redesign of moped
diploma project
sudhir atreya
industrial design centre

Approval Sheet

Diploma Project Entitled

R E D E S I G N O F M O P E D

By SUDHIR KUMAR ATREYA is approved for the Post - Graduate Diploma in Industrial Design.

Guide:

(Shri K.MUNSHI)

Chairman:

Examiners:

C O N T E N T S

1. PROBLEM SELECTION

(I Meeting)

Anyone of the existing product problems could be taken as an academic project of three months. Being personally interested in vehicles I decided to go for a two-wheeler. The most serious problem that the vehicles of today face is the fast increasing prices of fuel. In two wheelers petrol (gasoline) is the most commonly used fuel. Mopeds consume minimum petrol as they are light and low powered vehicles. So they could be very popular among the day-to-day users. But unfortunately in Indian markets mopeds are not sold well. They are very rarely seen on roads. Most of the two wheeler users are young males and due to some reasons they prefer to buy motorcycles or scooters. So the project started with " converting the possible buyers of scooters and motorcycles into the possible buyers of mopeds " as the basic objective.

2. PROJECT BRIEF

It was decided to give riding comfort the priority. Other design aspects to be considered were visual appeal, functional improvements and, ease in production and maintenance.

3. INFORMATION & DATA COLLECTION:

Users' survey, market survey and other such information was to be collected and used. The other sources of information were books, magazines, codes, catalogues, reports, and, dialogues with the manufacturers and designers.

It was decided to conduct such surveys before starting the actual design and to be in touch with the users and designers through the project duration. It was found that working for some time with a two-wheeler-machanic was the best way to be in touch with the users and their day-to-day problems. It also gave an idea about the various spare parts and functional solutions in various vehicles.

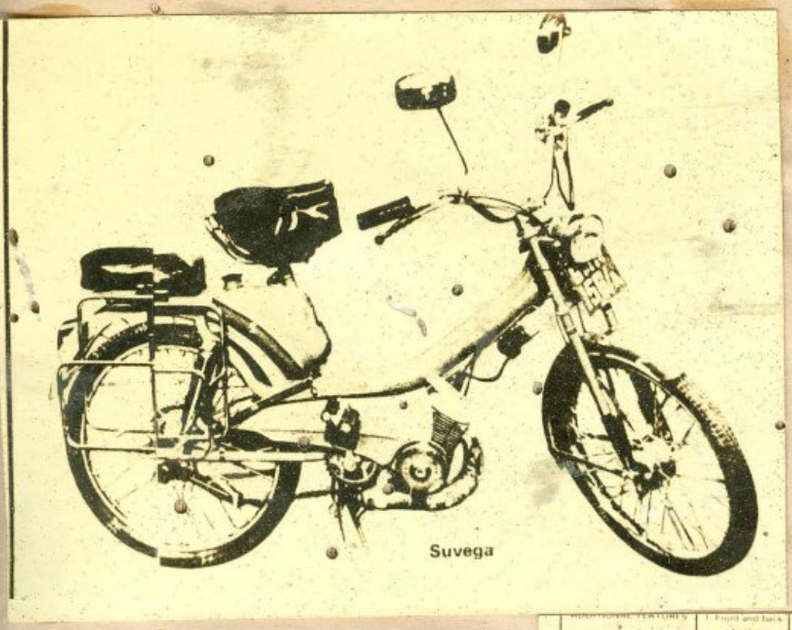
The important findings in various surveys are mentioned below. For detailed information, please see Annexure 7.1 to 7.4.

3.1 USERS SURVEY:

Users thought that the mopeds were meant for ladies and old people. A man riding on moped looked ungraceful.
They also complained about their low power and speed limits. While going up the slope, the rider had to support the engine by padels.

3.2 MARKET SURVEY:

The dealers thought that mopeds looked too light and cheap. Otherwise they could be very popular. According to them, the young people demanded for some heavy looking machine. They were grace-concious.



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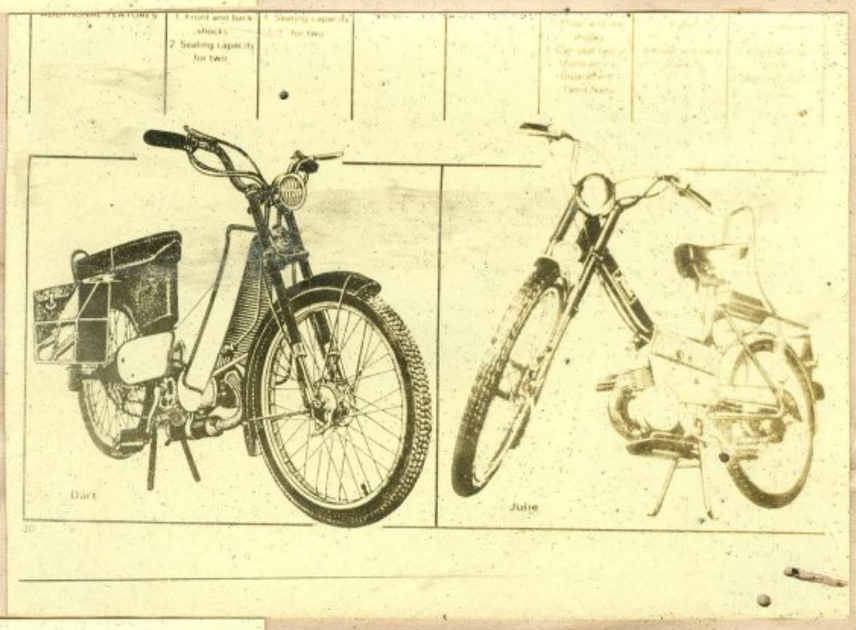
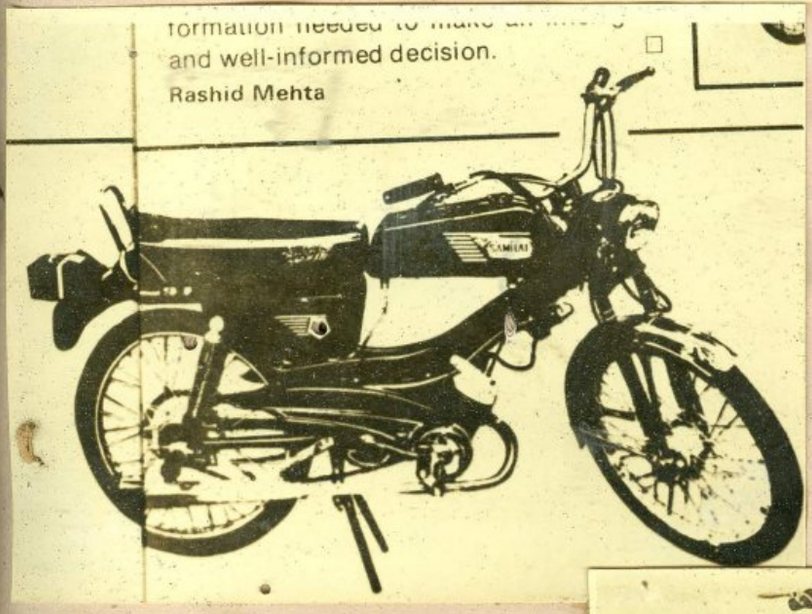


Dart

Julie

formation needed to make an informed and well-informed decision.

Rashid Mehta



Riding a moped costs you only a little more per kilometre than travelling by public transport.

3.3 MAGAZINE REPORTS:

According to which magazine (pl.refer annexure 7.4) in the heavy traffic of towns, a moped is likely to be atleast as quick as a motorcycle (if not quicker), and both will certainly be quicker than bus or car.

The mopeds were found to be little affected by side winds.

None of the mopeds had flashing direction indicators, so the sides had to give hand signals.

3.4 BOOK REPORTS:-

The torque that the engine delivers can be varied only within narrow limits. For this reason this is necessary to be able to alter the transmission ratio, so that the driving forces applied to wheels of the vehicle can be adopted to the varying road conditions.

3.5 AUTOMOTIVE PRODUCTION REPORT(STATISTICAL YEAR BOOK)

Definition of moped is a bicycle designed with an integrated gasoline motor to power generally the back wheel.

It may or may not have auxiliary pedals.

India, one of the world's most populous and poorest countries had a vehicle population of 2.3 million in 1974.

Out of them 4.7% were mopeds.

In the list of Indian automotive production the expected demand and therefore the target for the production of mopeds was likely to hit 130,000 in 1978.79, while it was 29,400 in 1974.

3.6 MANUFACTURERS' REPORT:

The current legal definition of a moped is a machine with an engine capacity of not more than 50 cc, and a maximum design speed of 30 mph. Most mopeds have pedals(though

COMPARATIVE STUDY OF INDIAN MOPEDS & MOTOR CYCLES

Based on users' survey
Approximately 8 users for each vehicle

	LUNA	LAXMI	SUVEGA	RAJDOOT	JAWA	BULLET	YEZDI 60
PERFORMANCE	3. Trouble on slopes - good starting	2. Trouble on slopes - bad starting.	4. less trouble on slopes bad starting(troublesome)	4. No trouble on slopes -good starting.	4. No trouble on slopes good starting.	5. Very good on slopes - good starting	2. Trouble on slopes bad starting
HANDLING	2. Poor in side winds -bad in sand and mud light riding and steering	2. Poor in side-winds bad in mud and sound light riding and steering.	2. Poor in fast winds bad in mud or sand light riding and steering	4. Good ride in all winds good on road, bad in mud steering & riding good.	5. Good ride in all winds good in all sound & mud steering and riding good.	3. Good ride in all winds bad in mud steering and riding	3 Bit trouble some in wind heavy in mud & sand steering & riding good.
BRAKING	4. Good braking more force required.	4. Good braking more force required.	4. Good braking more force required.	5. Good braking less force required.	4. Good braking more force reqd.	4. Good braking more force required.	4. Good braking more force required.
COMFORT (Seat, Vibration, Ride)	2. Seat not comfortable vibrations not much high riding jerks	2. Seat not comfortable vibrations not much high riding jurks	2. Seat not comfortable vibrations not much high riding jerks	5. Seat comfortable very less vibrations no riding jerks	4. Seat not comfortable not much no riding jerks	4. Seat not comfortable not much (no) riding jerks	5. Seat comfortable not much riding jerks not much
CONVINIENCE (stand, carrier, tool box)	3. Good & easy stand no proper carrier no proper tool box	3. Easy stand no proper carrier no proper tool box.	3. easy stand no proper carrier no proper tool box	5 Easy stand good carrier good tool box	5. Easy stand good carrier good tool box	3. Good carrier and tool box not good stand good	2. Not easy stand no good carrier bad tool box
MAJOR CONTROLS brake, thrittle, gears	2. Brakes O.K. problem governor not good	2. Brakes O.K. problem governor not good.	4. Brakes good problem good clutch system	4. Brakes good no problem O.K. bill not v.good	4. Brakes good no problem o.k.but not v. Good	tool box. 4. Brakes good no problem O.K.but not v. good	2. Brakes O.K. no problem gears troublesome
MINOR CONTROLS & INSTRUMENTS switches, choke, speedometer.	3. Not properly placed.	1. Badly placed	2. Badly placed	4. Nicely work and well placed.	5. very nicely work and well placed.	4. Nicely placed and work well.	4 Nicely placed and work well
LIGHTS AND HORN main beam dipped beam brake light indicator horns	1. Beam powerful no good brake lights no indicators home not well	1. Beam not powerful bad brake lights no indicators not well.	1. Beam not powerful bad brak lights no indicators home not good	2. Beam quite powerful bad brake lights no indicators home not powerful.	3. Beam quite powerful bad brake lights no indicators home O.K.	4. Beam very powerful good brake lights good indicators home very powerful.	2. Beam weak - bad brake lights no indicators home weak at slow speed
ECONOMY petrol range on full tank reserve range front type life back tyre life servicing interval	4. Very economical fuel reserve range good less type life servicing less	3. Economical fuel reserve range good less tyre life servicing more.	3. Economical fuel reserve range good less tyre life servicing more	5. Economical fuel reserve range good good tyre life less service and maintenance	3. Not economical fuel reserve range good less tyre life less service and maint.	4. Not economical fuel reserve range good less tyre life servicing range	4. Economical fuel good reserve range good tyre life very much servicing.
TOTAL	24	20	25	38	37	35	28

they no longer have to), a step through frame(as on a ladies bicycle), and are designed to carry only one person.

Most have an automatic clutch and cost around Rs. 3000/- Manufacturers also seemed eager to break the present image of the moped. Amongst the other changes demanded was the need to have a seat for two persons.

3.7 STUDY LAYOUTS:

A graphic chart was prepared to identify the good as well as bad points of the existing vehicles. Users' survey results were used for this purpose. This chart was very much helpful in understanding the problems and solutions of various two wheelers.

3.8 INFORMATION ANALYSIS & INVESTIGATIONS:

After all this general information was collected, the actual investigation into the riding comfort started. People riding on their own vehicles were photographed as they went by the road. Then in the enlarged photographs, their postures were studied, various angles between limbs and other body parts were measured. The heights and other dimensions were measured from photographs and the actual vehicles.

This threw light on to some new problems. Different people adopted different postures on the vehicles. It helped in understanding the flexibility and limitations on a vehicle.

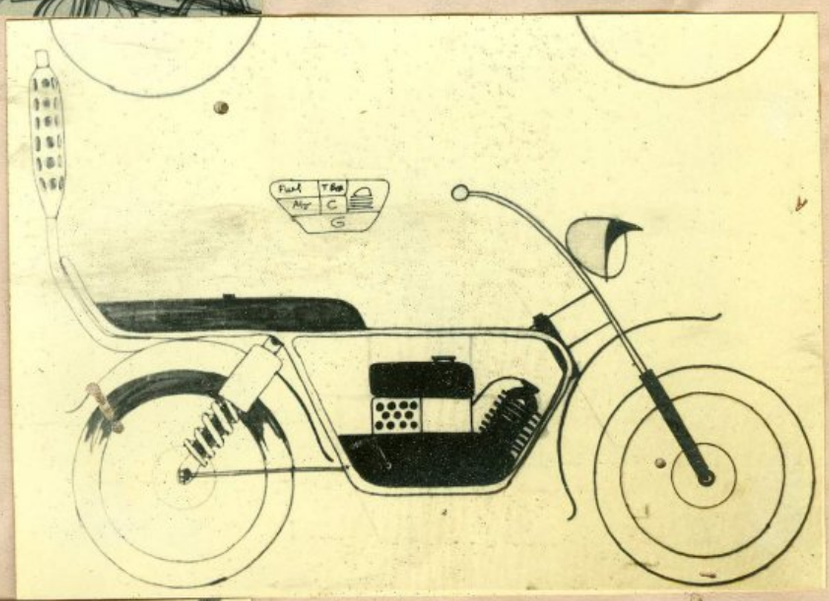

VOTE

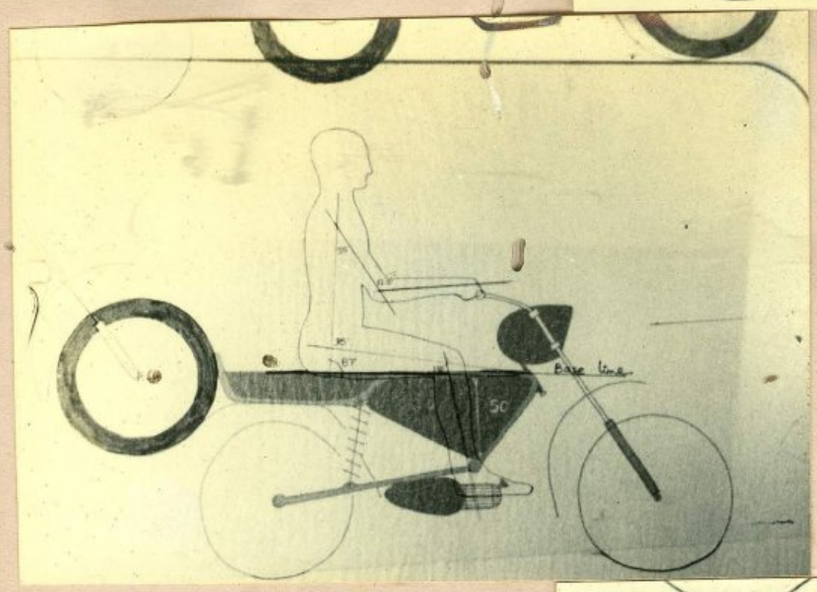
Discussions were held with users and designers about the comfortable postures. The available ergonomics data was used and a rig was made to stimulate riding postures. People of various hights were asked to sit and use the steering and foot rest. They were photo - graphed and measurements were taken on the spot when they felt comfortable.

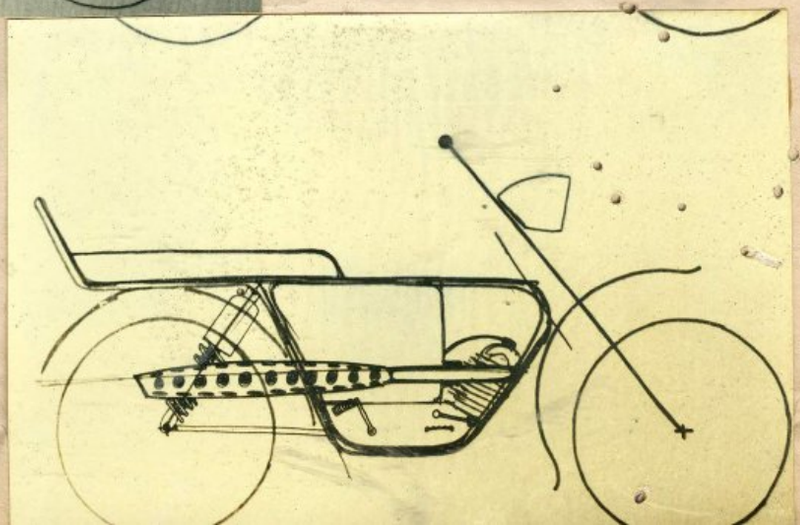
Similarly grip dimensions and handle grip angles were studied and openions of users were taken in this regard. Then the bumps were studied with respect to the Indian-road-conditions and existing vehicles. Vibration trans-mission from the engine to the seat was also attended to.

These are certain neglected problems in many existing vehicles.

One of the main problems was the swinging chain conne-ction between the engine and rear wheel. It was found that bump transformation and vibration transmission have not been given due attention, though all types of shock-absorbers have been used. Almost in all vehicles the engine and seat were mounted on the same shaft which resulted into direct transmission of engine vibrations, to the seat.







4.0 DESIGN METHODOLOGY.

4.1 APPROACH (II MEETINGS)

The approach part of the project was started with an open mind, ready to accept any change. Initially the basic constraint was to have a vehicle on two wheels powered by a 50 cc. engine and controlled by a so called rider. Gradually the field and requirements were narrowed down.

Rough sketching was also started at this stage. It was overlapped by the detailed study programme which was essential at this stage (see 3.8)

These sketches gave a vague idea of how the product could look.

4.2 DESIGN OPTIONS:

Since the moped users had not used pedals as bike riding, they could be avoided, if we could provide a footrest and increased power while going up the slopes. Introducing a gear box and removing the padels was one of the solutions. Thus the unnecessary height of the moped could also be reduced resulting into a more stable vehicle. In this way the stability complaing lodged by the moped users under "which" magazine survey could be rectified(p.see 7.4)

As stated under " Approach ", the vibration transmission problem could be solved by separating out the engine and seat from the same shaft. One alternative, and probably the best, could be to mount seat separately, and to let the engine and wheel be mounted together. This solution was also to solve the other problem of chain swinging.

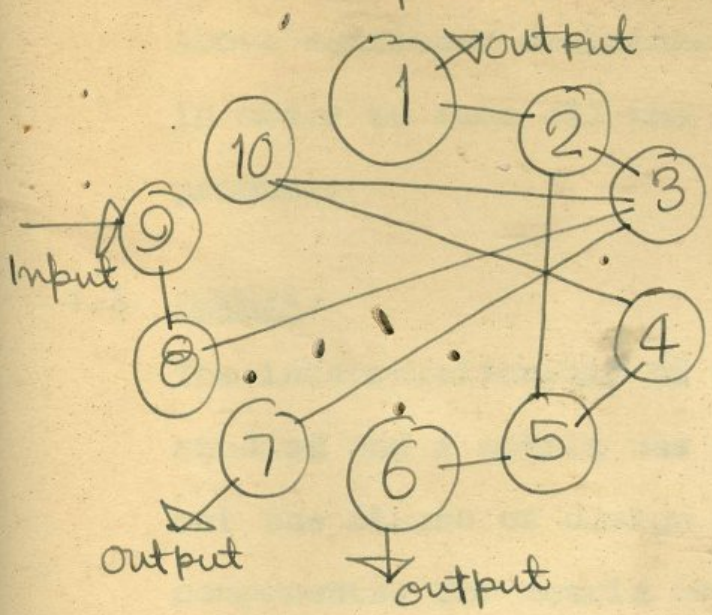
MATRIX :

Relationship chart I.:—

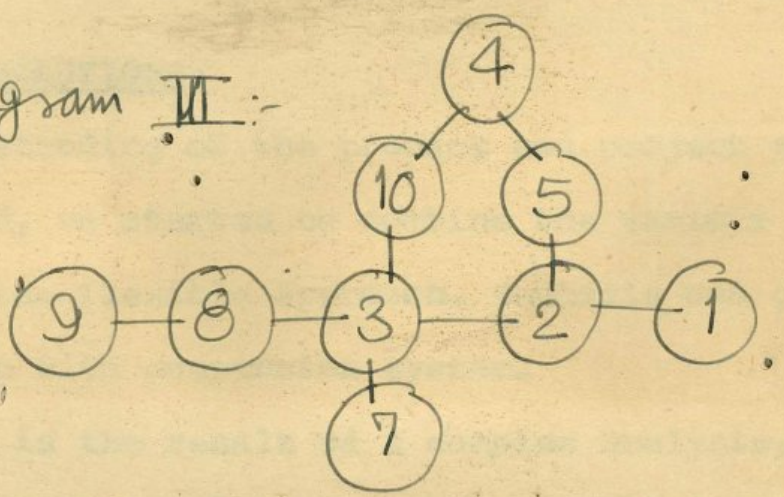
		1 WHEELS	2 GEAR BOX	3 CILENDER	4 IG. COIL	5 DYNAMO	6 LIGHTS	7 EXHAUST	8 CARBURETTOR	9 PETROL TANK	10 SPARK PLUG
1	WHEELS										
2	GEAR BOX	0									
3	CILENDER		0								
4	IGNETION COIL										
5	DYNAMO		0		0						
6	LIGHTS					0					
7	EXHAUST			0							
8	CARBURETTOR			0							
9	PETROL TANK								0		
10	SPARK PLUG				0	0					

Contd

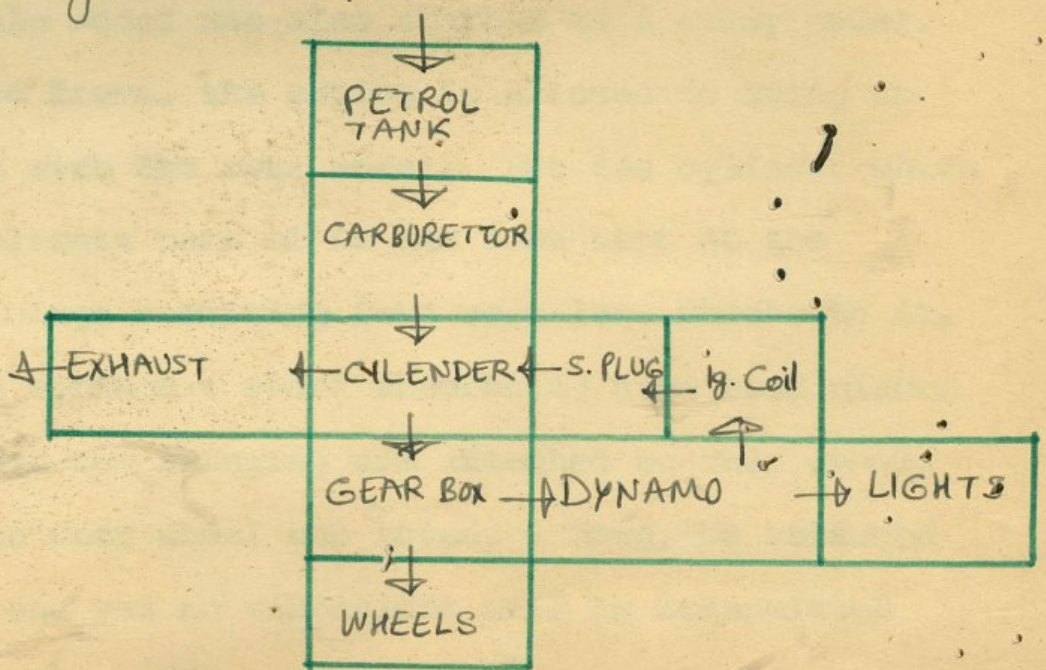
Relationship chart II:-



Relationship diagram III:-



Relationship diagram IV:-



Above mentioned decisions were taken and field separately in order to fuse all the solutions into an integrated product.

4.3 METRIX:

The interrelationship of various functionsl parts was studied and a metrix was prepared. This helped in planning out the stages of design and arrangement of various components. The metrix helped to reduced the length of the fuel pipe and that of electrical connections.

4.4 SYNTHESIS: DESIGN SOLUTIONS:

After a full understanding of the product and project programme was achieved, we started to combine the various decisions with a wide flexible approach. Emphasis was given on the frame design with suspension system.

The designed frame is the result of a complex analysis. Some intermediate scale models were made that helped in visualising the three diamensional product. Initially the final full scale model was also started as a study model.

In the designed frame, the engine is allowed to swing up and down along with the rear wheel. But the cylinder which is the most delecate part of it has been kept at the centre of the hinge resulting into very less shocks to it. The suspension springs (shock absorbers) have been placed between seat and the swinging arm attached to rear wheel. In this way the rear wheel can moveup & down, be attached to the engine and yet no vibrations will be transmitted from engine to the seat.

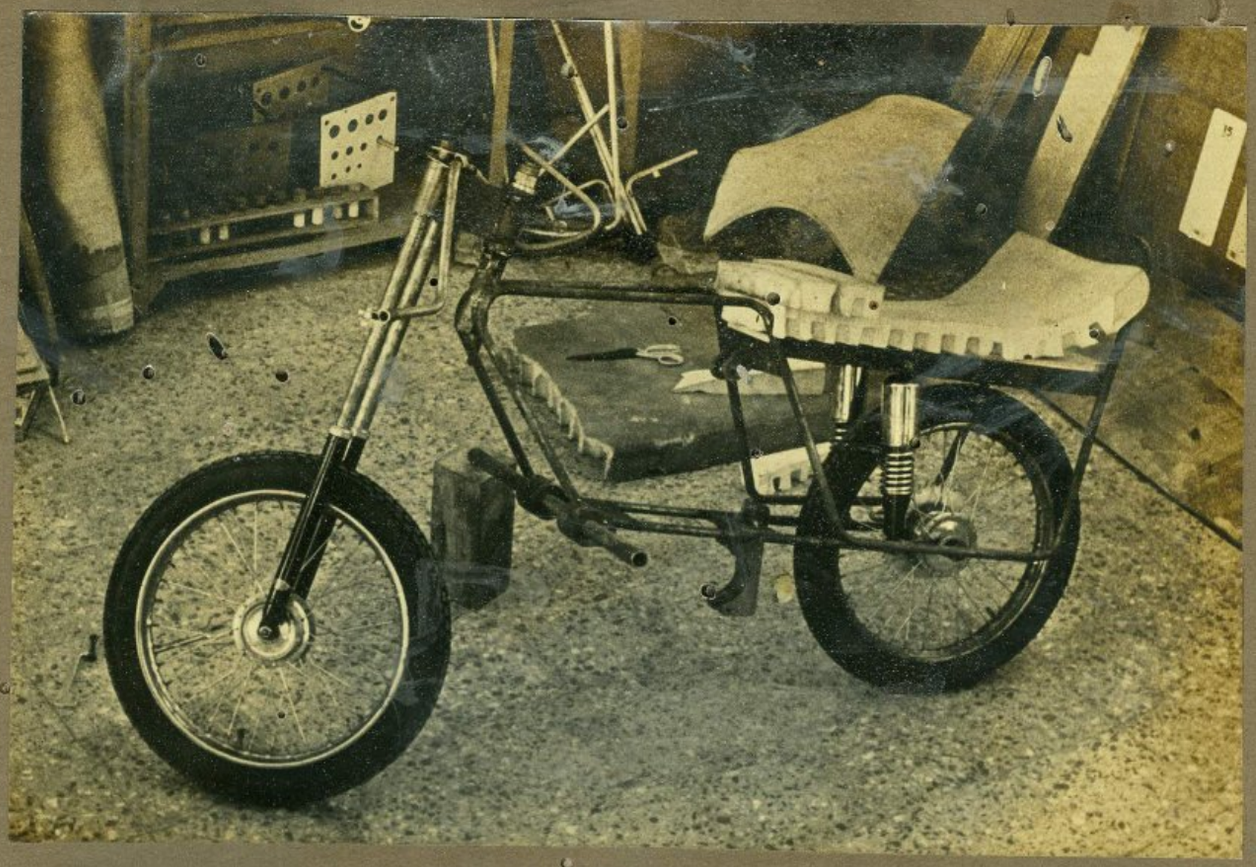
It was decided to place the engine below the wheel centres so that the moped may become more stable. A decision was taken to reduce the diameter of wheels. It was necessary to reduce the seat height and the total height of the moped 16" x 2.5" tyres were choosen to be fitted as they suited the requirements and are also easily available.

For demonstrating the sketches, two-dimensional dummy model of three Indians (shortast 5'-0"; medium 5'6", and tallest 6'-0") were made and used for determining the positions of various components like seat, handle grips, and foot controls. This two dimensional method was not the best one but it was the quickest.

It was very helpful for the design of frame, suspension system and management of spaces. With the 2-dimensional sketches, the physical dimensions of wheels, seat height, control portion, angle of steering and minimum ground clearance were decided. Then other set of sketches was made for the physical planning, looks and space utilisation. Simultaneously, different colours were used for these sketches which could help in deciding the colour scheme at the final stage.

For small maintenance and repairs some tools are required to be with the vehicle. They are plugspaner, screw driver, and paper, duster cloth etc.

In existing mopeds these are no tool boxes. We decided to design one. A combined seat for two persons was also proposed.



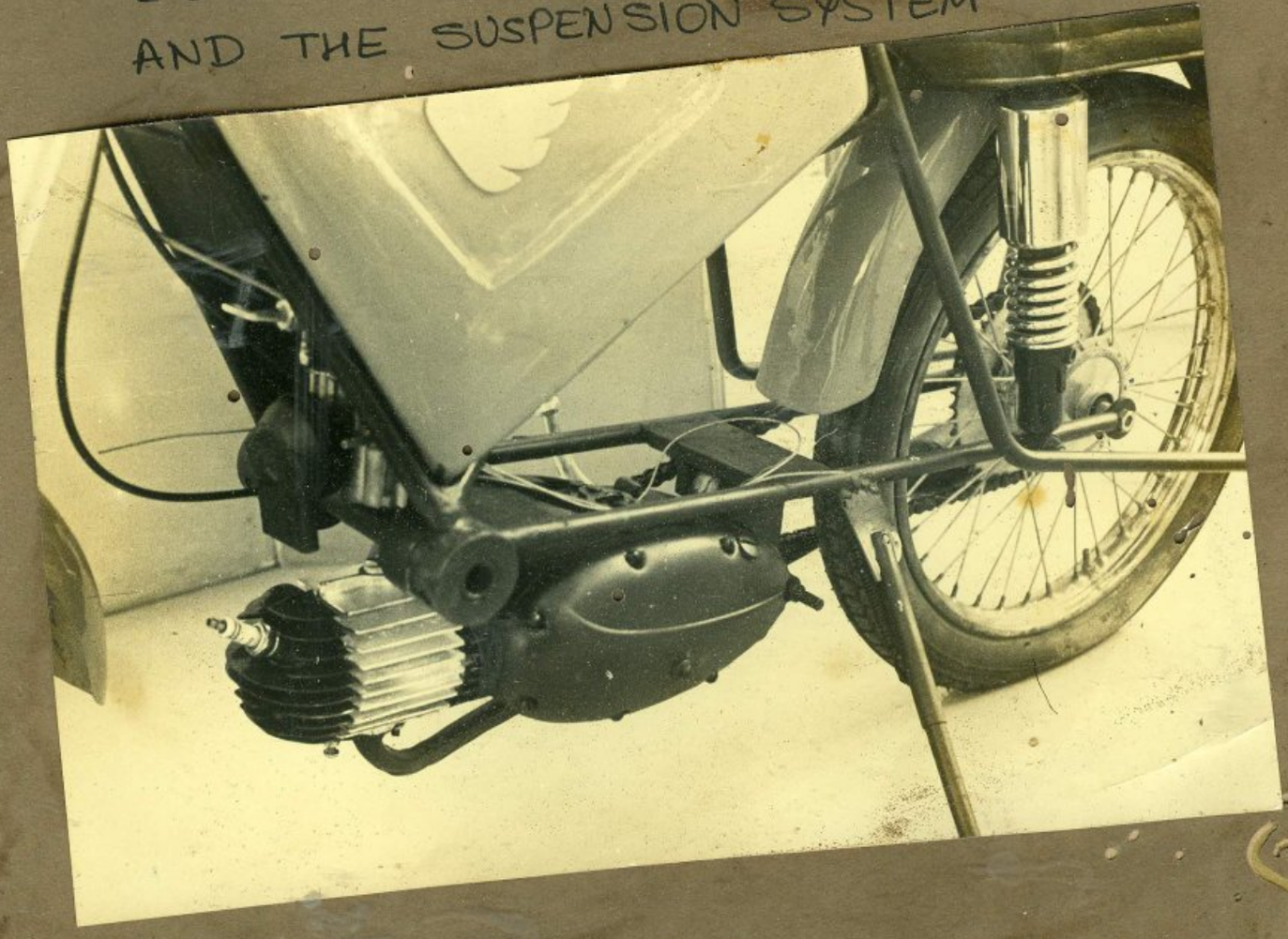
3

TESTING VARIOUS SHAPES AND SIZES OF SEAT.

4

THE FRAME AT THE FABRICATION STAGE.
THE TANK HAS BEEN FITTED FROM SIDE.

DETAILS OF ENGINE HOUSING BRACKET AND THE SUSPENSION SYSTEM



ENGINE AFTER FITTING

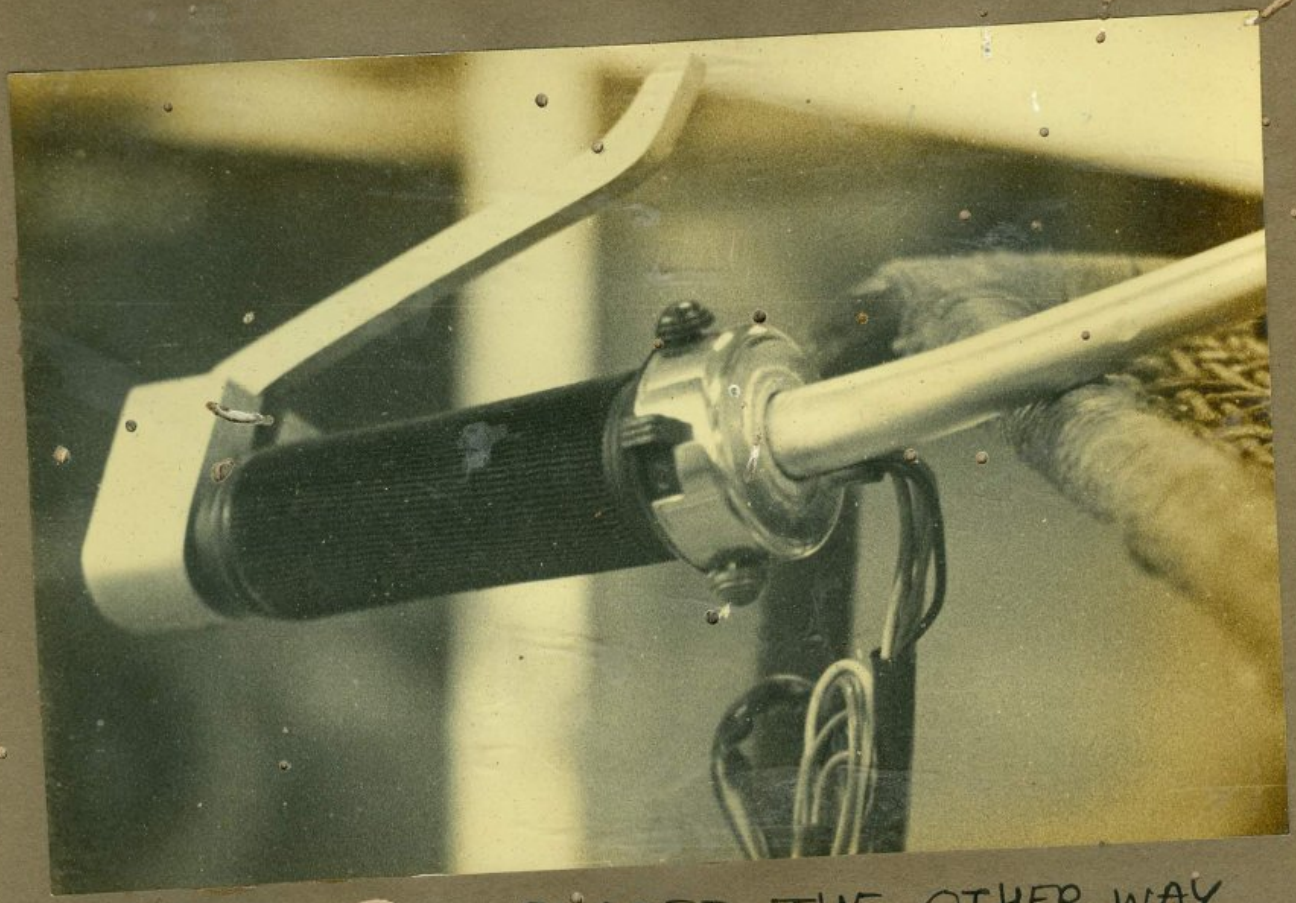
FRAME:

From our survey reports, we had understood that the youth liked a mobike image for their vehicles. The sketches were developed to achieve such image and yet to have the ideal arrangement of the functional parts. The most visible change was in the shape of the tank. From studies and sketches it was found that the vehicle looked hi-powered and grand with a bigger tank. So the petrol tank and the tool box were made to look one tank of big size. Some space behind the side flaps of this petrol tank was also used for the placement of carburettor and fuel cock. The frame was to be prepared by bending the available round pipe into two thin frames and then combining them to give a continuously running pipe look. The tank which was to be prepared separately could be slided into this frame.

Head light speedo meter:

It was decided to keep the speedo meter which gives the feed back information about the vehicles speed and distance moved, in such a way that it should be easily visible to the rider. For this purpose a slope of 22° to the horizontal was given which matched with the 68° slope of shock absorber. Head light top was given this inclination, integrating the speedo meter with it.

In existing vehicles, the steering-bearing housing and its connected members present a quite complex area, which does not look neat. A solution for making it look neat was to enclose it in a box namely - the headlight. The reflector



CLUTCH LEVER PLACED THE OTHER WAY
FOR HIGH EFFICIENCY

THE CONTROL LOOK FROM SEAT.

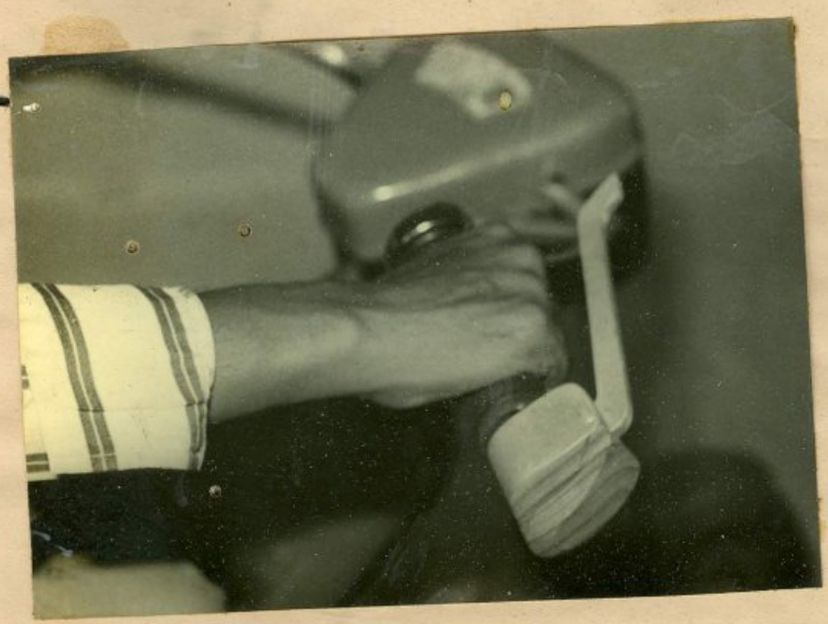
has been specially designed to throw light on required area of the road. Head light also contains horn and flasher unit within.

FRONT FORK:

The front wheel, hub, axle, brake drum have been used as they are available in the market. A pair of teliscopic shockups has been used as a front fork. They have been inserted into the headlight box where they receive the frame load through steering bearings. The inclination of this fork is 65° to the horizontal. It was found the most convenient angle for steering with 16" wheels.

HANDLE BAR:

A number of handle bars were made and tried to suit the users. The proposed handle bar is adjustable. It is made of hollow tube which takes the brake & clutch cables inside. The handle bar is clamped between two pairs of clamps mounted on the fork in the head light box. Whenever required, by loosening and tightening two bolts of these clamps, the angle of the handle bar - and hence the distance from seat and height above seat can be controlled. However, it has been designed for one optimum position. The side indicators ha e been mounted on the two ends of the H-Bar. The clutch has been kept on left hand and accelerator control and front brake on right as they are now on other two-wheelers. The turning/side indicator switch, horn switch and stop switch have been kept on a ring mounted on the left of the handle bar.



CONTROL LEVERS:

It was found that the fore finger and adjacent fingers can apply more force, have better stamina and have more accessability than the short ones. It was not suitable to give the short fingers this load, as it is now. Hence the levers were placed the other way round. In this position of levers, the exposed cables could pose unnecessary complications, so they were taken to their distination through the hollow part of handle-bar and head light.

The gear shifting lever has been kept on the left foot. In most of the motor cycles, the gear shifting lever has only one end, which has to be pushed down and lifted up in order to shift the gears. while lifting it up, one gets scratches on his shoe, a two way push system has been adopted to avoid this problem. In the adopted lever, one flat of the lever touches the toe and the other one the heel. In order to make the mechanism equally suitable to the riders with low heel shoes and high heel shoes, one extra tapped hole has been made on the heel lever.

The foot rests: The rider has one conventional foot rest on either side. The pillion rider has a place on the frame itself to rest his legs.

ACCESSORIES:

The saree guard, stand, luggage box and additional pair of foot rests for the pillion rider, shall be the accessories that can be fixed separately.

5.0 PRESENTATION:

Drawings and sketches were made before the final model was started. But it was found that certain dimensions and details had to be changed in order to prepare a proto type. Some of these changes were definitely the improvements and modifications but there were others that had to be done because of the technology and material limitations.

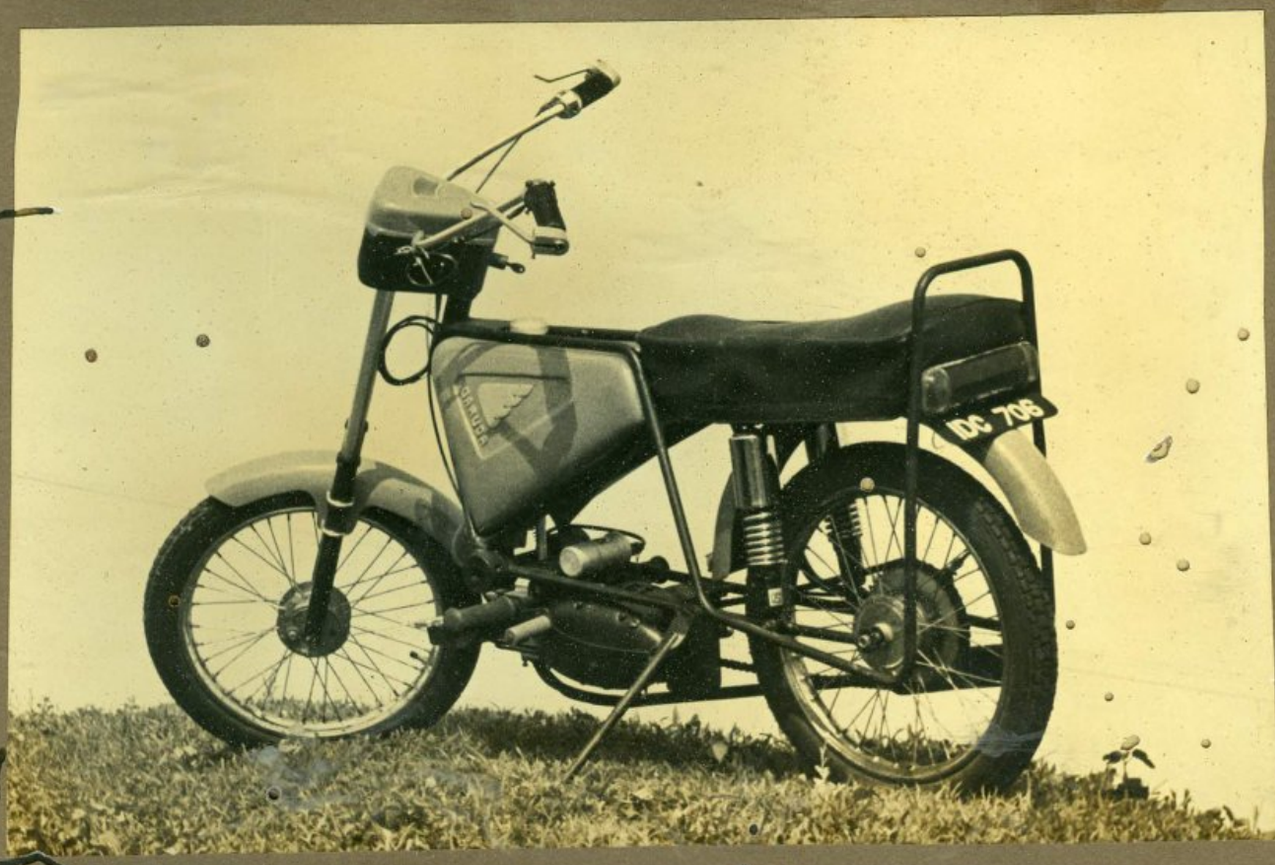
A final frame was made and the components of the frame were specified since bending of pipes was easily possible only in one place. Thus the frame erection also compelled us to think about the fabrication sequence.

The wheels were assembled, and were fixed to the frame alongwith the front and rear shock absorbers. Rubber foam and uripolythene foam in various shapes and thickness was placed in over the seat plank. Then it was tried out by some subjects.

Two of the satisfactory shapes were choosen for the final assessment on moving vehicle.

The two wheeler was rolled down the slopes with a rider in order to find the stability and seat comfort. At this stage some improvements in the frame had to be done, and the final seat was choosen.

Then the engine was fixed to the frame. The requirement for developing a proto type was felt at the later stage when the bump and vibration problems were traced. Because of limited project funds we had to work with an old engine. The engine which was bought, was not directly adoptable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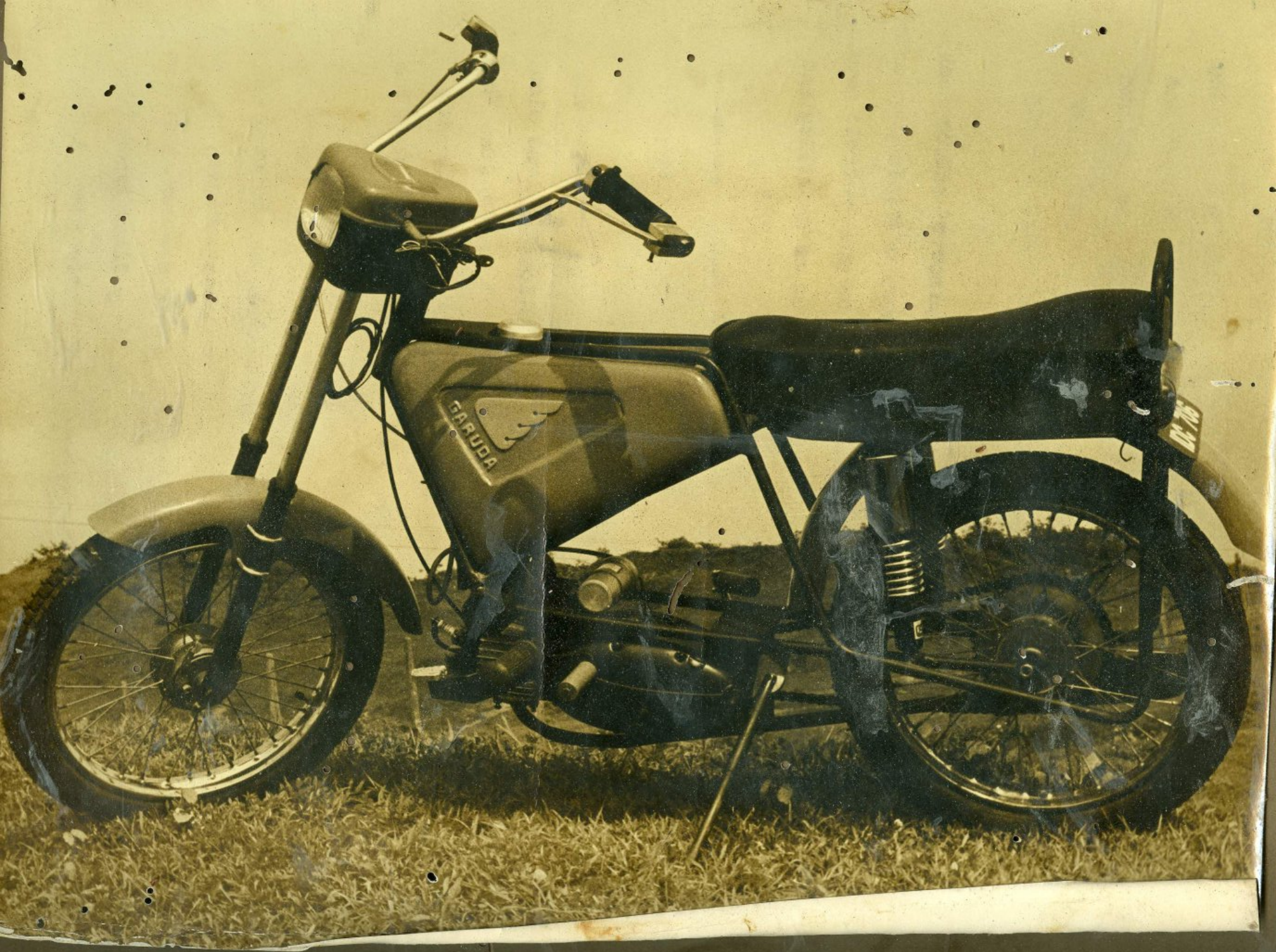
GARUDA

as the central axle and chain alignment were different than what we had assumed. In such circumstances, the engine was some how fixed and it also worked but the wheel and chain alignment with respect to the driving gear of the engine transmission box was not proper. However, they have been rectified and modified at the final drawing stage.

A small metal box was fixed, in the place of petrol tank, to supply fuel to the engine. Necessary controls were made in order to enable the vehicle move on gas(petrol) power. Then road trials were taken and degree of stability and riding comfort were discussed.

At this stage seat was given a final shape, and the most appropriate position of the handle bar was fixed. Please refer the R.H. view in the drawing.

Petrol tankwith tool box, and mudguards were made and fixed to this two wheeler. The headlight box was also made but it requires a special type of reflector. The tail lights, number plate, silencer, footrests etc. are all separately made and assembled to complete the product.

COLOUR SCHEME:

Colour was as important if not more, as the form and total shape of the vehicle. Keen observations, were made of the prospective customers, their dresses, vehicles and the colours/colour-schemes they liked most. The findings were interesting. Most of the youth liked fresh colours. Inspite of large number of such vehicles

6.0 CRITICAL ANALYSIS:

6.1 GOOD POINTS:

The good points of the proposed moped are :-

1. For the designed speeds of 30 mph the riding comfort has been achieved to a high degree. The seat height, foot controls, and handle bar are in dimensional relationship and compatable with human dimensions. Controls are easily accessible and body is at ease.
2. Transmission of vibrations from engine to seat has been minimised.
3. The amplitude of bumps has been reduced.
4. The form evolution is natural. The things have been filled where they were more suitable.
5. Due to the introduction of gear box, power can be appropriately used. It will add to vehicle power and speed(design speed 30 mph), whenever, needed - up and down the slopes.

6.2 LIMITATIONS OF DESIGN:

1. Although cost is an important factor, but it was not calculated in detail for this product, for the lack of time and special expertise required for cost analysis.
2. No engineering analysis of the structural frame was done as it was beyond the scope of the project. However, the structural models and any retundancy in the structure can be evaluated by using structural models and any retundancy in the structure can be

eliminated or additional strengthening members added, depending on the results of such analysis.

The usual process in small industries is to treat a vehicle in actual conditions and determine failure points, and make necessary alterations. After limited experiments some alternations were made in the moped design.

3. As stated earlier, the engine brackets, shock absorbers and wheels are not properly aligned in the model. The chain lightening arrangement has not been used in the model but these have been taken care of in the final drawings.

4. While changing the rear wheel, one has to open brake-lever, chain and the axle bolts. It could be simple and easy if only the rim and tyre could come out for short repairs, as in case of puncturers.

6.3 FUTURE SCOPE:

The basic objectives drawn for this academic project have been achieved. Thus it is more appealing to the customers eye, than any existing moped, is more comfortable to ride on, and Indian youth are likely to prefer it over the existing mopeds. But before bringing it on the production stage, some work has to be done. Cost analysis, proper and economical use of materials and processes have to be studied in the light of mass production.

However if brought in the production, it is likely to increase the demand of mopeds. Not only the gents, but ladies are also the prospective buyers, because this new moped has low seat and hence it is easy for ladies as well as short men to rest

their legs on ground when vehicle is not in motion. The introduction of gear box has extended the flexibility in the use of engine power. Now, while going up the slope, or while having a pillion rider, the rider may choose to go for a lower grear. It will give low speed and higher power. While going down the slope or in plane, the rider will use the top speed gear No.3 . It is more convenient to kick while sitting on the seat. In the existing mopeds, one has to paddle and then start the vehicle.

Thus, if put up in the market, the proposed product will surely attract many buyers of mopeds, mobikes and scooters. And it is expected that the customers/ users will be satisfied with the product's looks, sitting psture and riding comfort. They will also find it more convenient to use and control. Satisfied customers result into more customers and the demand is likely to increase.

7.0 ANNEXURE:

7.1 USERS' SURVEY: Around 60, users were surveyed formally. These users inclueded that of mopeds, scooters and motor cycles. They gave their opinions about their vehicles, other vehicles and why they did/ did not use mopeds.

The questions on performa used were:-

1. Which vehicle do you have?
2. Why did you buy this vehicle?
3. When do you use it?
4. Who else uses it?
5. How much is it used?
6. Any complaints regarding
   - Machine
   - Power and speed
   - Operation/use
   - Parking/storing
   - Looks
   - and others?
7. Did you ever have any accident? please explain.
8. Do you possess some other vehicle? which? why?
9. What is wrong with the available mopeds? what is good about them?
10. Why you have / have not gone for a moped?
11. Do you think mopeds in this existing form can fulfill your requirements?
12. If not what changes do you recommend?
13. Do you use pedals? when?

As has been mentioned in the " information and data collection, chapter 3"; generally the users of scooters

and mobikes thought that the person riding on a moped looked ungraceful and that they were low powered vehicles, not meant for them. The moped problems pointed out by them were:-

1. Horn is weak.
2. Troubles on sloped - lower power.
3. No good place for keeping legs.
4. Light is dim.
5. Riding man looks without work.
6. Punctures
7. Doesn't look good.
8. Never used pedals except starting.
9. Sound is too much, silencer not good.
10. Seat - higher than motor-cycle.
11. Low speed.
12. No work for feet.
13. Parking not safe.
14. Looks very cheap vehicle.
15. No good place for luggage etc.

Ofcourse the other people also thought that way, one gentleman gave a statement that " Mopeds were meant for ladies and old people ".

7.2 MARKET SURVEY:

In all 8 dealers of two wheelers were formally surveyed. The questions asked were:-

1. Which moped/mobike/ scooter is selling most? why?
2. Why do / don't people buy mopeds?
3. Which members of the society buy mopeds?
4. What should be done to increase the sale of mopeds?

5. What type of moped will sell the most?

6. What are regular complaints about them?

7. Any personal suggestions?

8. What do people like?

Apart from the statistical replies, thse dealers also gave realistic opinions and suggestions of design and market promotion. Accoriding to thom customer brings the customers. The people come to the shop with pre-conceived ideas about what they want to buy. According to them users go for mopeds because of their budget limitations and also because mopeds are freely available. Among all the two wheelers, young gents were the main buyers. Young people demanded for heavy looking machine. They were grace conscious. Sometimes they demanded for mirrors to look at their image when they sat on various two-wheelers in the show room. Initially, they did not find any dynamic possible change in their market, but they knew that mopeds were low fuel consumption vehicles hence must be popular. They agreed that something should be done to improve the appearance of the mopeds. They also felt that shape should be mobik'e type heavy looking, with exposed engine and other mechanical parts. They were very eager to give suggestions and probably the industry people hadn't try to talk to them in this respect.

7.3 MANUFACTURERS' SURVEY

One major moped making industries of India was interested in improving their product. The top level officers had discussions with the designers at Industrial Design centre, I.I.T. Bombay. The outcomings of the discussions were :-

1. Reorganise the elements like engine, fuel tank, wheel base, lamp, meter, foot pedals, seat.
2. Overall appearance improvement to give a mobike look.
3. Seating to be designed for two people.
4. Foot pedals to be placed at appropriate/convenient postures and then design.
5. Mudguards to be lifted.
6. Chrome plated things to be made optional.
7. Kick starter to be provided:- problem-shoes get wornout.
8. Provision for tool box.
9. Brake-light to be included.
10. Indicators if possible.
11. Steering locking arrangement.

7.4 MAGAZINE SURVEY:

Important magazines that have published articles on mopeds and postures were " which " magazine(April'78) ergonomics magazine, and consumer Guide. The text of ' which ' magazine is here:-

The current legal definition of a MOPED is a machine with an engine capacity of not more than 50 cc, and a maximum design speed of 30 mph. Most mopeds have pedals(though they no longer have to) a step through frame(as on a ladies bicycle) and are designed to carry only one person. Most have an automatic clutch and cost around £ 175 to 200. The minimum age for riding a moped is 16.

SPEED:

If your trayelling is done in quite heavy traffic in a 30 mph speed limit, a moped is likely to be atleast as quick as a motorcycle(if not quicker) and both will almost certainly be

quicker than bus or car.

SAFETY:

A two wheeler is 5 times unsafe than car.

WEATHER:

In summer it is a fun to ride a moped. The faster you go, the colder you get. For riding in rains one requires over trousers and over shoes.

COST.

@ 175 to £ 200

Helmet £ 9

Pair of panniers or a top box £ 15.

Protective clothing £ 40

PUTTING ON ROAD:

Tax £ 5 per annum.

Insurance - depending upon person and vehicle.

RUNNING COST:

Mopeds	100 mpg or more
Yearly mileage ridden	
1,600 - miles	moped
2,200 - ,,	commuter bike
2,900 - ,,	fora motor cycle.

cost of fuel would range from £ 10 to £ 50.

For servicing and repairs allow £ 20 a year.

CAPITAL LOSS.

£ 60 a year to cover depreciation on a moped.

£ 100 for commuter bike or 125 cc motor cycle.

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of the mopeds we tested, we pick the

HONDA CAMINO PA 50VL and MVT Easy rider ER1

OUR FINDINGS IN DETAILS

How easy to start - pedals.

How quick

with a legal speed limit of no more than 30 mph, a moped can be regarded as short distance transport only. Our mopeds were quick to accelerate from rest, but soon ran out of steam. some of them were poor at hill climbing.

HANDELING.

Most mopeds had jointly good straight line stability even on rather bumpy surfaces, and most were little effected by side winds None of the mopeds had flashing direction indicators, so the riders had to give hand signals. (indicators can be fitted at extra cost).

Hand signals are less than ideal for atleast two reasons: by letting go of the handle bar with either hand, you lose some steering control and, when signalling a right turn or to overtake, you no longer have control of the throttle(accelerator). Many of our users preferred a twist grip throttle on a moped to stay in any set position when released.".

The internal combustion engines generally installed in motor vehicles develop their power output at high speeds or rotation (4000-6000 rpm approx) It is therefore necessary to reduce the speed between the crankshaft and the shaft which driver the wheels. In addition, the torque that the ending deliveres can be varied only within narrow limits. For this reason it is necessary to be able to alter the transmission ratio, so that the driving forces applied to the wheels of the vehicle can be adapted to the varying road conditions.

7.5 REPORT SURVEY:

Here is the text of a report on two wheelers which has published some statistical datas.

"India, one of the world's most populous and poorest countries had a vehicle population of 2.3 million in 1974.

as shown below(thousand units) -

Passenger cars	717
Jeeps	74
Buses	108
Trucks	415
Other 4 wheeled vehicles	158
Motor cycles	275
Mopeds	110
Motorized rickshaws	55
Scooters	420

INDIAN AUTOMOTIVE PRODUCTION
(thousands)

Type of vehicle	1959	1964	1969	1974	Demand target 1978/79
Cars & Jeeps	16.5	33.6	43.0	46.0	78.0
Commercial vehicles	19.7 31.8	33.4	39.6	39.6	92.2
Scooters	2.8	20.0	49.7	80.9	300.0
Motorycles	3.2	13.9	34.5	53.2	130.0
3-wheelers	1.5	4.2	6.9	13.8	40.0
Mopeds	1.2	1.4	11.0	29.4	130.0
TOTAL	44.9	104.9	178.5	262.9	770.0

VEHICLE OWNERSHIP AND INCOME IN 1970

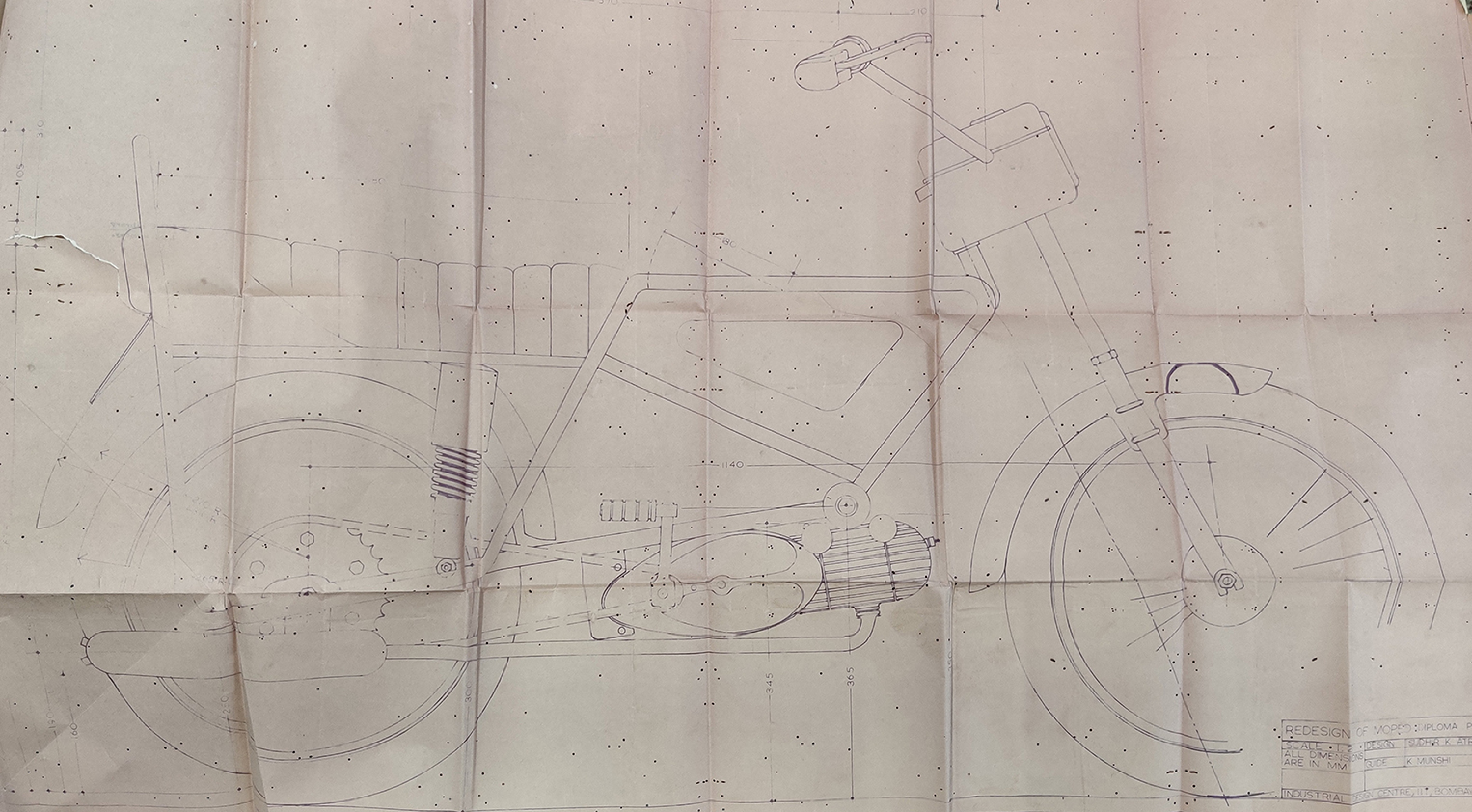
	National income per head ($)	Vehicles per 1000 persons	
		Cars	Commercial vehicles
U.S.	4289	430	88
Germany	2752	223	17
Australia	2633	312	78
Japan	1636	84	83
Italy	1591	190	24
Brazil	376	25	7
Malaysia	295	27	7
Philippines	225	8	5
Nigeria	135	1	1
Indonesia	98	2	1
United Republic of Tanzania	94	2	2
India	93	1	1

based on statistical year book 1974 U.N.Publication.

(a) MOTORIZED BICYCLE - consisting of a normal bicycle and a gasoline motor of upto 50 cc, adapted to power the front or rear wheel.

(b) Moped - bicycle designed with an integrated gasoline motor to power generally the back wheel. It may or may not have auxiliary pedals.

(c) Motor cycle, with engine from 51-350 cc for sturdy use may have a side car for passenger or cargo transport. "


1140
345
365
300
190
160
210
180
105
30
REDESIGN OF MOPED : DIPLOMA P
SCALE : 1 : 2
ALL DIMENSIONS ARE IN MM
DESIGN SUDHIR K ATR
GUIDE K MUNSHI
INDUSTRIAL DESIGN CENTRE, IIT, BOMBA