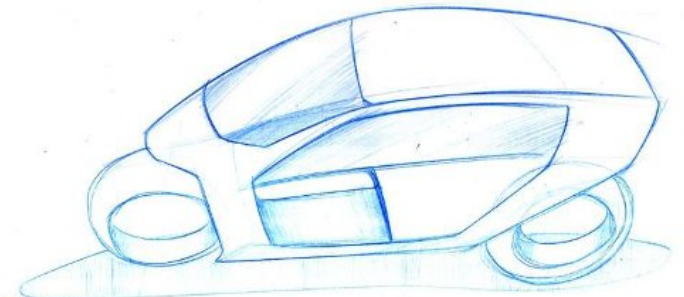
Bamboo weaved door



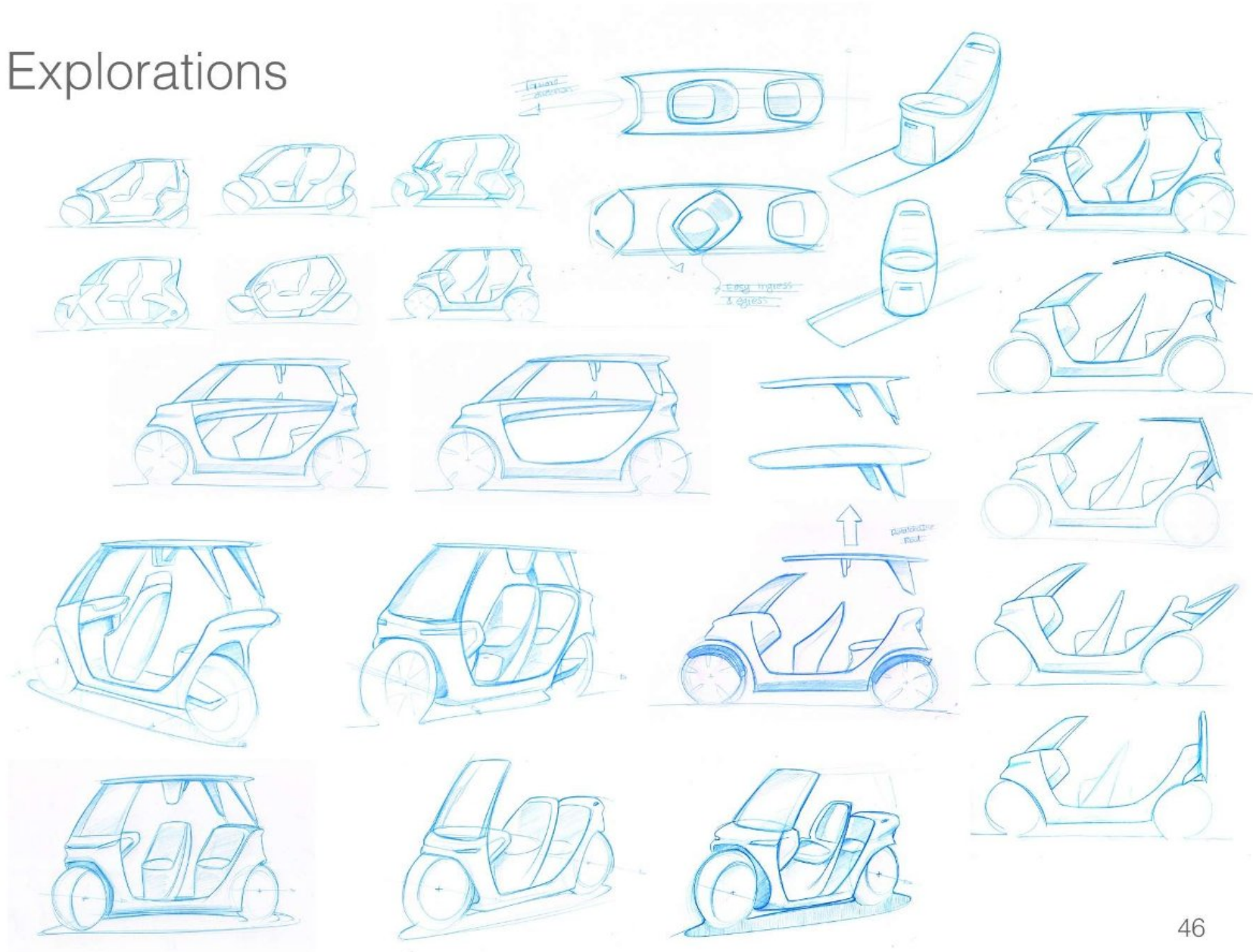
Open floor experience



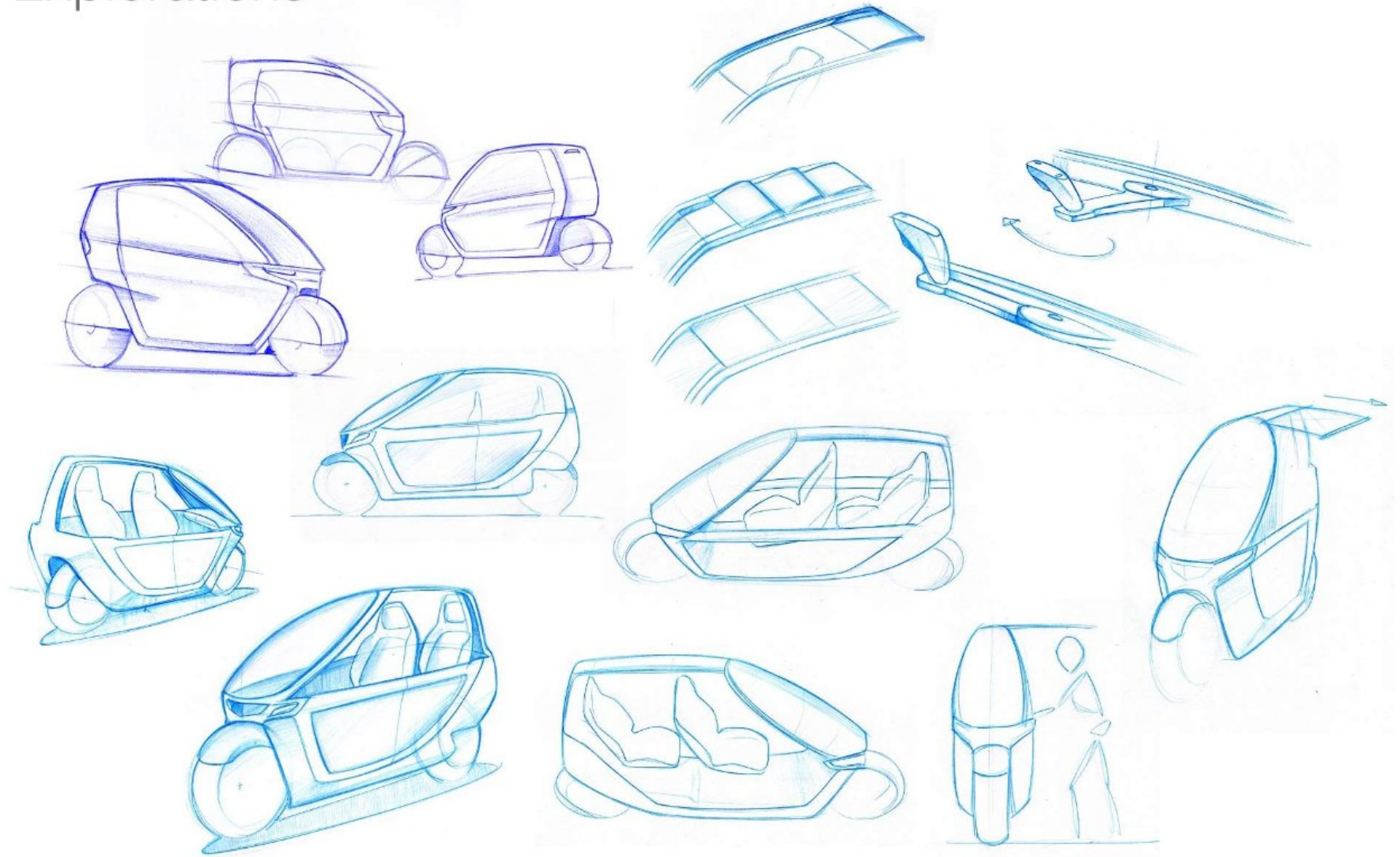
Open leg space for better control



Explorations



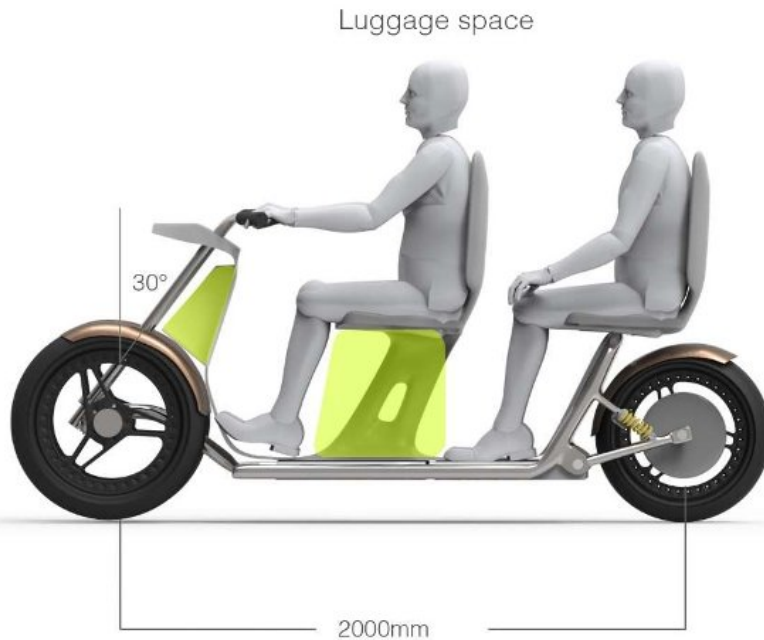
Explorations



8

VEHICLE
PACKAGING

Direction 1



Wheel base is 2000 mm which is 30% longer than royal Enfield bullet 350. Advantage of this layout is pillion person car seat comfortably with backrest and Indian women in saree can travel in this vehicle comfortably. This layout has 3 wheels which gives added stability and discard the need of gyroscope.

This packaging layout has upright seating posture, like scooter. So that wheel base reduced to its minimum possible dimension. This is tall boy configuration with 6 inch headroom. Luggage space is situated beneath seat. Pillion passenger has adjustable backrest.



Exploded view of vehicle Architecture



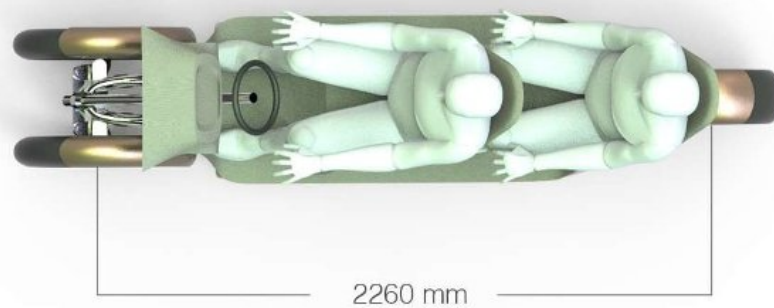
Direction 2 (Car like seating posture)

95th percentile male



This vehicle architecture has low slung profile and long wheel base. Thus this vehicle has more interior space and storage space. Driver and passenger will travel more comfortably due to relax seat posture.

Luggage space



Exploded view of vehicle Architecture



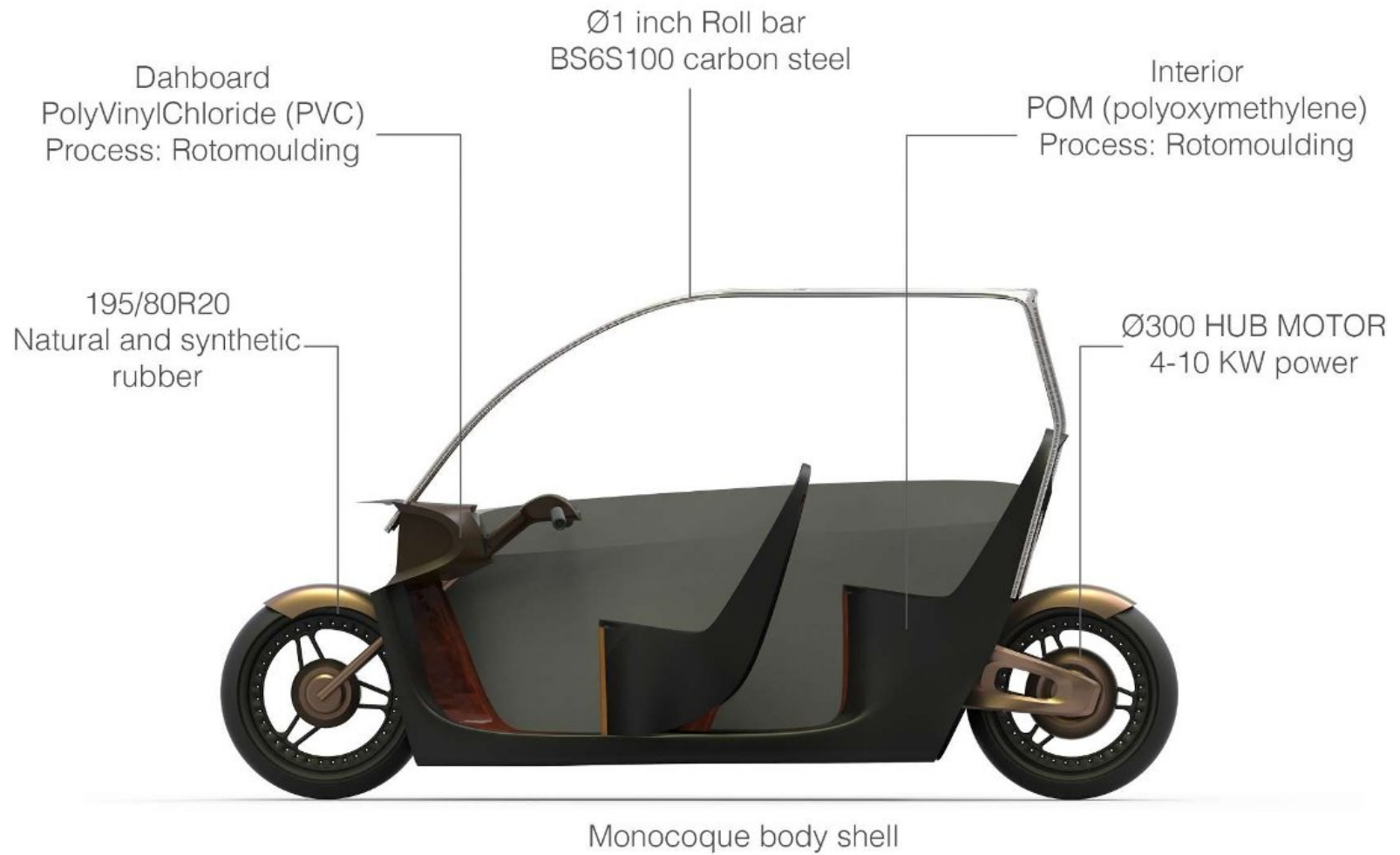
Direction 3 (mix)



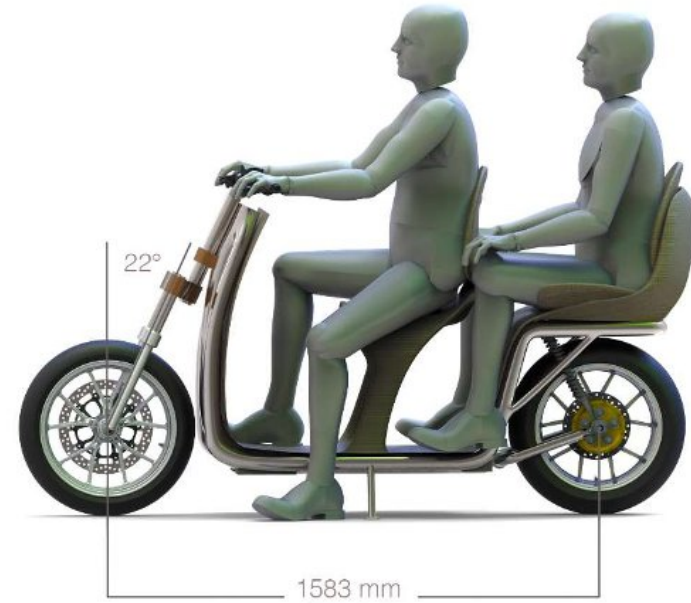
This vehicle architecture has comfort of 4 wheelers and maneuverability of two wheelers. It has two wheels balanced with gyroscope.



Component Details



PACKAGING DETAILS



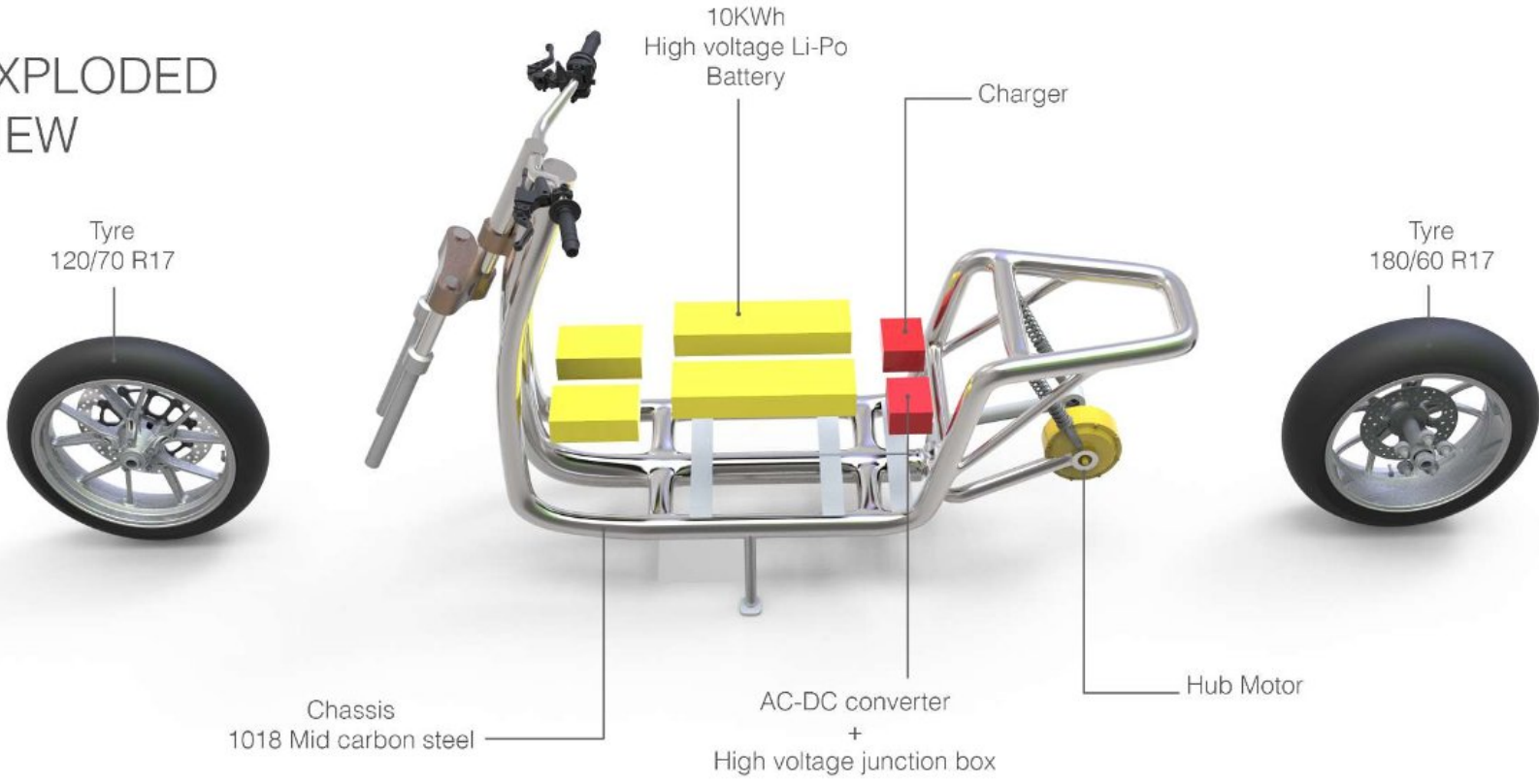
Human mannequin size is 95th percentile as per Indian anthropometric data



● Storage space



EXPLODED VIEW



9

CONCEPTS

Mood board



Perceived value



Personal Touch



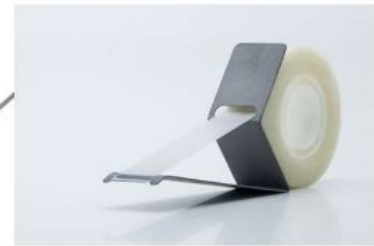
Comfort



Comfort



Value for Money



Perceived Value

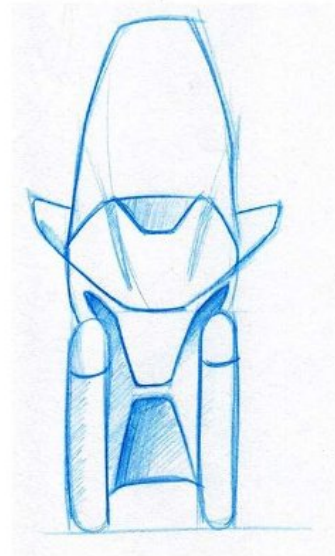
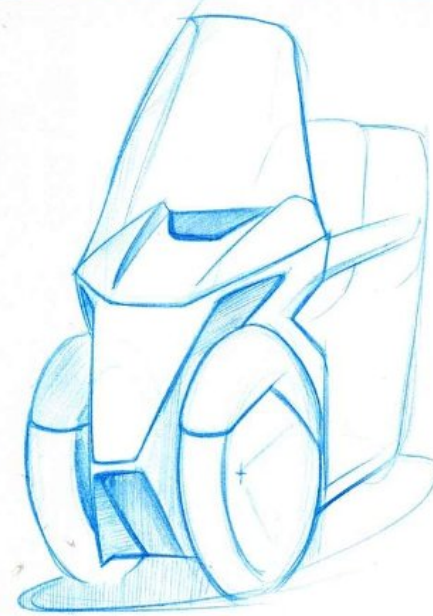
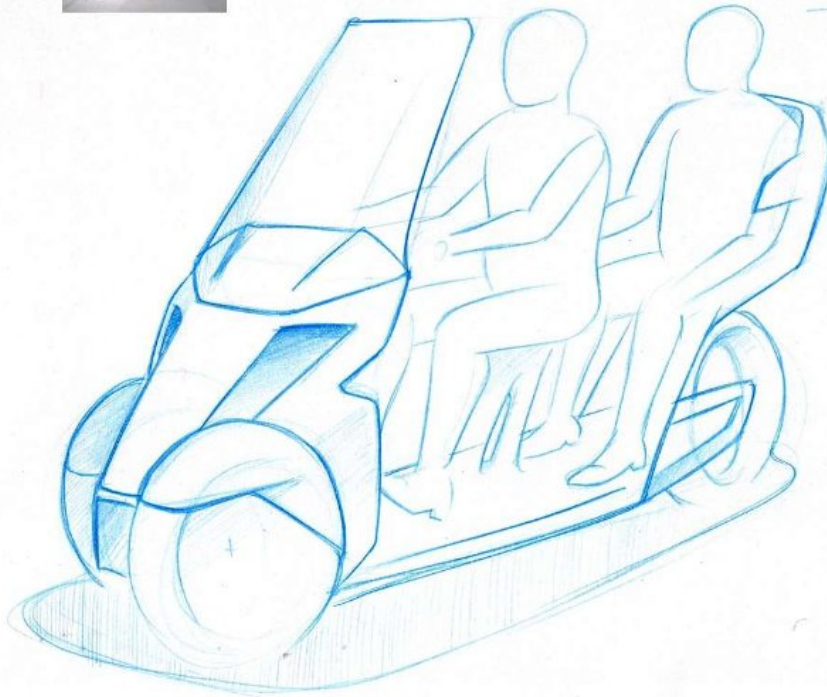
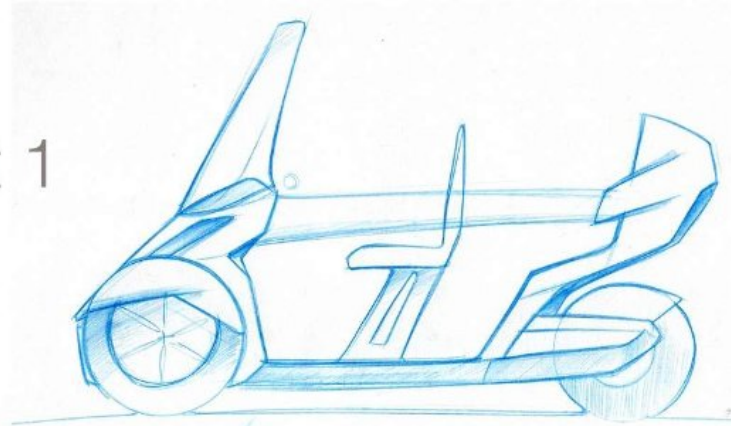


Personalize





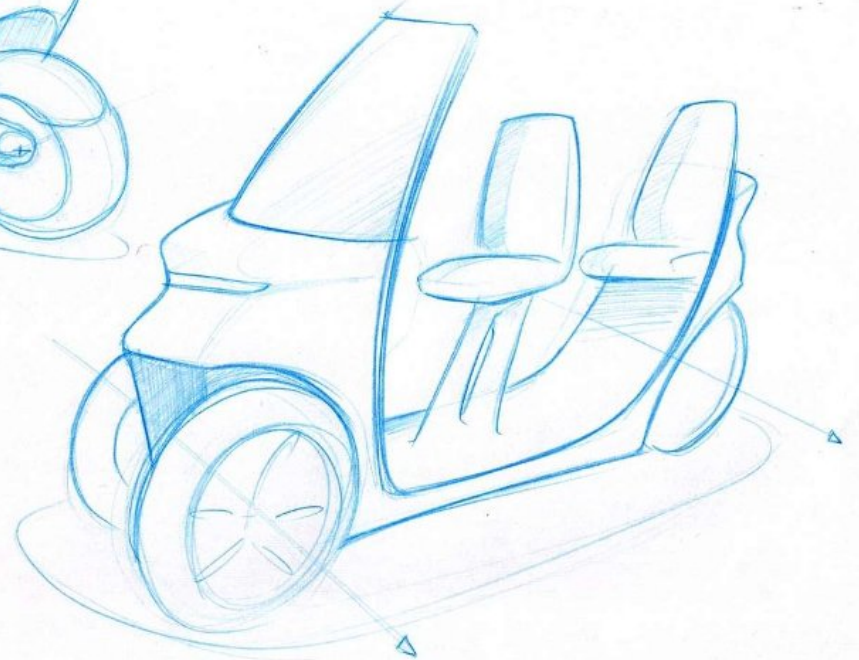
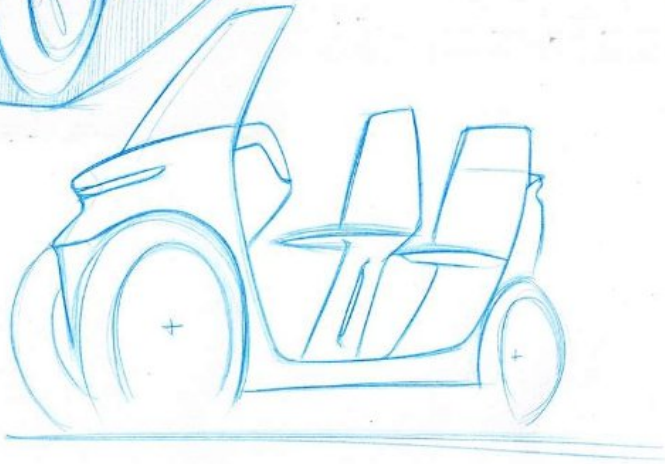
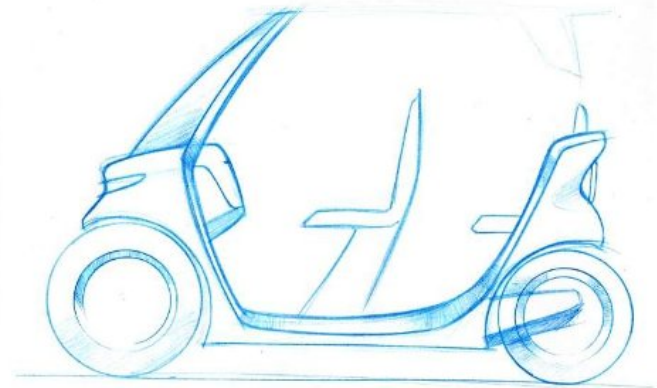
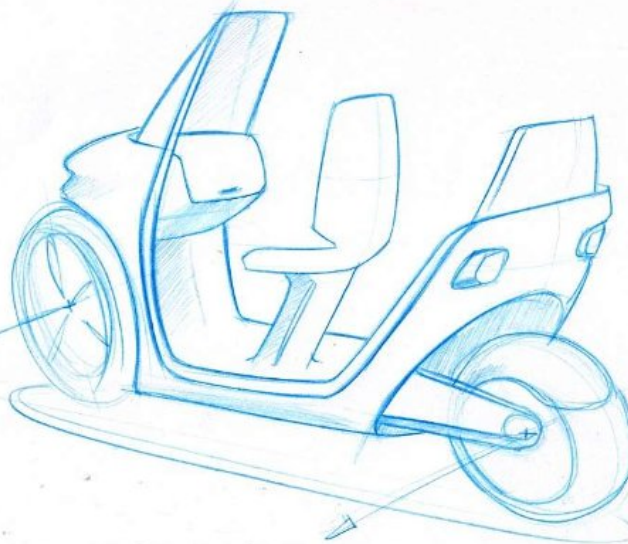
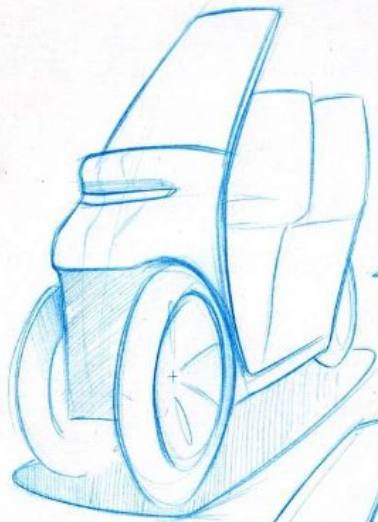
Concept 1

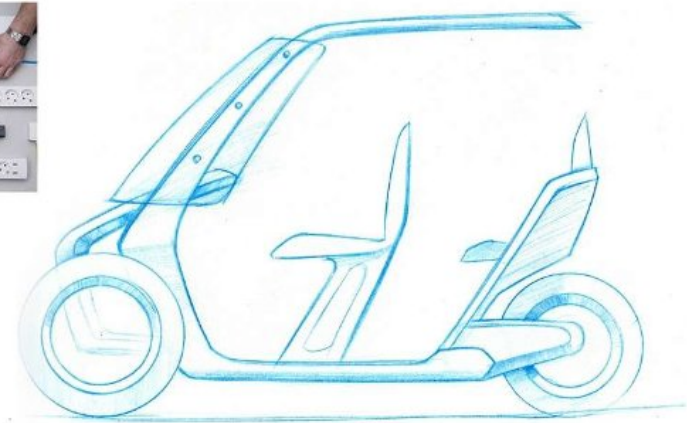
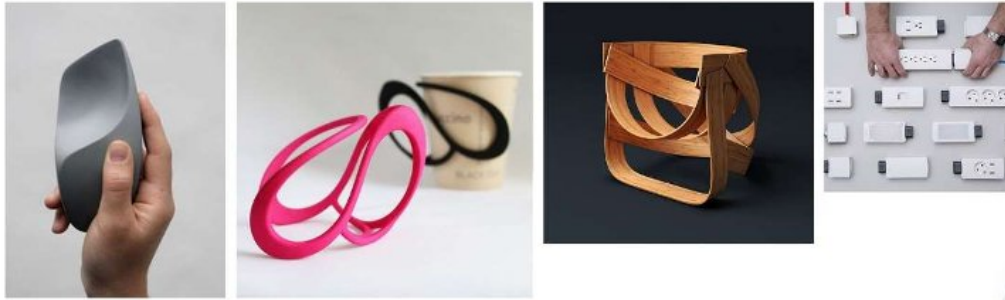


Concept 1 design is a hybrid design between car and motorcycle front portion covered and exposed wheel gives sporty look rear portion has swing arm to connect rear wheel

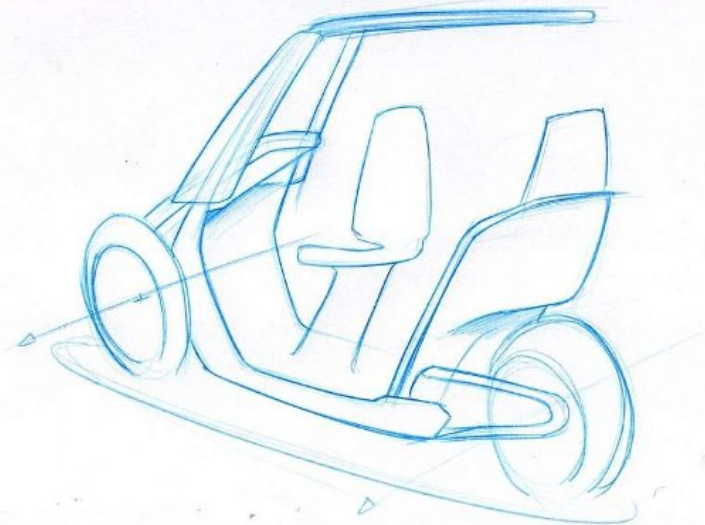
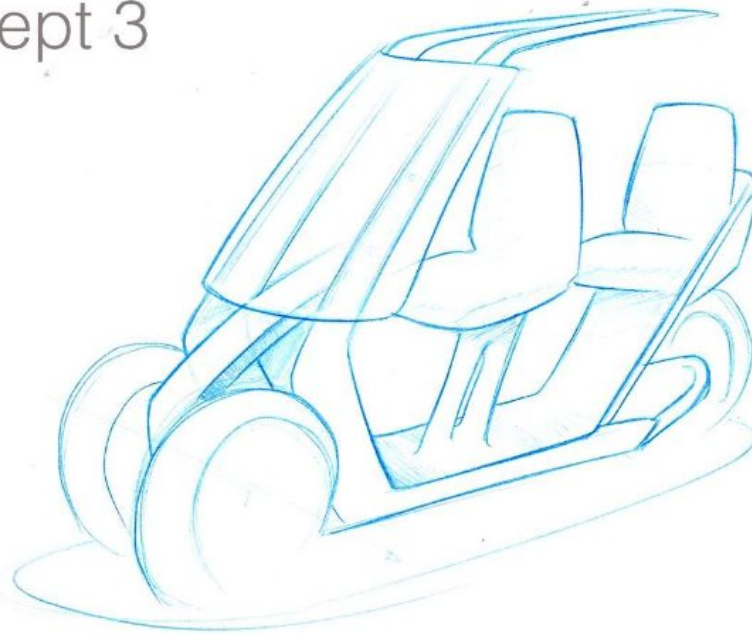


Concept 2



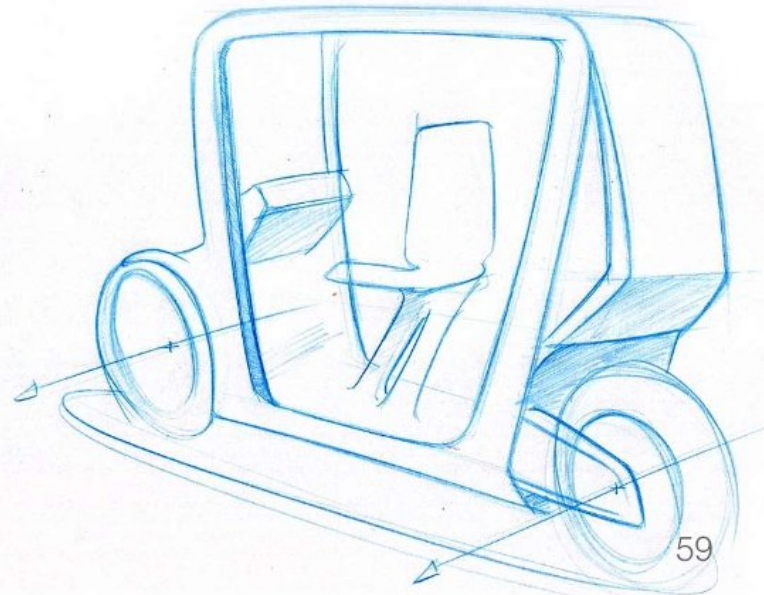
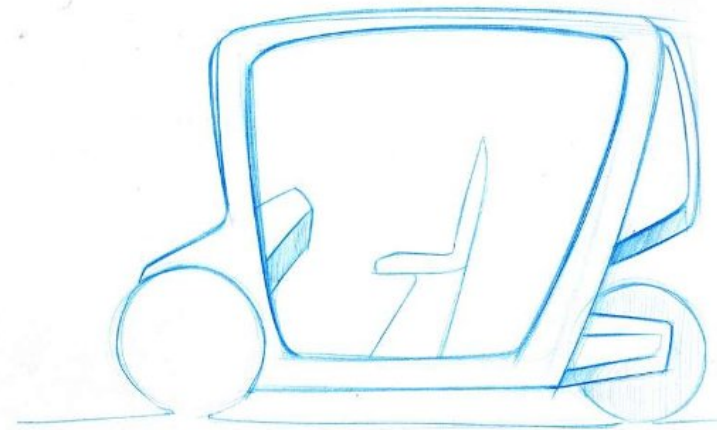
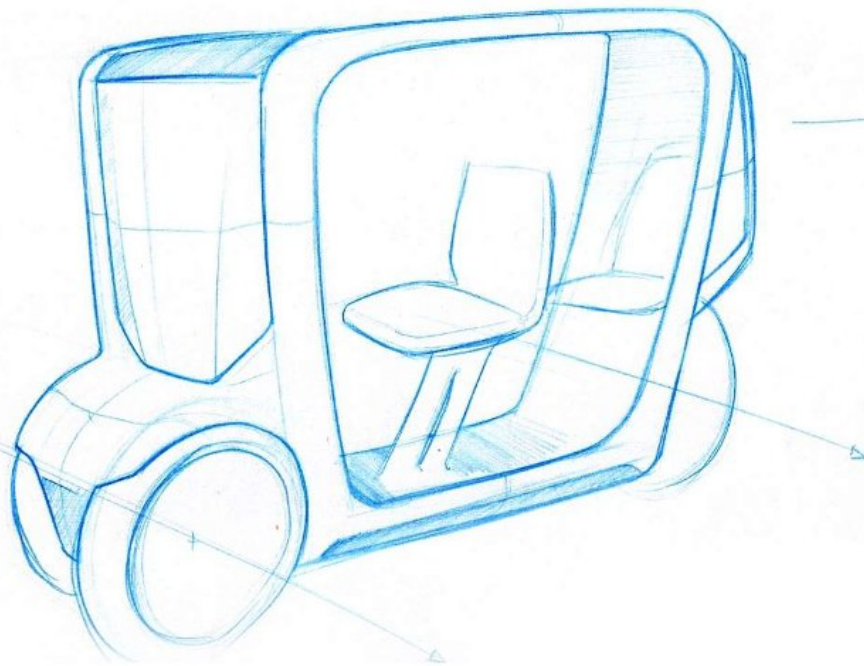


Concept 3



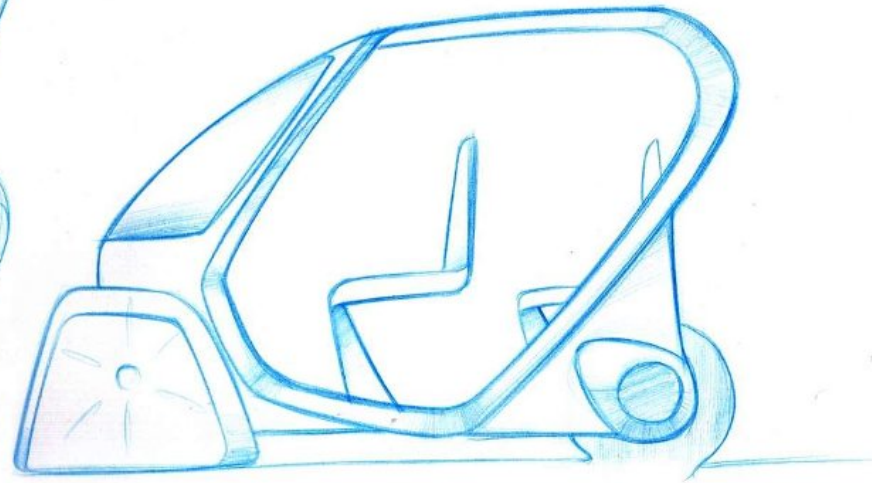
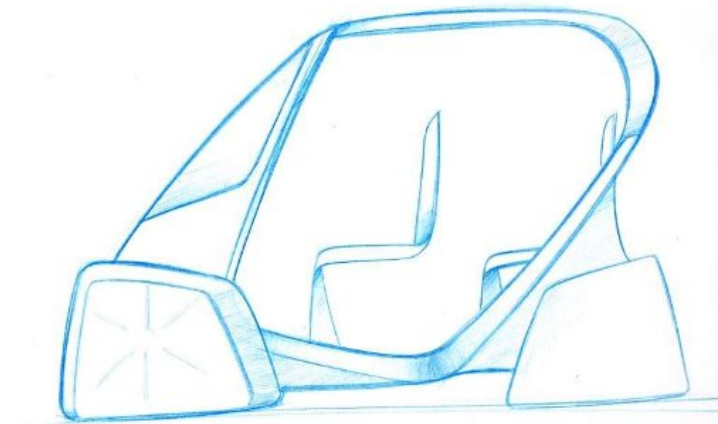
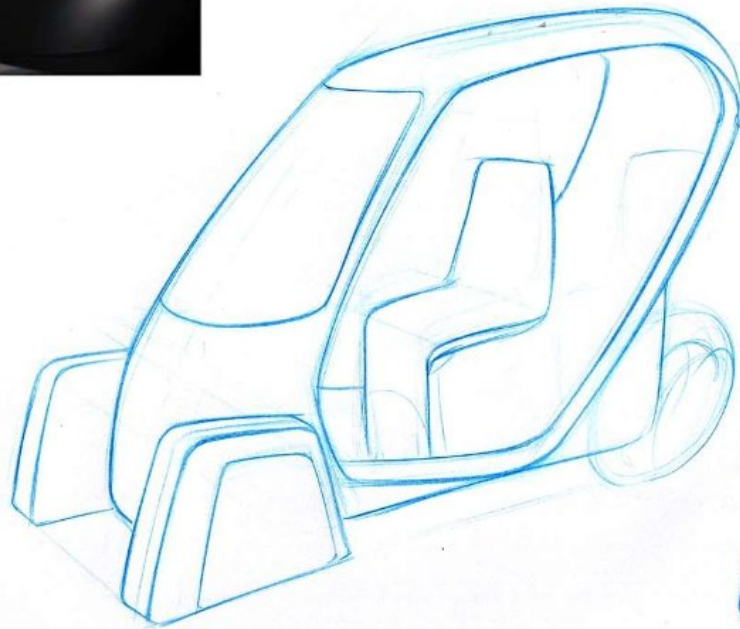
This vehicle has exposed frame structure. Thus this vehicle is highly modular and customizable. it has planar form. This vehicle gives feeling of motorcycle with partial weather protection.

Concept 4

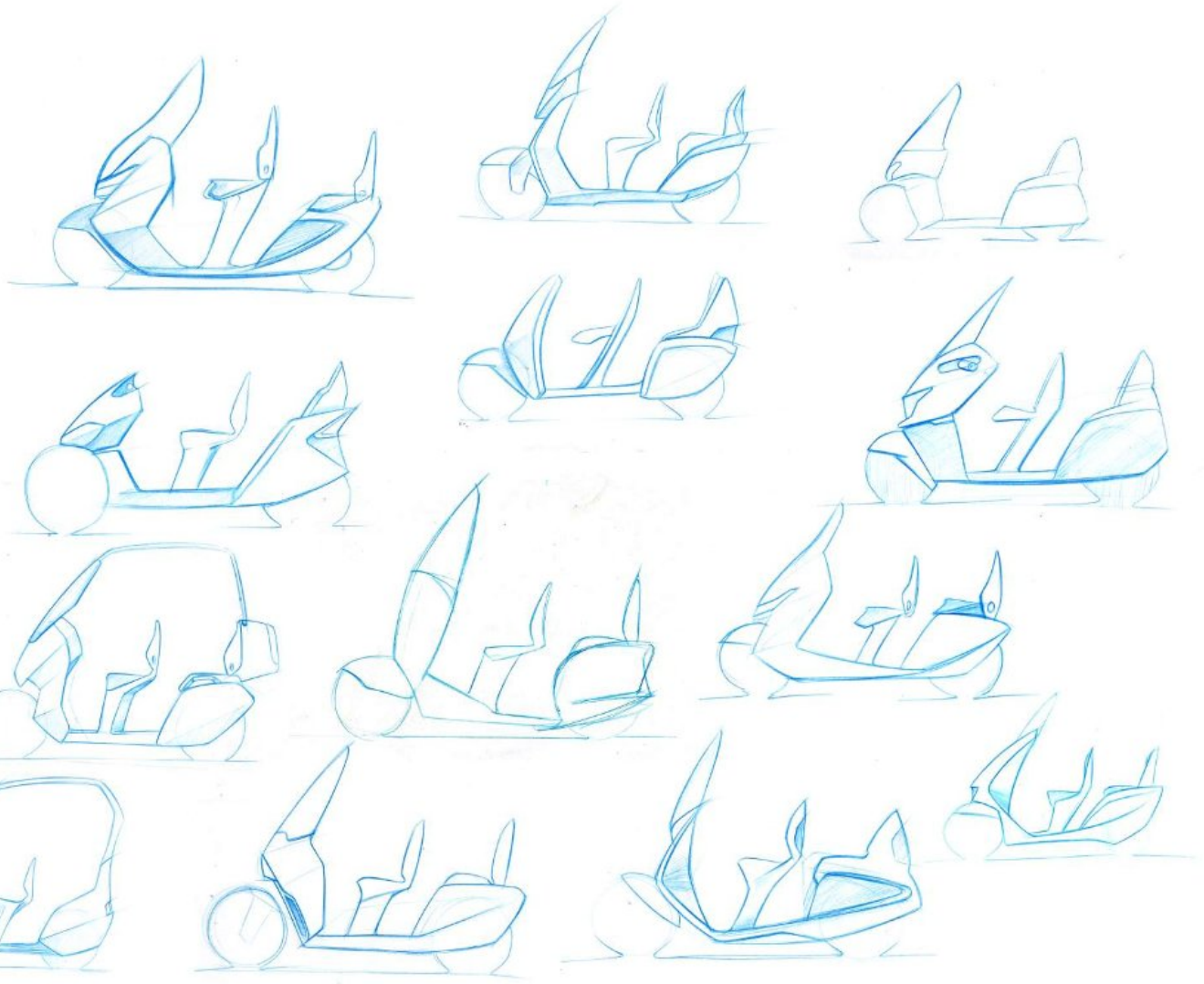




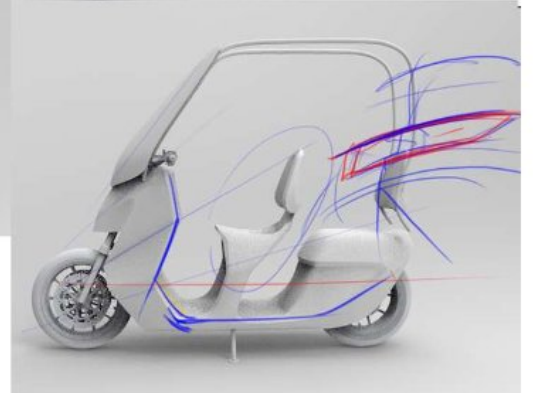
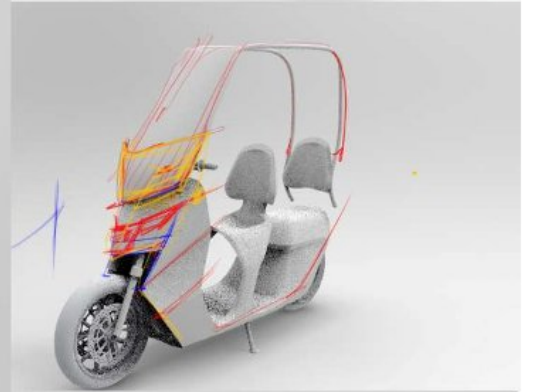
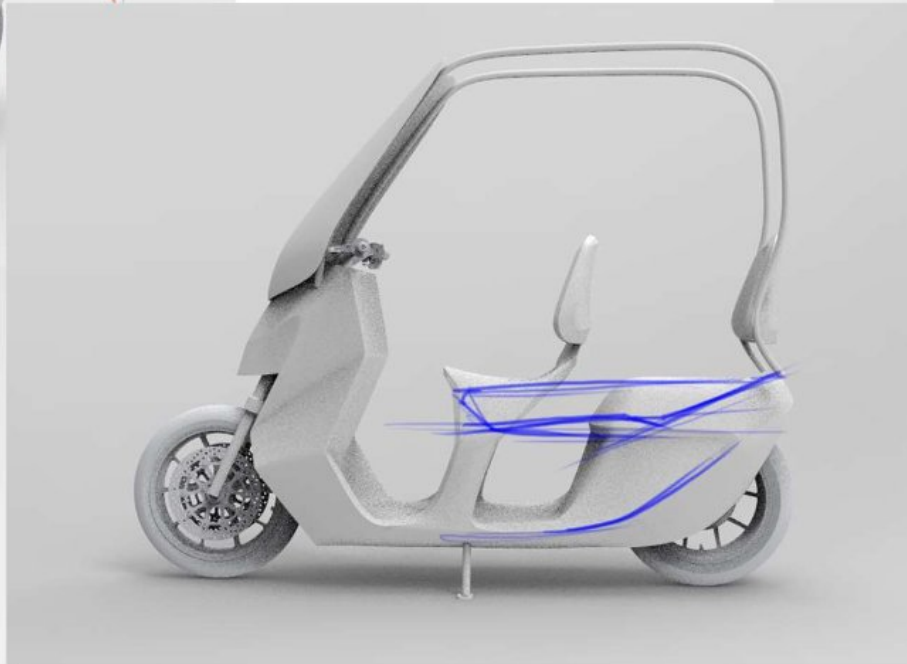
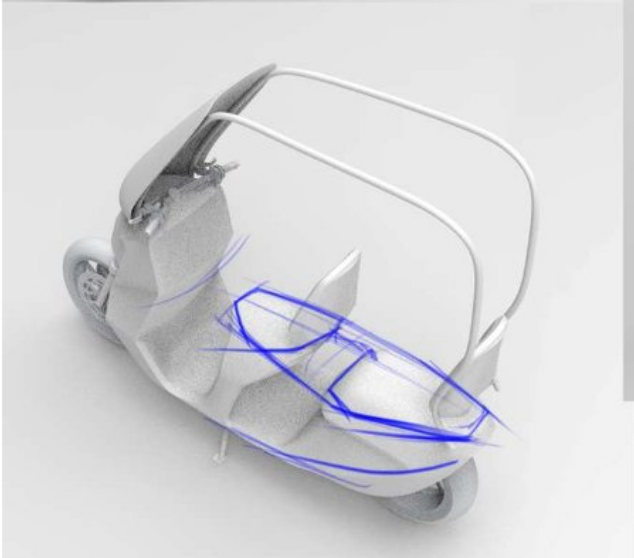
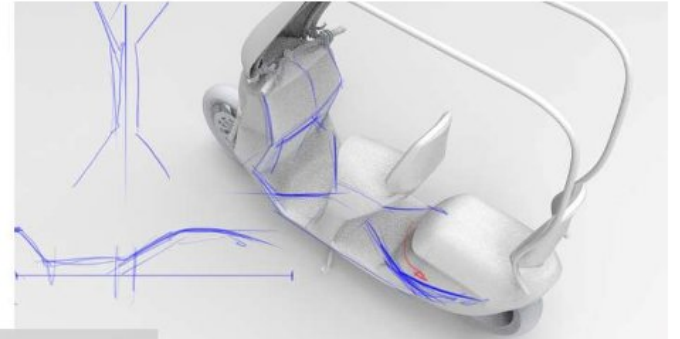
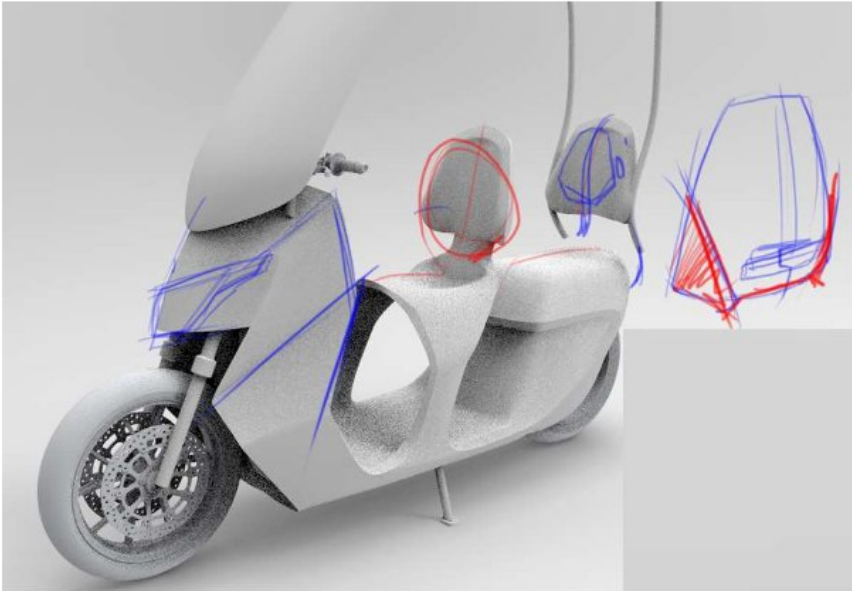
Concept 5



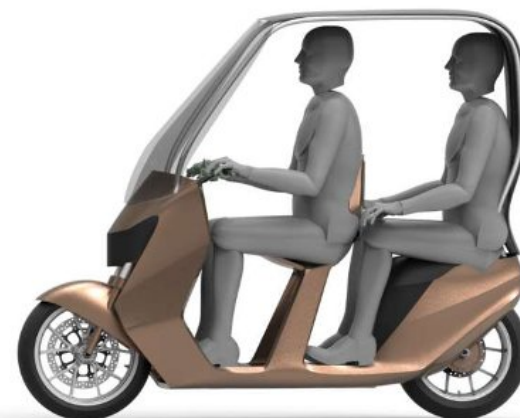
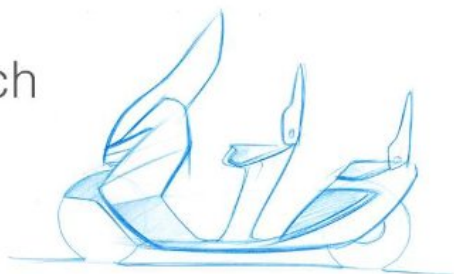
Organic shaped exterior gives cleaner look exterior shell is produced by roto moulding process. Wheels are placed slightly outside of the main body which improves stability and cornering ability. Vehicle has open frame to give more visibility.







Key
sketch





References

Automobile Domestic sale trend SIAM India

ICICIlombard two wheeler insurance info

mrv.c.in
indianrailways.gov.in

'India loses 60,000 Cr due to traffic' Times of India

Allegro Capital advisors Pvt Ltd

ACMA India

The automotive industry evolving dynamics KPMG India

Formula SAE anthropometric reference data 5th percentile female & 95th percentile male

Indian Antropometric dimensions - Debkumar Chakrabarti