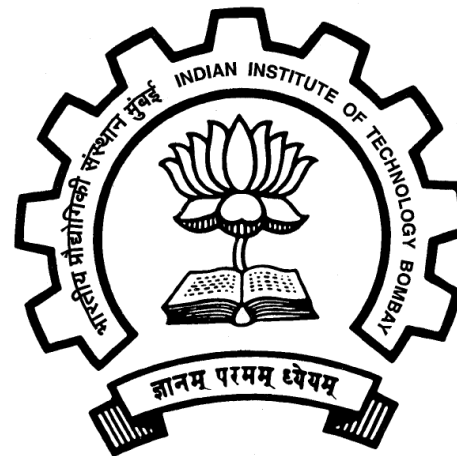


TWO WHEELER FOR PACKAGE DELIVERY PEOPLE
MOBILITY AND VEHICLE DESIGN PROJECT - II
MVD II - 38

BY
DIVYANSHU THAKUR
156390002

GUIDE: PROF. SUGANDH MALHOTRA



INDUSTRIAL DESIGN CENTRE
INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY
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Approval Sheet

The project entitled 'Two wheeler for package delivery people' by Divyanshu Thakur is approved in partial fulfillment of the Master's Degree in Mobility and Vehicle Design.

Signature: 

Guide: 

Internal Examiner: 

External Examiner: 

Chairman: 

Declaration

I declare that this written submission represents my ideas in my own words and adequate references and citations have been provided where required along with the original sources. I have adhered to all principles of academic honesty and integrity and have not misinterpreted or fabricated or falsified any idea or information in my submission. I understand that any violation of the above will be cause for disciplinary action by the institute and can evoke penal action from the sources which have thus not been properly cited of from whom proper permission has not been taken when needed.

Signature: 

Name: Divyanshu Thakur

Roll No: 156390002

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Divyanshu Thakur

Mobility and Vehicle Design, IDC IIT Bombay

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1. Introduction

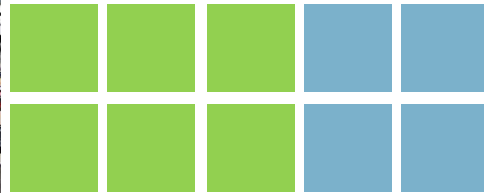
Package delivery has become a large business in the recent years in India. People order millions of products online on a daily basis and these products are shipped to them at their doorsteps mostly by delivery boys on their two wheelers. In the recent years, the fleet of two wheeler delivery boys has increased multifold due to the large demand of on door delivery. However, there are a lot of issues with the way these people carry the packages. A lot of health issues have been reported due to this delivery system by the riders. The riders often complain about lack of security features and discomfort due to the occupation. But as of now, no significant solution has been implemented to reduce or eliminate the problems faced by them. It is high time, looking at the sheer number of delivery boys on the road and the risks they have to face due to this occupation that a solution needs to be implemented to improve their situation. This project aims to design a bike which would aid the rider to perform his job in an easier and simpler way.

2. Pre Research

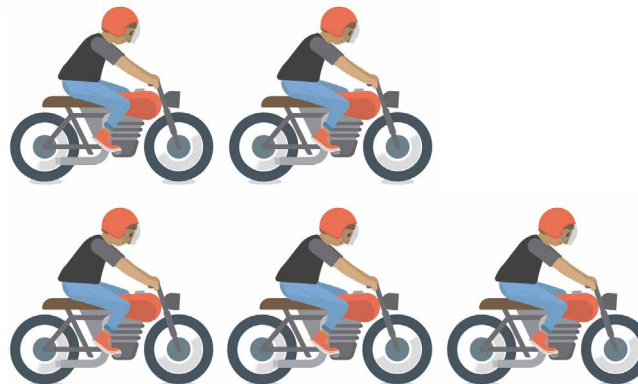
Before arriving at the ideas and the concepts, a preliminary research was done through the internet and newspaper articles. The methodology involved here was;

- Get a glimpse of the delivery service in India
The current scenario of package delivery in India
- The impact on health due to this delivery service
What are the ill effects on health due to this service on the delivery staff?
- Delivery systems
Comparing the Indian delivery systems to the global benchmarks
- Future scenario comparison
Will the current system be relevant in the near future with cut throat competition from technological advancements?

2.1 Delivery service in India

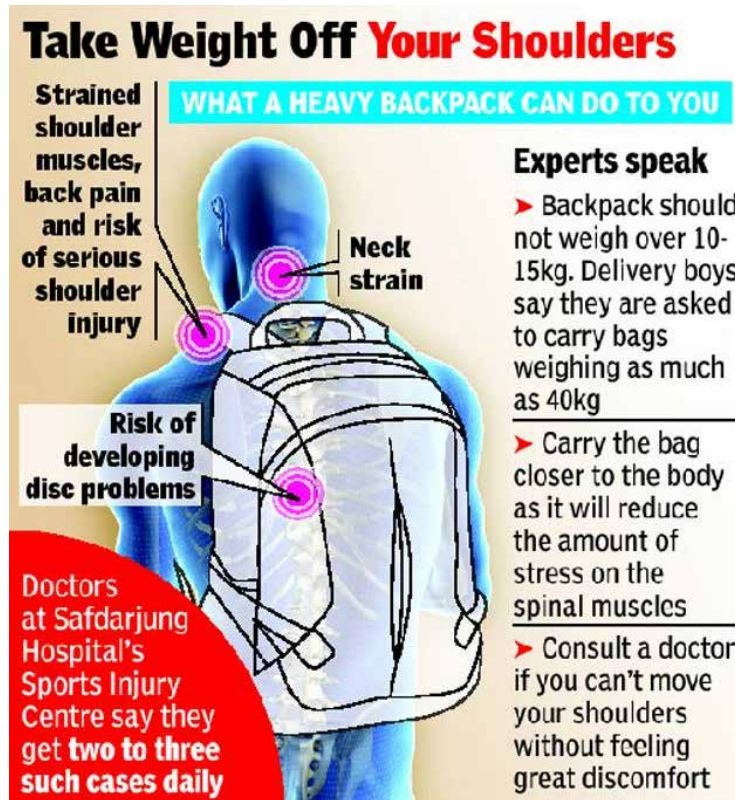


PACKAGE UNITS



Due to the massive growth in online trading and e-commerce, there has been a steady growth in the number of delivery vehicles on the road. Also, the number of stand alone delivery companies has increased in the past few years, opening up jobs for young people who seek an active lifestyle. As of today, over 60% of the deliveries are done by two wheelers owned by the delivery staff. Also if we look at the number of delivery vehicles on the road, for every delivery van out in the field, there are 5 delivery bikes. Hence the number of delivery two wheelers is quite large. But is the delivery bike system efficient for the person riding it? And what are the problems faced by them? Also, are there major health implications due to long term loading of the heavy bag on their backs?

2.2 Impact on health



2.2(a) Snippet from an article in Times of India

The implications on health due to carrying bags that weigh upto 40kgs daily include but are not limited to lower back problems, sprained shoulder muscles, neck problems and in some cases a slipped disc. According to the Time of India article 'You click, they break their backs to deliver' dated 23rd October 2014, backpacks should not weigh more than 15-20% of the person's body weight but online retail chains do not follow any such rules. It is inhuman that anybody in this modern age should be made to work like a pack mule. That it should be happening in sectors that are so modern, courier companies and online retailing websites.

Dr .Yash Gulati of BLK Super Specialty Hospital says the circumstances in which delivery persons for online retail companies work are no different from that of the porters. "They are rather more difficult. The latter can make a choice about the weight they may carry but these young individuals are forced to do so to earn a livelihood. Accidents caused due to poor balancing of the backpacks while riding bikes is common."

2.3 Delivery systems in India



In India, the two wheeler delivery service gained massive momentum after e-commerce sites boomed. Several companies like amazon, delhivery, ekart, etc. started hiring riders who own a two wheeler on a contract basis. Unlike their global counterparts, the riders have to use their own personal bike for this job. Since these bikes are not optimised for delivery services, a lot of problems are caused which affects their health, safety of the packages and also their performance. There are other delivery systems like the dabbawalas for example, they are known for their efficiency and timely service. Their speciality is that they use special signs and colours to identify the address. This minimizes the error involved in transactions.



2.3(a) A user using the seat as a table



2.3(b) A user talking on the phone while riding



2.3(c) Sorting out the packages

The problem with the delivery service in India is that the delivery boys themselves have to get their own bikes which is not standardized and neither suitable for the job. From the images above we can see that the delivery boys try to make the best out of their vehicle but it is not very helpful. Simple activities like reading, writing and sorting the packages becomes difficult due to the lack of sufficient desktop space. The user has to either use the seat of the bike or sit on the ground and spread the packages to sort them out. This becomes inconvenient on the long run.



2.3(d) Dabbawalas with their bicycles



2.3(e) The special colour coding scheme used by the dabbawalas to identify the address

Dabbawalas are a group of people who deliver home made lunches to offices across the city. They have very impressive efficiency and complexity in their process of delivering around 175,000 tiffin boxes each day, mostly by illiterate and unsophisticated men. This industry is over 125 years old and has continued to serve with brilliant efficiency. Their greatest strength lies in the use of bicycles and public transport for the delivery of tiffin boxes. This reduces the cost of transport incurred by them and it is also a very environmental friendly solution. Each dabbawala delivery anywhere between 15-20 boxes by collecting them from every home and leaving at a drop off point. It is then transported by local trains to the appropriate stop where another person picks up the tiffins and delivers it to various offices around the city.

2.4 Delivery systems across the globe



Two wheeler delivery services are present in many parts of the world. In developed countries, there are some solutions to the problems associated with the two wheeler package delivery system. These solutions have been developed by DHL and a French postal service called 'La Poste'. In another instance, a modified Vespa is being used to carry large packages with the front part extended. there are some solutions to the problems associated with the two wheeler package delivery system. These solutions have been developed by DHL and a French postal service called 'La Poste'. In another instance, a modified Vespa is being used to carry large packages with the front part extended.



2.4(a) La Poste's delivery bike in France

La Poste, a french courier company has developed a delivery bike which has three wheels. This gives more strength to the vehicle to carry heavier loads. There are provisions for storage in front of the vehicle and near the foot rest. The rear storage space is large enough to carry loads of upto 100kgs. Since it is an independant storage space, it does not create any stress on the rider.



2.4b) 'Motofocker' cargo scooter from Netherlands

Moto focker is a company based in Netherlands that has been using old Vespa scooters to turn them into a cargo scooter. The front end of the scooter is extended and a special steering mechanism is added which connects the front wheel and the handlebar. The storage space is massive and can carry loads of upto 140kgs. To power this, the engine has been modified to bear the additional load.



2.4(c) Lit Motor's Kubo electric cargo scooter

Dubbed as the 'Pickup truck on two wheels', the Kubo scooter is an electric two wheeler developed by Lit Motors. It has a 22" square cargo space with a variety of rails, hooks and cables to secure the cargo. The advantages it has are a very short turning radius making it nimble and agile, it can charge within a matter of few hours from any standard wall socket and gives a mileage of upto 50kms.



2.4(d) DHL's bicycle courier

DHL uses its bicycle courier in most European countries as a move to save fuel and conserve the environment. The bicycle has a frontal cargo space which can hold upto 140litres of cargo. It has a special steering mechanism which connects the front wheel to the handlebar from under the cargo space which is neatly hidden and is very easy to maintain and repair in case of faults.

2.5 Future Scenario comparison



What would the future of two wheeler package delivery would be with the advancement of different modes of transport and technology? Will it be relevant? Is it a sustainable mode of delivery on a larger scale? These are the questions whose answers are being looked for through this study. In this case study, a few different modes of package delivery are explained in details here along with their unique selling propositions and their shortcomings. This is compared to the two wheeler delivery bike system in India.



The pro's and con's of each system is compared on a table based on several parameters. The parameters are; Speed of delivery, drivery safety, versatility of the vehicle, package safety, maximum delivery volume, self reliance, parking space being occupied, range of operation, operational cost and ease to the customer. Each parameter is scored on a maximum of 5 points. These points are then added up and the final result is compared. The highest scoring service means it has a better overall performance compared to the others.





2.5(a) Fedex delivery truck

Delivery vans have existed before two wheeler delivery bikes. Their biggest advantage is that they can carry a large volume of goods. Even large objects can be easily carried. Usually two people are always present; one who drives and the other who keeps track of the inventory. With this, it becomes efficient. However, the delivery van has trouble when it comes to speed of delivery and ability to reach areas over rough terrain and narrow streets. Their range is limited to cities with wide roads.



2.5(b) Amazon's drone delivery bot

Drone delivery system has recently entered the picture with Amazon. Drones are incredibly fast at delivery and they usually deliver within an hour of placing the order. Terrain does not cause any problems. However, a rough climate can affect it. Also, drones can only deliver one package at a time and always need a good cellular network along with a person to operate it. It is being only used for express delivery systems for delivering urgent packages.



2.5(c) Terrestrial delivery robot

Another form of terrestrial delivery system is being tested in the streets of New York which is an automated delivery system. Here the advantage is that it doesn't rely on human input to drive itself. The user just has to place the order and give the location of delivery and the robot will dispatch on its own. This is useful in situations where fairly large packages need to be delivered. However, it has a limited range of operation and can be fairly expensive to operate. Also, it can only work on flat surfaces.



2.5(d) Autonomous delivery truck

Self driving vehicles are on the rise in this age, and pretty soon they will replace human drivers. Some self driven delivery trucks already exist now. They have all the advantages of a pickup truck. Since there is no driver compartment, more space is made available for packages. Hence the overall volume of storage is increased considerably. However, this system is the most expensive one and also the human interaction element is not present which makes it difficult for the customer to interact with it.

Service	Speed	Driver Safety	Versatility	Package Safety	Delivery volume
	5	NA	1	4	1
	3	2	4	1	2
	2	4	2	5	5
	1	NA	1	4	1
	2	NA	2	5	5

This table compares all the different systems at once. Based on a scale of 5 points, each parameter is scored for every systems individually. The methodology of scoring here is based on their comparison of the parameters relative to all the systems. For examples, if we take the parameter of 'Speed', drones are the fastest followed by the delivery bike. Vans and autonomous vans have similar speeds and hence they are given an equal rating. Since the small delivery bot is the slowest, it is given the lowest rating.

Service	Self Reliance	Parking Space	Range	Operation Cost	Customer ease
	1	3	3	2	5
	5	4	4	5	4
	4	1	5	2	3
	1	5	1	3	4
	1	1	5	1	1

We can see that the delivery bike has the highest scores in most categories and also the total adds up to give it the highest score.

2.6 Inferences



From the study it is inferred that the delivery bike will be relevant in the future even with the advancement of technology. Factors like human interaction with the customers, being able to make decisions on the fly, navigating through unknown routes and also sustainability are factors that are in favour with the delivery bike.

Although the other autonomous systems excel in a few parameters like speed and volume of delivery, they are meant for a specialized purpose and are not efficient overall. The technology is still being tested and it is not yet sustainable.

3. Research

To understand the system in detail, a deeper level of understanding needs to be built. The methodology involved here was to first observe and then interact with the user on a personal level. It starts with observing the user and how he interacts with the product and also interacting with them. Observation helps to find out certain problems that are experienced by the user but he is unable to express those issues. Direct interaction with the user helps to find out certain problems they have been facing which cannot be directly seen through observations. More problems can be found out by directly interacting with the product the user is using themselves so as to experience the problems first hand.

3.1 Visit to Delhivery dispatch center



I had the opportunity to visit the Delhivery dispatch center which is located near Sakinaka metro station, Mumbai. I had spent two days here to document and understand how a dispatch center works. The head of operations, Mr. Sathish guided me through their facility. My visit involved clicking photographs and interacting with the employees who work in the facility as well as the delivery boys who usually halt for a few minutes to collect their packages. From the visit I was able to understand how the system works.

Usually, a large tempo or truck arrives at the center with a large number of consignments. These are then coarsely segregated depending on the delivery zone. Each delivery zone is assigned 2-3 delivery boys who collect the packages which are placed in bins marked with their names.

3.2 Operations at the dispatch center



3.2(a) Primary sorting



3.2(b) Scanning packages for location tag



3.2(c) Bins marked with the zone name

The dispatch center is where the sorting process first begins. The center receives packages from all over the country. Then it is scanned for its destination tag. Once the destination is identified, it is placed in the appropriate bins. The bins are marked according to the postal zones of the city.



3.2(d) Assigning packages to delivery boy



3.2(e) Red bucket assigned to a delivery boy



3.2(f) Packages placed in the bucket

The packages that had been segregated into the zones are now picked up by another employee. This employee scans them to assign the package code to a particular delivery boy. Then the package is put into a red bucket which is labelled after the delivery boy's name. In the second image it can be seen which areas the delivery boy is supposed to cover during his shift.

3.3 Observational research



Observational research involves studying the user while he is interacting with the vehicle. This study helped in understanding how the user interacts with the vehicle, what are the different ways in which he uses the vehicle for and what sort of problems he faces while using it that is might not be even aware of.

The methodology followed here was to locate delivery boys around the city at several hotspots and observe their actions and click photographs. Some key observations include their interaction with the customers, how they try to make themselves feel comfortable with the environment and also they different ways in which they multitask

3.3.1 Using the seat as a desktop



3.3(a) Using the seat as a desktop



One key observation is that all of the users used the back seat of the bike as a desktop space, either to write, read or just keep their belongings on top to make themselves free while working.

In the images above, we can clearly see that there is a need of a desktop space for writing and reading atleast. Also the user sometimes has to bend down considerably to do his work.

3.3.2 Problem with bags



3.3(b) Unsecure bags



3.3(c) Plastic used to secure packages



3.3(d) Bag covered with a rain jacket

The bags which are provided by the company do not have anything special about them besides being large in volume. The bags usually have around 100 litres of storage and are not water proof. The delivery boy has to protect the packages with another layer of plastic or polythene bag and then place it in the delivery bag which is only secured with a zipper or a couple of clips and velcro.

3.3.3 Accessibility



3.3(e) No space to secure documents



3.3(f) Sorting is an issue



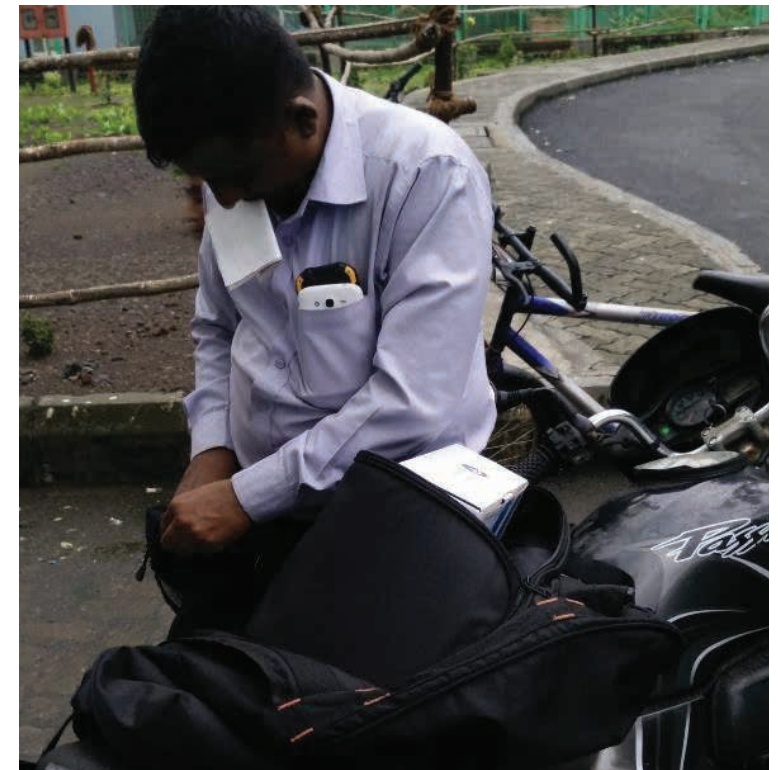
3.3(g) Additional plastic bag to store more packages

There are numerous accessibility issues with the service. Accessibility is a major issue which hinders the delivery boy from performing well in his job. There is no space provided to keep his documents. They have to stick it between the brake lines of the bike and the handlebar. Also, sorting the packages becomes another problem.

3.3.4 Multitasking



3.3(h) Answering the phone while riding has serious accident risks



3.3(i) Stuffing the pockets and unable to store documents

To save time, the riders usually multitask. Answer a phone while riding, storing a lot of stuff in their pockets, etc. means they try to maximise their productivity by saving time.

3.4 Motion Study



In this study, we look at how the user interacts with his bag and the bike. This study becomes relevant when we want to understand the problems faced by the user while interacting with the vehicle and what causes these problems.

First, the user has to lift the bag and strap it on his back. This adds a lot of weight on the upper part of his body and there is a tendency of disbalancing. This affects the way in which he gets on and off the bike. All the additional weight has to be managed while also taking care of himself and the bike. This makes it tedious for the delivery boy to get on and off the bike every time he has to make a stop.

3.4.1 Lifting the bag



3.4(a) Bending down to grab the bag



3.4(b) Lifting the bag with both arms



3.4(c) Securing it on the back

Here we can see that the user is trying to lift up the bag. One major reason for why they have to put the bag down on the floor is because they can only access the bag from the top, which becomes difficult when it is placed on an elevated platform, like the seat of the bike. As the user picks up the heavy bag, a lot of stress is created on their back which is a major cause of their back problems.

3.4.2 Getting on the bike



3.4(d) Approaching the bike



3.4(e) Lifting the main stand



3.4(f) Getting on the bike



3.4(g) Adjusting the bag on the seat

Here the user is approaching the bike with the heavy bag on his back. It has been noticed that the weight of the user shifts towards the handlebar due to which getting on the bike becomes difficult. The fact that the user has to get on the bike along with the heavy bag on his back only makes this otherwise simple activity a difficult one.

3.5 Experiencing the current system



3.5(a) Starting the bike from a standstill



3.5(b) The bag tends to shift while negotiating a turn



3.5(c) Weight of the bag pulls the torso backwards while accelerating

I had the opportunity to ride one of the delivery boy's bikes along with the bag. The bag here has packages worth 35kgs in it which is usually the normal weight of these bags. The problems that were faced while riding was that the bag hampered my comfort while sitting and especially during accelerating and braking where it would pull the torso and put a lot of stress on the shoulders where the straps connect. Another major problem faced was that the bag would tend to sway a lot while negotiating a turn and there was always a risk of the bag slipping off the seat. The bag also tends to disbalance the body when I get off the bike or even when I get on it. The delivery boys usually counter this problem by either placing the bag on the bike seat first or by tilting forward till the back rests on the back and then getting on the bike.

3.6 Inferences

From the observational research and the motion study, the following inferences have been noted;

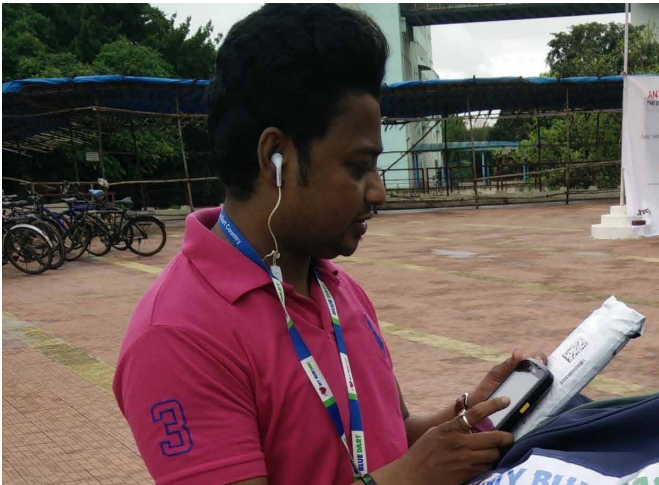
- There is a dire need of proper desktop space for the user.
- The user operates the bike as his own office space.
- The bags are not secure- susceptible to theft and damage to the packages.
- It is quite unnecessary for the user to carry the bag around everywhere even when not needed.
- There is a lack of space to keep his gadgets and comfortably access them.
- There is no provision to secure the bag to the bike, which makes it difficult for them to ride and get on the bike.
- Step in or step through seating would make accesibility better.

3.7 User research



The aim of this study was to understand the user in depth. A few users were chosen at random for this study for qualitative analysis.

A questionnaire set was made which was then used to interview users. The questionnaire included questions related to service, the bag and their gadgets, payment, their bike and personal questions regarding their lifestyle. The questionnaire helped in retrieving information regarding their usage of the product and understanding the service in better light.



3.7.1 Questionnaire

Service related

How many packages do you deliver daily?
Where do you collect the packages from?
What happens when you misplace a package?
How do you carry expensive packages?

Payment

Do you get paid for fuel?
How much do you earn?
Where do you keep collected cash?
Where do you keep the card payment device?

Bike

When did you buy this bike?
What do you like/dislike about it?
What modifications have you done to it for the job?
Is this helping you to perform better?
What else do you use the bike for?

Bag & gadgets

How heavy does the bag get?
Is it weatherproof?
What is special about the bag?
What are the devices you carry for this job?
How do you keep them?

Personal

How old are you? Where do you live?
What is your education level?
Do you have any previous work experience?
What do you like/dislike about this job?

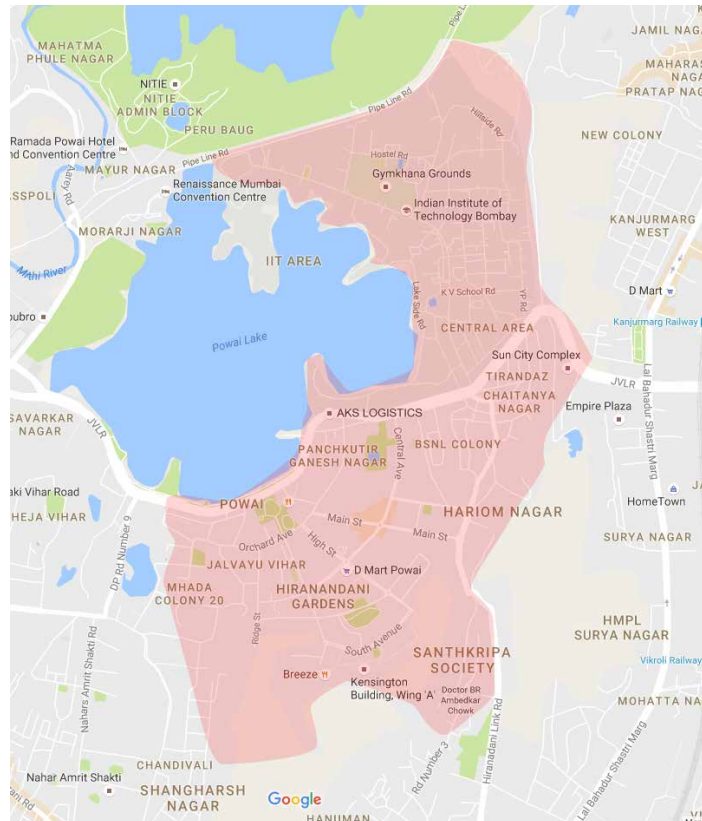
Miscellaneous

Did you have any incidents during your job?
What do you think can make this work easier for you?
What makes you successful in this work?

3.7.2 The users

User 1

Shehbaaz, 22 years old



Works as a delivery boy on contract,

Studied till 10th.

Bought a second hand Pulsar to get the job.

Uses plastic bags to protect the packages.

Wants a bike that is more versatile.

Complained of back problems initially.

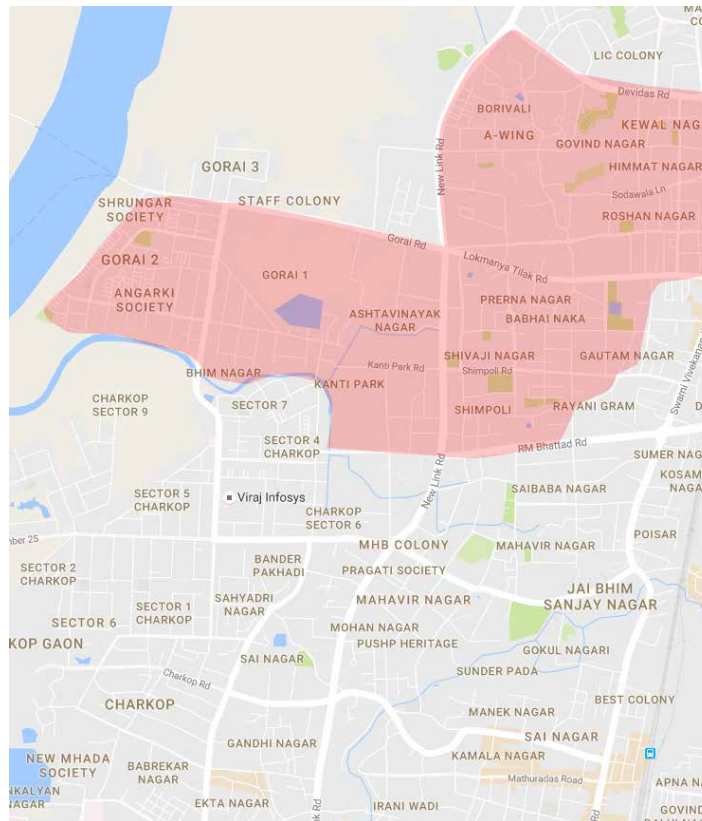
Delivers 40-45 packages a day.

Starts from Sakinaka, passes through Hiranandani and covers IIT.

Travels 30-35kms for each shift

User 2

Chiranjiv, 28 years old



Bought a Yamaha FZ 2 years ago.

Worked in retail, wanted a more active job.

Complains about the bag being uncomfortable while riding.

The bag sways while taking a turn, braking and accelerating.

Has back problems every now and then.

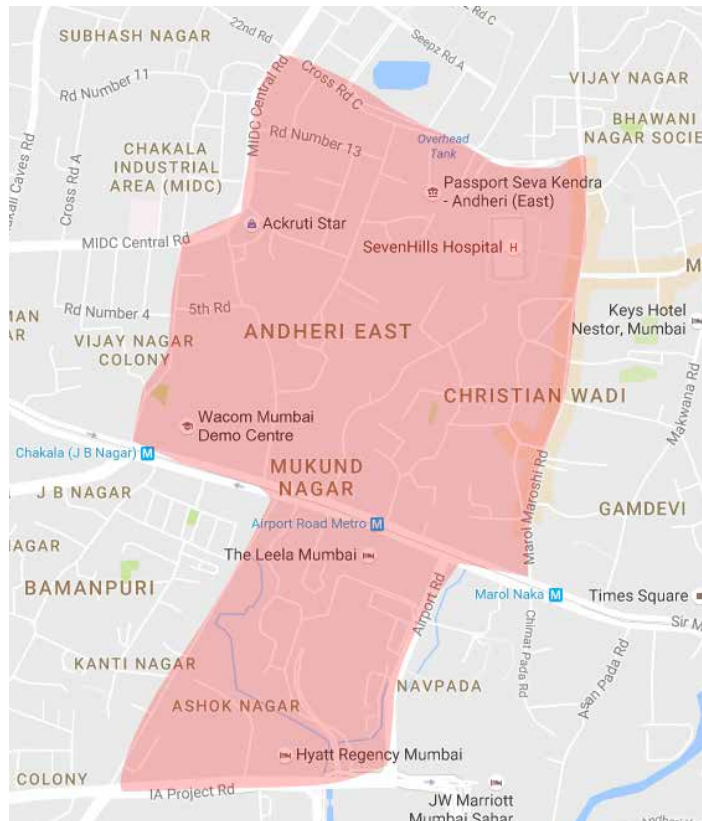
Delivers 40 packages a day.

Starts from Borivli and ends shift at Gorai.

Covers 35kms every day.

User 3

Shravan, 21 years old



Is a student, works part time to make money.

Uses spare time in the afternoon to study.

Father bought a bike to travel to college.

Splits his packages in a backpack and a plastic bag to reduce load on his back.

Wants to do a similar job with higher pay after graduation.

Delivers upto 50 packages a day.

Starts from SakiNaka, moves through Seepz and MIDC.

Covers 30kms for every shift.

User 4

Subhash, 25 years old



Owns a Splendor since 5 years.

Has a lot of back problems.

Is excited about the prospects of getting a new bike just for delivery services.

User 5

Harish, 26 years old



Owns a Pulsar.

Has problems with the bag sagging while turning.

Does not like to carry the heavy bag while going upstairs in a building.

3.8 Inferences

From the user research, the following inferences have been noted;

- The users are generally satisfied with an active job.
- They try to sort some problems on their own, but the solution is mostly temporary
- The bike does not have provisions to store and attach gadgets.
- Otherwise a comfortable mode of transport, discomfort happens to the user only because of the heavy bag.
- Changing gears become tiresome and fatiguing.
- The users wish for a less intense experience while having to struggle with securing documents and storing their belongings.

4. Product Study

The aim of this study was to understand the kind of vehicles the delivery boys use and also the bags in which they carry their packages. This would help in understanding how much volume of packages a delivery boy carry on an average. This data will help in deciding the volume of storage for the final output. The kind of bike they use would help in deciding the key factors for which they choose a particular kind of a motorcycle and what are the features of that motorcycle for which the delivery boys prefer them over the others.

4.1 The bag



4.1(a) Empty bag with no packages. Has no inherent structural stiffness



4.1(b) Packages being filled inside. It is difficult to fill because the opening keeps collapsing inwards



4.1(c) The bag takes the shape of the packages but still it is susceptible to movement inside

On an average, the volume of the bags the delivery boys carry ranges from 70 to 100 litres. Usually they are not waterproof and have no inherent structural support which can protect the packages. They are accessed from the top and secured either with velcro straps, clips or a tie rope. Hence there is no security to the contents inside; anyone can open it and steal if it is left unattended. Since there is no other way to access the contents, the delivery boy has to take the bag off the bike and then remove the contents. This makes the whole process cumbersome.

4.2 The bikes



4.2(a) Hero Splendor



4.2(b) Honda Shine



4.2(c) Honda CD 110

All the delivery boys ride a commuter bike with an engine capacity of between 110-150cc. Their choice of a commuter bike mainly depends on the cost and the mileage it returns. Although the daily commute of a delivery boy does not exceed more than 50kms per day, they use the bikes for their personal needs also for which they require a vehicle with good fuel economy. Also, commuter bikes are extremely lightweight due to the lack of body panels and are very quick and agile thanks to lighter tyres and wheels and a short wheelbase coupled with the light weighted engine.

4.3 Inferences

From the understanding of the products that the delivery boys use, the following inferences have been made:

- The vehicles have no in built security features, lockability, etc.
- Bikes are used for professional as well as personal purpose, hence mileage becomes an important factor.
- A lot of inconvenience is created while accessing the packages in the bag. It becomes too cumbersome to have to take it off the bike and dig through the packages.

5. Design Brief

To design a two wheeler for package delivery purposes which fulfills the following requirements:

- Has a step in/step through seating.
- Should have 100 litres of storage volume.
- Accessibility features for the delivery personnel.

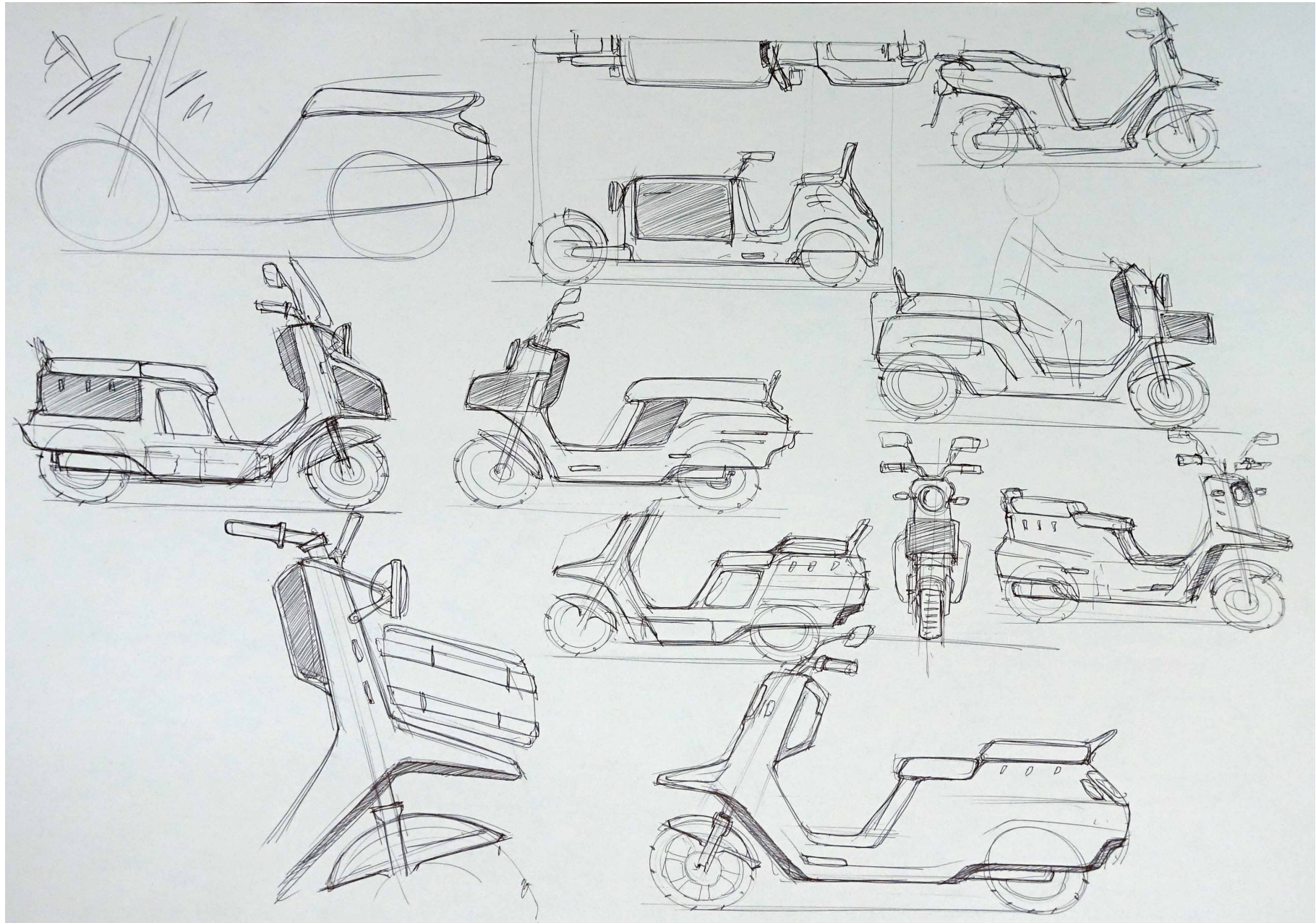
Technical Specifications:

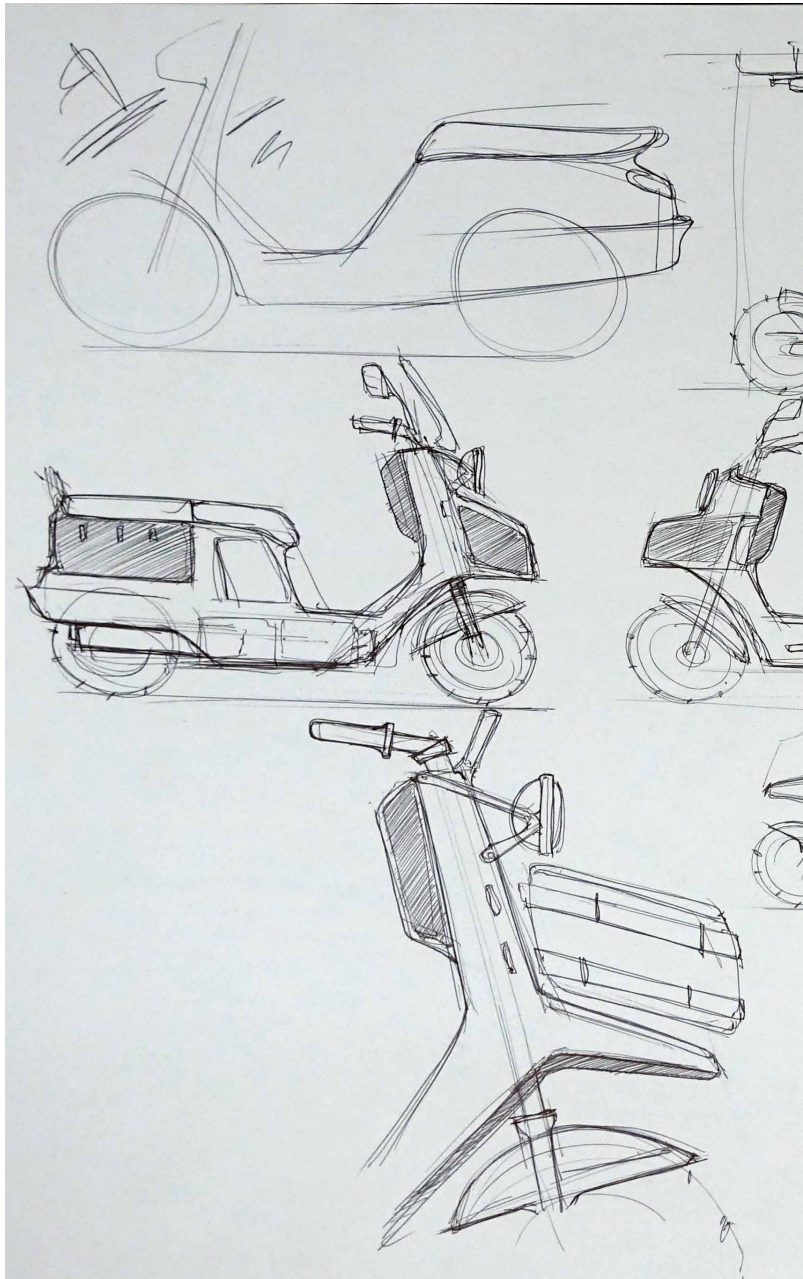
- Maximum Dimensions(LxHxW): 1900x1100x750mm
- Seat height: 760mm
- Ground clearance: 150mm
- Wheelbase: 1300mm
- Engine capacity: 125cc 4 stroke

6. Ideations

Based on the inputs from the research, several directions had been explored during the ideation phase. These directions have come out from the need of the user and their ability to use the vehicle as a commercial mode of transport. The different ideas were weighed in for their pros and cons and depending on that, the final concept was designed.

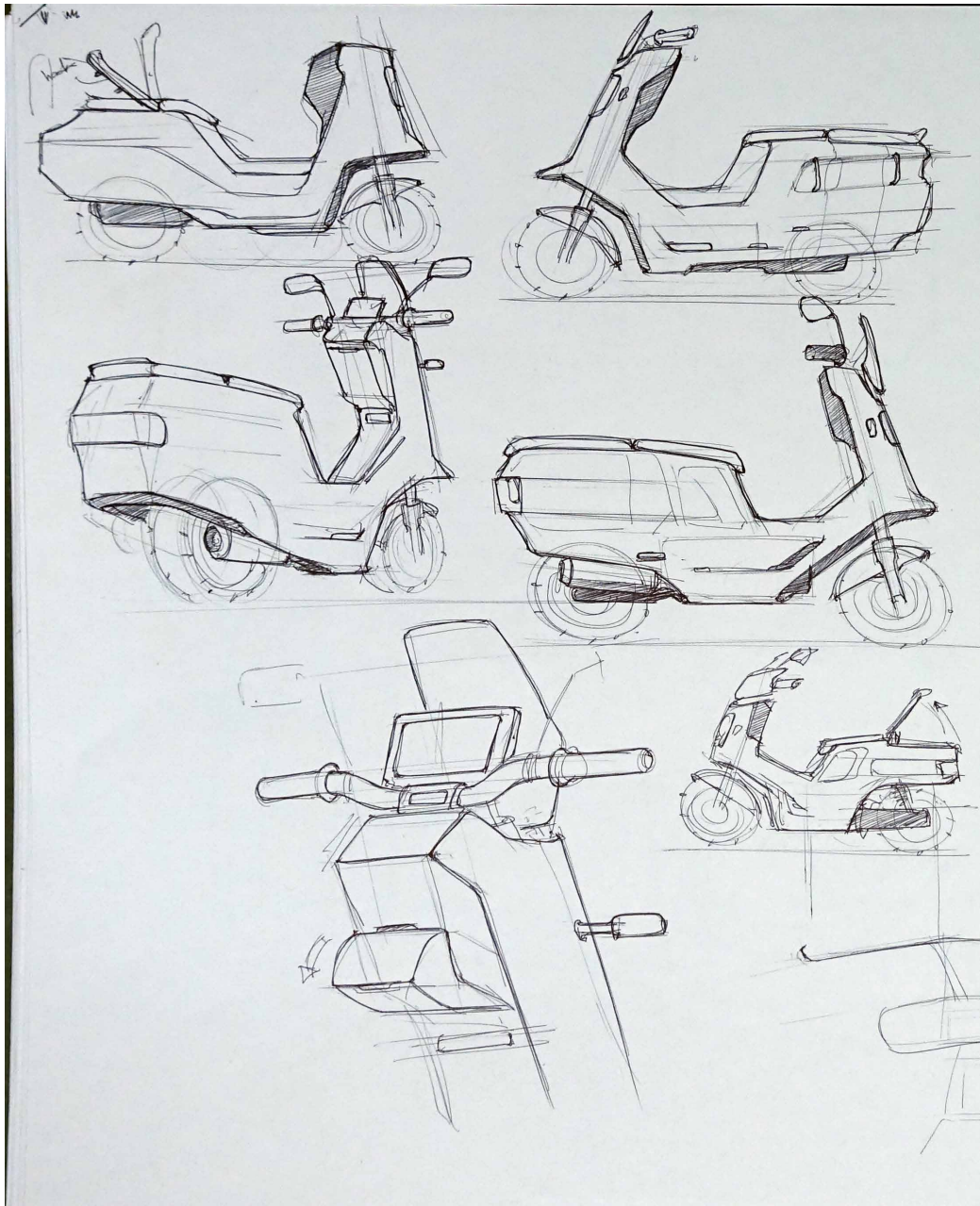
6.1 Modular storage





A modular storage system makes stacking of packages easier and the delivery personnel doesn't have to carry the entire weight of the box at all times with him. The compact storage box can be attached in front of the vehicle and even above the pillion seat.

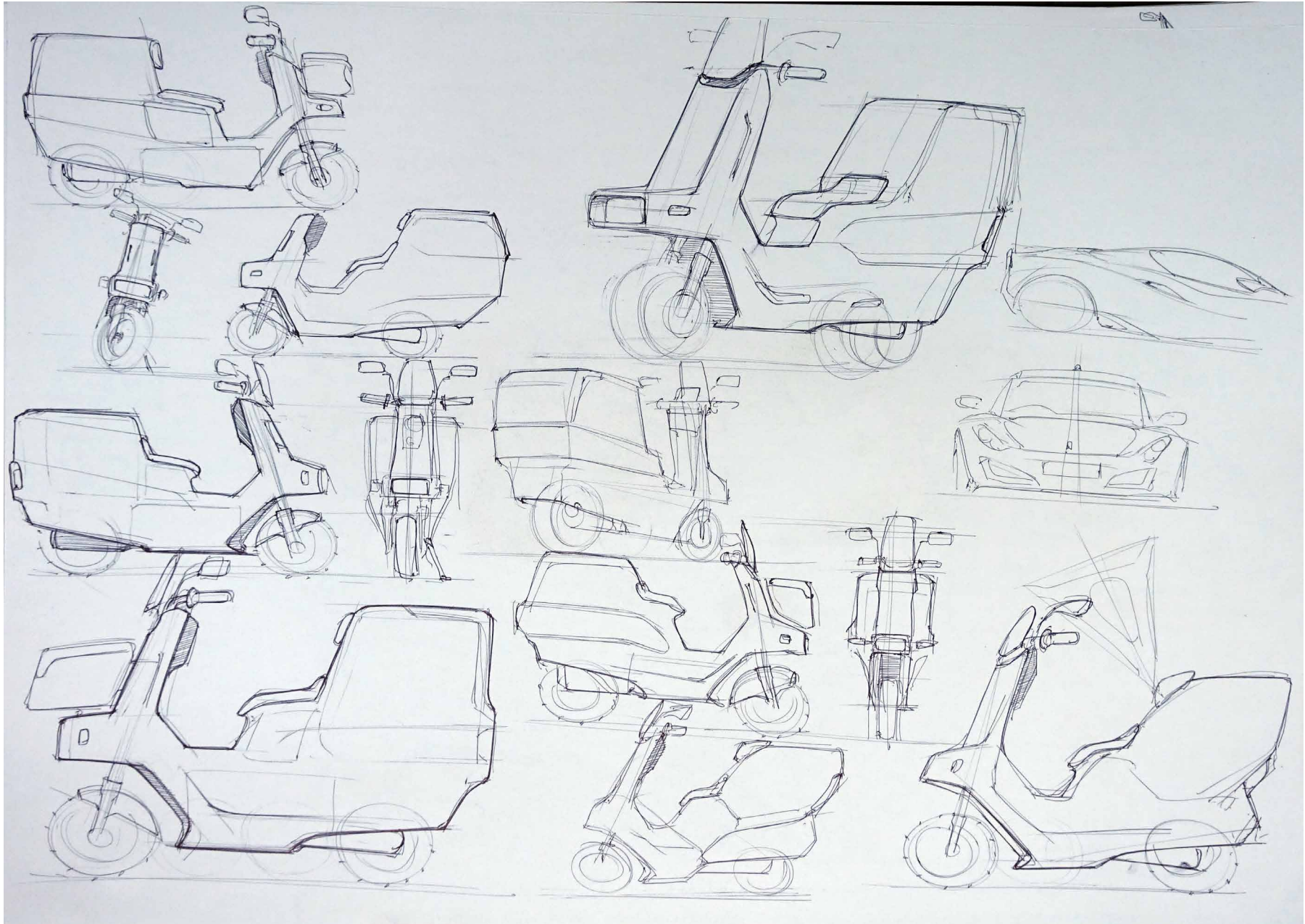
A collection of hand-drawn sketches of various motorcycle and scooter designs, arranged on a grid. The sketches include side profiles, front views, and rear views of different models, some with storage compartments or unique bodywork. The drawings are done in a loose, sketchy style with visible pencil or light ink lines. In the top left corner, there are some handwritten marks that look like 'X' and 'A' with asterisks.

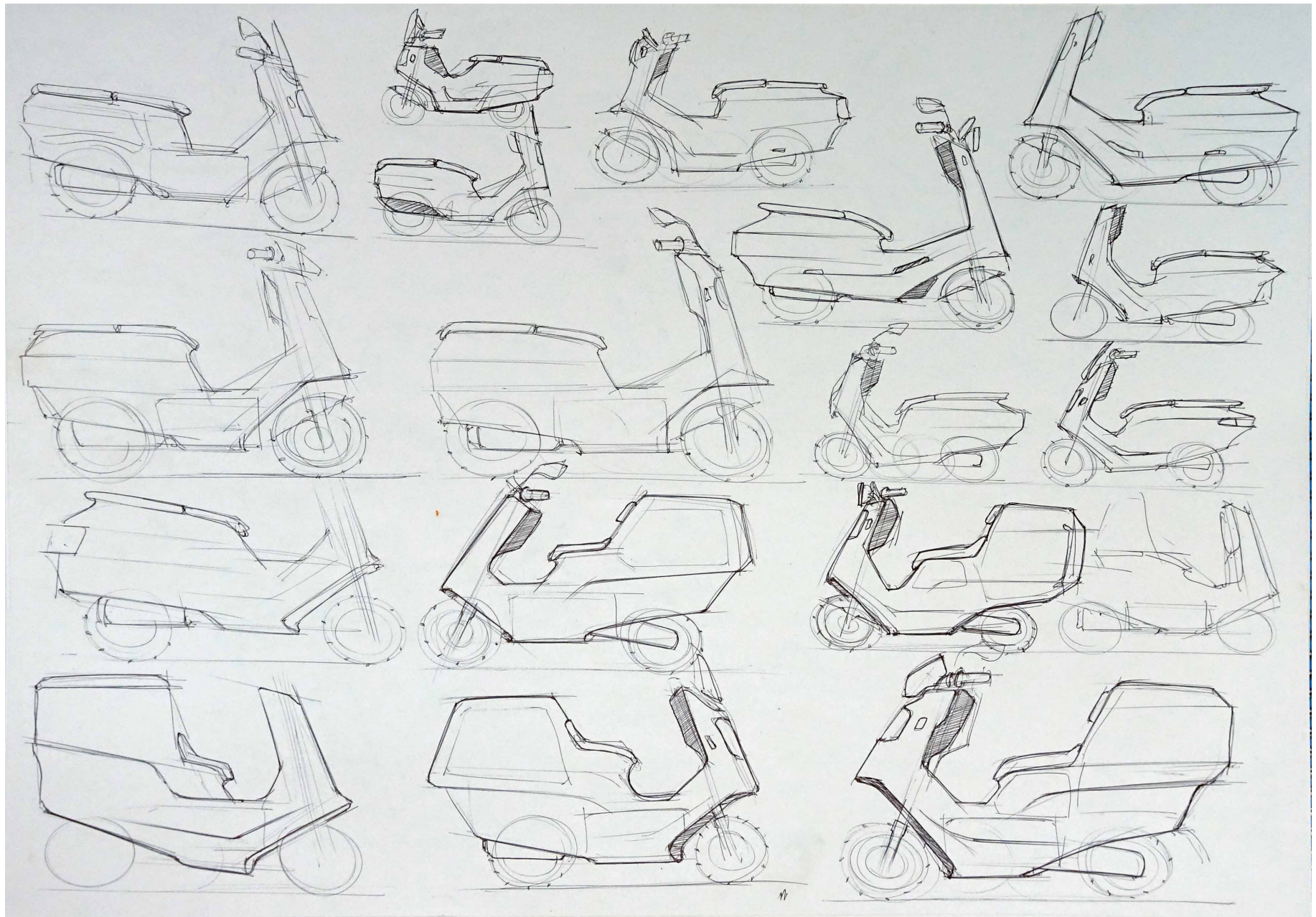


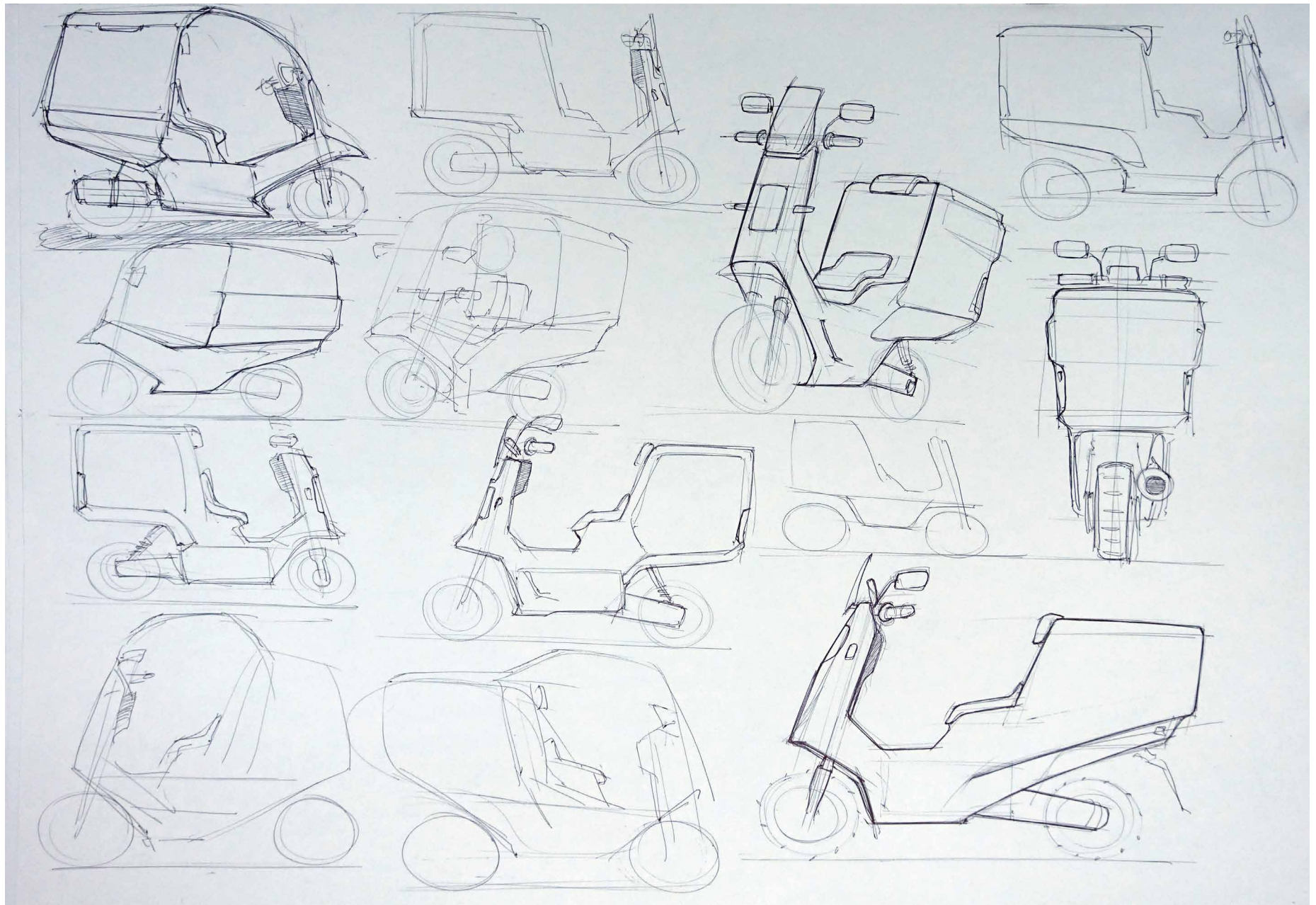
The scooter can be a multipurpose vehicle as well. The pillion seat can be folded up to act as a backrest for the driver and he can attach the bag to the hooks provided under the seat which also collapse into the seat cavity, preventing shifting of weight while negotiating a corner. This makes riding more comfortable.

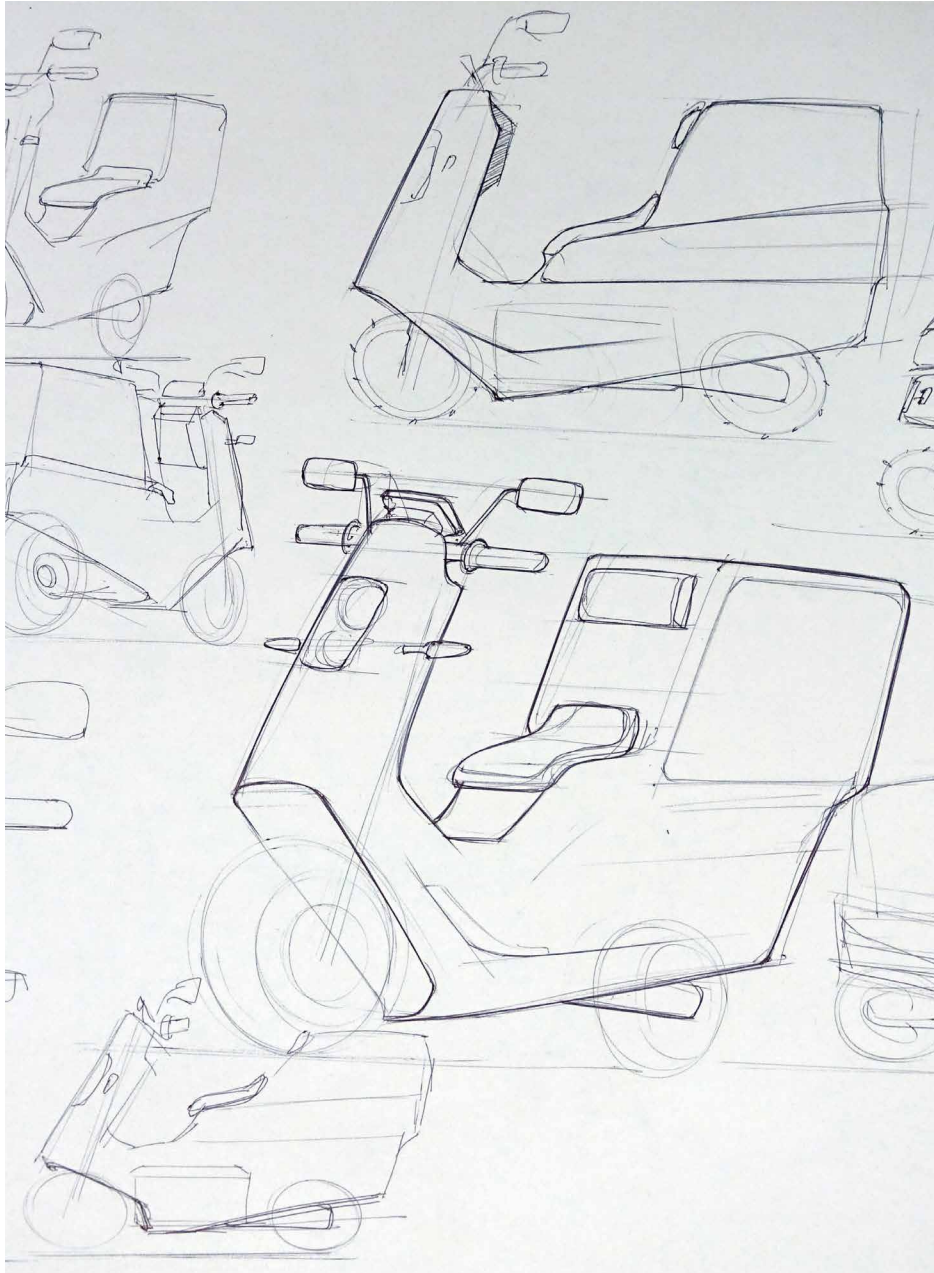
The front of the vehicle also have provisions to dock his phone and tuck it away. The phone display is replicated on an LCD screen on the dashboard area. The dock is a water proof compartment which simultaneously charges the phone as well.

6.3 Unified storage







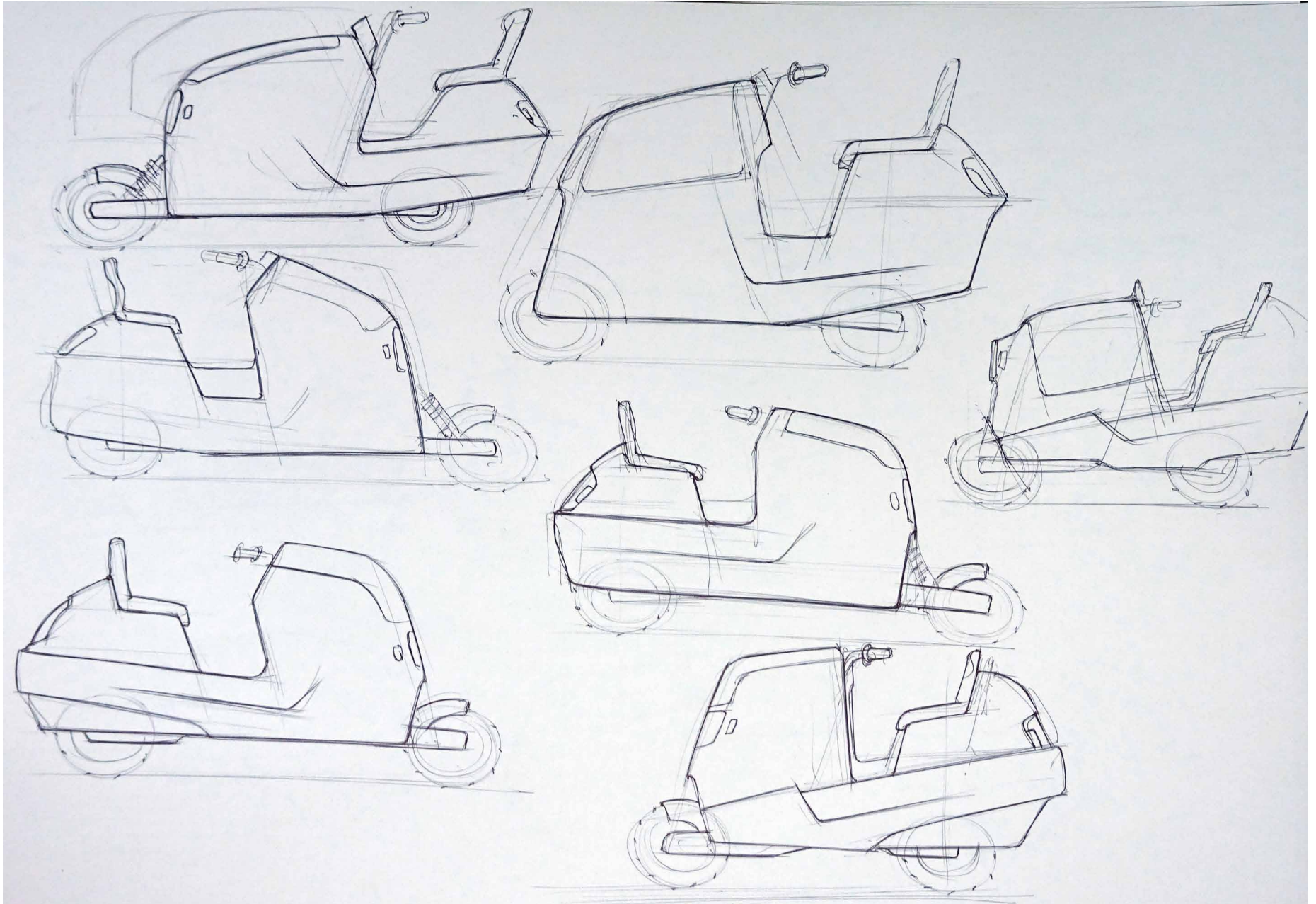


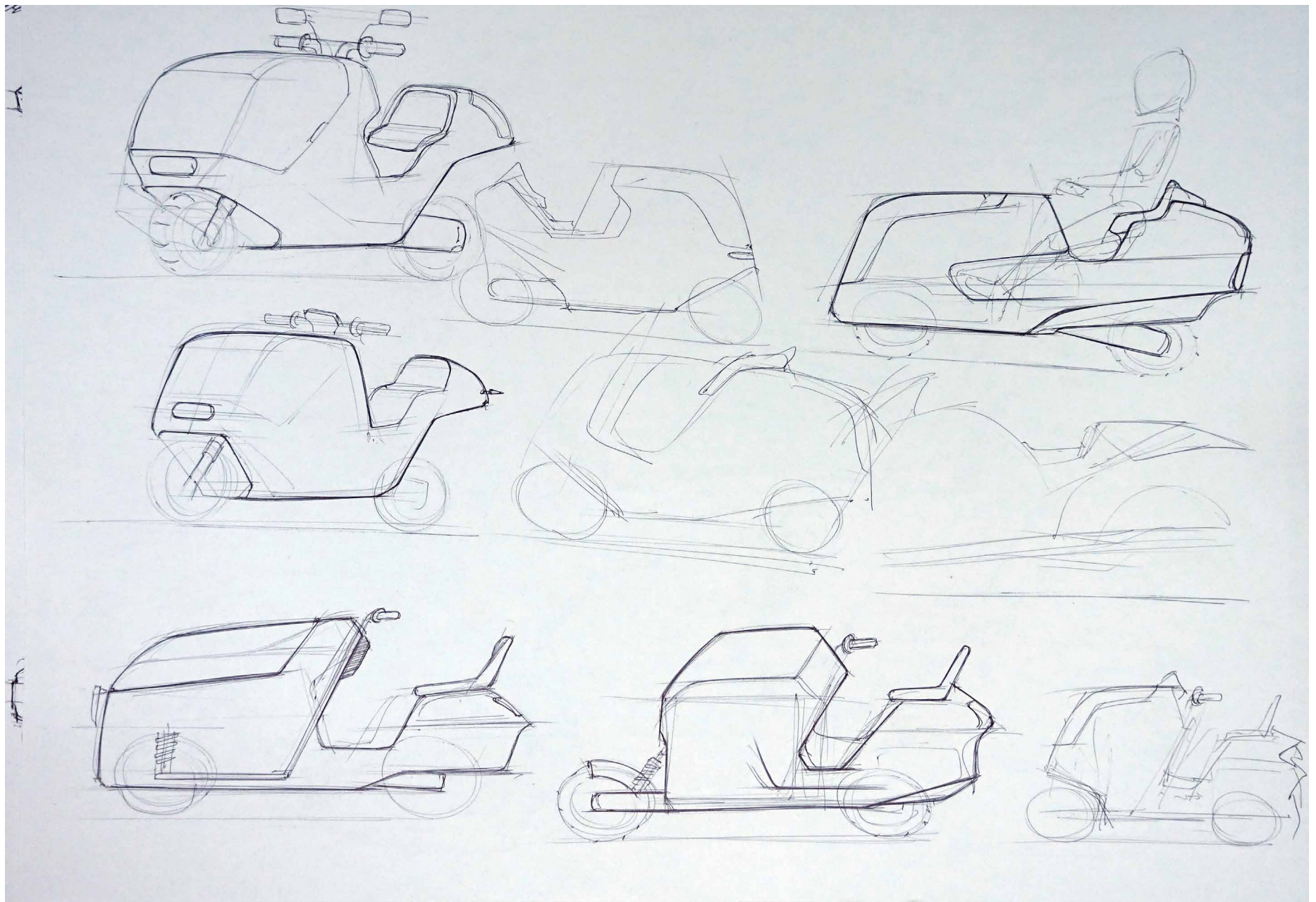
This consists of a large, single storage space in the rear instead of the pillion seat, thereby making it a single purposed vehicle. The large storage space means it can accomodate larger packages and they can be easily stacked as it won't shift or tumble in the box unlike the bags which the delivery personnel carry in.

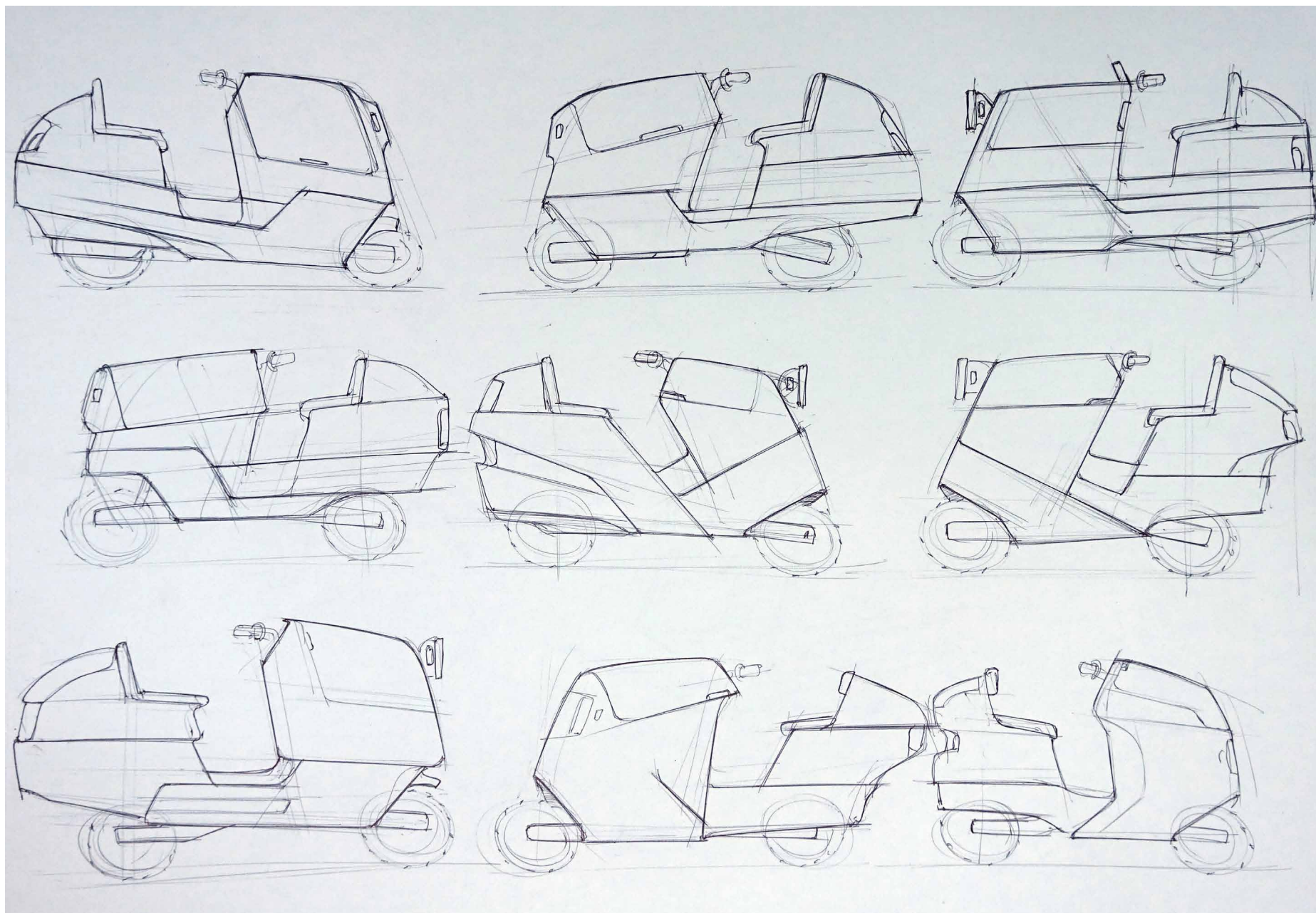
Also, a roof like structure can be attached to the top of the vehicle which has two purposes;

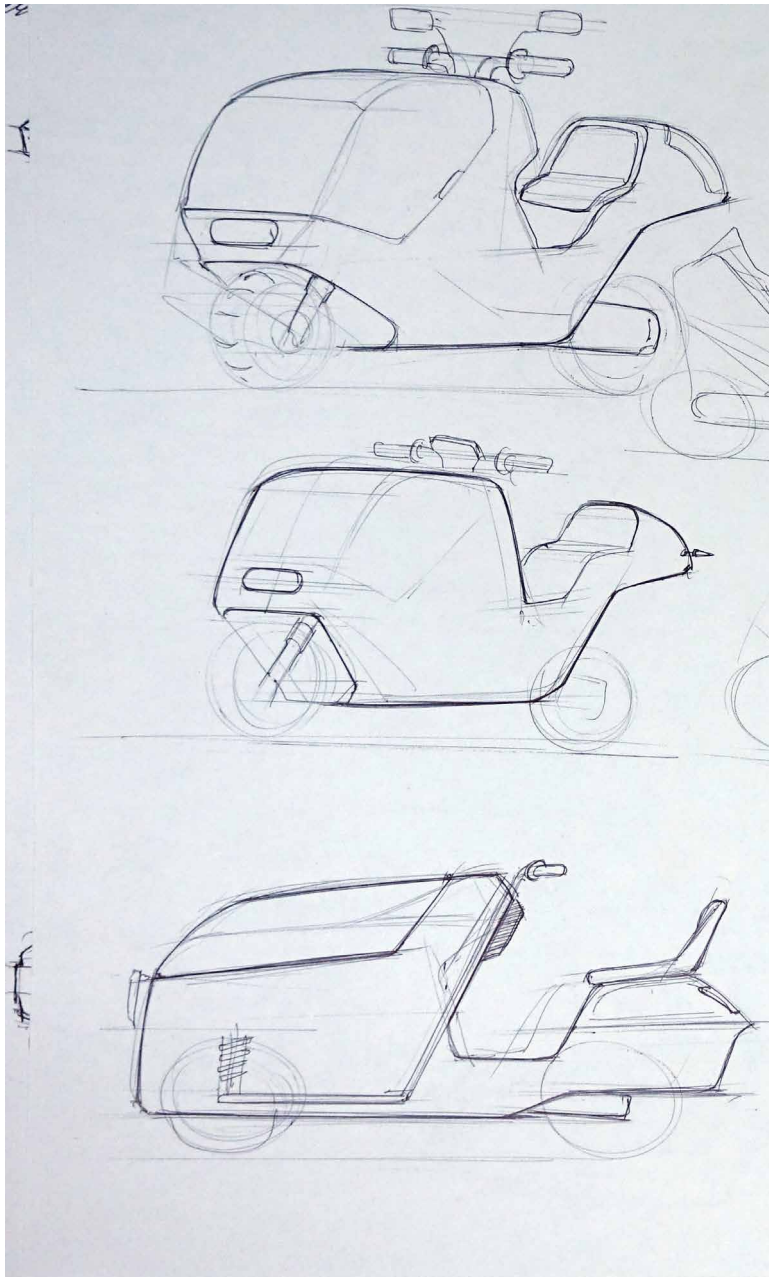
1. It acts as a sort of shade for the driver while riding under the hot sun.
2. Increases visibility of the vehicle even from a greater distance such that the customers can easily identify the vehicle.

6.4 Extended front







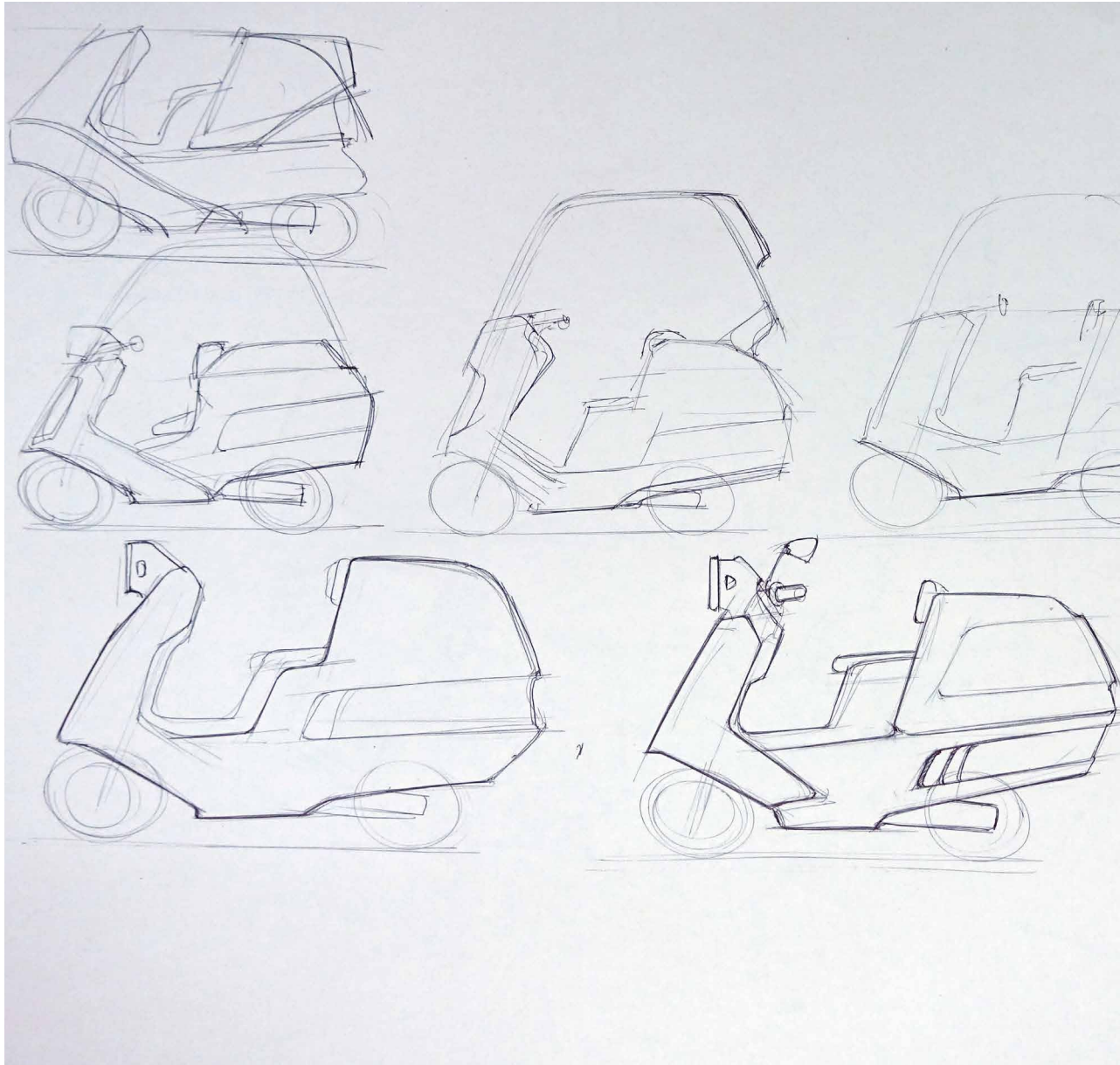


One way to accomodate a large storage space is to provide it in the front and offset the steering system with the help of linkages. The steering systems is now offset and there is a large amount of storage space now made available in the front.

Since the vehicle is quite low, it would be easier for the delivery personnel to use the top of the vehicle as a desk space, which can be expanded after opening the hatch.

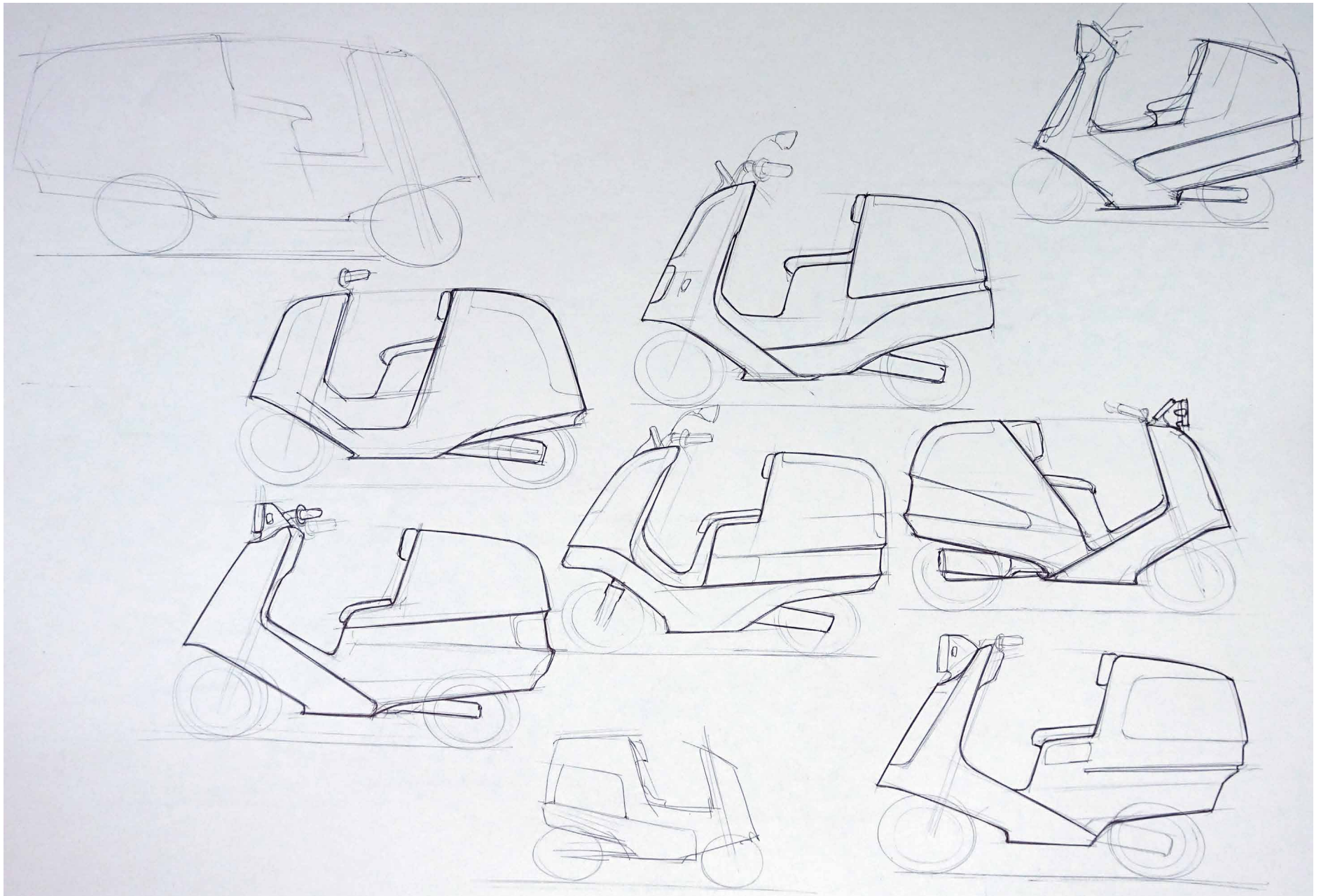
There is a small space behind the driver's seat which can accomodate something like a helmet or a bag.

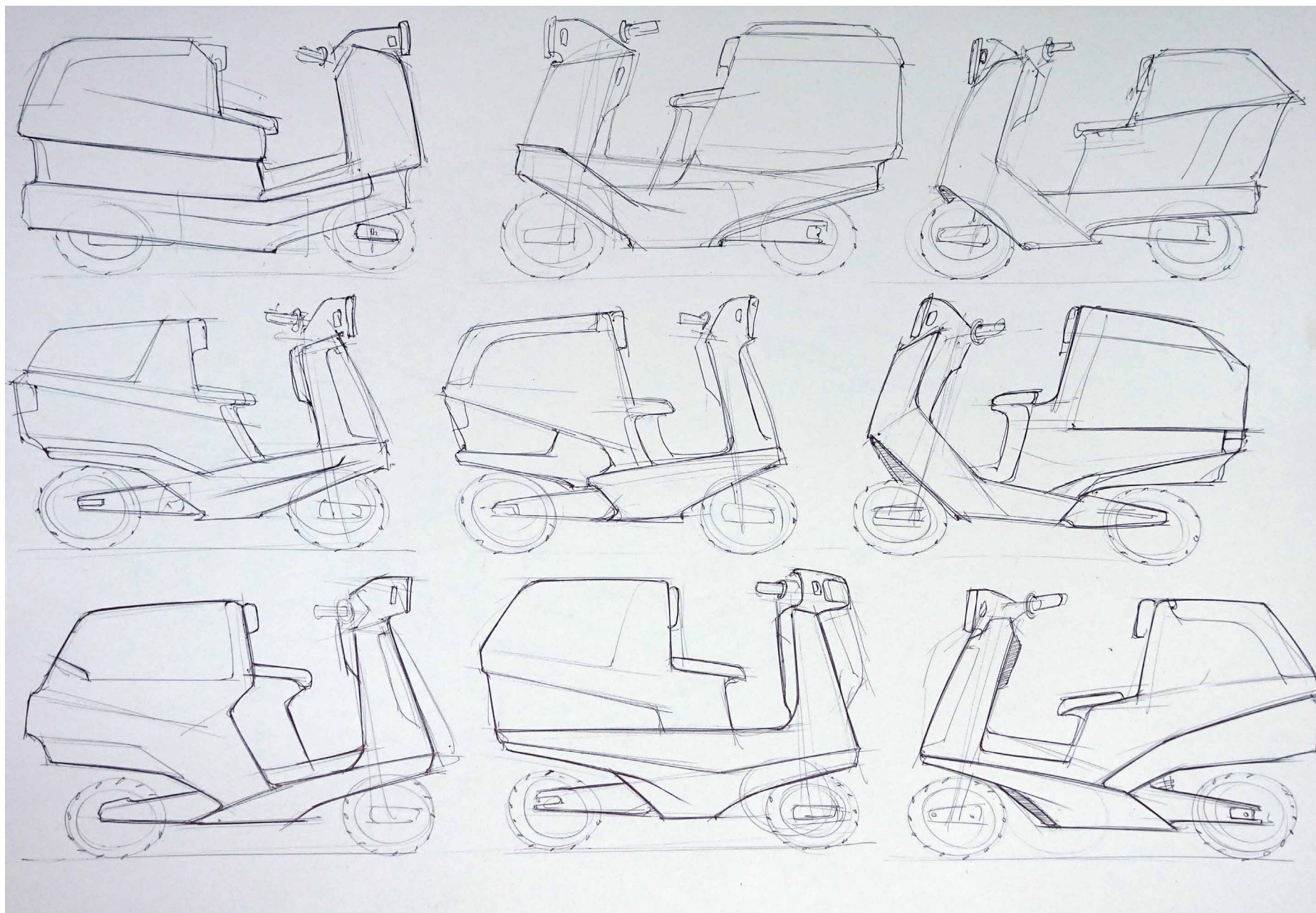
6.5 Split cargo space



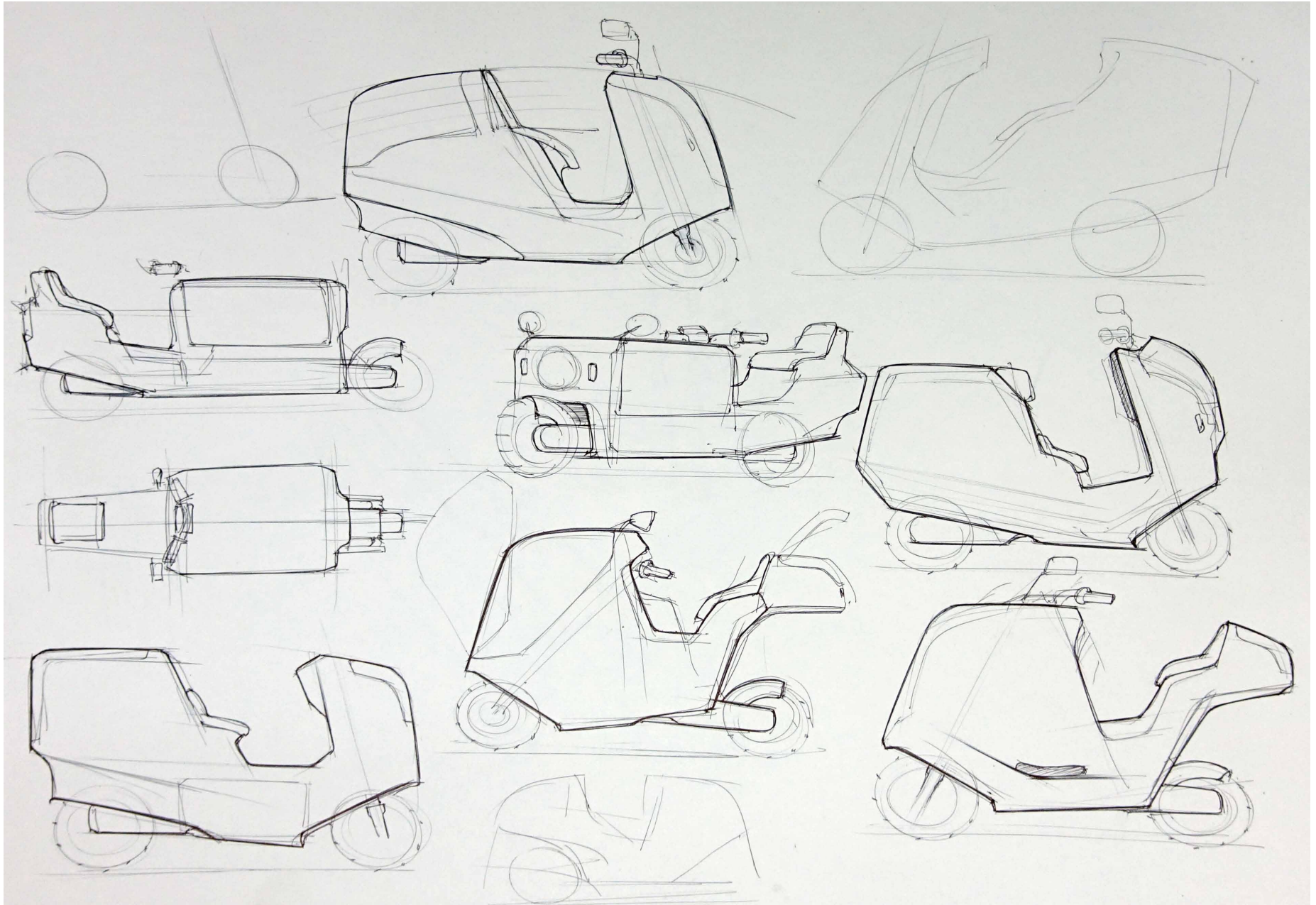
Splitting the cargo on the front and rear of the vehicle is a good way to balance the weight and hence make the ride easier for the driver.

A small hatch opens up in the front to store smaller packages which can be easily accessed while the rear space can be used for larger items.





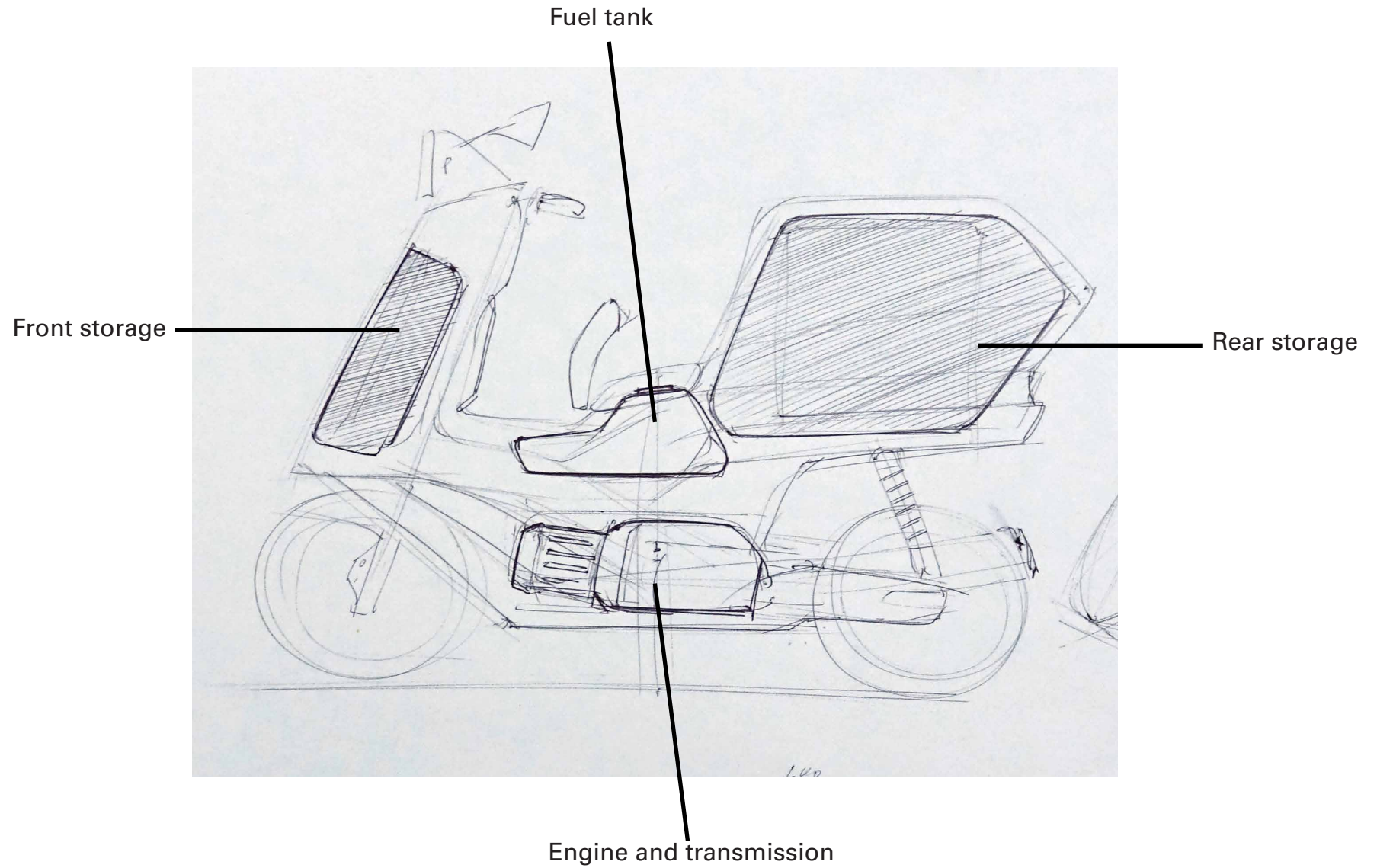
6.6 Alternative layouts



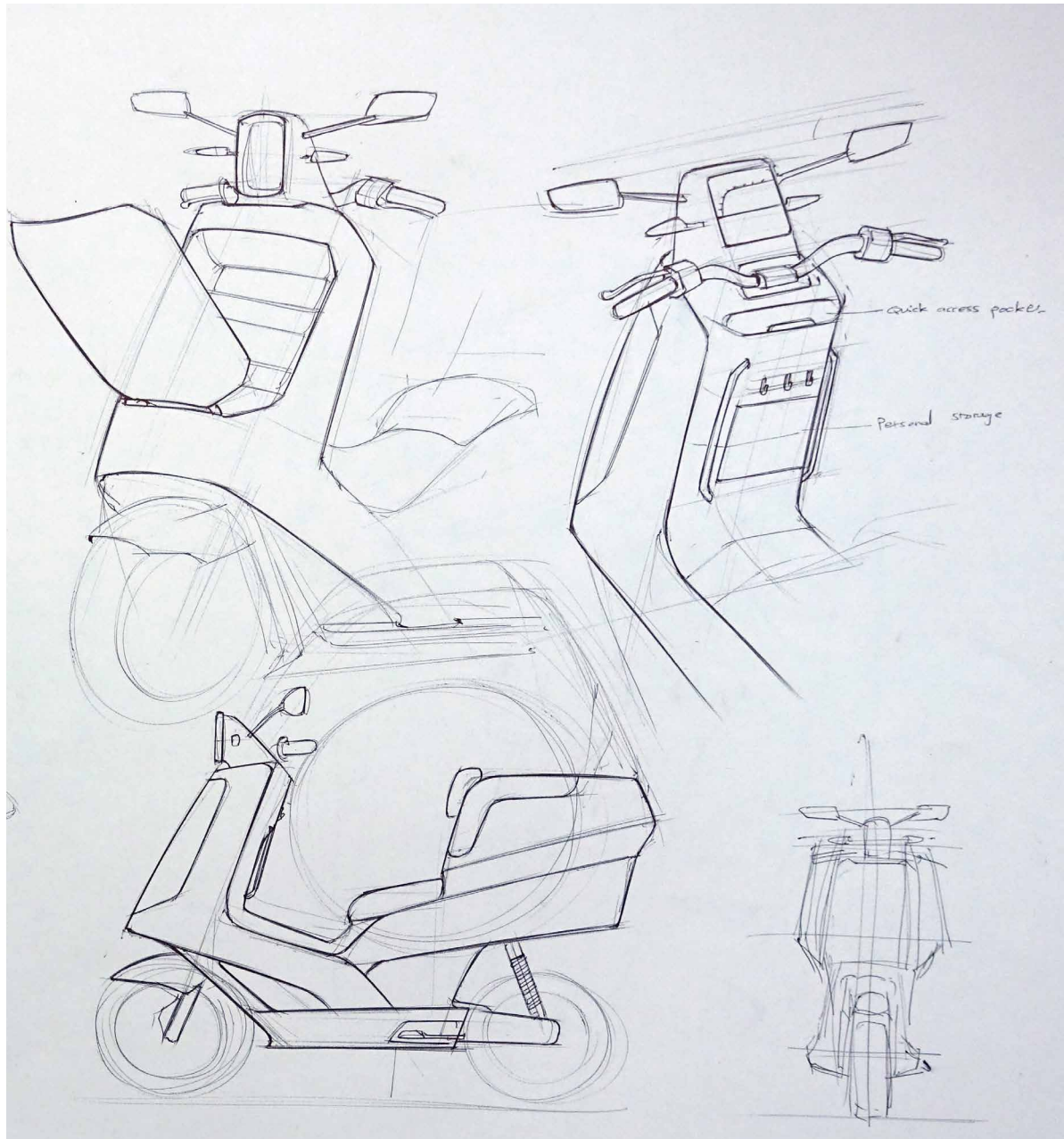
7. Concept

Most of the ideas that were developed during the ideation phase had many pros and cons. Some ideas were taken and merged into a single concept which was refined with a few iterations. A final render of the concept was made in Photoshop.

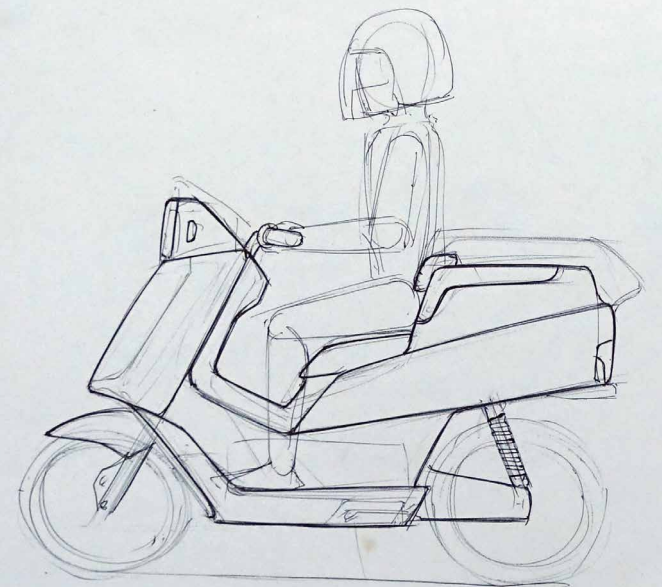
7.1 Packaging

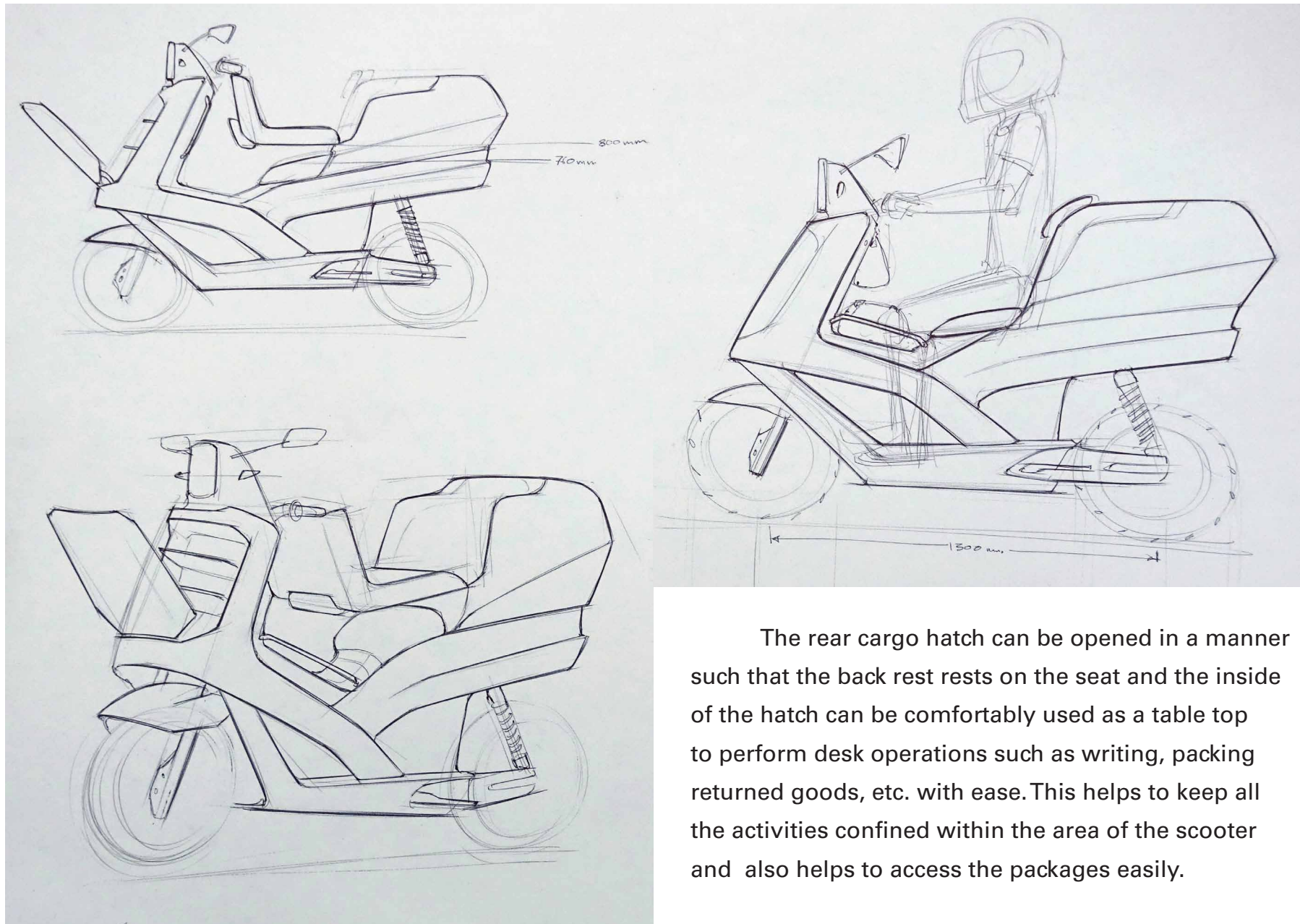


7.2 Details

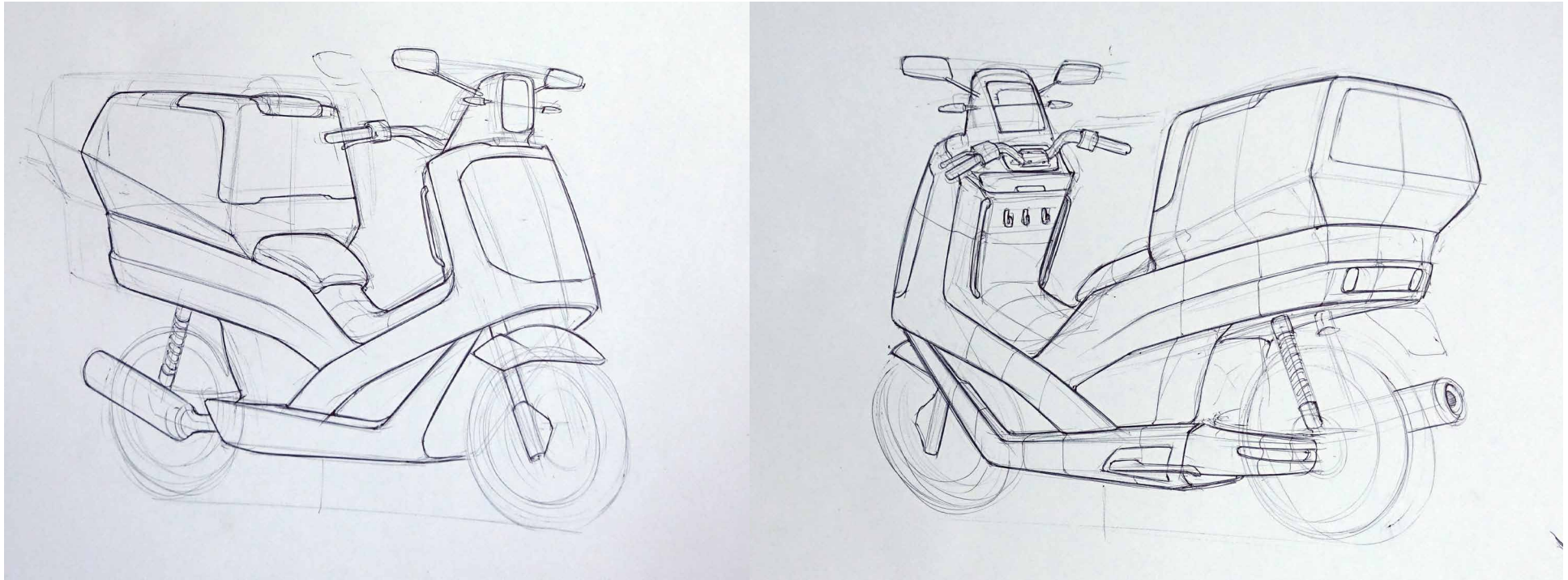


The user has comfortable access to storage compartments right in front while riding the scooter. There is a small section below the hooks provided to keep small personal things like a small bag, wallet, vehicle documents, etc. Above this there is a docking station for the phone which can be replicated on a secondary display below the instrument cluster.





The rear cargo hatch can be opened in a manner such that the back rest rests on the seat and the inside of the hatch can be comfortably used as a table top to perform desk operations such as writing, packing returned goods, etc. with ease. This helps to keep all the activities confined within the area of the scooter and also helps to access the packages easily.



The front and rear cargo space add up to a total storage volume of more than 100 litres which can comfortably accommodate the entire day's packages, with additional space to spare. In case there is shortage of space, the rider can easily place some packages by dropping the side rails provided and latching them near the seat to create an additional space for keeping stuff like a bag, helmet, etc. Hooks are also provided in case the rider wants to suspend extra bags or small packages kept inside polythene bags.

The phone can be docked right below the instrument cluster in a waterproof compartment, along with small documents. The phone's screen is replicated on a secondary display with the instrument cluster so that the user can access it without having to take his hands off the steering, thus eliminating the need of multitasking.

7.3 Final Render

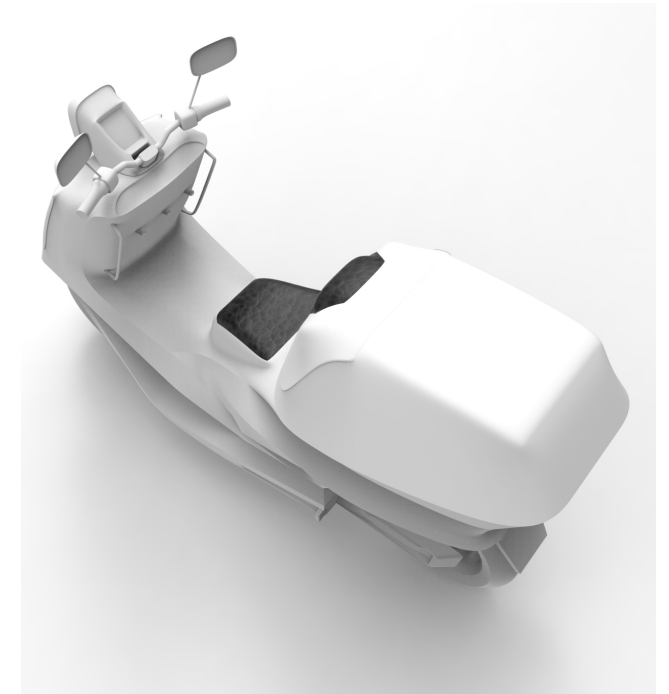




7.4 3D Model



The Final 3D Model was made in Alias and Speedform. Details have been added to show the various features of the vehicle. The model was finally rendered in Keyshot for a realistic feel.





8. References

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- https://en.wikipedia.org/wiki/Amazon_Prime_Air
- <https://www.youtube.com/watch?v=96PJdbJysxQ>
- Image source: images.google.com
- Map source: maps.google.com