Design of a Three Wheeler

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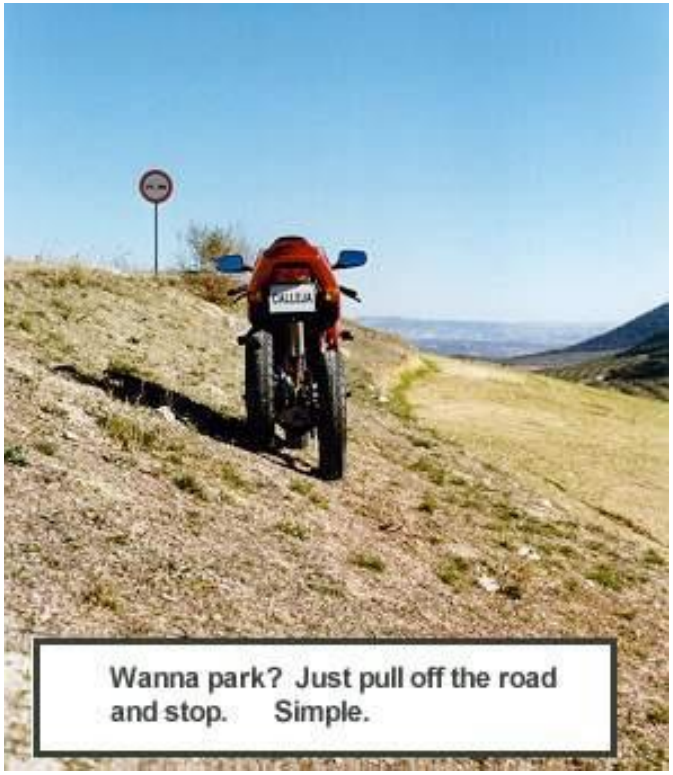
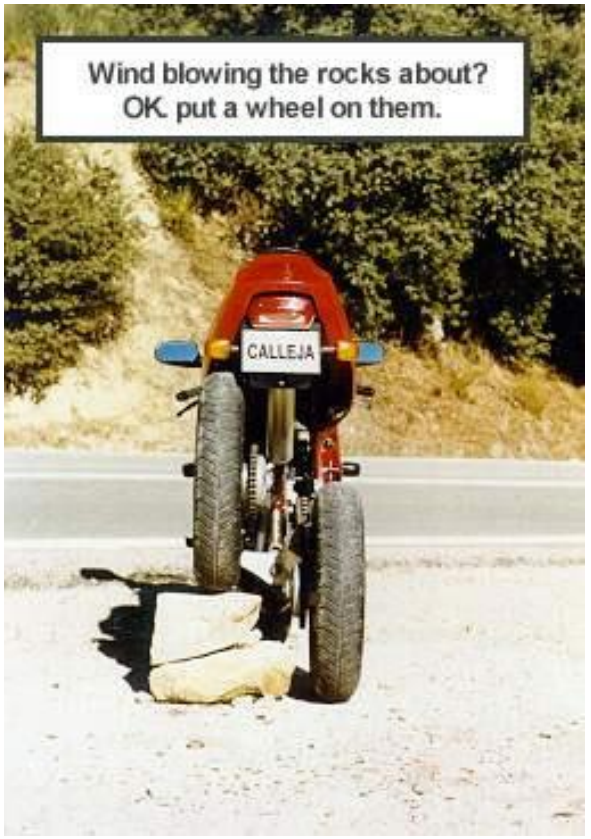
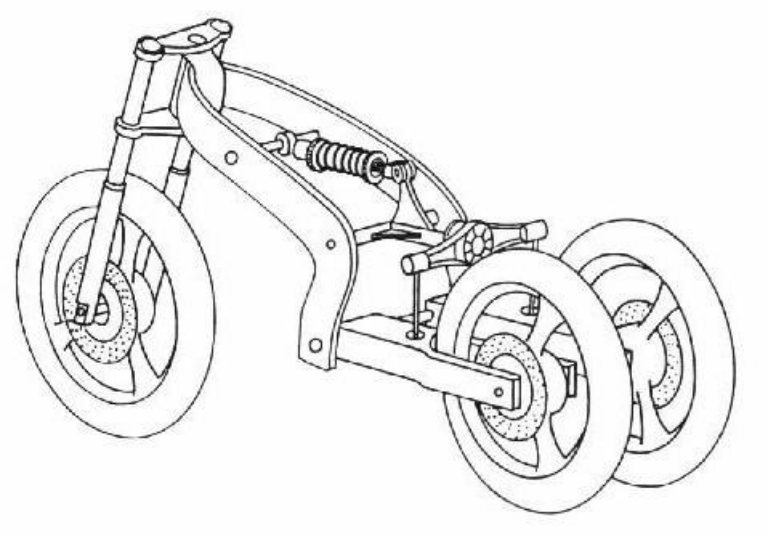
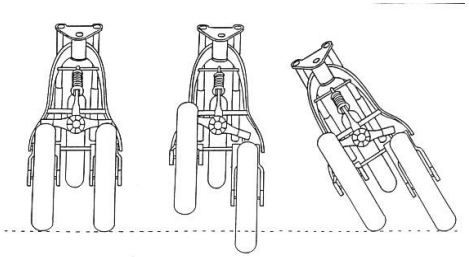
Guide: Professor V. Bapat

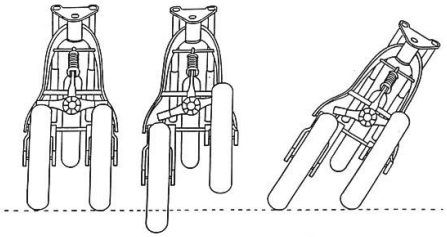
Inspiration

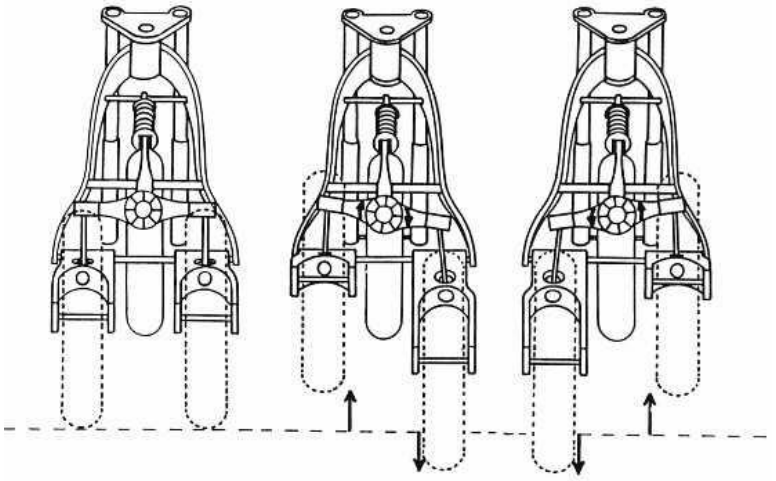

Wanna park? Just pull off the road and stop. Simple.


Wind blowing the rocks about? OK. put a wheel on them.
CALLEJA

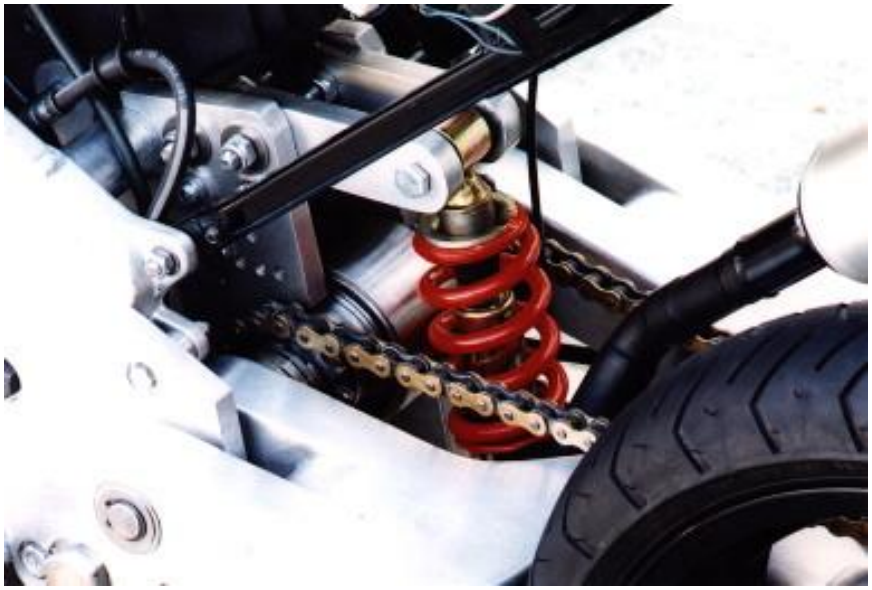




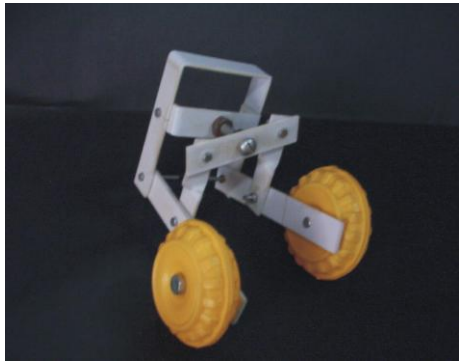


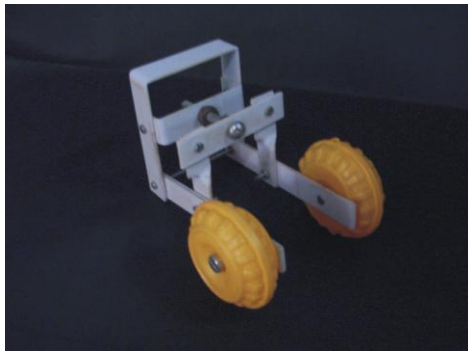


Mechanism

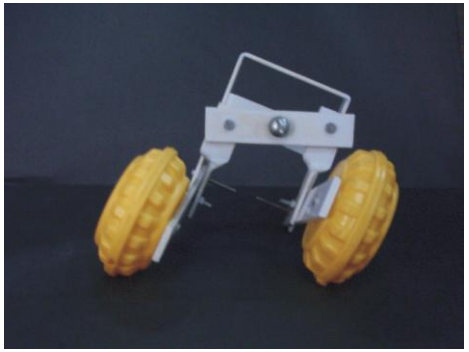


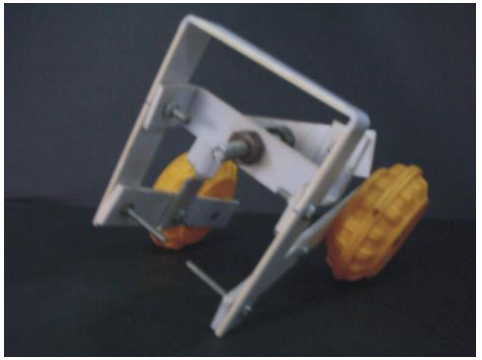
Suspension and differential





Model to study the mechanism and understand its working





This invention provides dynamic stability as well as static balance in a light-weight, narrow vehicle having a high center of gravity.

This vehicle, which maintains the " motorcycle feeling", offers diverse advantages with respect to a conventional motorcycle:

• It considerably reduces the possibility of the rear tyre sliding (the most frequent cause of motorcycle accidents).

•It offers more traction in any situation on any type of terrain, in particular when they are slippery.

•The third wheel offers better braking as well as increased stability whilst braking.

•No effort is needed to park the vehicle, even on inclined road surfaces, since has no stands.

•The driver need not hold the vehicle when stationary, because it maintains its upright position when the balancer is locked.

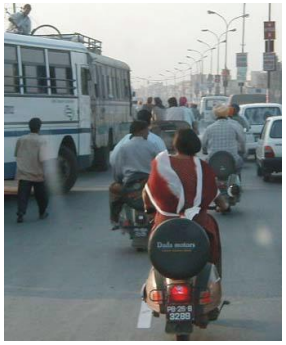
•This allows the vehicle to be enclosed, protecting the driver against hot weather and rain.

Need for a different vehicle

Worldwide, benefits and liabilities of cars have been targeted, for their hunger for fuel and traffic congestion.

A fresh direction will be needed to move vehicle designers, manufacturers, and Consumers away from the idea of multi-purpose, high-performance cars for routine local trips, and toward the concept of specialized vehicle types for urban and commuting travel.

Transportation in Indian cities



Economic growth

Increase in buying power of the people

Increase in sales of small cars and two wheelers

Two wheeler which was designed as a performance fun machine used as a family vehicle in India.

Increase in number of accidents.

Direction the manufacturers are adopting

No more cut throat price wars

Executive models as next growth segment

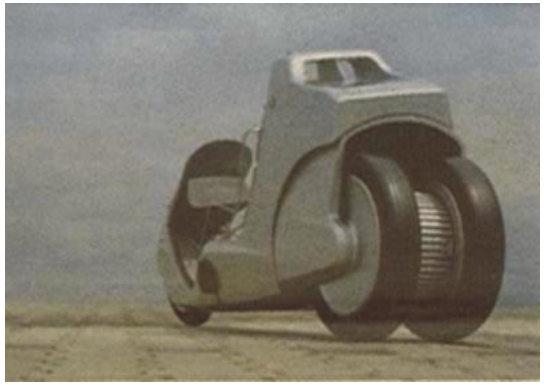
Higher priced models that mean more profits

LML, Bajaj, Hero Honda, all going in for upper segment models

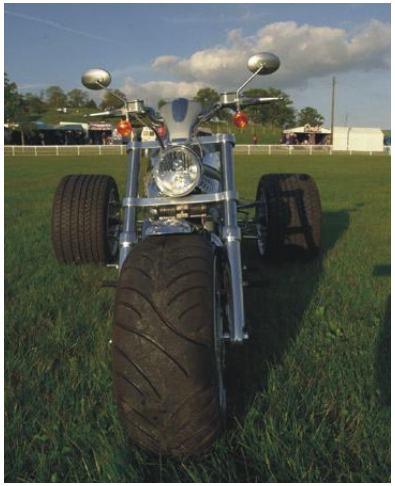



Three wheelers of the world

These three wheelers are all based on a car platform



Narrow track three wheelers



Narrow track three wheelers

Three wheelers of India

The mention of three wheelers in India bring forth such similar images. the rickshaw look that has been greatly embedded on our minds.

The very mention of the project as a three wheeler design made people think that I am doing something on the auto rickshaw platform.

Very soon I realized that I will have to have a form that will have to destroy such image.

But then there were two wheelers with side cars that were an accepted means of transport, in fact as an extended family vehicle. The clue is to keep the two wheeler identity.

User survey

The target user was decided early on and very specifically in order to clearly define the scope of the design.

The user would be……

Middle/upper middle class urban individual

Aged 20 to 35 years

Someone having a small nuclear family

Or single

Young couple

Other possible user

A rich person buying a second or third vehicle as a substitute to a car

Sales person/ delivery person

Elder citizen.

Why middle class??

This is the class of people that mostly use a two wheeler.

They have a monthly salary of about 10,000 Rs.

They can’t afford a car.

They are educated, marrying later and have fewer children.

They are the people who want something more in life.

They Look for convenience in fast paced urban life.

They have a changing standard of living.

More no of women have started working, and need a vehicle to travel.

Talking to the user

Casual talk with the user

No hint of project given

No questionnaire, just key questions in mind that were asked appropriately in the conversation

Insights were noted down

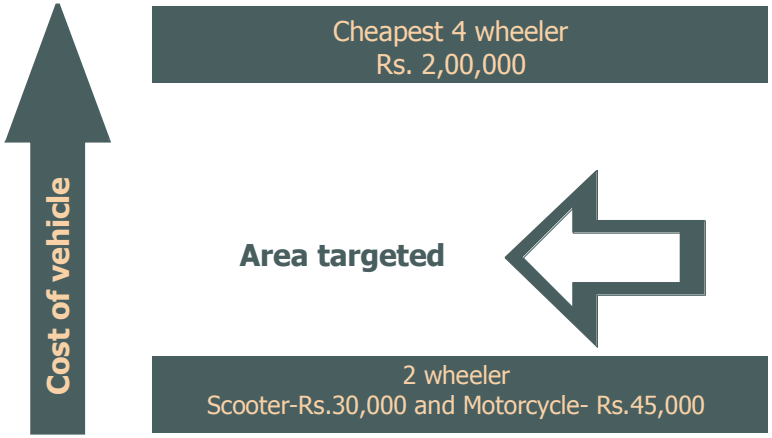
People who were interviewed included, young college students, office going people both male and female, house wives with children, and some doctors from a municipal hospital.

Some of the insights

•Many females don't ride a two wheeler because they find it difficult to balance
•Sitting with legs on either side feels more safe
•Can't sit comfortably with a sari
•There is no protection from rain
•During rainy season rain drops enter the eyes while driving
•Mud flaps are inefficient in motorcycles in rains, hence a temporary
polypropylene sheet covering is put on the leg guard
•Putting the leg down in a puddle in slow moving traffic is a nuisance

- Car feels more safe because of the bonnet ahead
- Car has a protective body
- Car is more desirable
- Motorcycle is more fun to drive
- Two wheeler has most no. of accidents.
- Head injuries most common and fatal.
- Youngsters are more prone to accidents.
- Family riding on a scooter is at high risk.
- Ground clearance is too low, in some two-wheelers
- Luggage space is less
- Enhanced rickshaw as a family vehicle is not acceptable
- Three wheels on a two-wheeler

More study



Purchasing capacity of people was studied

Most buy a two wheeler first and then a car as family grows

Also occupancy of vehicles was observed

Mostly the car was underutilized.

Of the 50 cars observed, 36 had only two or less no of occupants.

Of the 78 two-wheelers observed only 23 were riding single.

Parking of a two-wheeler took approximately 10 seconds

Finding a place to park for a car itself took around 2.5 minutes.

Product Brief

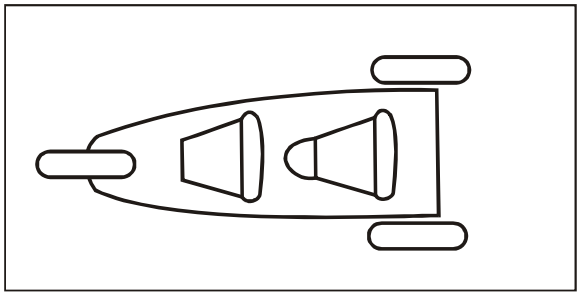
Technical:

Will carry two adults, a child of up to 12 years and small luggage
Will have a hardtop transparent hood, tinted in the roof section
Will be a light weight construction
Will be compact and narrow, i.e. the wheel track will be small.
Should be priced under one lakh
Should be mass-produced.

Form:
Form should have an individual identity, but not looking like a car.
It will be without doors
Will have an open feel
Form should be based on the users attitude and mind
Should be able to animate the inanimate

Safety:
Should have a stabilizing mechanism to take the cornering forces
Should be self balancing
Should have adequate head room
Have comfortable seating with backrest
Should have excellent front and side visibility.

Seating layout



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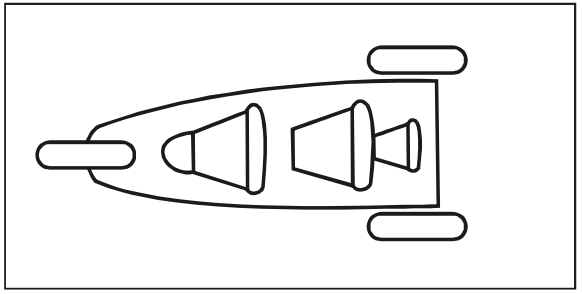

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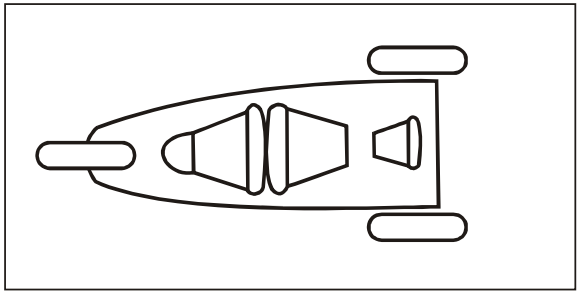

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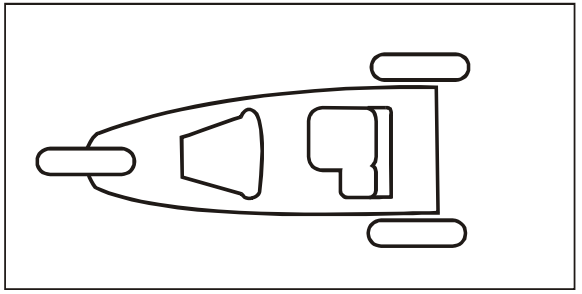

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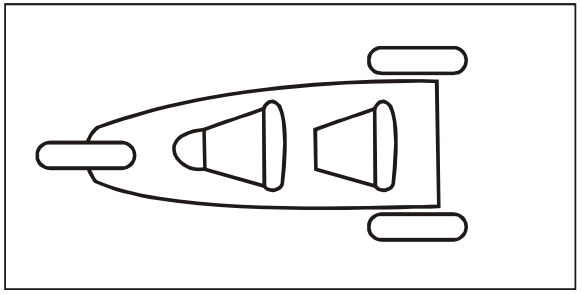
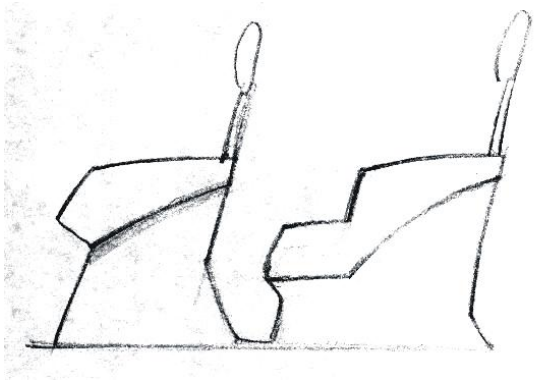
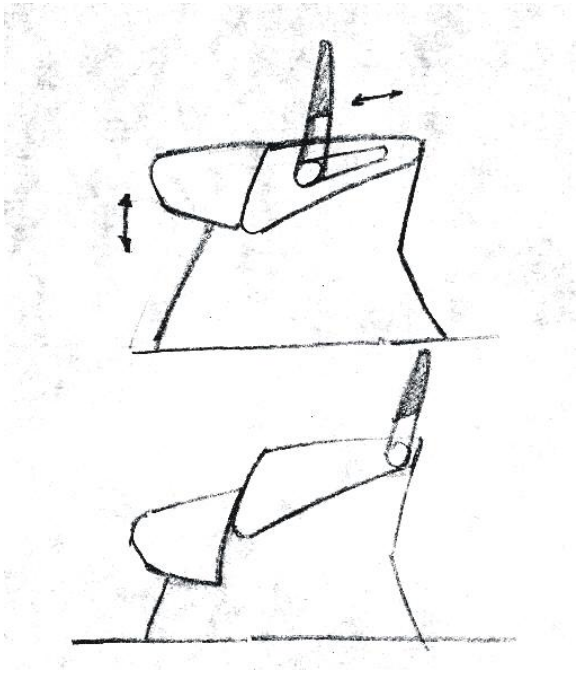


5 selected

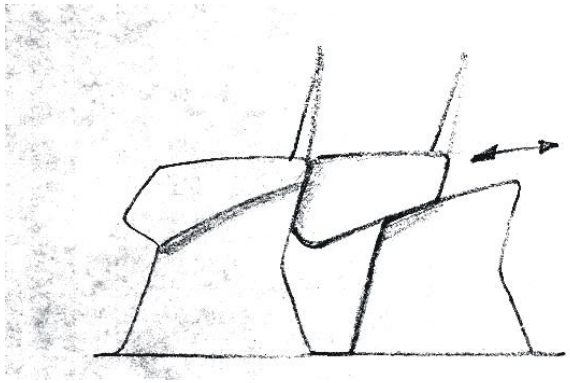
Concepts for seat adjustability



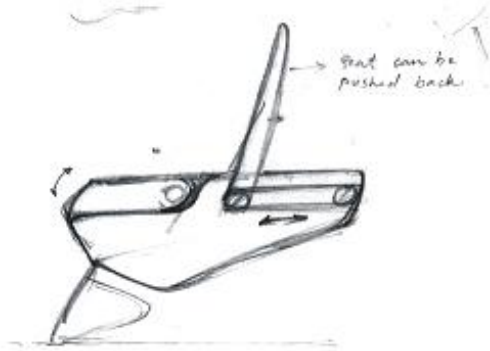
Low height child seat in between the rider and pillion.



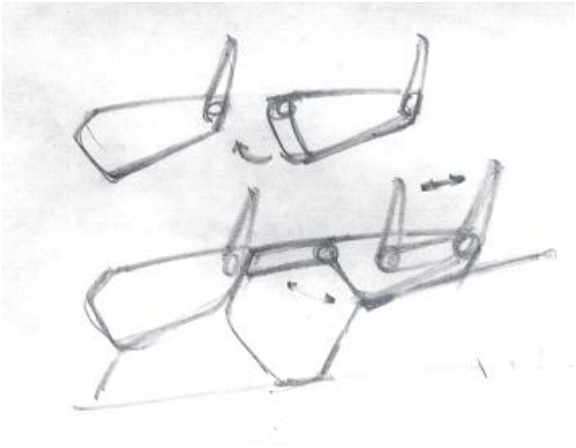
Adjustable child seat that can be pushed down and the back rest pushed behind for pillion rider when a child is to be seated



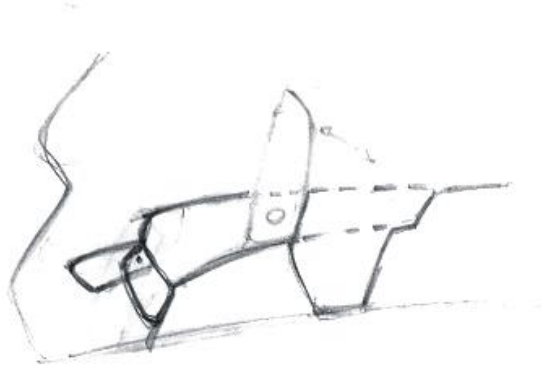
Rear seat that can be slid forward to increase intimacy after egress.



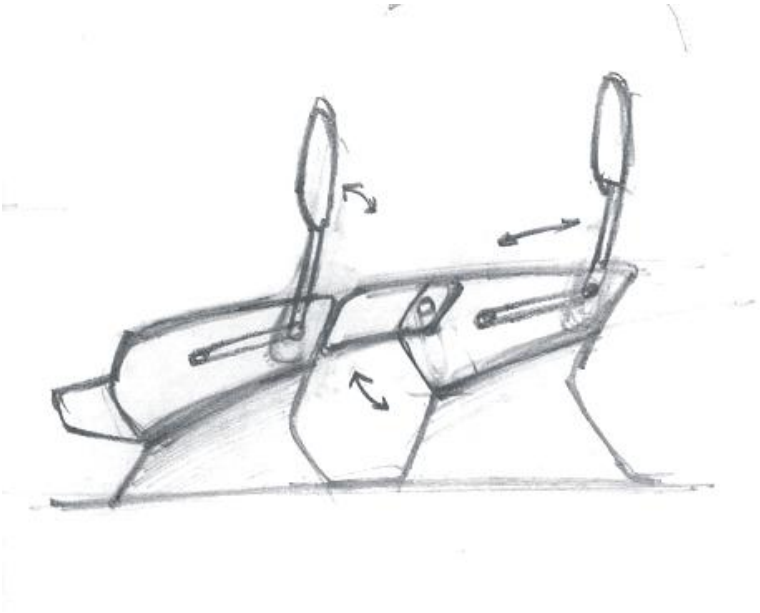
Part of the base becomes a backrest when lifted for the child seat and the backrest of the rider can be pushed behind. This way the child and the adult seating position can be made to interchange.



The rear seat unfolds up to bridge the gap between the two seats after the pillion rider enters. This allows intimacy between the two riders and this portion also can be used as a child seat too. The backrest is movable too. But if a female is wearing a saree then the child seat cannot be pulled up.



In this arrangement, the backrest of the rider unfolds down to bridge the gap. Female wearing a saree will have no problem in this case. There can be a small child seat that unfolds in the front.

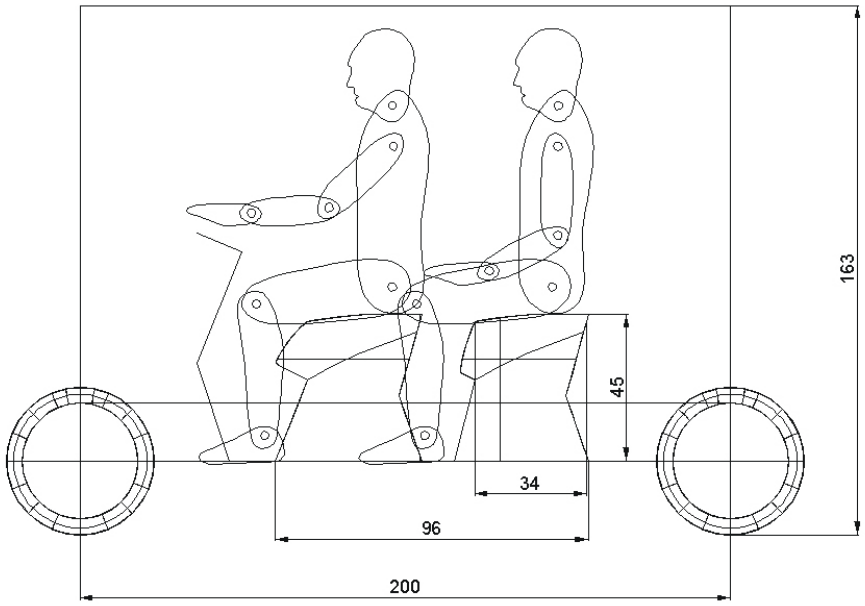


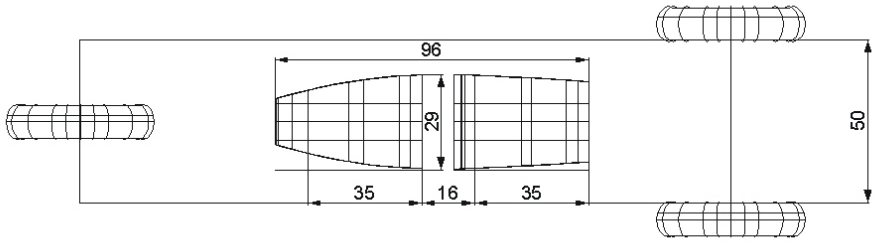
This is the most comprehensive solution. A small folding child seat in the front. Front backrest that folds down if there is a female seating behind wearing a saree and she wants to accommodate a child in between. rear seat that folds up if the pillion rider wants to come close and seat, and the rear backrest that moves back and forth.

Two children can be accommodated in this arrangement along with two adults.

Preferred concept

Ergonomics





Seating position alert type

Vehicle seat dimensions by referring to Indian anthropometric data

Technical specifications

Engine: Bajaj Eleminator (petrol)

Displacement	174cc
BHP	15.2/8500
Torque	13.7/7000
Transmission	5 gears
Mileage	42 kmpl approx

Steering : direct steering

Brakes : front disc
Rear drums

Wheels : 14 inch alloys

Tyres : 3.00-14 Zapper M (MRF)

Concept generation

To understand the likes and dislikes of the user
Clues were taken from:

The clothes he wears

The kind of products he buys from the supermarket

The kind of music he listens to

The kind of profession he belongs to etc.

The observation was noted down, analyzed and the user was broadly classified in to three types

Type I

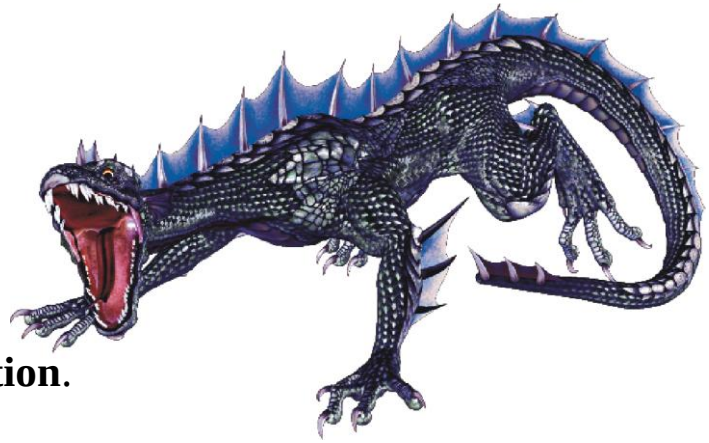
Handsome and Aggressive

User is bold, ambitious and classy.
Wants to move ahead in life, wants to prove a point. Wants an image for himself
Is aggressive, and ready to take cutthroat competition.
Ha wants to be handsome
Wants a balance between style and class
For style, his dream vehicle is a Ferrari or Porsche and for class, a Mercedes or a BMW
He has a move ahead attitude.

Diagonal lines, clean surfaces, good stance of the vehicle can bring out these qualities in the design

Diagonal lines, sharp edges, pointed triangles, all convey the feeling of dynamism, determination, aggression and boldness.

Aggressive
Bold
Killer instinct
Prove a point
Get ahead
Make way
Kill the competition.



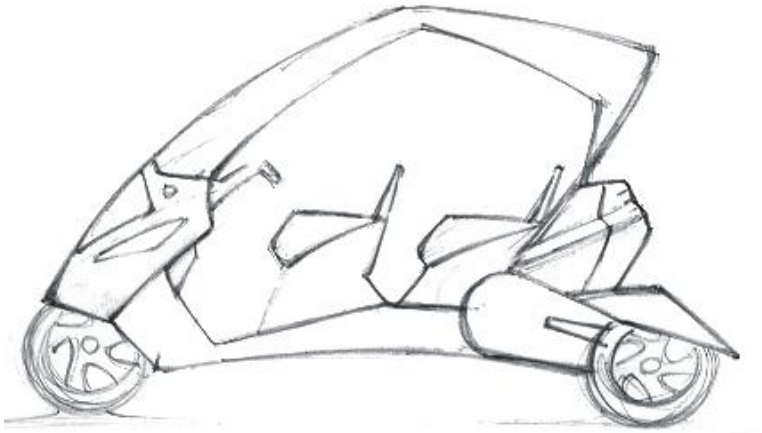
Smart

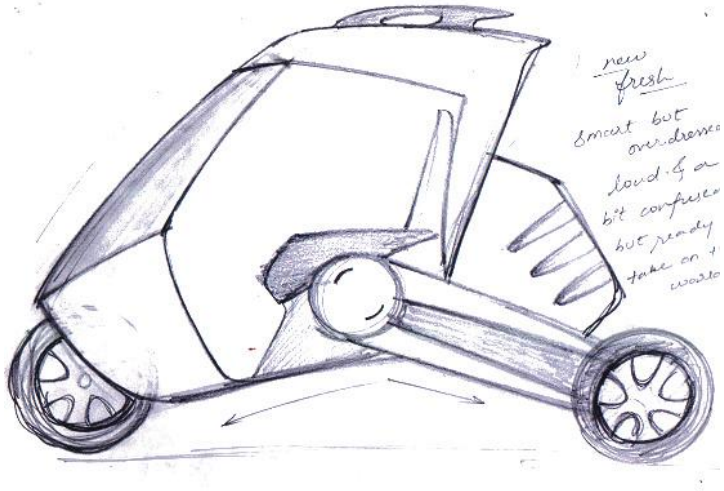
Dynamic

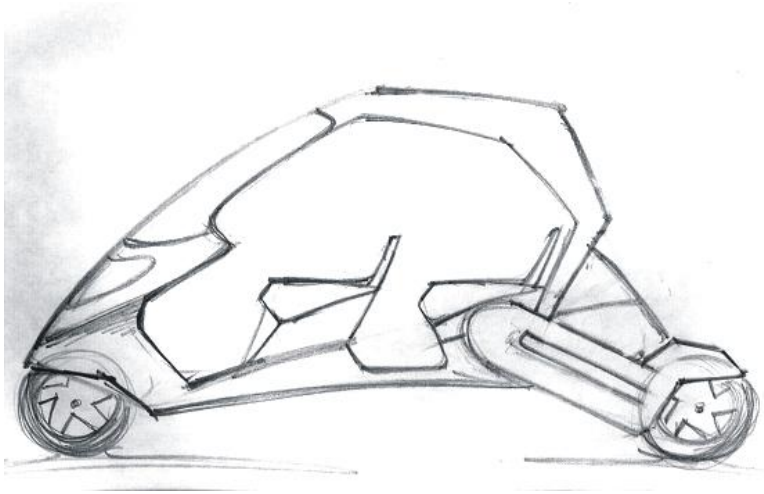
Classy

Mannered

polished

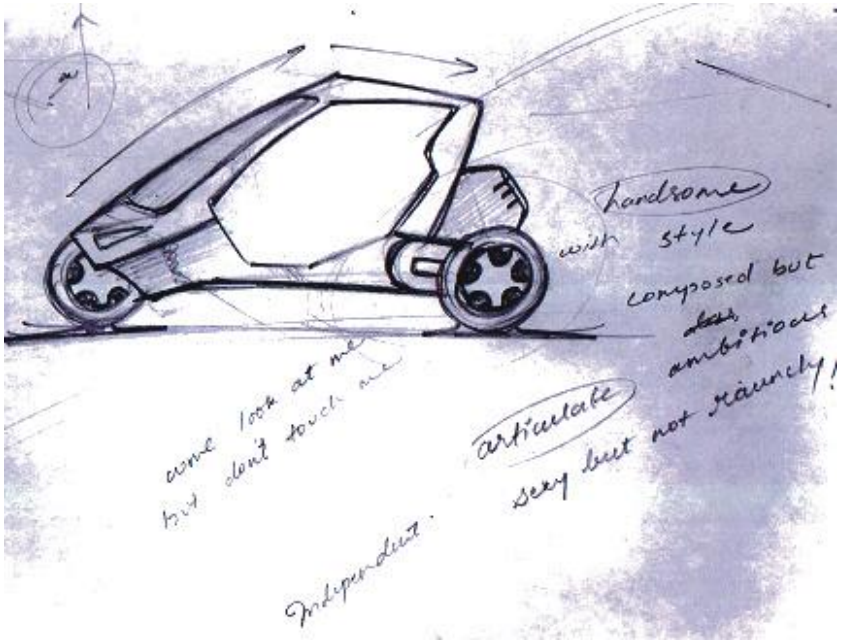


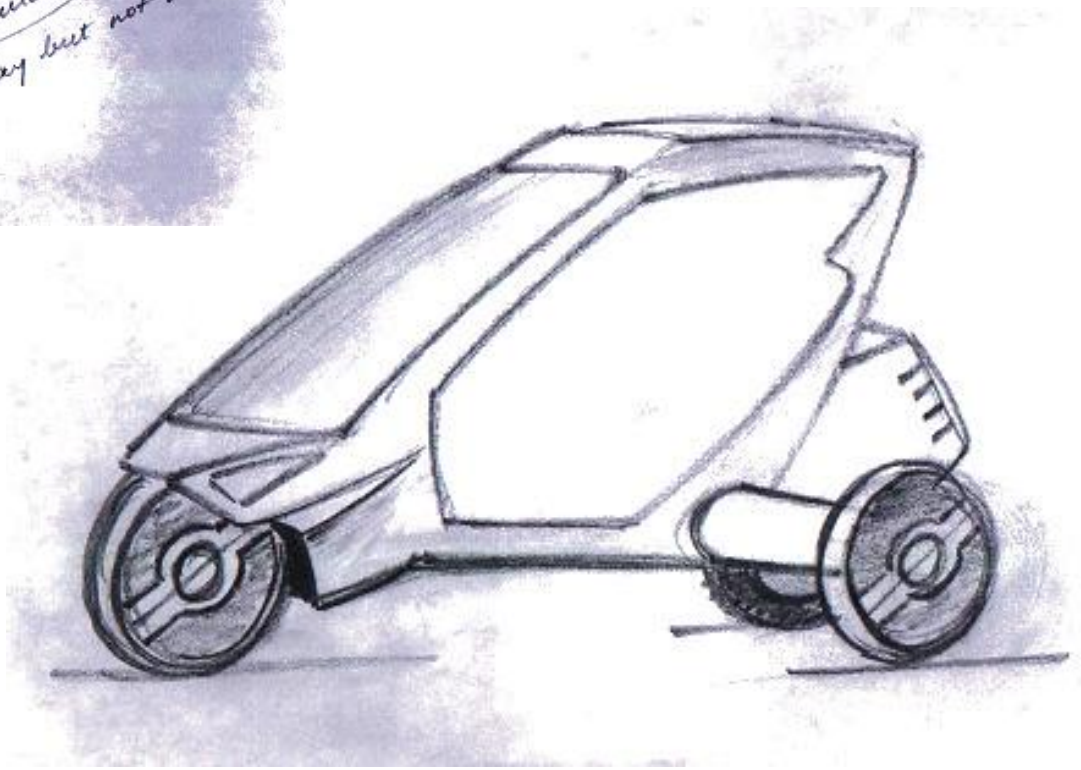




Preliminary concept to bring forth the stance and poise of the vehicle, to reflect the attitude and the emotion.

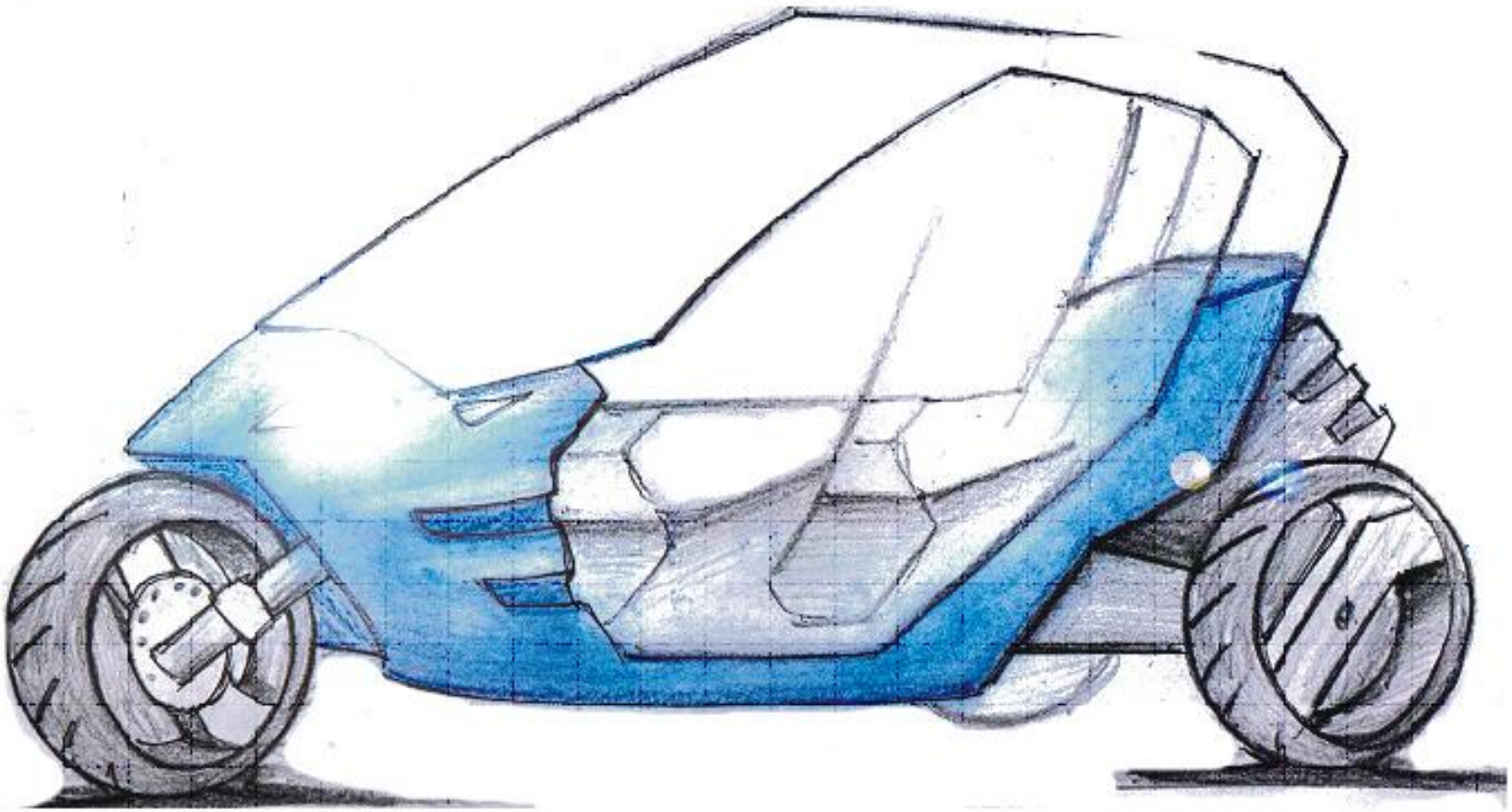
Concept 1.1


handsome
with style
composed but
ambitious
articulate
sexy but not raunchy!
come look at me
but don't touch me
Independent.

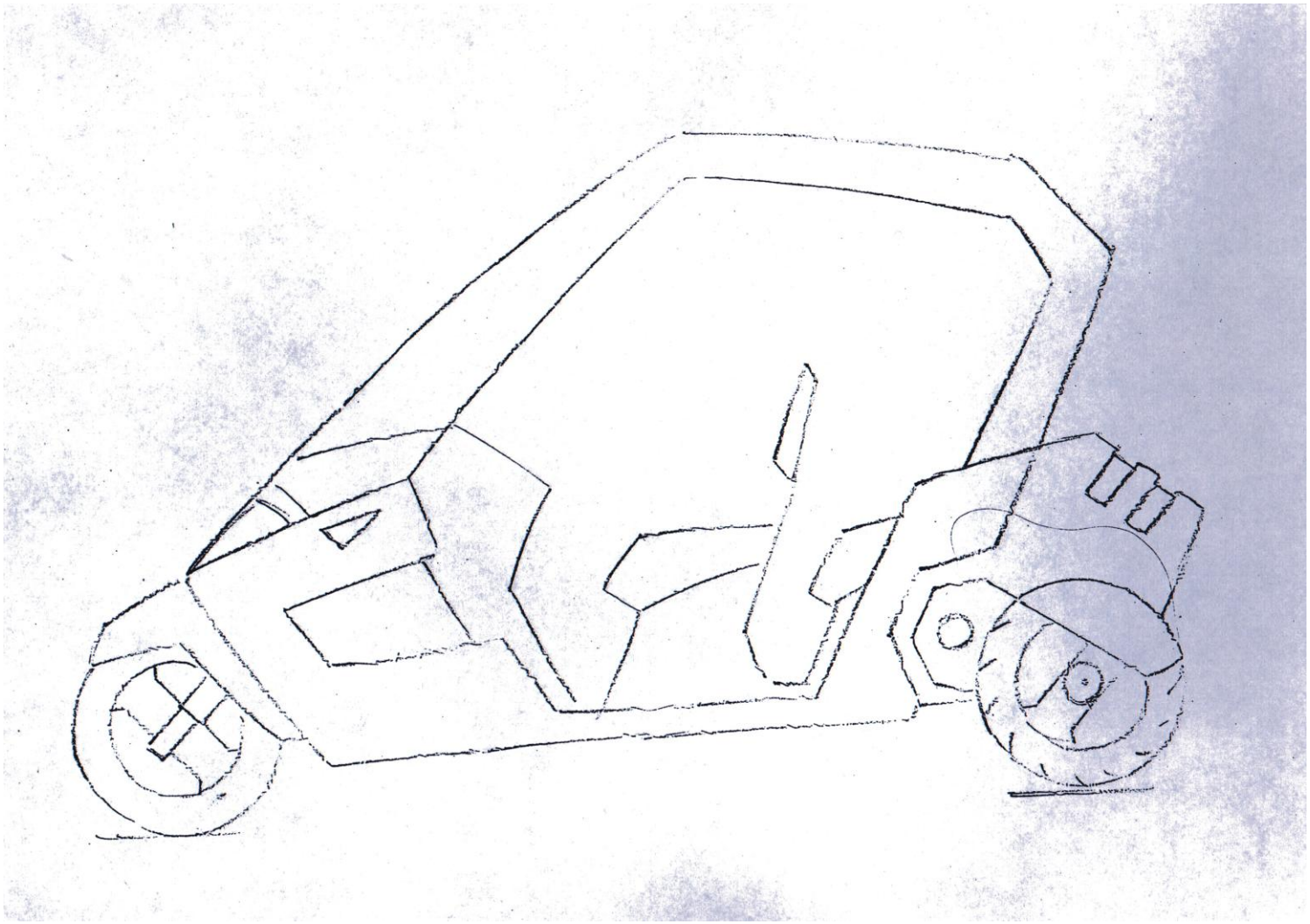


Thermocole concepts to understand the surface were also tried out
These were refined further to arrive at the final form.

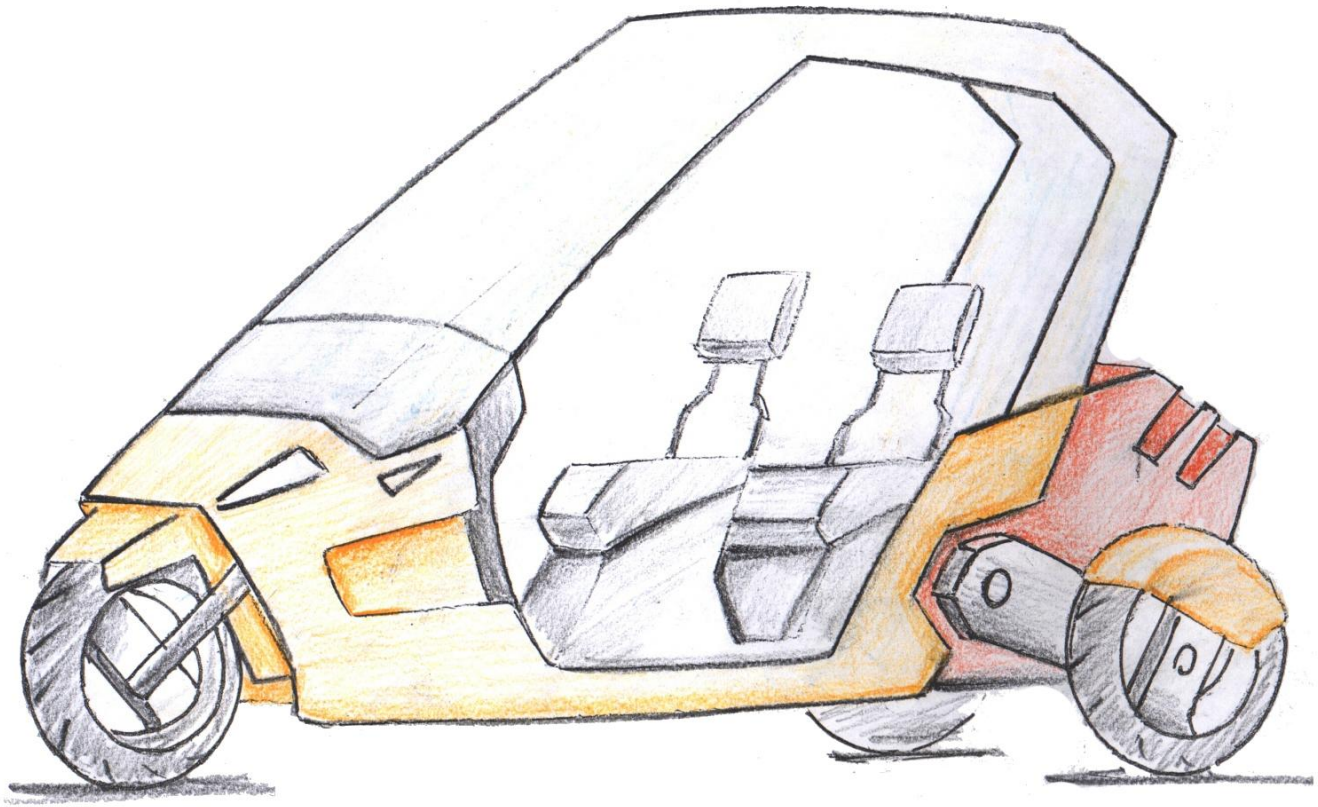
Concept 1.2

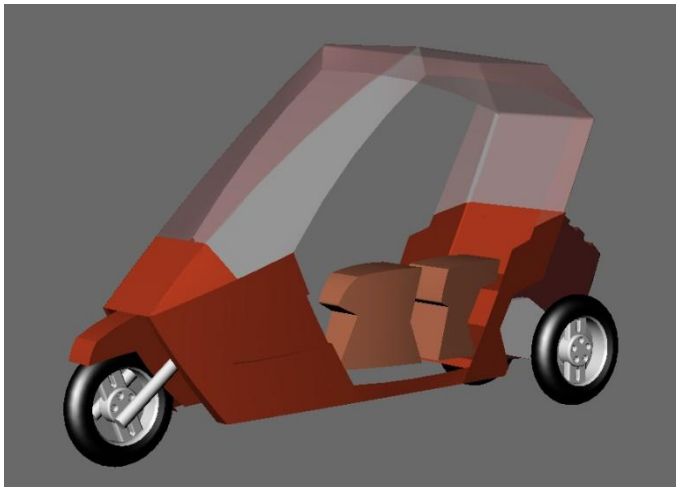


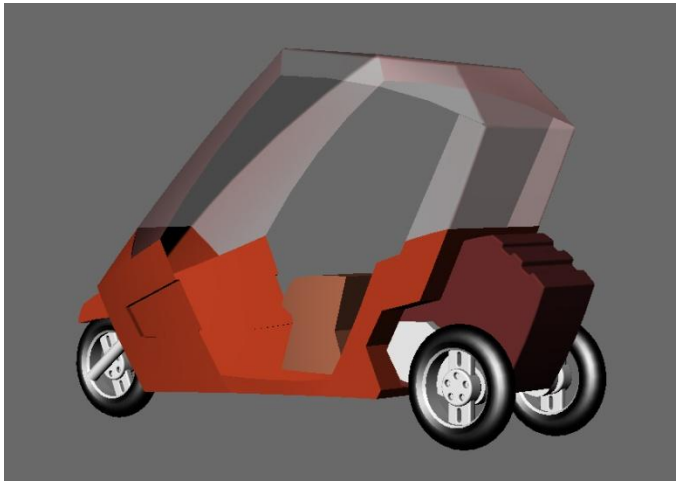
Concept 1.3



Selected concept in type I







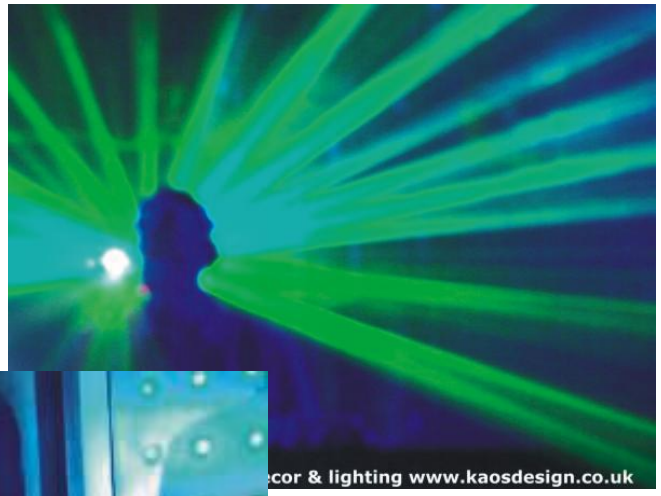
Rhino model

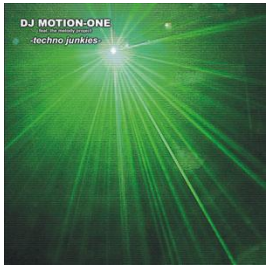
Type II

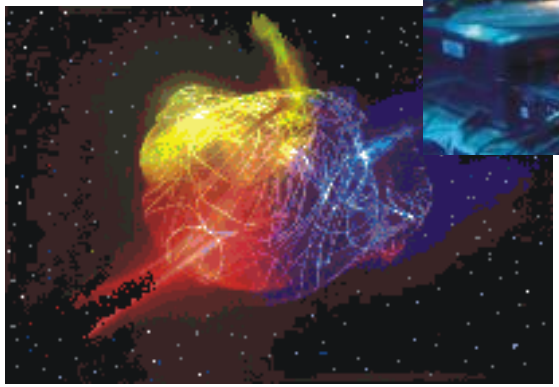
Techno

User is wise, technologically aware
Knows hi end products
Is a computer literate.
Digs laser lights and discotheques.
Listens to techno and trance and belongs to the remix culture
Buys hi end music players
Likes to have a lot of gizmos

Intelligent use of materials and smart components with
visible hi tech parts will justify this category.





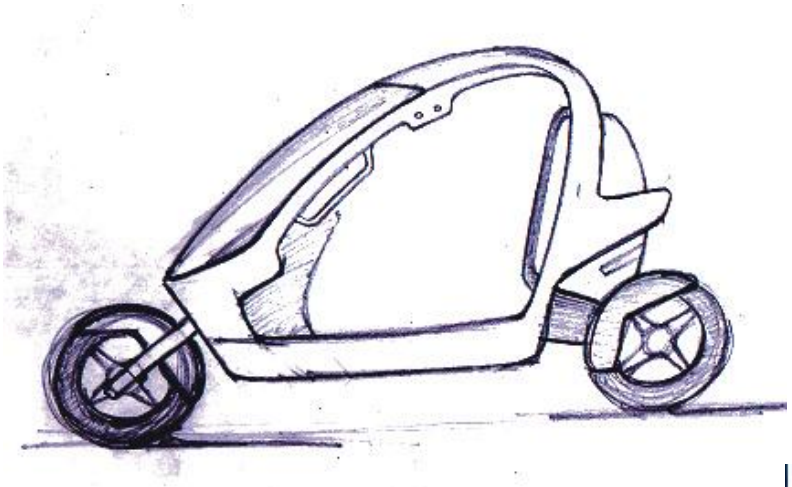


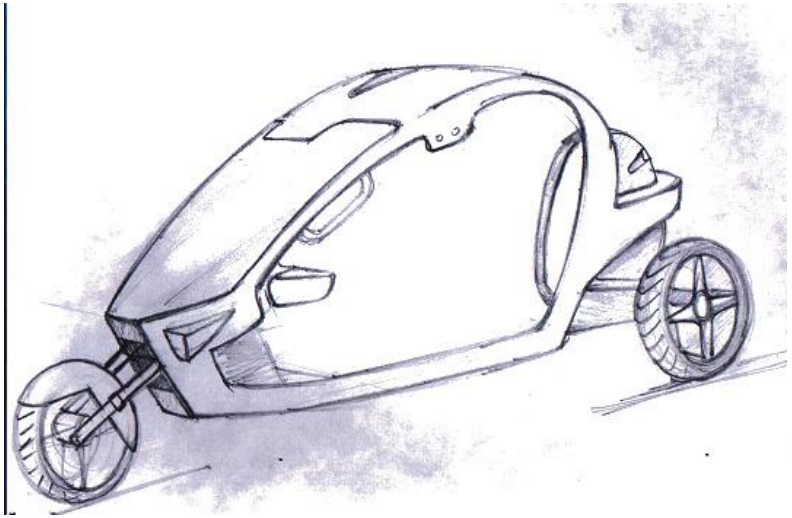
Neon
Laser
Sophistication
Technology
Jazz
Razzmatazz

Sleek
Neat
Elegant
Smart

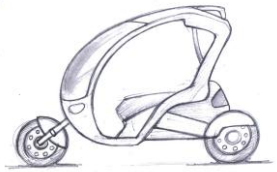
Clean
Hi fi
Intelligent
Aluminum
Chrome

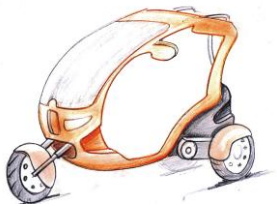
Concept **2.1**





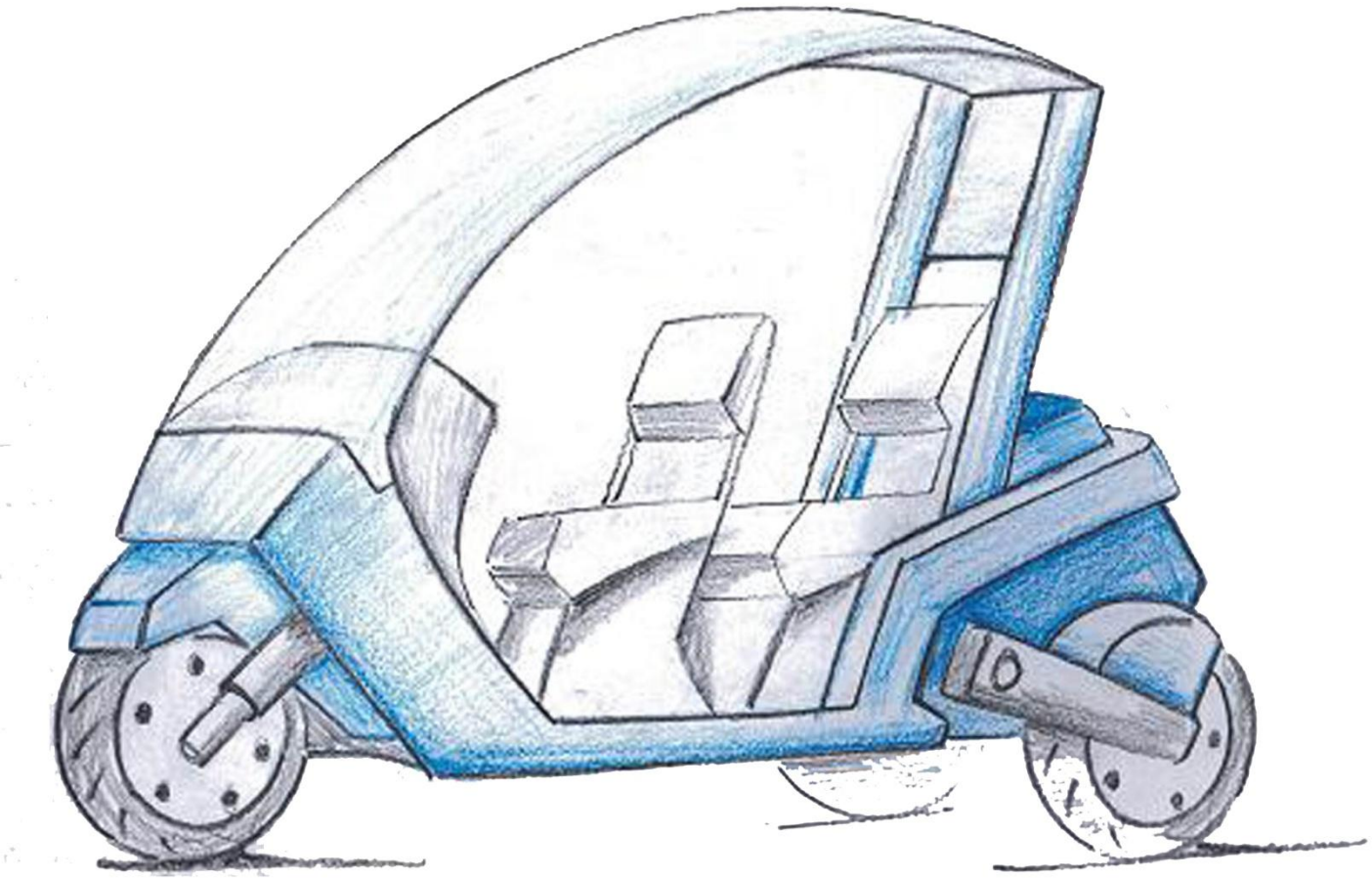
Concept 2.2





Concept 2.3

Selected concept in type II



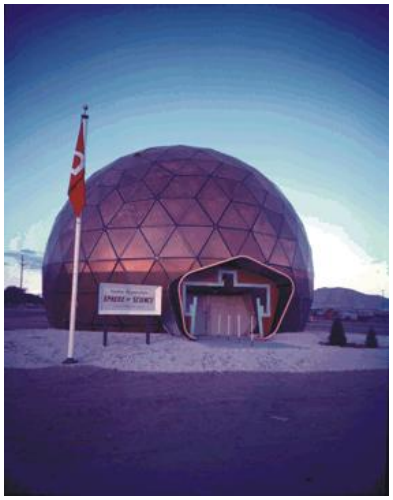
Type III

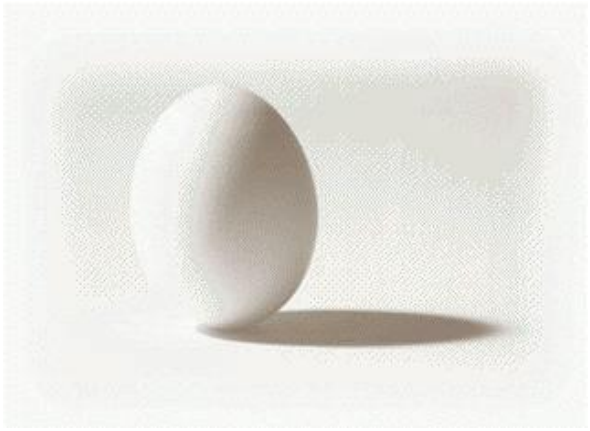
Safe

User is a family man.
Is a provider. Is caring and affectionate
He feels he is responsible for his family
But at the same time he is playful with his kids and is wise.
He is adorable to his children and funny and candid with his wife.

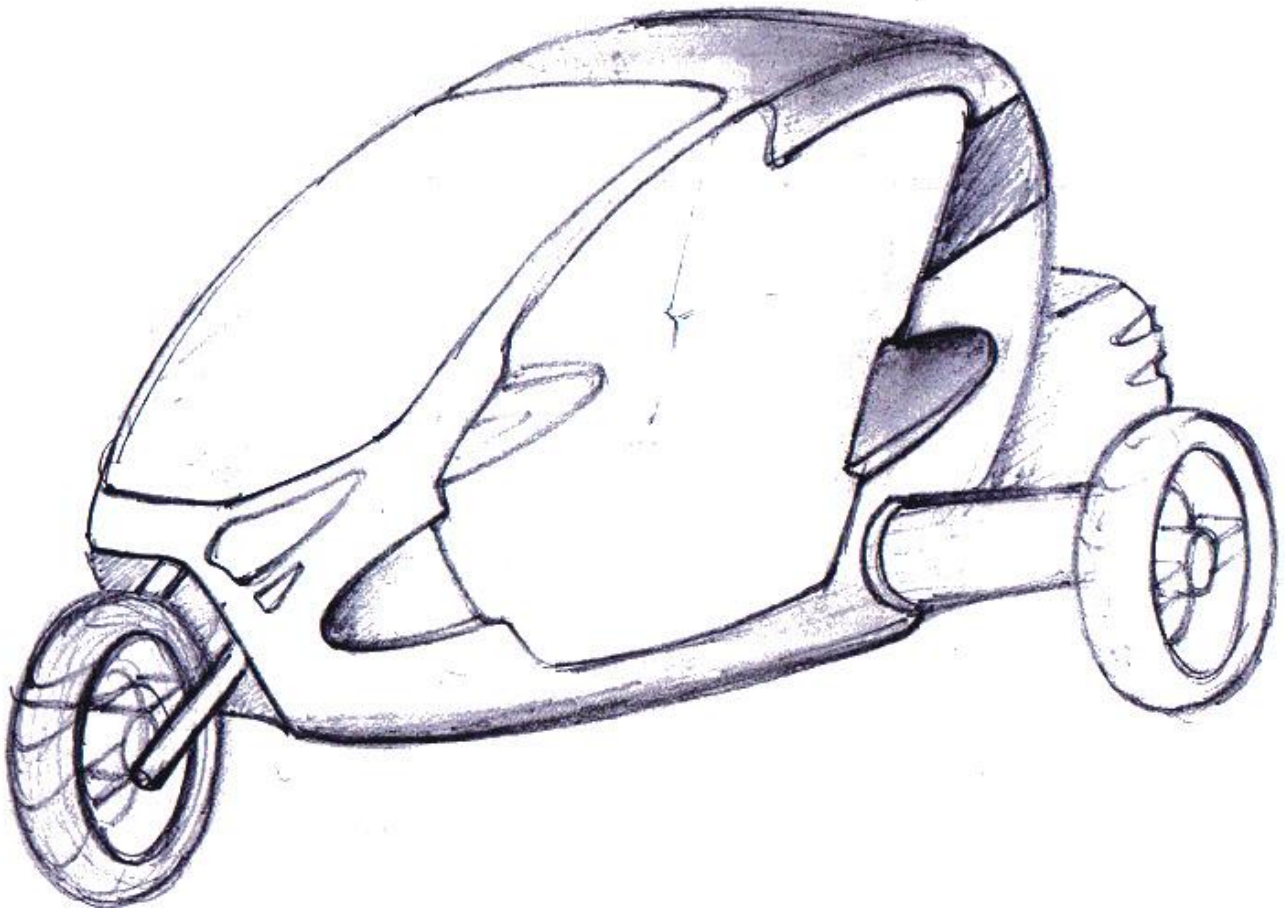
A cuddled up, cocoon like form that is practical and subtle, not loud but assuring is the key to design here.

Soft
Caring
Protective
Nurturing
sharing

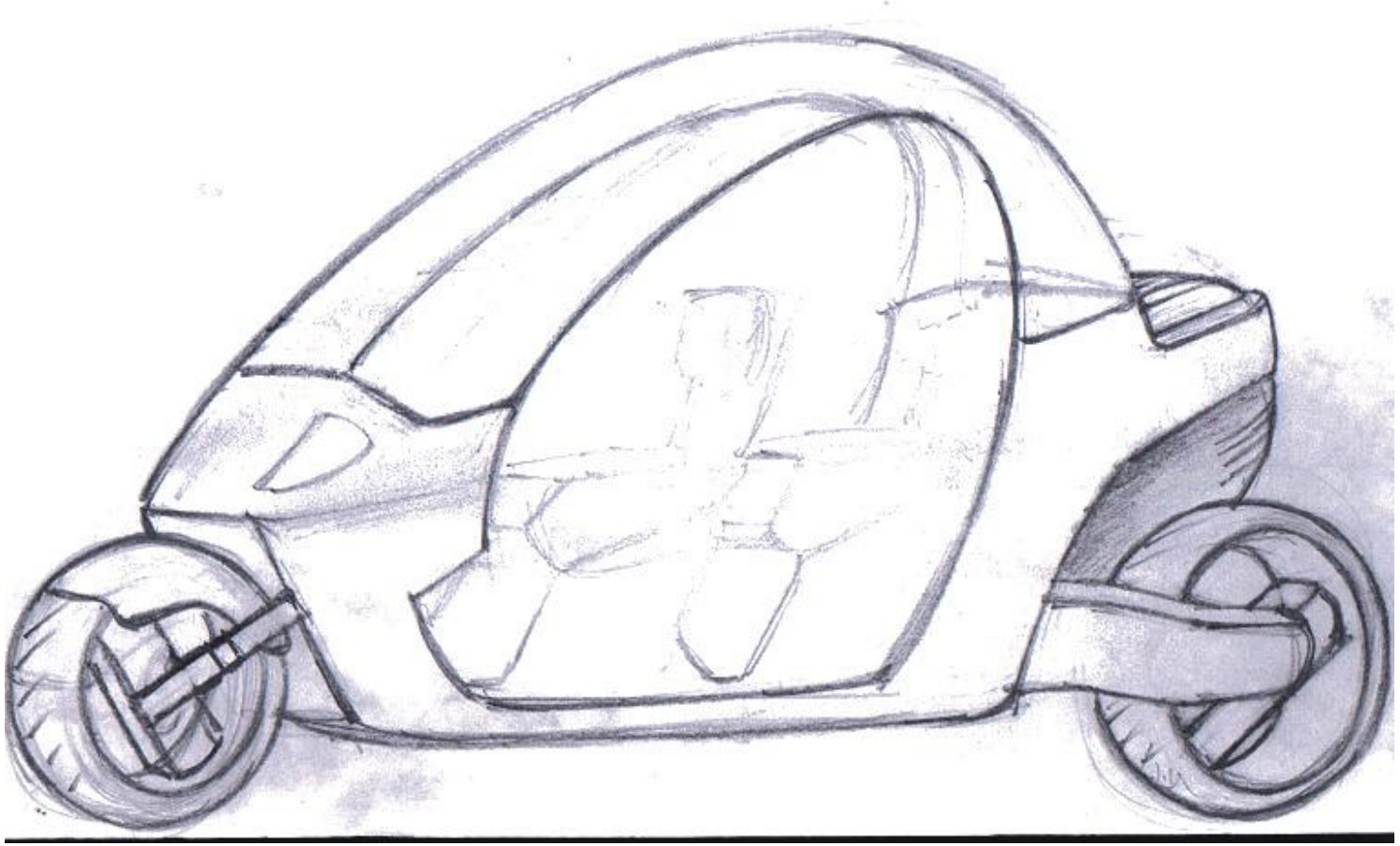




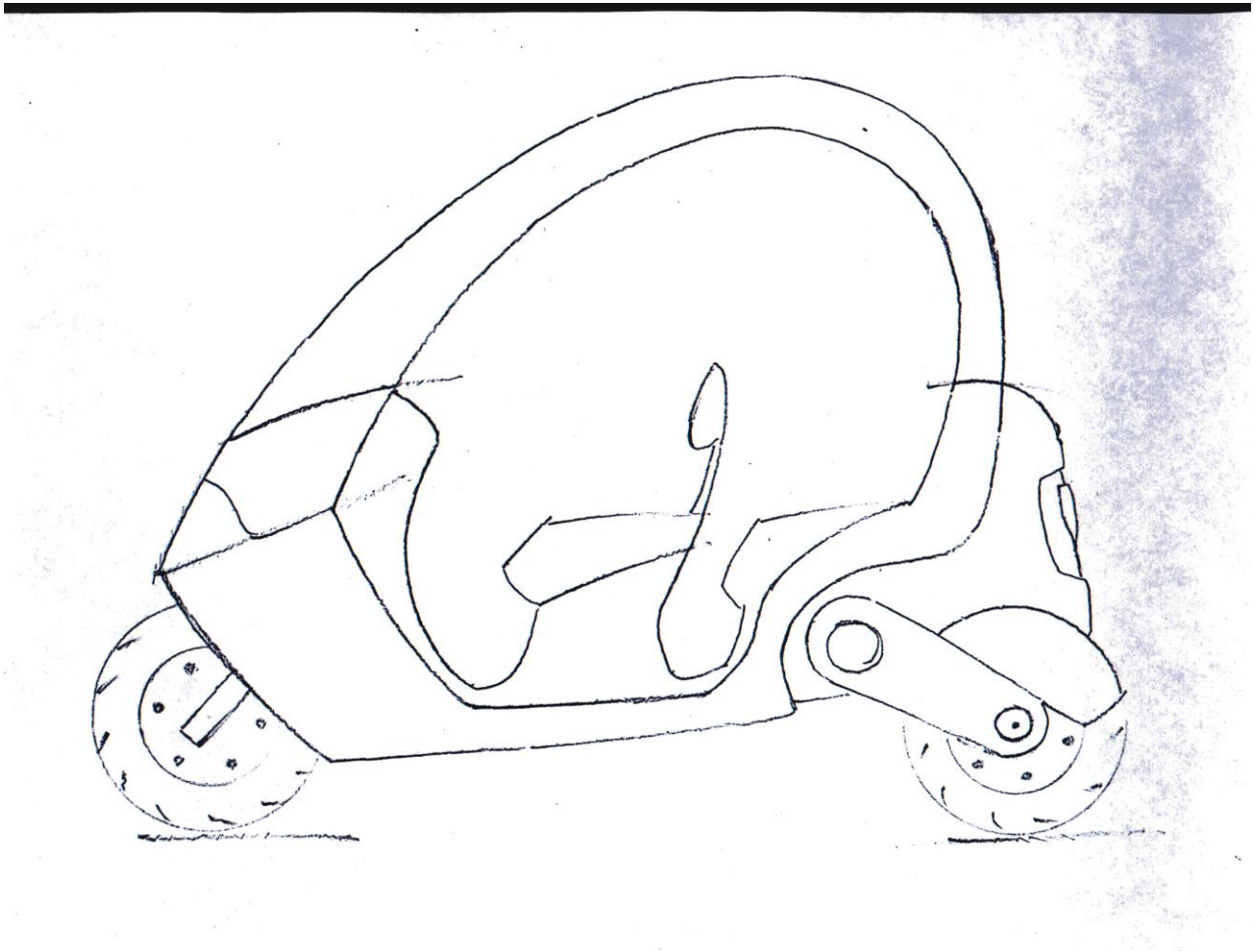
Concept 3.1



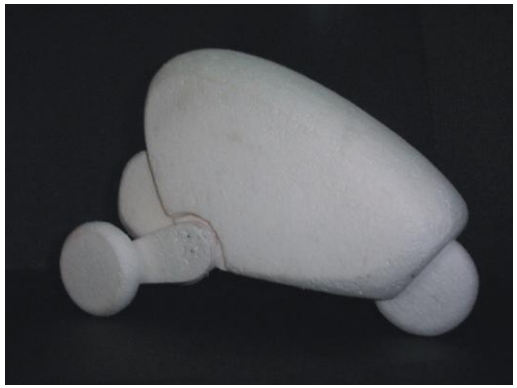
Concept 3.2

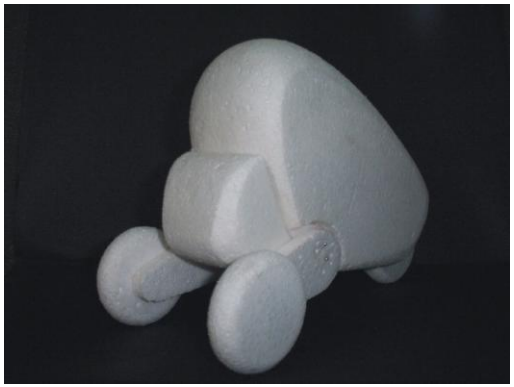


Concept 3.3

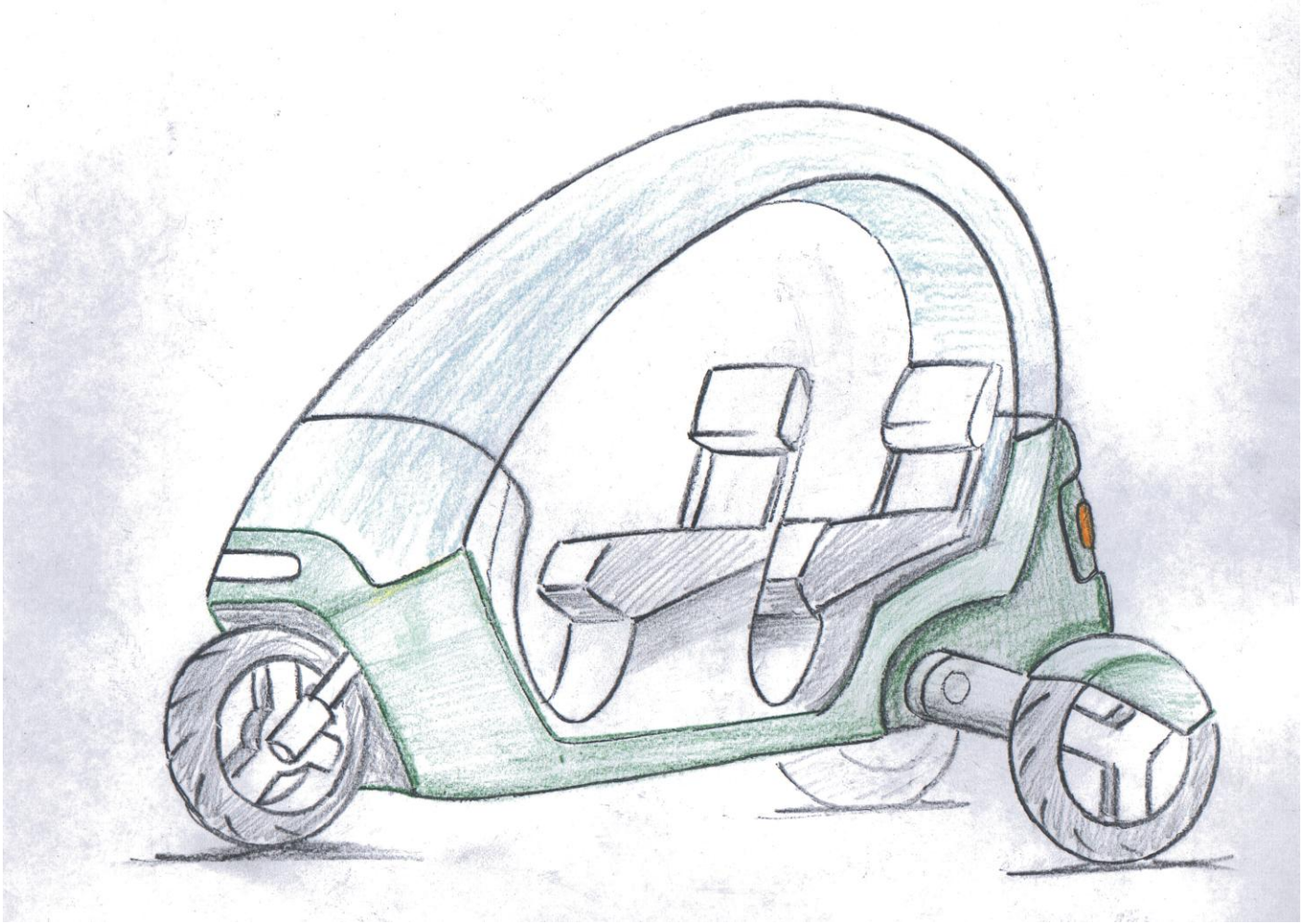


3d explorations

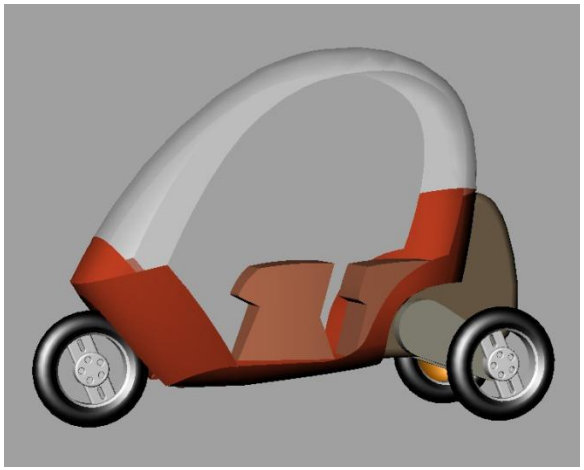


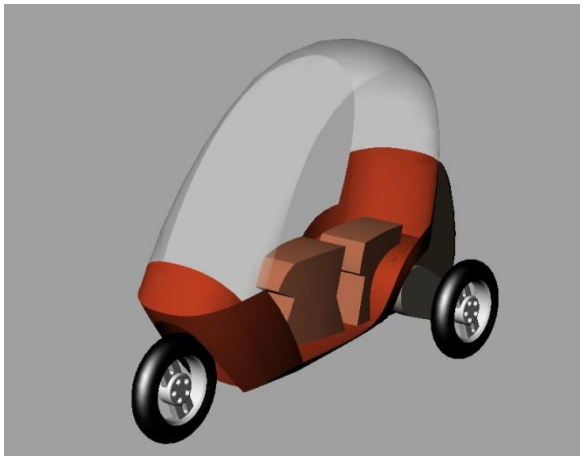


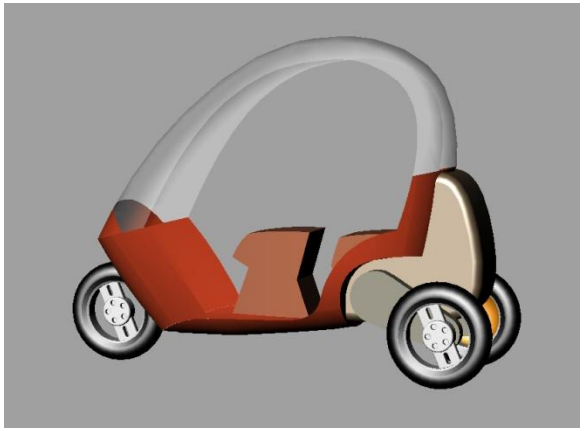
Selected concept in type III



Rhino models







Concept evaluation

	Type I (1.3)	Type II (2.3)	Type III (3.3)
Form			
Resemblance with users temperament	3	4	4
Futuristic form	1	5	3
Unique Identity	2	5	4
Open feel	2	5	3
Comfort			
Ingress/egress	4	4	3
Head Room	3	4	3
Front Vision	3	4	3
Rear Visibility	3	5	2
Technical Specification			
Solution to the Traffic Problem	4	4	5
Compactness	3	4	5
Luggage space	5	3	4

Evaluation criteria

The comparison is done on different parameters, like form, comfort and technical parameters

Each evaluation parameter is given different weightage according to its importance and then each concept has been given rating out of 5 for each parameter.

Eg. Concept type II had got the rating 5 for futuristic form and the weightage for that parameter is 8, so 5*8 = 40 points. And similarly all the points of all the parameters were summed up. Then the total sum was divided by sum of all the weightage like concept 2.3 type II has a total of 342 and the weightage total is 80, so 342/80 = 4.275. this was the rating given to concept type II concept 2.3

Similarly the rating for the other two were calculated.

Type I (1.3) = 3.0375

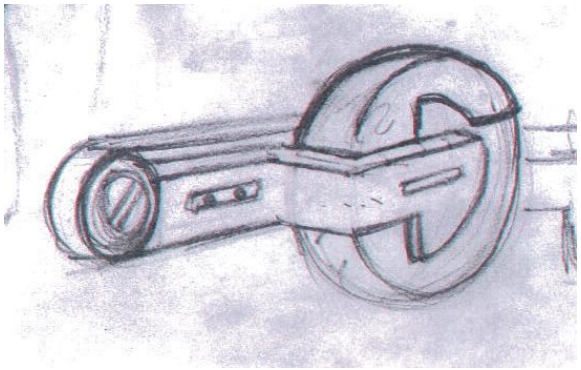
Type II (2.3) = 4.275

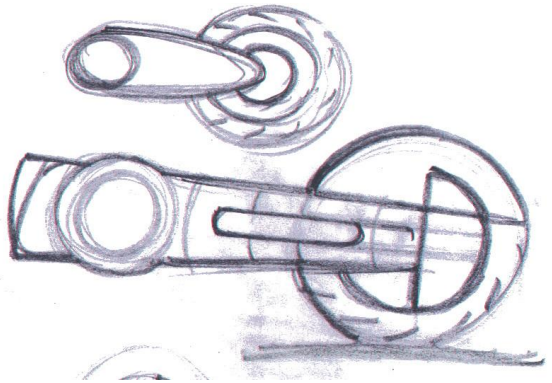
Type III (3.3) = 3.5875

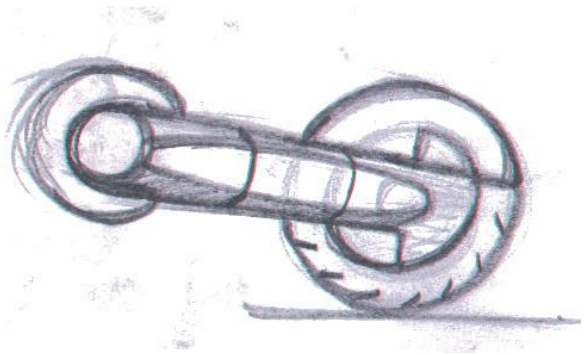
After considering all parameters, points distribution and also user feedback, it was decided that concept Type II (2.3) has got maximum potential to be developed further.

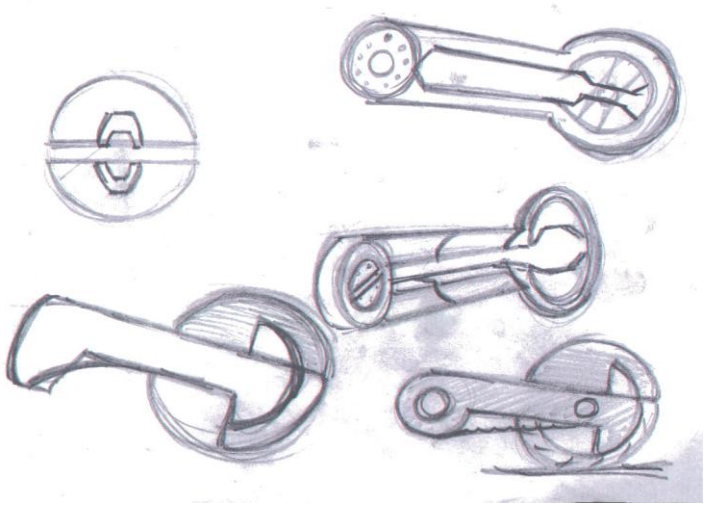
Refining the final form

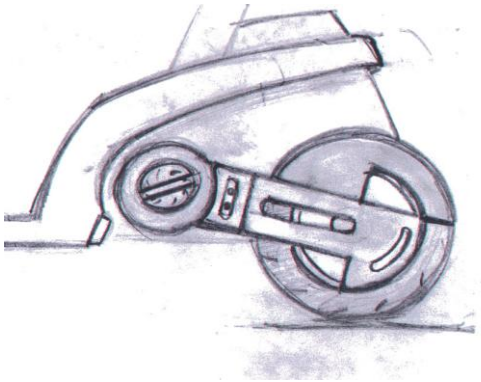
Rear suspension sketches.

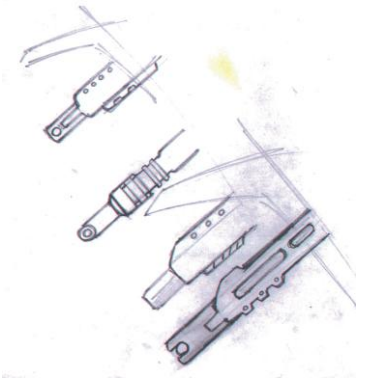




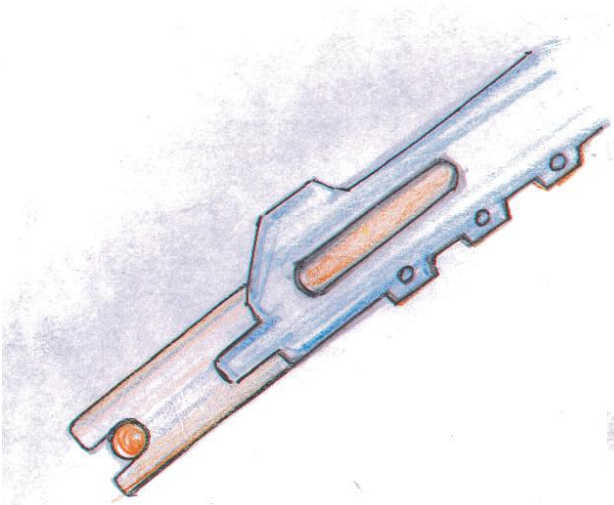


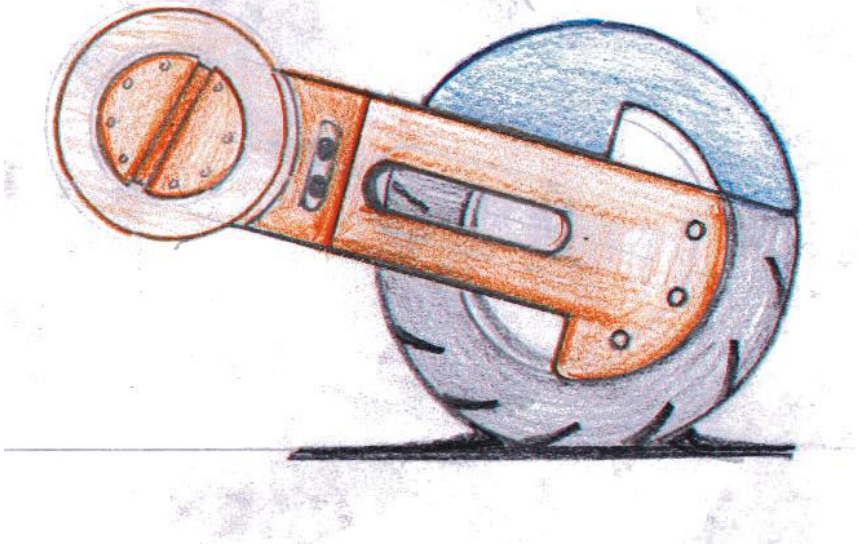






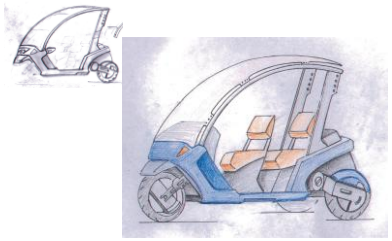
Rear suspension element

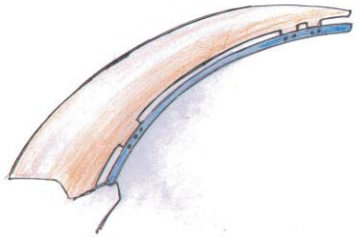


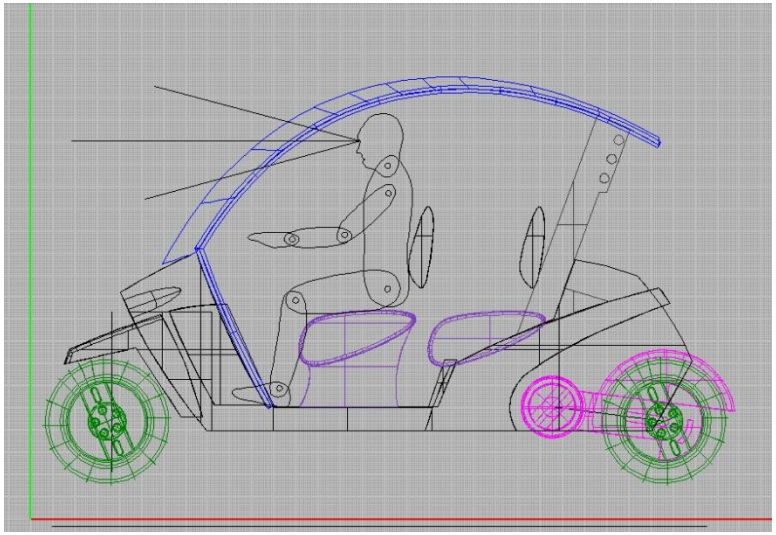


Front suspension element

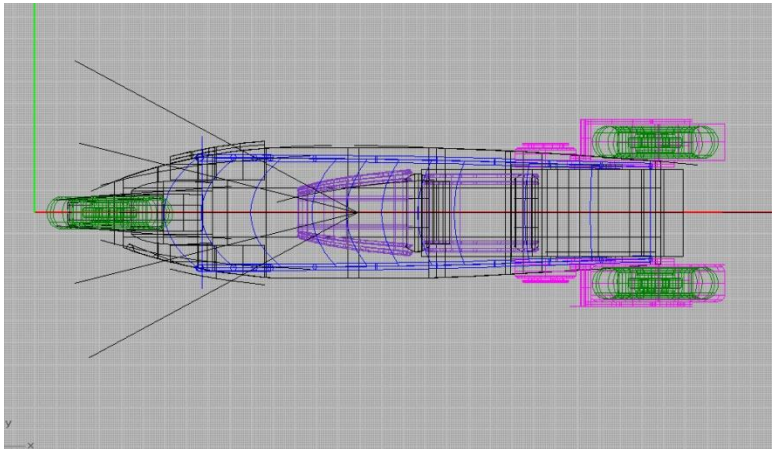
Further refinement

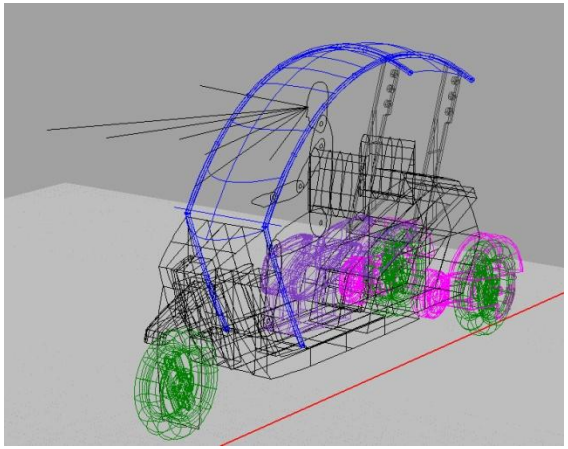


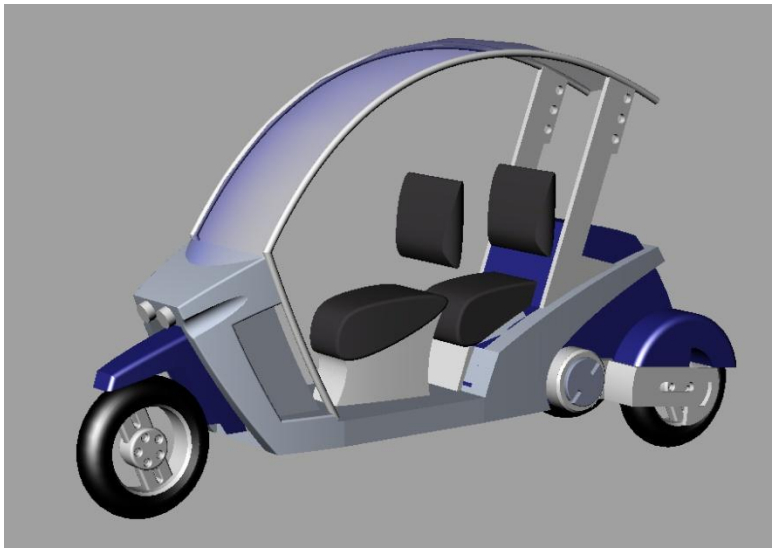




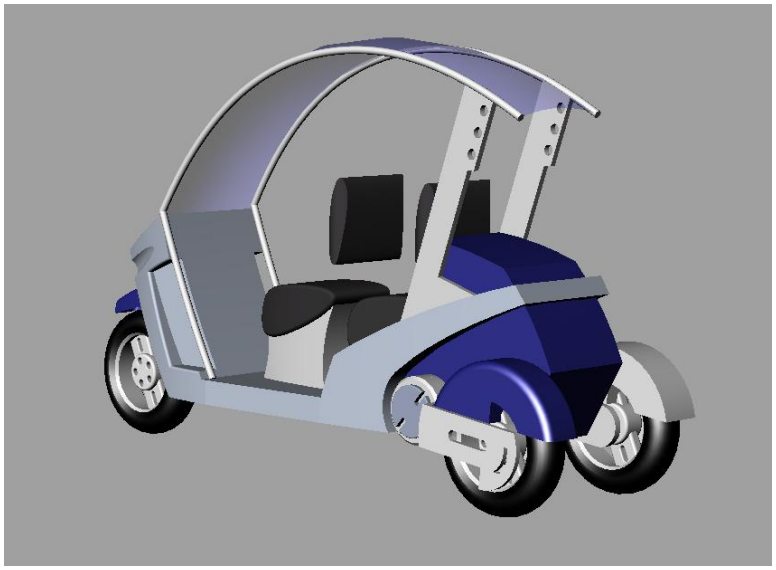
Proportions and cone of vision







Rhino model



Thank you