Mobility and Vehicle Design Project II

DESIGN OF INTERIORS OF AN AUTONOMOUS TAXI FOR 2040

IDC School of Design
अभिकल्प विद्यालय

Submitted by

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Declaration

I declare that this written report represents my own idea in my own words, and where others, ideas or words have been included, I have mentioned the original source. I also declare that I have adhered to all principles of academic honesty and integrity and have not falsified, misinterpreted or fabricated any idea, data, facts or source in my submission.

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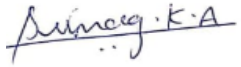
Sign - 

APPROVAL SHEET

This Mobility & Vehicle Design project report entitled "Design of Interiors of an Autonomous Taxi for 2040", by Srinag K A is approved in partial fulfillment of the requirement for Master of Design degree in Mobility and Vehicle Design.

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Date - 20/12/18.

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Date : 20/12/18

Table of contents

1. Abstract 1
2. Introduction 3
3. Future in 2040 6
    3.1 Technological Aspects 7
    3.2 Human Aspects 9
    3.3 Environmental Aspects 9
4. Current Trends 10
    4.1 Renault EZ-GO 11
    4.2 Smart Fortwo 12
    4.3 Volkswagen SEDRIC 13
5. Design brief 14
6. Scenario 16
7. Persona 18
8. Brainstormng 20
9. Benchmarking 23
10. Moodboard 26
11. Ideation 28
    11.1 Initial Ideation 29
    11.2 Concept 1 30
    11.3 Concept 2 32
    11.4 Concept 3 33
    11.5 Concept 4 34
12. Final Concept 35
13. Physical Model 38
14. Bibliography 40

1.Abstract

1.1 Abstract

The increase in human population and influx of people from the rural to urban areas is loeading to congestion of cities. With cities expanding where the sub-urban areas are becoming the part of the cities and the outskirts are turning into cities, the distance between sub urban parts and cities is increasing which in turn increases the time taken to travel

Due to the location of commercial hubs in the city mailnland, the high prices of land and rent would force people to live in sub urban areas. Lower rent rates, presence of more space would convert sub urban areas into residential areas. Due to rise in population, congestion on the roads would increase. Since the city centrals are commercial hubs to which people travel everyday from their home located in suburban areas for work, the traffic and distance would lead to wastage of time and lead to stress- especially for people who drive.. Due to this they might not get to spend quality time with families. When they have to spend quality time with the family members during the weekends by going to places of interest, recreational places such as parks etc, the family members again have to drive. This again would be stressful to them and the family time would be taken away due to traffic.

This project aims in designing the interiorrs of a taxi for the year 2040. The existence of autonomous taxis in 2040 in urban areas was one of the reasons for choosing this particular year. The interiors must be designed such that the experience of joy and fun of a family traveling together.

2.Introduction

2.1 Introduction

Due to the advent of taxi booking applications, it has been becoming easier to avail a ride in a taxi. Traveling directly to destination in comfort with privacy in a car compared to that of a public transport vehicle such as local train, bus etc is one of the many reasons why people are going to switch traveling in taxi. Since the driver has the complete responsibility of handling the vehicle where as the passenger has to just sit in the vehicle, it gives passenger space and relax, work, engage in activities such as reading a book etc. These factors upheld the reason for the rise in number of people choosing a taxi to travel on a regular basis.

The advent of autonomous technology has given a rise to vehicles having spacious interiors without increasing the overall dimensions of the vehicle without increase in the overall dimensions of the vehicle. This has also given an opportunity to come up with new packaging to create different user experiences. This has also given an opportunity to design the interiors of the vehicle such that it is more that just the interiors of the car.

2.2 Scope of the project

The future generation would prefer traveling by taxis on regular basis rather than traveling by a personal vehicle as the number of people owning a personal vehicle is going to be low due to various factors such as depreciation value of the vehicle, lack of space for parking the vehicle, etc.
The main aim is to create the experience of joy when a group of friends or a family books the taxi to travel within the city. The project also looks at how the family can have a nice time and stay connected when they are travelling together.

Fig 1. Technological Aspects

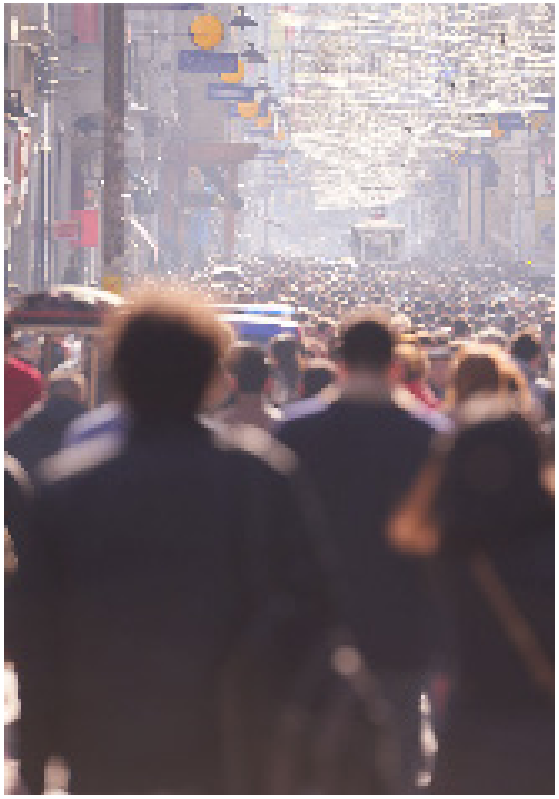


Fig 2. Human Aspects

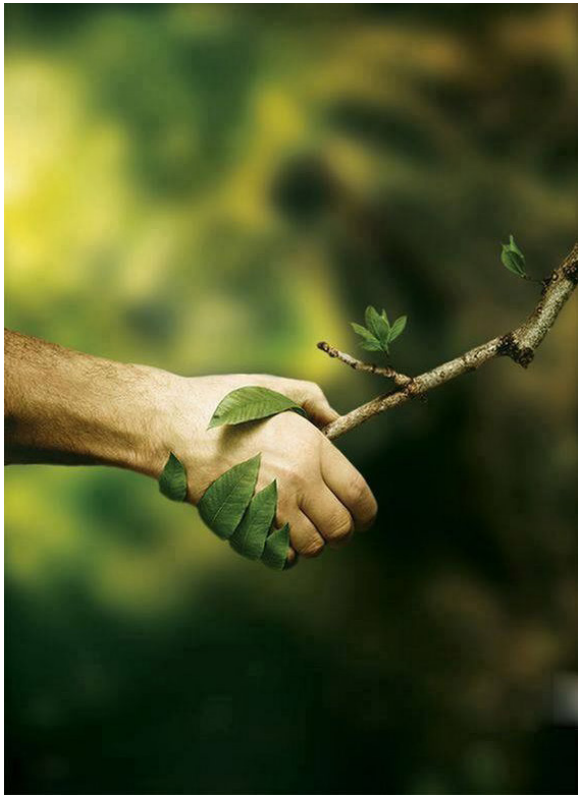


Fig 3. Environmental Aspects

Technological Aspects

Human Aspects

Environmental Aspects

To get an insight on various factors that may influence the future. it is viewed in three various aspects- technology, human and environmental aspects. These aspects are fundamental when it comes to gaining an insight on the future as these aspects influence the design of vehicles.

3.Future in 2040

3.1 Technological Aspects

Fig 4. Bike body frame created

Generative design is an iterative design process that involves a program that will generate a certain number of outputs that meet certain constraints, and a designer that will fine tune the feasible region by changing minimal and maximal values of an interval in which a variable of the program meets the set of constraints, in order to reduce or augment the number of outputs to choose from. This helps in generating structures with high strength with low consumption of material. The process combined with the power of digital computers that can explore a very large number of possible permutations of a solution enables designers to generate brand new options, beyond what a human alone could create, to arrive at a most effective and optimized design.

Fig 5. 4D printed structures

4D printing is the process through which a 3D printed object transforms itself into another structure over the influence of external energy input as temperature, light or other environmental stimuli. The most obvious advantage of 4D printing is that through computational folding, objects larger than printers can be printed as only one part. Since the 4D printed objects can change shape, can shrink and unfold, objects that are too large to fit a printer can be compressed for 3D printing into their secondary form.

Fig 6. Holographic Display

Holographic display is a type of display that utilizes light diffraction to create a virtual three-dimensional image of an object. Holographic displays are distinguished from other forms of 3D imaging in that they do not require the aid of any special glasses or external equipment for a viewer to see the image. 3D hologram displays are the next step in more human-compatible digital content. The applications for the new technology are limitless. A hologram projected in a room could show a 3D concept car like it was really there, and 3D presentations for meetings and conferences will wow audiences. Holograms have the potential to dramatically improve training, design, and visualization in many business settings and production facilities. Being able to “look at, zoom in on and manipulate 3D versions of in-progress designs radically enhances the design process.”

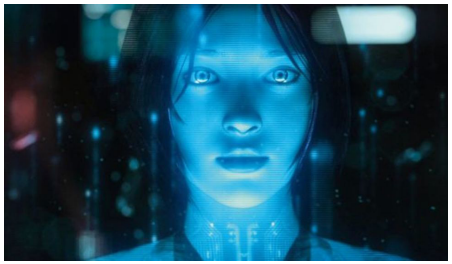


Fig 7. Cortana

Virtual assistant or intelligent personal assistant is a software agent that can perform tasks or services for an individual. Sometimes the term “chatbot” is used to refer to virtual assistants generally or specifically those accessed by online chat. the capabilities and usage of virtual assistants are expanding rapidly, with new products entering the market and a strong emphasis on voice user interfaces. the capabilities and usage of virtual assistants are expanding rapidly, with new products entering the market and a strong emphasis on voice user interfaces.

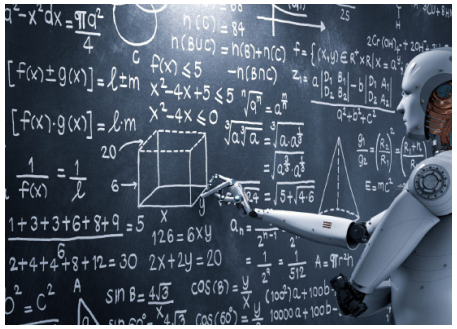


Fig 8. Artificial intelligence may

In the past half decade, artificial intelligence and machine learning have made significant leaps into the mainstream and into our daily lives. Artificial intelligence can help humans to copy their brain, behaviors personality into the machine so that when you’re not present in place of problems and opportunities machine can play your role. While a huge area of contention surrounds how our current job roles will fair against AI developments, in the same way as other advances in history, AI is set to make our own society a more productive one. As with the first industrial revolution and subsequent periods of technology innovation, the human skills that people have needed to make the most out of these developments have driven a new distribution of jobs in our society.

3.2 Human Aspects

Fig 9. Electronic implants could lead to transhumanism

Transhumanism is an international philosophical movement that advocates for the transformation of the human condition by developing and making widely available sophisticated technologies to greatly enhance human intellect and physiology. Transhumanist thinkers study the potential benefits and dangers of emerging technologies that could overcome fundamental human limitations of using such technologies. The most common transhumanist thesis is that human beings may eventually be able to transform themselves into different beings with abilities so greatly expanded from the current condition as to merit the label of post human beings.

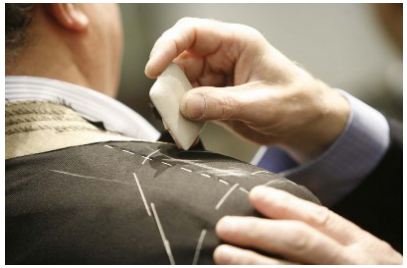


Fig 10. Products are going to be tailormade in future

Customizing a mass-produced manufactured product isn't anything new, of course. If you walk into a new car dealership and buy a car, you'll soon be experiencing a world of options—heated seats? Italian leather or fabric? Fifteen-inch wheels or seventeen? But this buffet-style customization still isn't exactly for you: thousands of cars are made, just like the one you've picked out. Clothing has always been the area most likely to give us truly custom-fit products, and even some big companies have had an eye on the custom-fit area. Marketing departments know customization appeals, engineering teams are going to have the technology to support these aspirations.

3.3 Environmental Aspects

There is going to be complete dependence upon renewable sources of energy. Possibility of every household being powered by it's own solar panels and wind mills exist in the future.
It is estimated that 77% of the world will be relying on energy generated from solar panels and wind turbines.

Fig 11. Renewable source are the major sources of energy

Land is becoming scarce as the world's population grows and environmental changes shrink the amount of livable space on Earth. Some creative thinkers say the solution is to build up. These proposed structures, which can be up to 400 floors, contain all the components of a city, from housing and hospitals to universities and municipal departments. Advocates claim vertical cities will save energy, support a growing population, and preserve land for food production, nature, and recreation.

Fig 12. Vertically stacked buildings

4.Current Trends

Fig13. Renault EZ-GO Exteriors

Fig14. Renault EZ-GO Interiors

Fig15. Renault EZ-GO Interiors

4.1 Renault EZ-Go

The Renault EZ-GO is meant to provide the privacy and freedom of your own personal car, as well as the ease of mind of a fully autonomous vehicle. What's more, as a shared service, Renault says the EZ-GO is also quite affordable, with a price-per-mile that should rival even that of mass transit. However, before we get into the specifics of the technology and sharing, let's start with the basics. The EZ-GO can provide transportation for up to six passengers, with a large opening in front providing safe ingress and egress. There's also splash puddle lighting to indicate where the descending platform will land when pulling up to the curb.

Passengers can simply walk on in at standing height, plus there's easy access for those in a wheelchair or on crutches, as well as anyone pulling luggage on wheels or pushing a stroller. LED strips in the floor help guide passengers to the exit when the car is at its intended destination. The interior itself was designed for whatever it is you want to do, be it working, sleeping, or reading. There's plenty of visibility outwards, while above is a panoramic glass roof that will automatically darken when the sun gets too intense.

Bench seating and a flat floor help to maximize space, as does the lack of driver's seat, the extended wheelbase, and the fact that all the power-train components are mounted under the floor. Between the lounging and socializing, passengers can also access info from the large inboard screens mounted in front, which provide info on the city through which they're traveling. Extra helpful tidbits include info on the estimated time of arrival, planned stops for boarding and leaving, available city services, points of interest, and more. It also gives passengers access to various vehicle-to-infrastructure features, and lets you do stuff like buy tickets to the museum you plan on visiting while en route.

Fig16. Smart Vision EQ Exteriors

Fig17. Smart Vision EQ Interiors - HMI

Fig18. Smart Vision EQ Interiors - seats

4.2 Smart Vision EQ

The concept embodies the future of urban, automotive luxury and convenience. the rechargeable lithium-ion battery has a capacity of 30kWh. when not in use, the EQ fortwo can find its own way to a charging station. in an alternative effort to more effectively use energy, this concept car demonstrates essential elements that make it a viable option for the car2go system. smart works to transform ‘urban traffic’ into ‘city flow’ in the future. EQ fortwo not only benefits the individual users, but also the public at large, cities, and municipal authorities — target groups for future car sharing concepts from smart. The fully-autonomous, electric vehicle dispenses with the traditional steering wheel and pedals

Smart’s vision seeks to not only minimize the overall mass of the vehicle, but also maximize the interior space for passenger comfort, embracing the minimalist design of many of the brand’s vehicles. to save additional space, the doors have a wing-like pivot over the rear axle — also reducing likely collisions with passing cyclists and pedestrians. by making steering wheels and pedals obsolete, the interior can become more spacious. the dashboard in the smart vision EQ fortwo is replaced by a 24 inch screen. the interior also prioritizes intelligent storage, providing easily accessible storage options for easy accessibility and tightening straps for larger belongings.

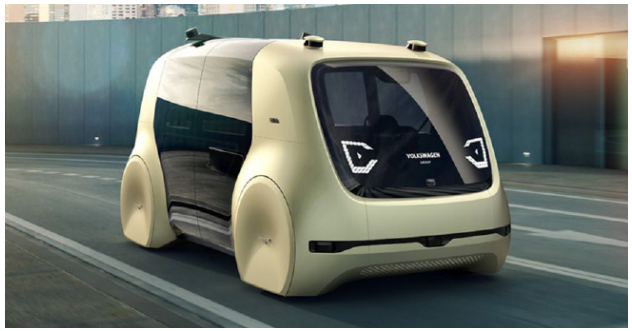


Fig 19.Exteriors of Volkswagen SEDRIC

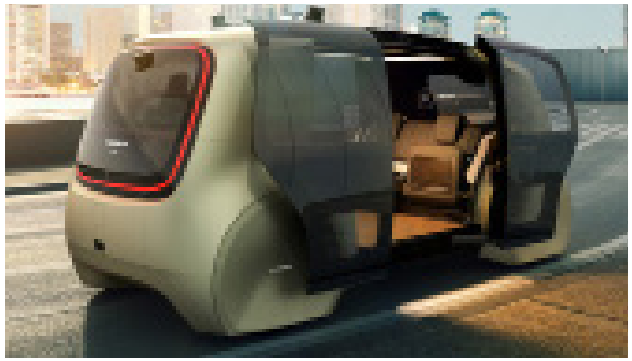


Fig 20.Exteriors of Volkswagen SEDRIC

Fig 21.Interiors of Volkswagen SEDRIC

4.3 Volkswagen SedriC

With self-driving vehicles already hitting the streets, Volkswagen is re-imagining car design for a driver less future. The German car company unveiled a future-forward concept car at the 2017 Geneva Motor Show. The Sedric (which stands for SElf-DRIving Car) is envisioned to operate within a ride-sharing service. The fully driverless, electric-powered car would be hailed through an app or remote control and told its destination via a voice-controlled interface. Its boxy shape takes full advantage of the space saved by not having a driver's seat, placing the battery between axles, and fitting the engine beneath the seats.

This leaves ample room for an open interior that looks more like a lounge than a car. Four couch-like seats face inward, facilitating conversation. Wood paneling covers the floor and door sections, though transparent glass is the predominant material throughout. In a nice design touch, a small garden of succulents graces the rear of the vehicle. Volkswagen also touts the accessibility of the design, which makes it usable for less-mobile individuals like children, the elderly, and the disabled.

The concept offers tailor-made mobility for everyone: adults and children, retirees and people with physical disabilities, city people who do not have their own car or a driving license, and visitors in a new city who suddenly decide they want to get from A to B in a convenient mobility setting.

5.Design brief

To conceptualize the interior space of an autonomous taxi for the year 2040

Specifications

The interior volume is 3200 mm x 1520 mm x 1275 mm

Objective

The interiors of taxi should bring out the feeling of fun and joy of a family traveling together in an autonomous taxi within the city.

Target Market

Next generation family living in urban cities in the year 2040

Package

Should accommodate 6 people of one family (grandparents, parents and 2 kids)

6.Scenario

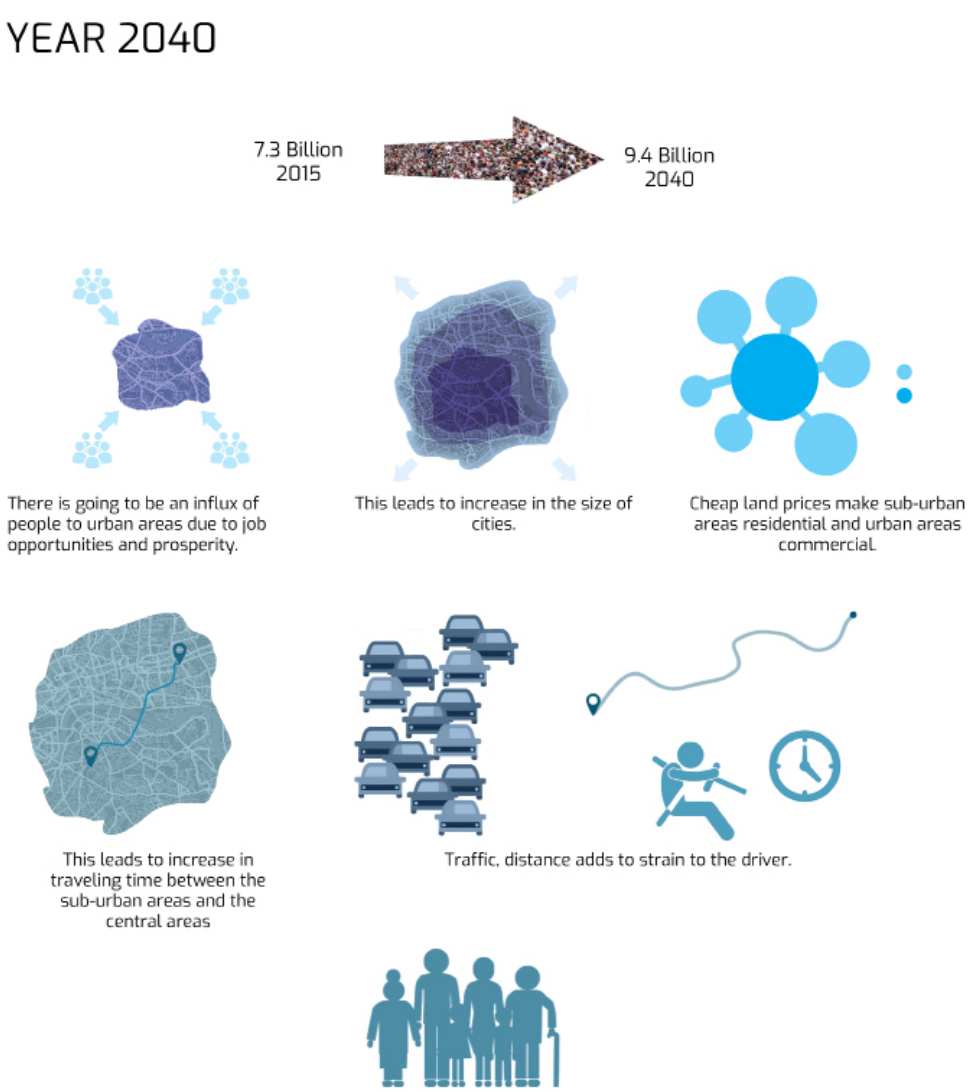


Fig 22.Scenario

The rise in population in the future, the migration of people to urban areas would lead to expansion of cities.
Cities become congested due to the influx of people from rural areas which leads to expansion of cities.
Therefore suburban areas become the part of the city mainland and the outskirts become sub urban areas.
Since the land prices are low in sub urban areas, sub urban areas become residential areas.
Presence of various recreational centers such as museums, restaurants in urban areas would still attract people living in sub urban areas.
Long distances, traffic would create stress to the user to drive to the city central. An autonomous vehicle which could be hired such that the user spends quality time with his family. It also reduces the stress caused to the user by driving in traffic for long hours

7.Persona

The family consists of 6 members. Anand and Aditi own a car to commute to their work everyday. The spend around 12 hours a day out of their home which would include traveling to work and work. They are usually tired when they return home from work and would like to spend some time with their kids and parents/ in-laws. The kids are off to music classes in the evenings thus don't get much time to interact with the parents.

They have a habit of traveling to the city central in the weekends for shopping etc. But the traffic, the distance between city central and the sub urban areas isn't welcoming for either Anand or Aditi to drive. The weekend time that they get is again spent by driving in the traffic. The family of 6 travels together during the weekends and done have a vehicle big enough to fit all 6 of them in it.

This leads to the need of hiring a six seater so that the family can travel together and hence interact with each other in the car. The family can spend quality together in the car.

8.Brainstorming

Brain storming was done in order to understand what activities families do together for fun and joy. The brainstorming group constituted 8 members who and were asked what they would do with their families for fun and joy of when they are together. It was also mentioned that the family must also include their grandparents as they are traveling together.

Initially, the context was informed to the users. The group was asked what fun would people have. Later on, they were asked to imagine what technologies that would exist in 2040. They were asked to imagine the human lifestyle, gadgets, interactions, families that would exist in the year 2040. The basic intent here was to try to connect fun and joy a family of 6 would have together. Later on, the concept of taxi was added. Later on, the brainstorming session continued to how the families would have fun in a car in the year 2040. With the addition of the concept of autonomous cars, the discussion further proceeded to how a family would interact and have fun when they are traveling in an autonomous car.

Insights

When the phrase ‘‘having fun with family’’ was introduced, the group spoke about the activities that they did together with their families. Most of them got nostalgic about their childhood days and they added the fun activities they did together with their families. Further discussions proceeded to they as kids spent time together with their families. They mentioned about the games they played, indoor activities such as watching movies together, most of them mentioned about the stories that kids used to listen from their grandparents. They also cherished the experiences thy had with the family such as going for walks with their grandparents and pets, the lullabies that were sung, especially from grandmothers etc. When the concept of technology was introduced, the group started mentioning about the media of communication etc. Various inputs obtained revolved around the way memories are shared, the way the family members played games through they were together in a car. The discussion also included on how the change in layout of the-car would affect the design process of the vehicle. It also involved how the seating layout of the vehicle affect the design experience part the fun and joy of a family traveling together. It included the fact that the families when they sit facing towards each other rather than sitting in conventional rows.

Activities a family together

Walks in park
Watching movies
Playing games (indoor and outdoor)
revisiting memories
having tea and fryums
visiting places of worship
bonfire
celebrating festivals
gardening
cooking
barbecue parties
solving puzzles together
yoga
visiting native
long rides
getting nostalgic
cleaning vehicles
sharing experiences
camping
craft work

Autonomous Taxi in 2040

More space
Touchscreen
voice control
alexa
Cortana
lounge seats
Passengers facing each other
cars connected to each other
IoT
Self Parking
Hologram
Gesture control
intelligent
share and ride
see through screens
opacity control
transformable seats
seats into sleeping bags
privacy inside
customizable seats

Family+Autonomous Taxi in 2040

connected
star gazing
Interactive
sharing memories
relaxing
playing games
Family space
common media
lay down
entertaining
customizable
own comfortable space
stress free

Based on the inputs received from brain storming, it was clear that the feeling of coziness has to be created in the interior space. The cozy space must be complimented with connected feeling of a connected family, a family that is together and is having a nice time. Therefore the words Cozy, Connected and Pleasant were chosen. Based on these words, a mood board was created which would furthur give directions during the ideation phase.

9.Benchmarking

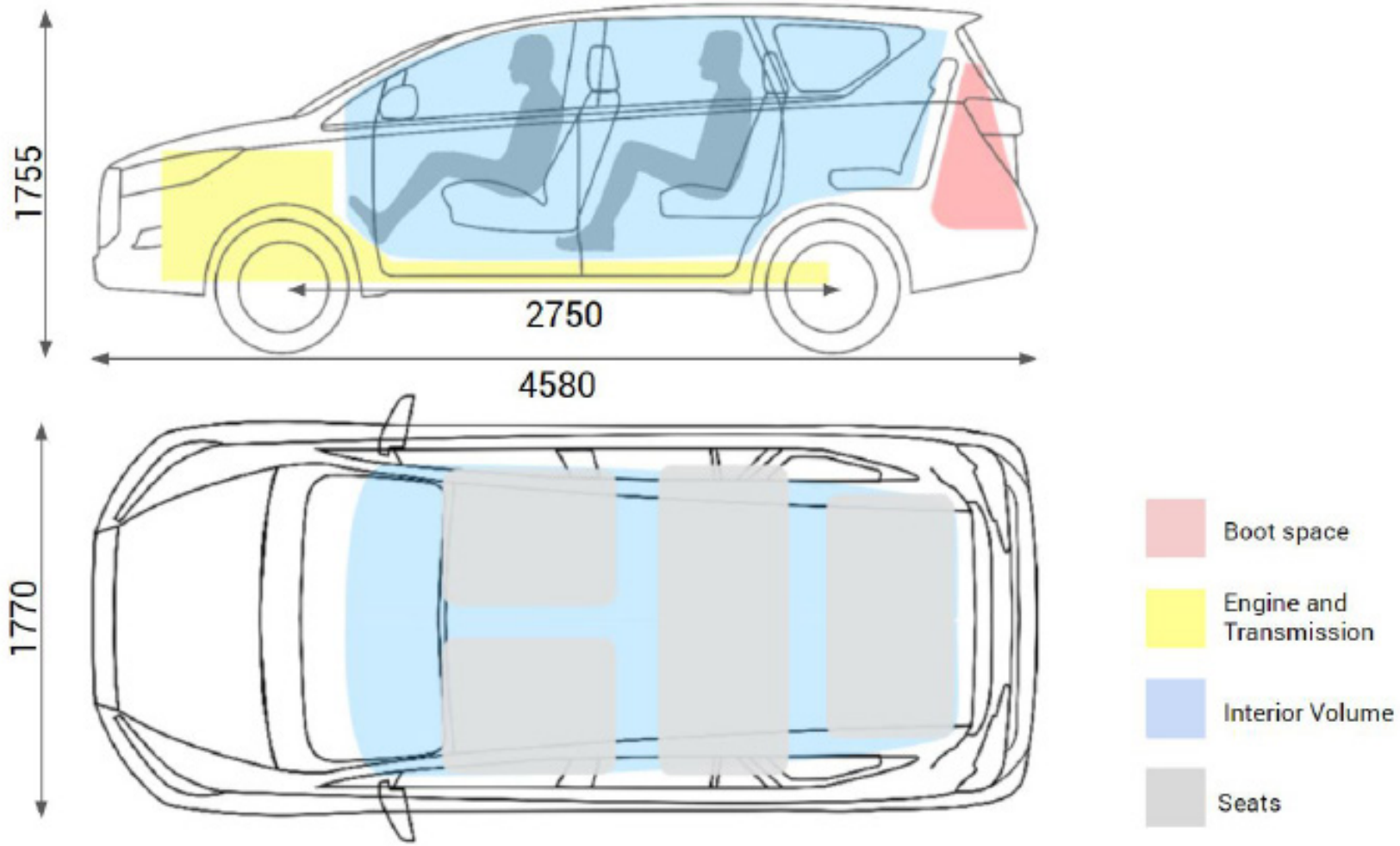


Fig 24.Toyota Innova Packaging

Toyota Innova Crysta was chosen as the basis for benchmarking as it can accommodate 6 people. Since the engine and the transmission is going to be replaced by batteries and the motors are going to connected directly to the wheels, the overall length of the vehicle decreases.

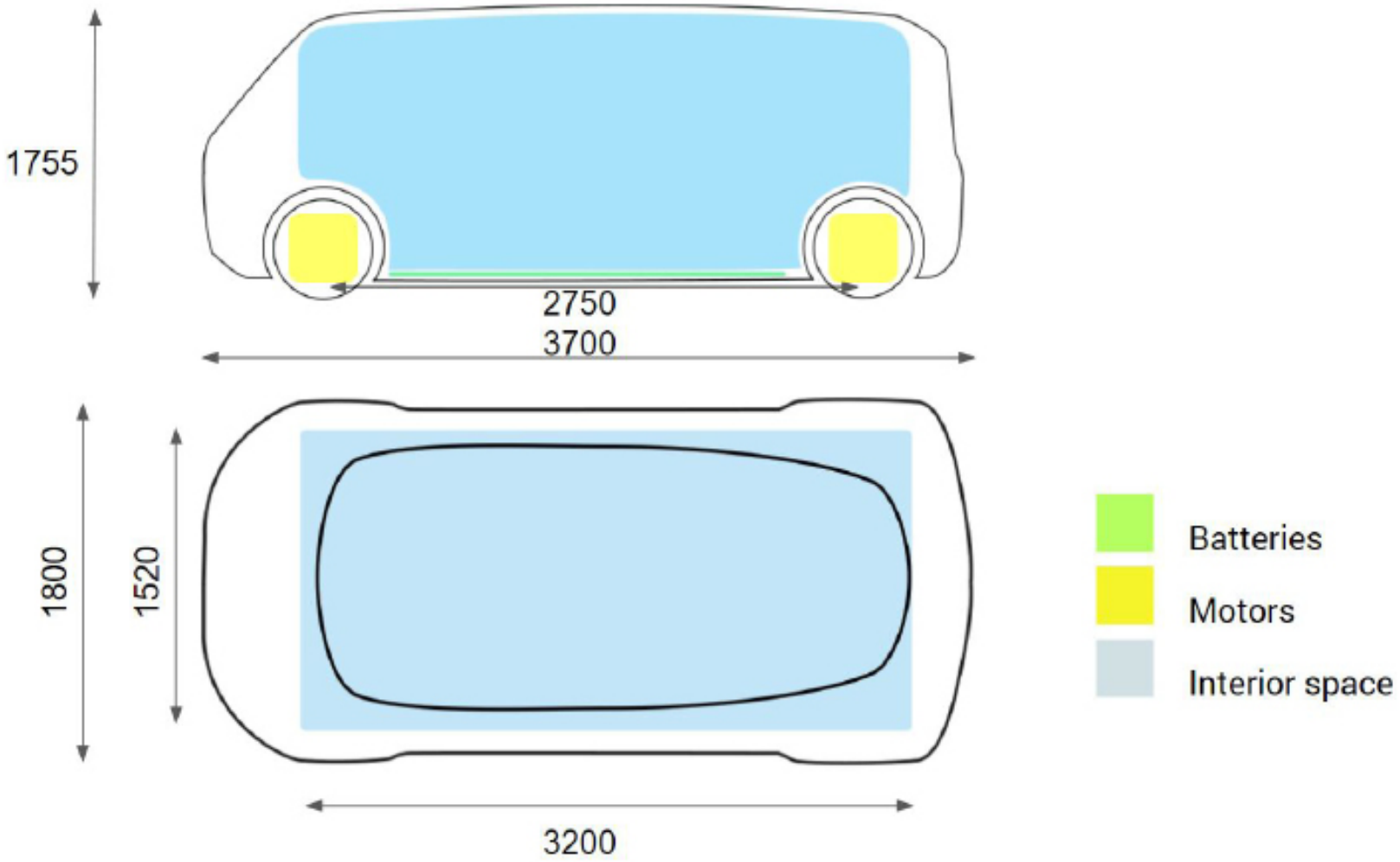
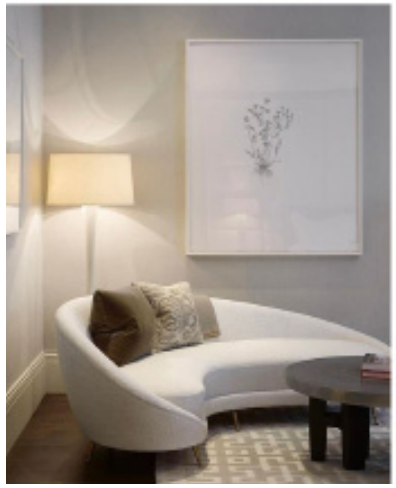


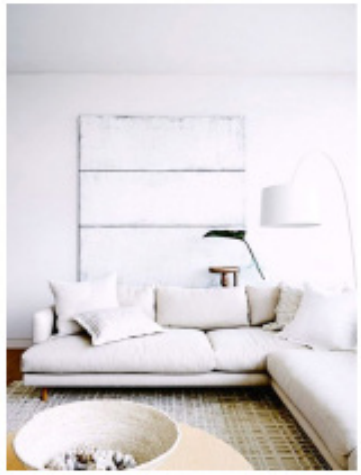
Fig 25. Interior volume of the existing vehicle

The decrease in overall length does not affect the inner volume of the vehicle. The wheel base is same as that of Innova The inner volume also includes the boot space thus providing more room for passengers inside the vehicle.

10.Moodboard



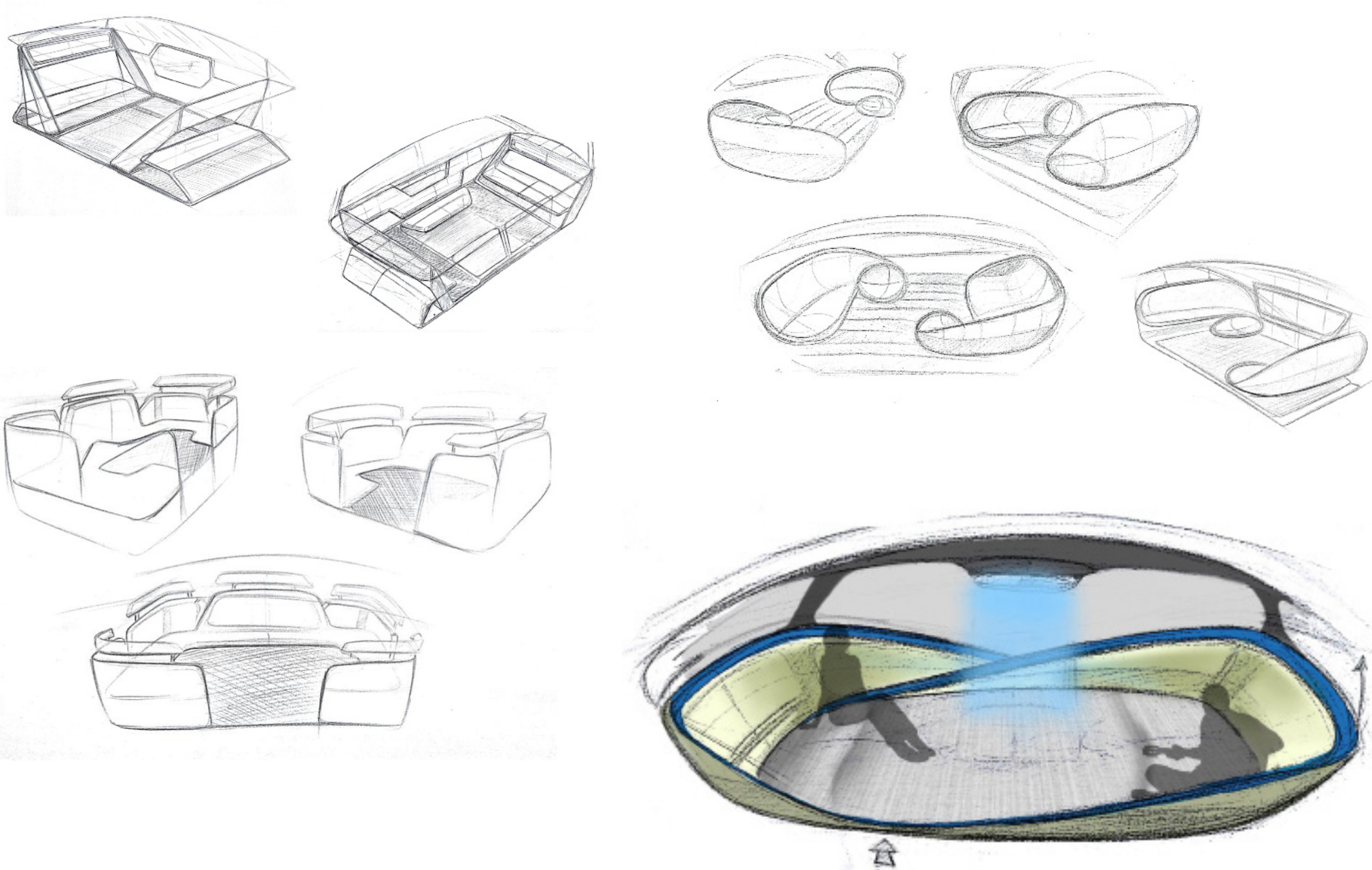


Connected
Cozy
Pleasant

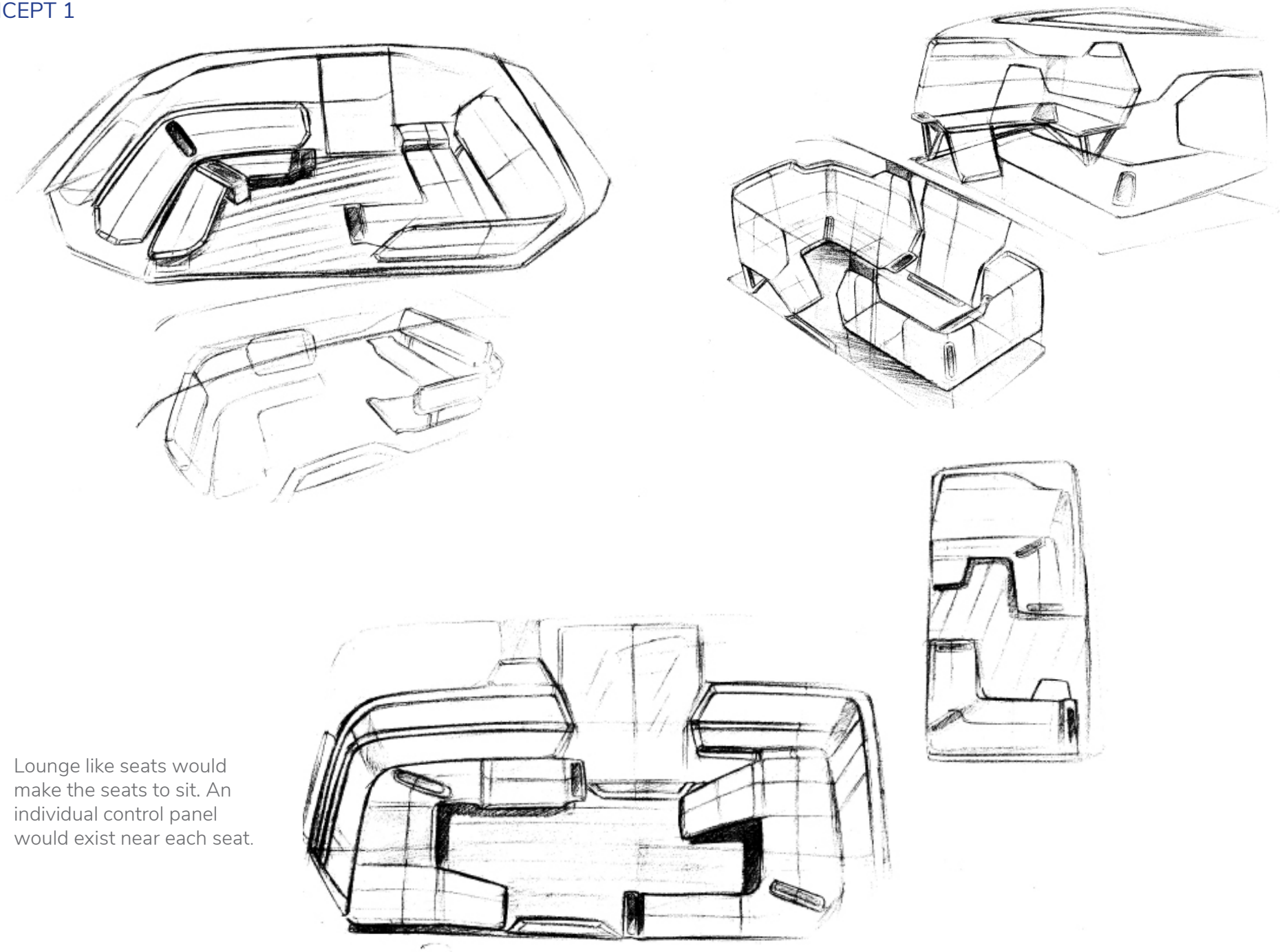
Based on the brain storming information, the words- connected, cozy and pleasant were derived. The intent behind design is to bring out the feelings of togetherness in a family where the family is having a nice time in a cozy space. the images were chosen such that the emotions of the words- cozy, connected and pleasant are derived. Based on these words, ideation was done to bring about the feeling of these words in the interior spaces of the taxi. Since the taxi is for a journey with in the city, the objective was to give the feeling of a cozy space, bring out the feeling of a a connected family having a pleasant time together while traveling a long distance in a taxi.

11.Ideation

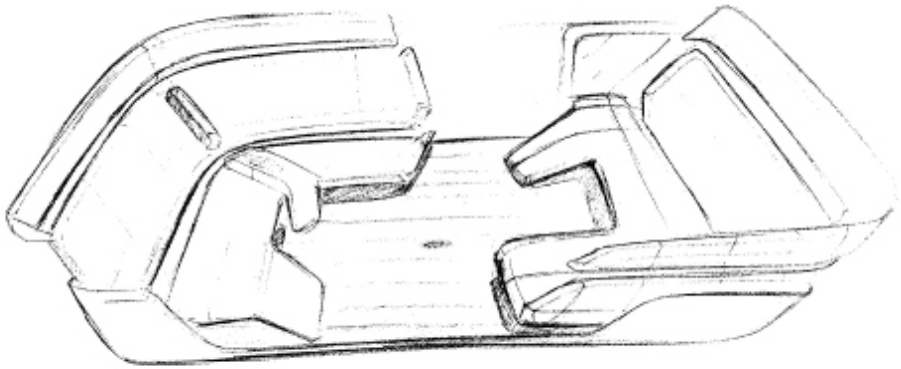
11.1 Initial Ideation

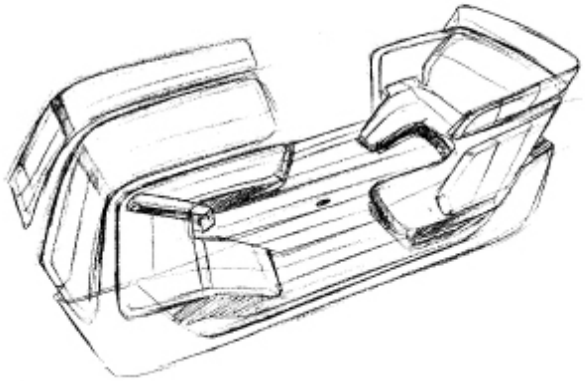


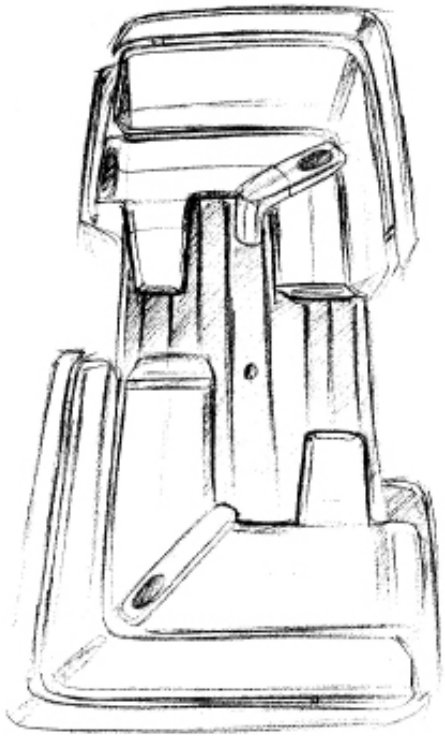
11.2 CONCEPT 1

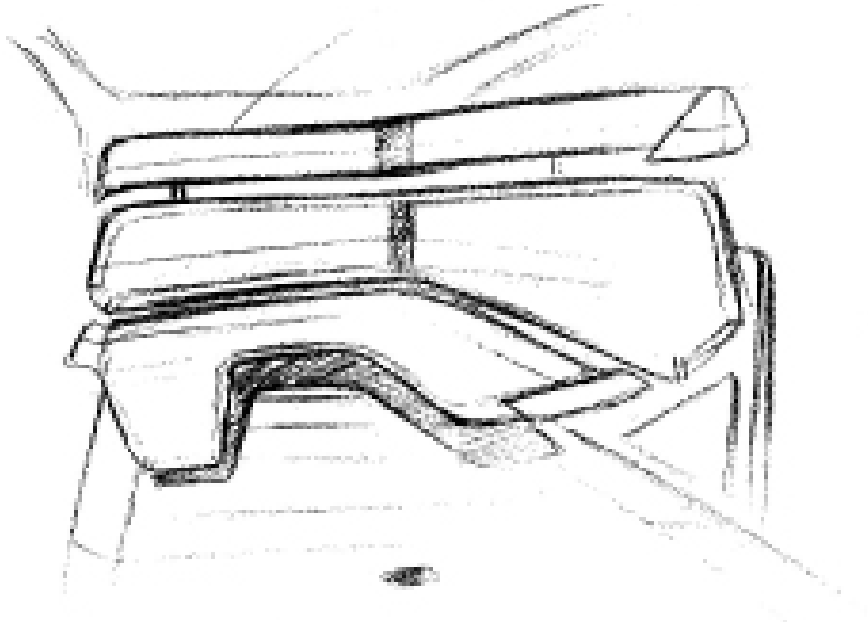


Lounge like seats would make the seats to sit. An individual control panel would exist near each seat.



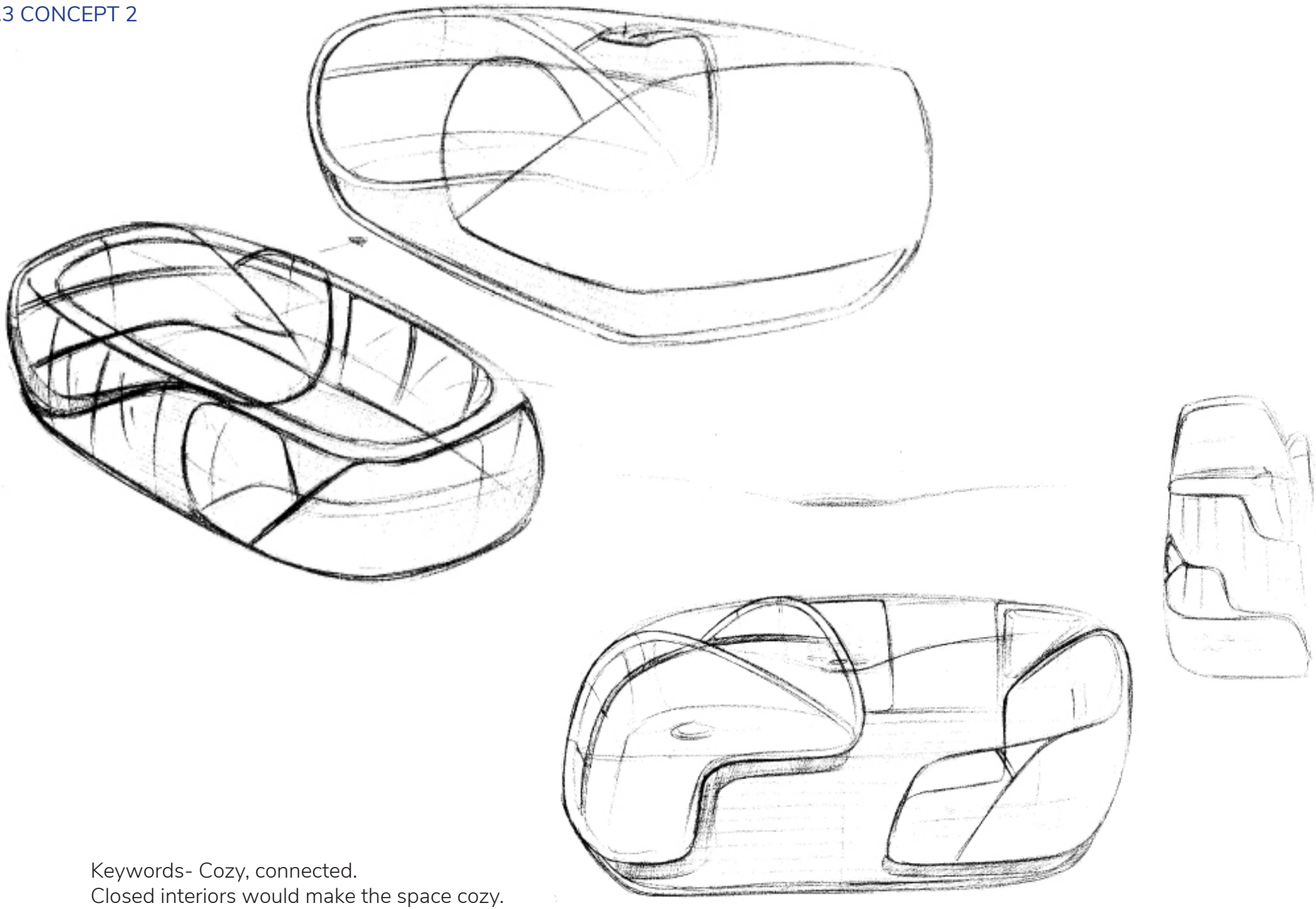






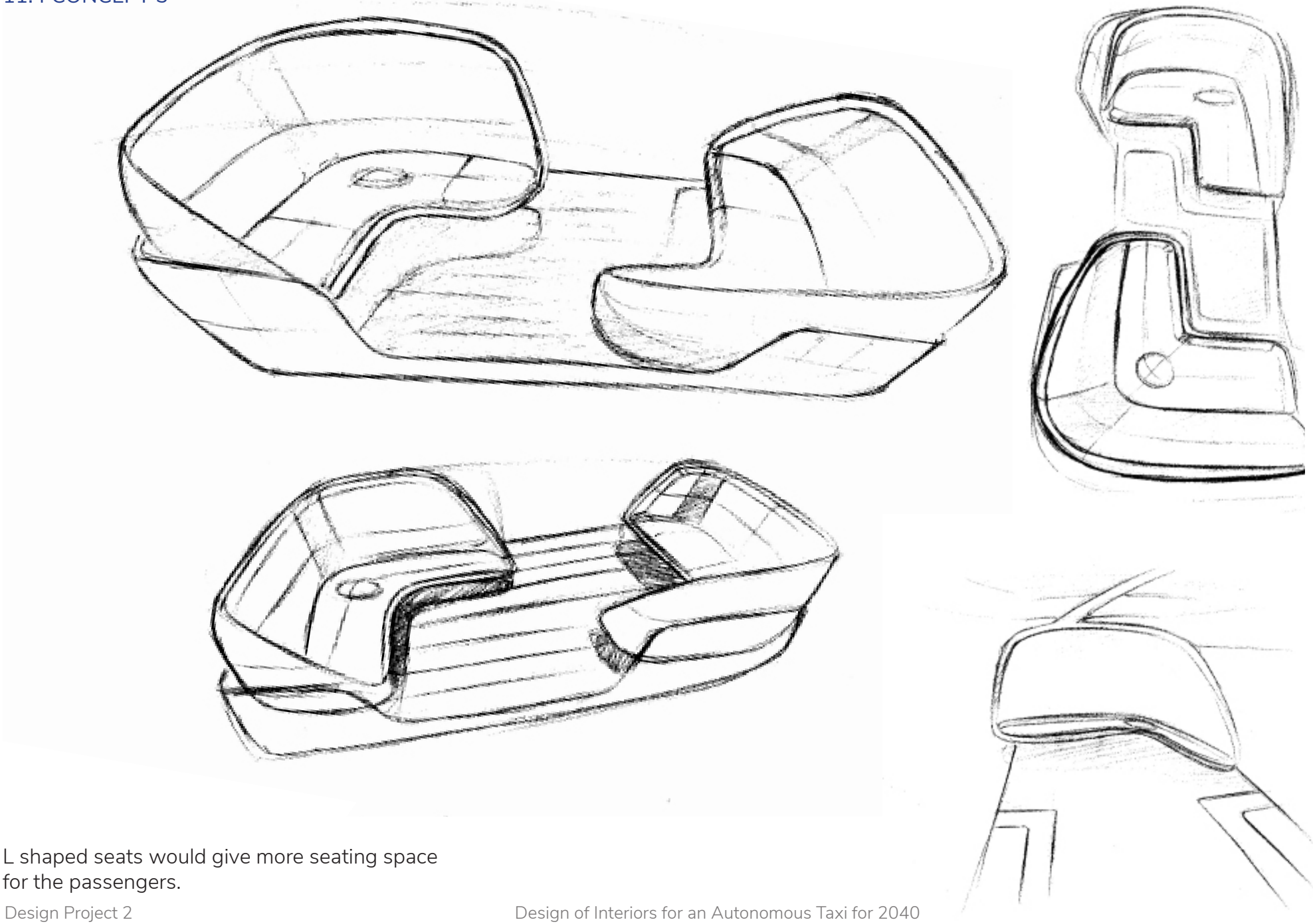
Keywords- Cozy, connected

11.3 CONCEPT 2



Keywords- Cozy, connected.
Closed interiors would make the space cozy.

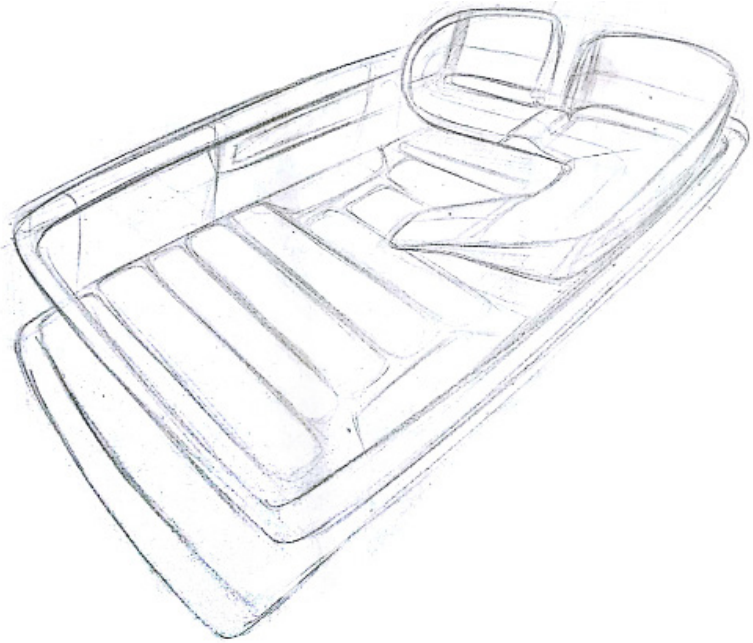
11.4 CONCEPT 3

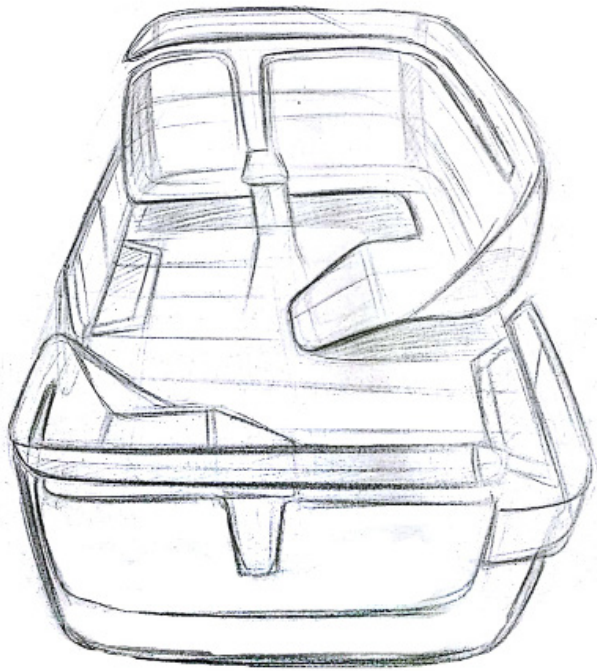


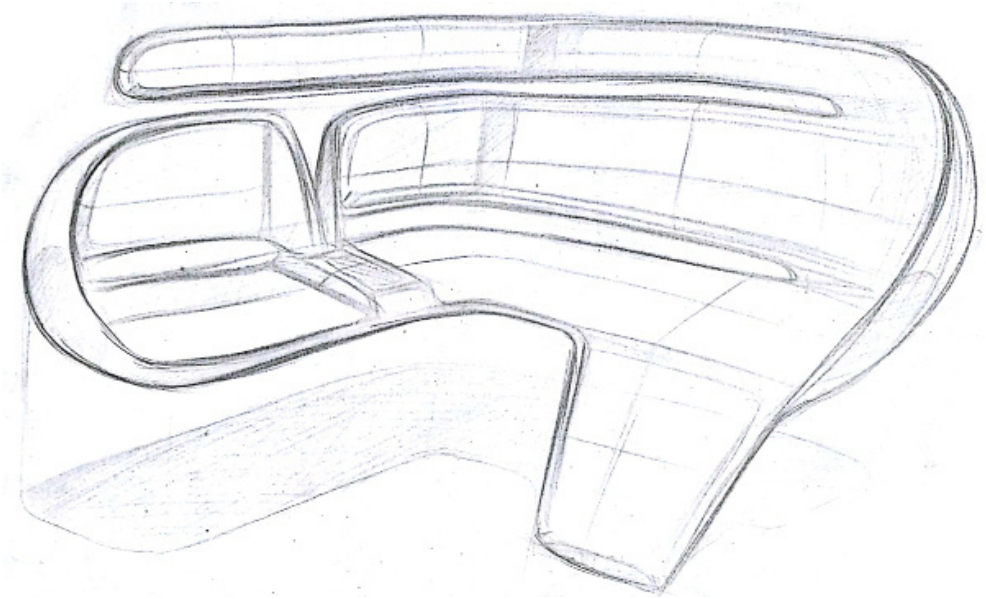
L shaped seats would give more seating space for the passengers.

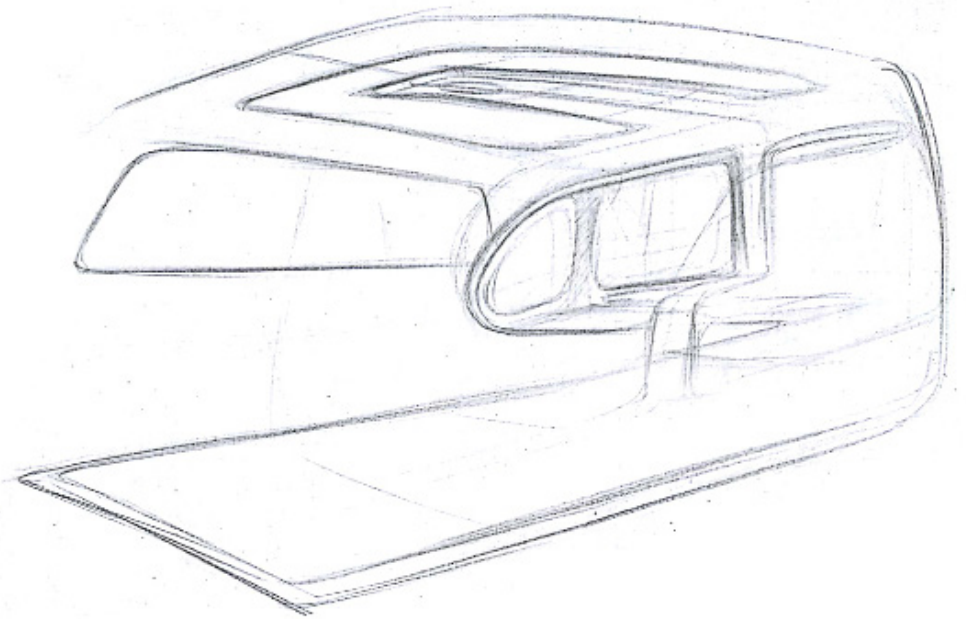
11.5 CONCEPT 4

Curved seats give a cozy feeling to the user. The feeling of connectedness is obtained where the seats are connectedness to each other. Lounge seats give a cozy feeling to the passenger.



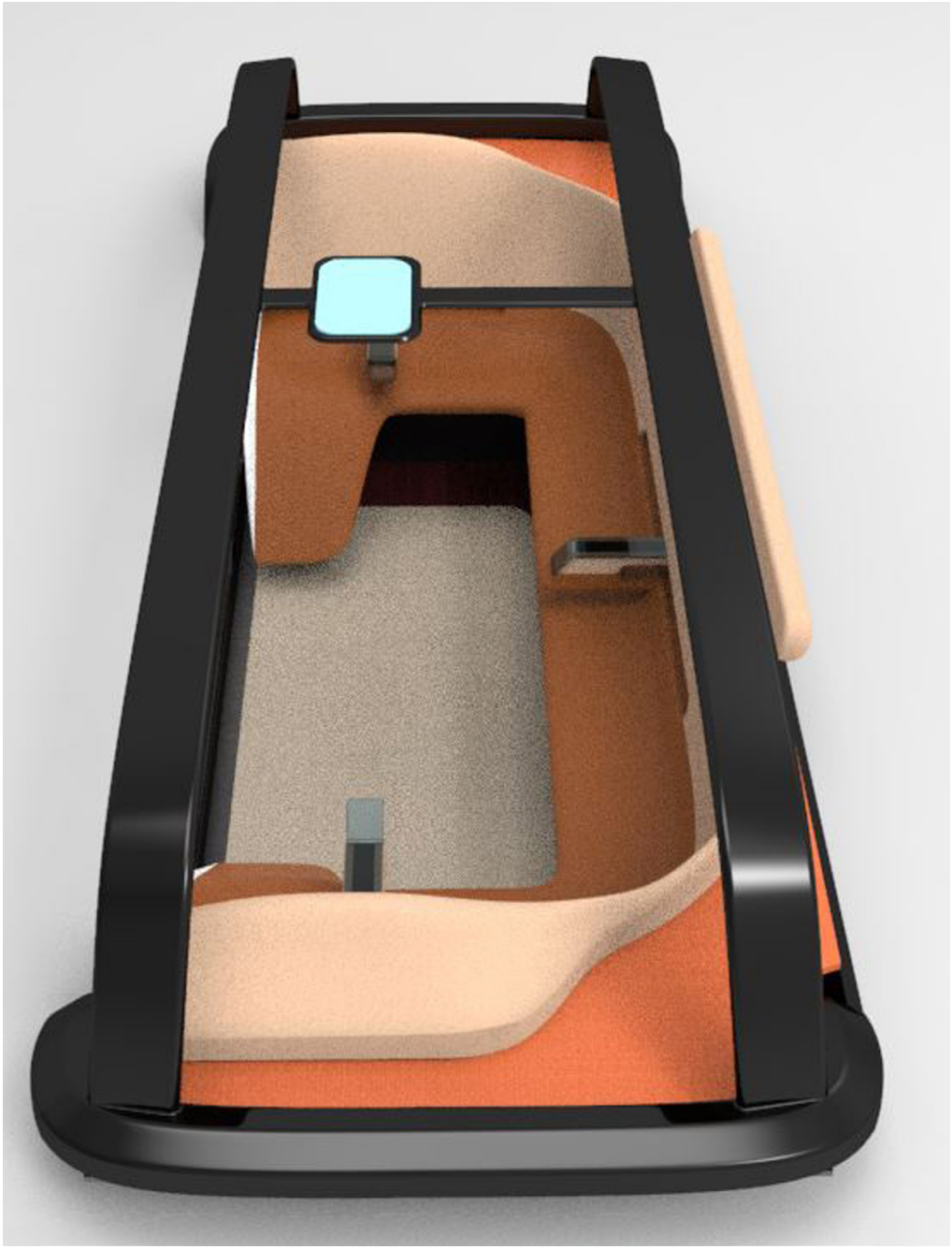


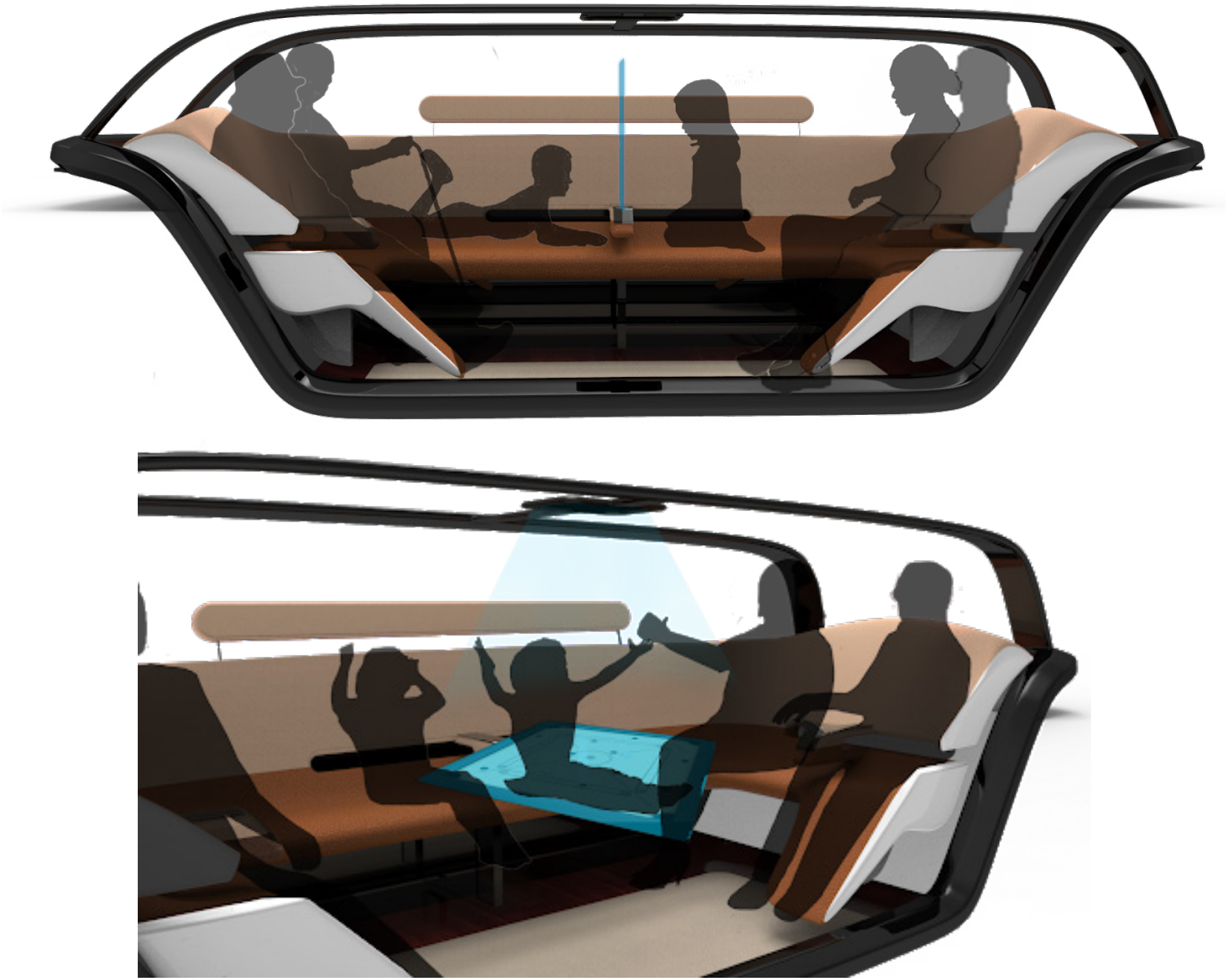




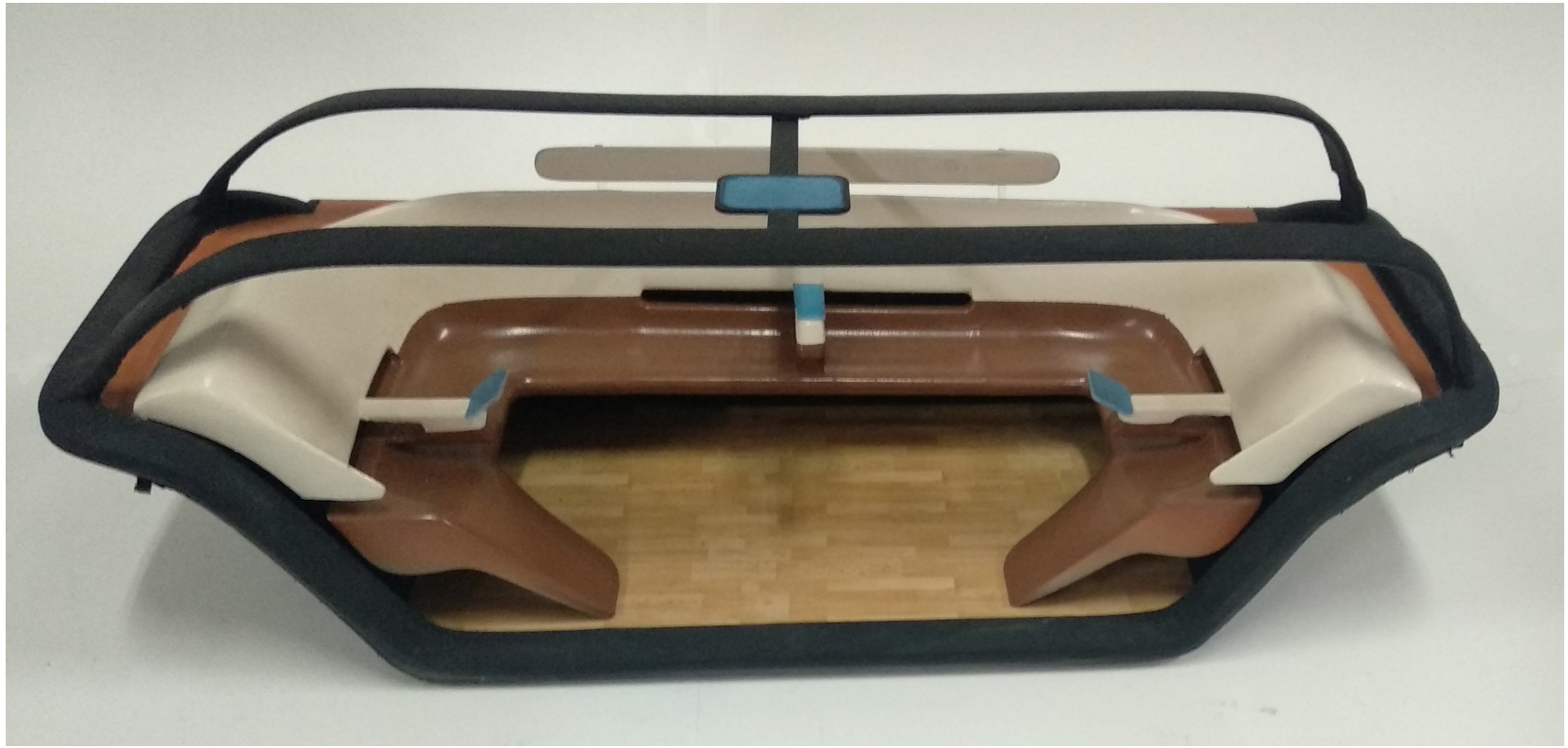
12.Final Concept

A set of lounge seats are present on both sides. These seats are retractable at the back and provide comfort to the user. A touch panel is present at the hand rest region which enables the user to control the vehicle. A hologram projector present on the roof not only acts as an entertainment console, but also acts as HMI unit.





13.Physical Model



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