

Restyling the
**BAJAJ
CHETAK**

Design Project 2

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Guided by Prof. Nishant Sharma

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1 INTRODUCTION

The Bajaj Chetak has been part of the Indian culture ever since its launch in the early 70s. The fondly known *Hamara Bajaj* was a licensed copy of the Vespa Sprint. The Chetak was the first motorised personal transport that was affordable by the Indian middle-class. An entire family of four or even more perching on a Chetak was a common sight in the 80s and early 90s Indian streets.

Chetak has become an icon much like the original Vespa. But rising competition from modern motorbikes and scooters made the Chetak obsolete and production was ended in 2009. Bajaj under the leadership of young Rajiv Bajaj, concentrated more on motorbikes and less on scooters.

Recent rumours have spurred up hinting the revival of the Chetak brand, as Bajaj has re-registered the Chetak brand.^[1] As a designer, it would be tremendously challenging to restyle a design classic like the Bajaj Chetak. A modern interpretation of the Chetak which would create an as strong product value as the original is the agenda of this project.

1.1 Why restyle?

The Bajaj Chetak was a licensed copy of the Vespa Sprint. It had slight mechanical differences from the Vespa like bigger tires and higher ground clearance, but it more or less looked the same. Around 1980, the original Vespa licensed design was replaced by an in-house design that introduced the squared off indicator housing on the front apron. Bajaj followed *if it ain't broke, don't fix it* strategy with the Chetak, giving it minor cosmetic upgrades thought its lifetime.

The Indian as well as international scooter market has matured, modern products from players like Honda, TVS and Suzuki dominate the Indian market. This made the Chetak irrelevant and finally was killed off in 2009 by Bajaj because of poor sales. ^[2]

^[1] <http://auto.ndtv.com/news/bajaj-chetak-set-to-make-a-comeback-in-the-indian-scooter-segment-743847>

^[2] https://en.wikipedia.org/wiki/Bajaj_Chetak

1 INTRODUCTION

The Chetak brand was killed and hence it has not been imagined comprehensively restyled while the Vespa has come a long way in terms of styling and product. Hence, a restyling of Chetak makes sense.

1.2 Scope of the project

Advancement in technology and materials mean newer and more efficient forms can be designed. Compact, newer IC engine drivetrains or even electric drivetrain can give much more freedom in design and packaging of the restyled vehicle.

A new and contemporary interpretation of the classic design could give new character to the Chetak. Original Chetak had more of a work horse like character.

Almost exclusively ridden by men, it reflected the strong patriarchal society of 80s & 90s India. The new design is ought to be a unisex design appealing both to men and women.

Restyle will be challenging as the new design should respect the nostalgic values of the Chetak and also should be different from the current Vespa lineup.

2 HISTORY OF CHETAK

Post World War 2, the Italian aircraft industry was heavily restricted in both capacity and capability after Italy's agreement to cessation of war activities with the Allies.

Piaggio emerged from the conflict with its Pontedera fighter plane plant demolished by bombing. Italy's crippled economy and the disastrous state of the roads did not assist in the re-development of the automobile markets. Enrico Piaggio, the son of Piaggio's founder Rinaldo Piaggio, decided to leave the aeronautical field in order to address Italy's urgent need for a modern and affordable mode of transportation for the masses. ^[1]

This led to the design of a scooter with enclosed engine and a step-through design highly influenced by Piaggio's history in aeronautics.

2.1 Designing the original

In 1944, Piaggio engineers Renzo Spolti and Vittorio Casini designed a motorcycle with bodywork fully enclosing the drivetrain and forming a tall splash guard at the front. In addition to the bodywork, the design included handlebar-mounted controls, forced air cooling, wheels of small diameter, and a tall central section that had to be straddled. Officially known as the MP5 ("Moto Piaggio no. 5"), the prototype was nicknamed "Paperino" (either "duckling" or "Donald Duck" in Italian).

^[1] <https://en.wikipedia.org/wiki/Vespa>

2 HISTORY OF CHETAK

Enrico Piaggio was displeased with the MP5, especially the tall central section. He contracted aeronautical engineer Corradino D'Ascanio, to redesign the scooter. D'Ascanio, who had earlier been consulted by Ferdinando Innocenti (creator of Lambretta Scooters) about scooter design and manufacture, made it immediately known that he hated motorcycles, believing them to be bulky, dirty, and unreliable.

D'Ascanio's MP6 prototype had its engine mounted beside the rear wheel. The wheel was driven directly from the transmission, eliminating the drive chain and the oil and dirt associated with it. The prototype had a unit spar frame with stress-bearing steel outer panels. These changes allowed the MP6 to have a step-through design without a centre section like that of the MP5 Paperino. The MP6 design also included a single sided front suspension, interchangeable front and rear wheels mounted on stub axles, and a spare wheel. Other features of the MP6 were similar to those on the Paperino, including the handlebar-mounted controls and the enclosed bodywork with the tall front splash guard.



Piaggio MP5 "Paperino", the initial Piaggio prototype
<https://en.wikipedia.org/wiki/Vespa>

2 HISTORY OF CHETAK

Upon seeing the MP6 for the first time, Enrico Piaggio exclaimed: "*Sembra una vespa!*" ("It resembles a wasp!") Piaggio effectively named his new scooter on the spot. *Vespa* is both Latin and Italian for wasp—derived from the vehicle's body shape.

2.2 Aeronautical influence in the design of the Vespa

All mechanical components of the Vespa were shielded by aerodynamic teardrop shaped cowl, giving it the iconic and holy recognisable engine cowl design. The rider is shielded from the elements with tall splash guard, deflecting air and dirt away from the rider.

The Vespa had single sided front & rear suspension, inspired from aeronautical landing gear which greatly reduced the weight of the vehicle.

A metal monocoque chassis, where the body panels are active stress members meant that the bodywork itself acted like the chassis. Thereby avoiding any need of adding any panels to hide mechanical components. Fuel filler caps and auxiliary components are well integrated into the main bodywork.



Enrico Piaggio and the design team with one of the first Vespas to roll out of the factory
http://www.repubblica.it/motori/motori/2011/11/24/foto/motori_mostra_inventore_vespa-25507775/

2 HISTORY OF CHETAK

2.3 History of Bajaj

The company came into existence on 29th November, 1945 as M/s Bachraj Trading Corporation Private Limited. It started importing two wheeler and three wheeler from international brands. [1]

In the year 1960, during the *License Raj*, Bajaj received the license both from Government of India and from Piaggio to manufacture two wheeler and their first model was the “Vespa.” The same year Bajaj became a public entity.

The first launch was that of the Vespa 150 in the year 1960. It was launched under license of Piaggio.

In the year 1971, the company started to launch their three-wheeler goods carrier. Just a year after, Bajaj Auto launched its ever famous Bajaj Chetak, a licensed copy of the Vespa Sprint with slight modification for the Indian market. The name was given after the legendary horse of Indian warrior Rana Pratap Singh, the Chetak. The Chetak was an affordable means of transportation for millions of Indian families for decades and thus the slogan ‘Hamara Bajaj.’

The license agreement with Vespa expired in the year 1977. However the production continued and Bajaj launched the Bajaj Super, the then status icon of Indian families. Apparently, it was used as a form of dowry then.

[1] https://en.wikipedia.org/wiki/Bajaj_Auto

2 HISTORY OF CHETAK

2.4 Historic context of the Bajaj Chetak

India lacked the R&D capability or rather the vanity immediately post independence to engineer and produce automobiles.

Also, the License Raj tightly regulated industrial development. It was an elaborate system of licences, regulations and accompanying red tape that were required to set up and run businesses in India between 1947 and 1990. ^[1]

The Cold War affected Indian customers' choice in automobiles. The market was dominated by Italian and then USSR origin automobiles manufactured by Indian companies under license. ^[2] (For example Premier Padmini, Lambretta, Yezdi Roadking, Jawa 250)

The Chetak was launched as an upgrade from cycles to a motor vehicle for the Indian middle-class. Chetak was reliable and tough, ideal for the Indian roads. Also, the market was flooded with spares and this resulted in very cheap repairs. The Chetak became a runaway success.

^[1] https://en.wikipedia.org/wiki/Licence_Raj

^[2] https://en.wikipedia.org/wiki/Automotive_industry_in_India#Restrictions_under_the_license_raj

3 EXISTING PRODUCTS & TRENDS

The Chetak was launched in 1972 by Bajaj Motors. It was affordable and reliable, making it hugely popular among the Indian middle-class. The product was perceived as a workhorse for its reliable mechanicals and tough all metal body.

Today, the Honda Activa can be likened as the Chetak's spiritual successor. Activa too is reliable and affordable making it hugely popular. All metal body panels made it durable and a sturdy rattle-free scooter.

3.1 Vespa and Bajaj today

The current lineup of Vespa consists of retro-styled scooters that pay homage to the classic Vespas keeping the heritage of Vespa intact.

Products like the Vespa S 125 (2015 model year, available in India) have all the characteristic design features of original Vespa along with mechanical details like monocoque chassis and air cooled engine.

Bajaj at the same time has concentrated more on it's motorcycle lineup. Their flagship products like the Pulsar NS 200 & AS 200 (2015 model year) are aggressively styled with very busy design, following international design trends.

Bajaj's current aggressive design language isn't strong or apt enough to be considered for the restyling of the Bajaj Chetak.

3 EXISTING PRODUCTS & TRENDS

Vespa 946
(Flagship)



Vespa Sport 125



Bajaj Pulsar RS 200
(Flagship)



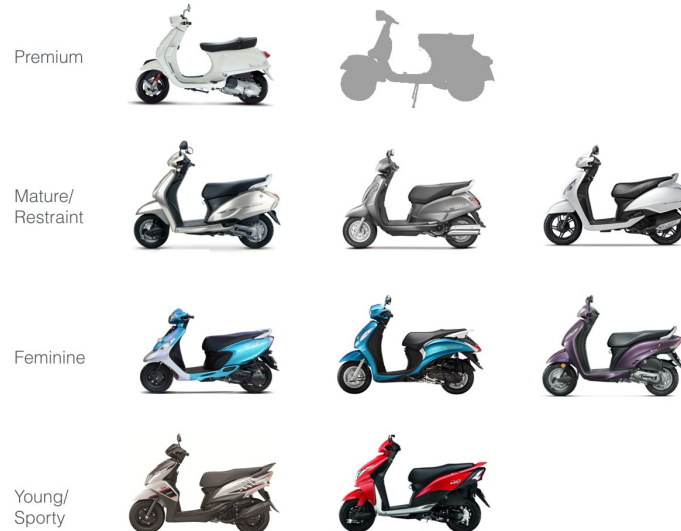
Bajaj Pulsar AS 200



3 EXISTING PRODUCTS & TRENDS

3.2 Scooters in Indian market

The scooters in the Indian market can be categorised into 4 groups depending upon their character and intended target audience.



3.3 International design trends

Today's international market scooters have overly aggressive styling, while they spend most of their time in slow city traffic. Superficial air vents are added to create a sense of sportiness to regular commuter scooters. Although plastic panels give designers more freedom with styling, they compromise on durability.

Products end up following recent trends in vehicle styling. Ugly stickers are added on the product to keep it from looking *old* towards the end of its product lifecycle. Needless chrome added to the product in order to make the product look *premium*.

The so called *family face* look and lacklustre styling make everything on the road alike. Products lack any personality and are more treated like use-and-throw items.

3 EXISTING PRODUCTS & TRENDS

Future Robot Aesthetic



Masculine Proportions



Aggressive Design
Complex Surfaces



Busy Graphics
Overly Detailed

3 EXISTING PRODUCTS & TRENDS

3.4 Revived vehicle design trends

Rather than retro-style a new vehicle, in the car design fraternity, designers tend to prefer designing a contemporary interpretation of the classic vehicle while being honest to the original intent of the vehicle.

One can see this trend in the case of the new 2015 Renault Alpine A120 concept and the 2013 Jaguar F-Type reminiscing the Alpine A110 (1961-77) and the Jaguar E-Type (1961-75) respectively.



Alpine A110



Jaguar E-Type



Renault Alpine A120
Concept



Jaguar F-Type

3 EXISTING PRODUCTS & TRENDS

3.5 Futurism, Retro or Retro-futurism?

The Vespa was born out of the aftermath of Futurism movement of 1909 originated from Milan, Italy. Vespa design rejected every preconceived notion of a two wheeled automobile.

The current line-up of Vespas can be likened to *retro-style*, as they are nostalgic homage to the original Vespa design. But the recent Vespa 946 is clearly example by Piaggio experimenting with Retro-futurism.



Vespa 125 (1957)
Futuristic design



Vespa LX 125 (2008)
Retro design



Vespa 946 (2013)
Retro-futuristic design

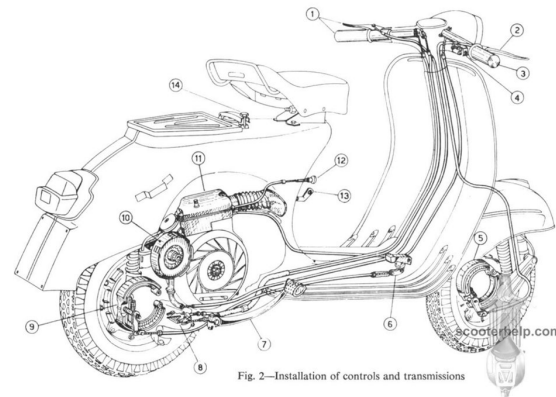
“Good Design is honest.” An honestly designed product must not claim features it does not have – being more innovative, more efficient, of higher value. It must not influence or manipulate buyers and users.”

– Dieter Rams

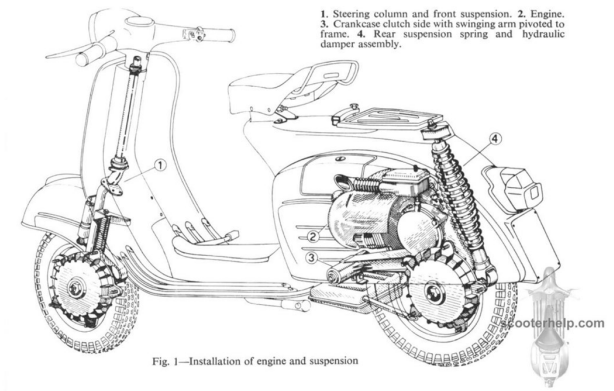
4 UNDERSTANDING THE CHETAK

The Bajaj Chetak was a licensed copy of the Vespa Sprint. The Vespa had small wheels as compared to motorcycles, hence it could have a side mounted engine very close to the rear tire.

This meant that the area ahead of the rider got freed up and this led to the iconic step-through design of the Vespa.



Side mounted air cooled engine
<http://www.scooterhelp.com/serial/VLB.manual.html>



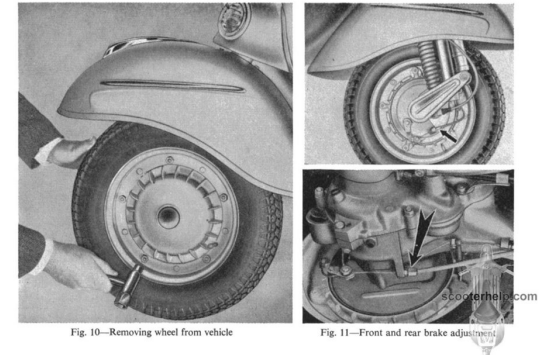
Monocoque chassis

4 UNDERSTANDING THE CHETAK

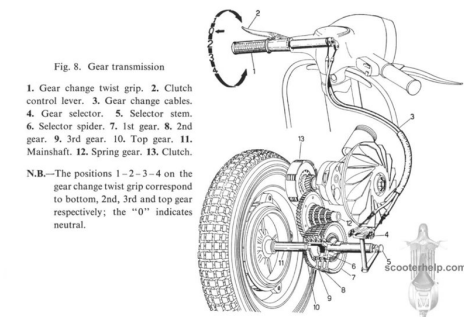
The engine was a two-stroke 145 cc air cooled side mounted engine. The engine was mated to a 4 speed manual gearbox with hand controls. The engine and gearbox assembly also doubled as the rear suspension arm with the rear wheel directly linked to it. Single sided suspension on both the front and back meant that maintenance access to the wheels and tires was easy.

4.1 Chassis of the Chetak

The Chetak had a monocoque chassis derived from the Vespa Sprint, meaning the body of the scooter was an integral part of the chassis. Two removable aerodynamically shaped cowls on either sides enclosed the engine and other mechanical parts of the scooter. These cowls gave the Chetak its unique characteristic looks.



Single sided front suspension



Four speed hand operated manual gear
<http://www.scooterhelp.com/serial/VLB.manual.html>

4 UNDERSTANDING THE CHETAK

4.2 DNA of the Bajaj Chetak

Chetak communicated to the Indian users through its functional existence and the through its visuals that were unique when compared to other 2 wheelers.

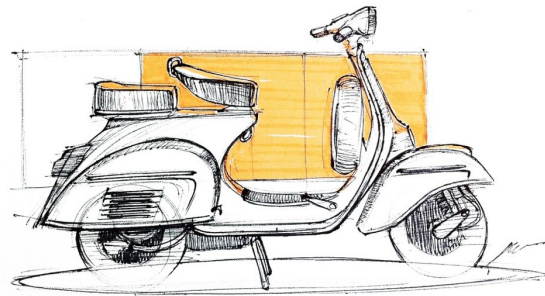
The Chetak was perceived as a workhorse as it had a very reliable engine and almost nil maintenance. The sturdy metal body made the scooter durable and created a visual sense of endurance and resilience. Following are few of the keywords that come into one's mind while picturing a Bajaj Chetak.



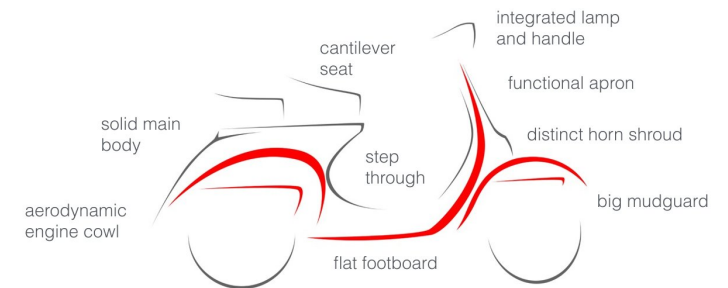
4 UNDERSTANDING THE CHETAK

4.3 Essentials of the Bajaj Chetak

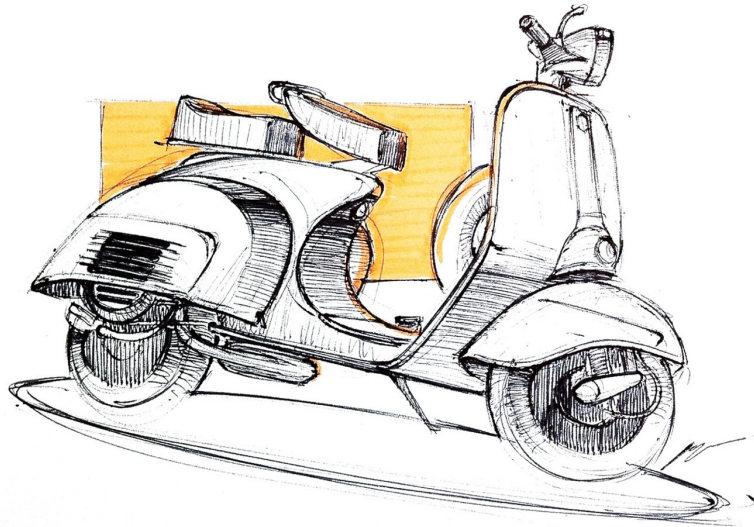
What makes the Chetak the Chetak? What are the essential elements of the Chetak that should be retained in a restyling project to stay honest to the original design of the Chetak?



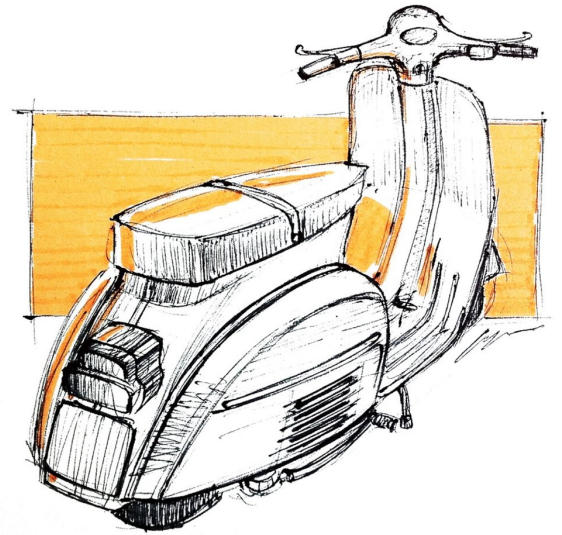
Chetak's character is dictated by 4 main elements, namely the front mudguard, the apron & the footboard, step through and the engine cowl. Other details like the integrated headlamp & handle assembly, cantilever seat are also essential in establishing a successful restyle of the Chetak.



4 UNDERSTANDING THE CHETAK



Front 3/4 view



Rear 3/4 view

4 UNDERSTANDING THE CHETAK



5 USER STUDY

A new revived Bajaj Chetak should be honest to its predecessor. To understand the expectations of this new Revived Chetak, it is essential to understand users of the original Chetak. Five original Chetak users were interviewed to gain intimate information about the relationship between the vehicle and the rider. The users were asked to also include any memorable event that they had with their Chetak, to investigate if any of the design element had more importance.

The user research is intended to give deeper insight into the Bajaj Chetak not only as a vehicle, but also as an important character in the user's life. The emotional values of the Chetak were investigated through this research.

A quantitative questionnaire style user research was also conducted to decipher the taste and preferences of the target user. The questionnaire aimed at understanding the kind of volumes and design language that would work for the target user.

The user research was conducted on an equal number of men and women since the final product would be unisex.

5 USER STUDY

5.1 Chetak user study

User 1: Sridhar Gaddala

- Age 27, Design Student
- Used dad's old off-white Chetak for college commutes
- He loves the spring loaded rider seat and the convenient bag hook under the seat
- His dad was cautious, so he never travelled standing on the footboard as a child

Expectation from a revived Chetak

- Comfort and ease of use as the original
- Brighter illumination at night
- Easy handling like on the original Chetak



5 USER STUDY

User 2: Ajit Nagpure

- Age 28, Interior Design
- Rides a coffee brown custom modified Chetak
- Loves the classic appeal of the Chetak
- Modified his Chetak so it has better handling characteristics and lean angle

Expectation from a revived Chetak

- A mature and classic design
- Single seat version
- A performance version with good braking performance and sporty decals



5 USER STUDY

User 3: Sachin Payyanad

- Age 27, Engineer
- Rides an original grey Chetak as a daily driver
- Loves retro design, the analogue nature of the Chetak and the old Bajaj Logo
- Doesn't like imbalance created by the offset engine layout which in turn hampers riding dynamics

Expectation from a revived Chetak

- Balanced, centre mounted engine layout
- Better braking and better foot brake ergonomics
- Powerful engine



5 USER STUDY

User 4: Uday Barve

- Age 52, Architect
- Rode a light blue Chetak
- A family of 4 could be easily accommodated on the Chetak with the youngest son standing on footboard
- Also used it for occasional long family picnic trips and transporting LPG cylinders

Expectation from a revived Chetak

- An experience different from the current generation of Vespas
- Low handle like the original Vespa which added a sense of lightness to the vehicle



5 USER STUDY

User 5: Akshay Kamthe

- Age 25, Transportation Designer
- Learnt riding on uncle's old white Chetak
- Loved the comfortable and relaxed riding posture
- Didn't like foot operated brake and cold starting

Expectation from a revived Chetak

- Comfort like the original and hand operated gear
- Retro paint of the original
- Tastefully done chrome



5 USER STUDY

5.2 Inference from the Chetak user study

The Chetak was bought by the father in a typical Indian middle-class patriarchal family of the 80s and early 90s. Often it was the only vehicle owned by the family, hence it garnered a special significance in the user's family, almost like a trustworthy family pet. Due to significance of the Chetak in everyday household, it is nostalgic to today's youth as it was part of their childhood.

Revived Chetak must have the following:

- Comfortable riding posture like the original
- Ample storage space
- Comfortable rider seat
- Longitudinally balanced powertrain layout

- Light handling with good lean angle clearance
- Usable front footboard
- Contemporary but honest interpretation of the original design

5 USER STUDY

5.3 Vehicle styling preference questionnaire

The purpose of the user research is decipher the taste and preferences of the target user.

The following is the questionnaire that was filled by 10 target users consisting of equal number of men and woman in the age group of 18 to 30 years. The questionnaire tries to understand whether the target users prefer trendy or classy, angular or smooth and voluminous or void design.

Vehicle Style Preference Questionnaire

Answer the following questions.

Which is your favourite scooter?

A. 

B. 

C. 

D. Actually, I like the _____

What is most important to you if you were to buy a new scooter?

A. Styling
B. Utility
C. Joy of riding
D. Uniqueness
E. Riding comfort
F. Customisability

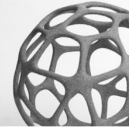
What features (realistic) would you love to have on your scooter?

What are your hobbies/interests?

Select one from the following set.

Set 1

A. 

B. 

Set 2

A. 

B. 

Set 3

A. 

B. 

Set 4

A. 

B. 

Thank you for your time!

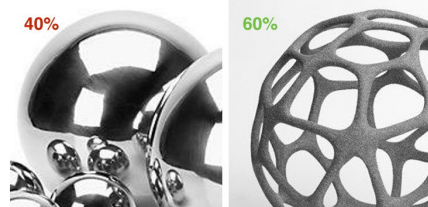
5 USER STUDY

5.4 Questionnaire inference

The target user prefer both voluminous & excavated geometry.

Vespa lovers are mostly hipster, people who are not affected by ever-changing trends. Hipsters prefer quintessential and timeless design. Overall, the target users preferred graceful forms over aggressive forms.

Set 1



Voluminous

Void

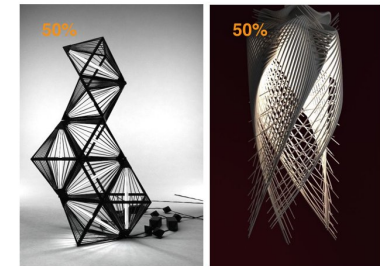
Set 2



Restrained/Hipster

Casual/Trendy

Set 3



Angular

Curvaceous

Set 4



Graceful

Aggressive

6 DESIGN BRIEF

Design a contemporary interpretation of the original Bajaj Chetak for today's youth.

Audience

The scooter is targeted towards today's urban youth.

Aesthetic Intent

The aesthetic intent of the scooter should be honesty to the original design of the Chetak. The new design should also be contemporary and visionary and not a retro-style.

Package

The rider posture should be reminiscent to the original Chetak. Electric drivetrain is considered for the new design.

7 AUDIENCE

7.1 Target audience

Scooters are an affordable means of transport for students and newly employed. Scooters are also ideal for short commutes when compared to a car or even public transport, making them ideal for urban environments. Scooters are liberating. Scooters are easy to maneuver in traffic, easy to park, offer good functionality & comfort and reasonably storage capacity.

Urban Youth (20-35 years)

Scooters are easily affordable and have low maintenance cost. They also have low fuel consumption. Scooters are highly customisable, making it possible for the user to express his/her individuality.

Both Men & Women

Women prefer scooters as it is less intimidating and more practical than motorcycles. It is estimated that 35% scooter customers in India are women. ^[1]

[1] http://www.business-standard.com/article/companies/a-quarter-of-scooter-buyers-are-women-115072500999_1.html



7 AUDIENCE

7.2 User persona

- 20 to 35 years old male & female
- Single/in a relationship/newly married
- Settled in urban cities
- Gleeful, independent and fashionable, yet want to stand out among the crowd
- Loves work and loves casual house parties on the weekends
- Enjoys simple things in life
- Loves the beach, brunches at rustic cafes and a cold beer



8 MOODBOARD

The moodboard attempts to evoke joyous memories. A joyous holiday-like atmosphere is created by elemental air and water. Air signifies freedom and sea creates an engulfing, larger than life experience.

The last board brings colour to design, complimentary warm and cool colours add cheerfulness and a sunny happy-go-lucky warmth.



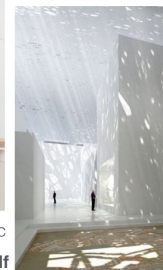
freedom



sea / air



nautical / rustic



engulf



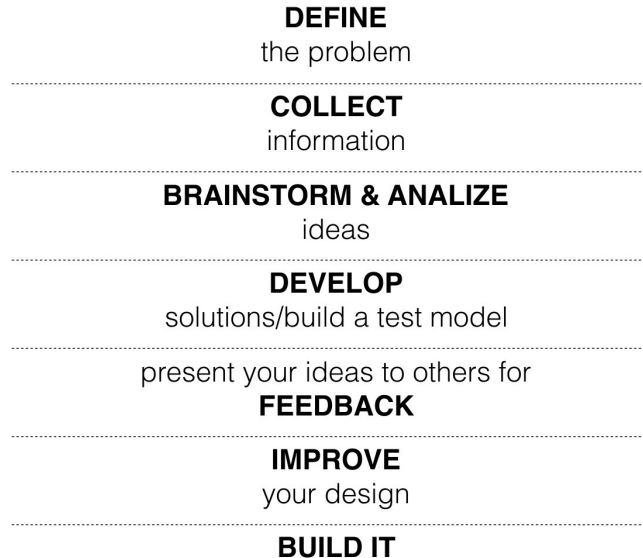
playful / warm
glee



9 DESIGN CONSIDERATION

9.1 Design process

Following is the diagram that represents the design process employed in this restyling project.



9.2 Vehicle geometry reference

Reference vehicle geometry has been taken from the 2011 Vespa S 125 (available in India.) The Vespa S 125 is a compact package, ideal for city commute.

Seat height, handle height, seat contour and footboard height & depth have been considered. Seat contour and footboard depth are important as it shouldn't intrude while the riders sets his foot on the ground.

Ergonomic information from <http://cycle-ergo.com>



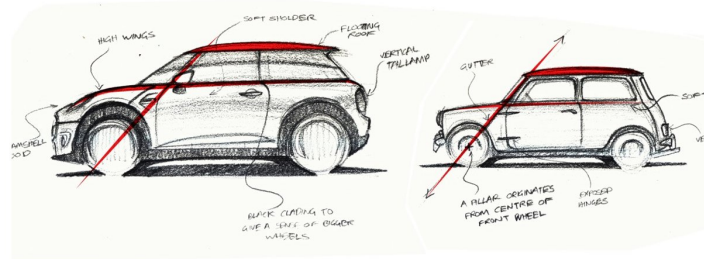
9 DESIGN CONSIDERATION

9.3 Design constraints

Since this is a restyle project, the basic proportion and features have been maintained throughout all the design explorations and iterations. Genuine attempt has been made to stay true to the original stance of the vehicle.



Character lines of the Chetak



Study of restyled/revived iconic cars

9 DESIGN CONSIDERATION

9.4 Drivetrain consideration

Electric drivetrain gives more packaging freedom as compared to IC engine two wheelers.

Volumes can be interestingly explored as electric drivetrain components are minimal. This also equates to more storage space inside the vehicle.



9 DESIGN CONSIDERATION

9.5 Flexible seating

Flexible seating meaning easily user switchable from single seater to double seater vehicle.

Single seat emphasizes individuality of the rider. But sometimes you want to share the experience or have someone else to drop

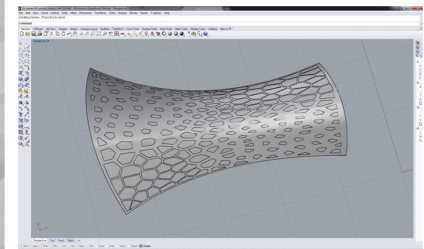
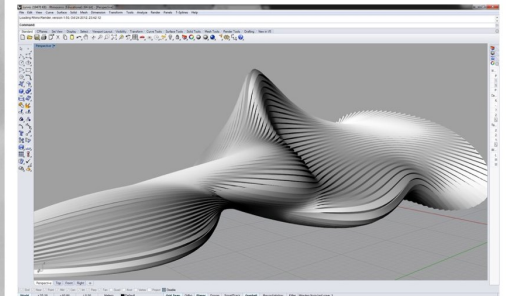
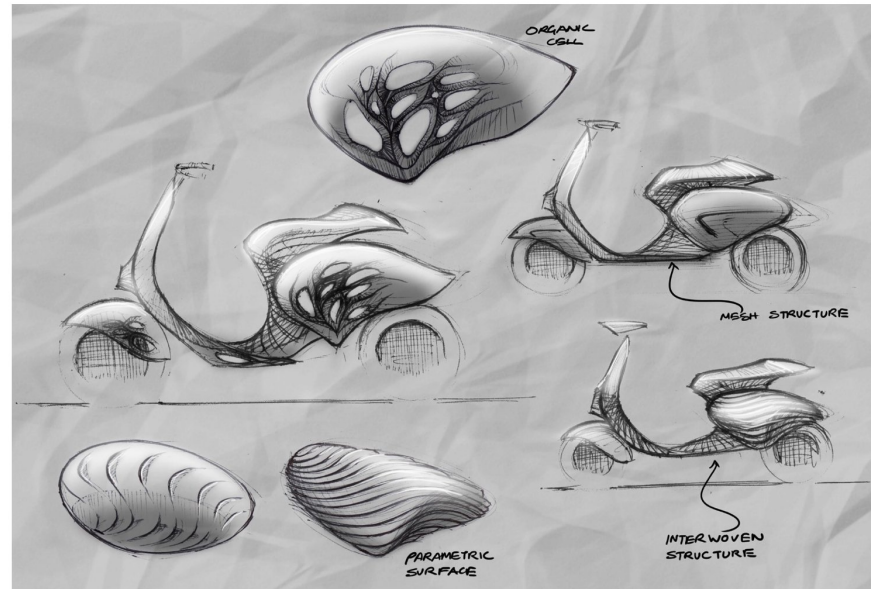


10 CONCEPT DIRECTIONS

10.1 Parametric

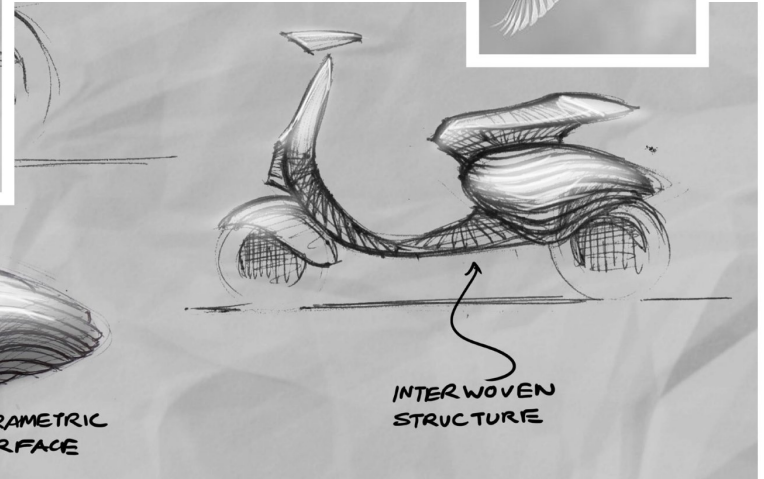
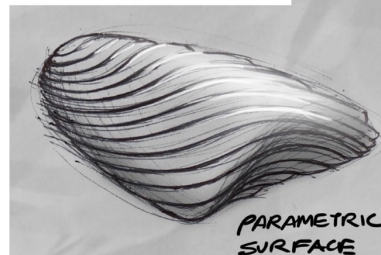
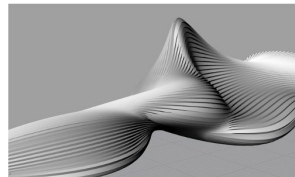
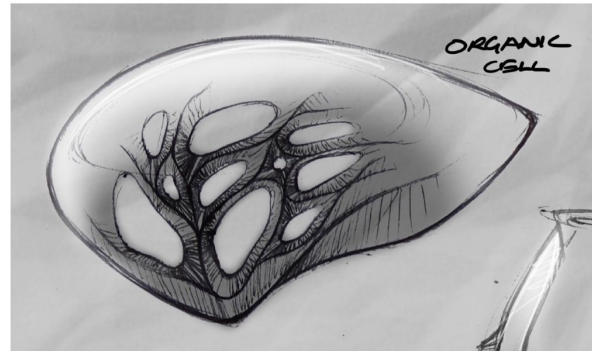
Parametric concept direction is inspired by intricate & organic forms generated by parametric modelling.

It evokes fluid movement emphasised by repetitive papers and lines. Parametric modelling helps add intricate details and supple transitions.



10 CONCEPT DIRECTIONS

The inspiration for parametric concept direction is the feathers on a seagull's wings. For form inspiration, 3D parametric forms were generated using Grasshopper plugin for Rhinoceros.

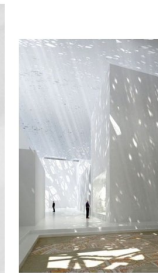
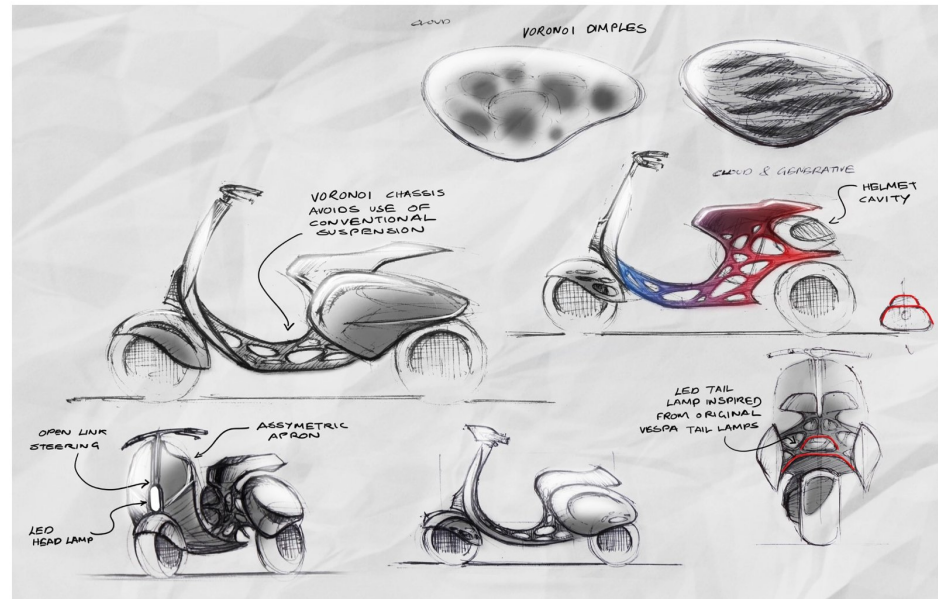


10 CONCEPT DIRECTIONS

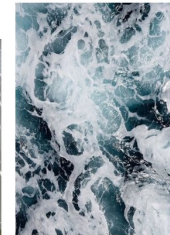
10.2 Generative

Generative design direction is inspired by the beauty in the apparent randomness of sea waves or dappled light.

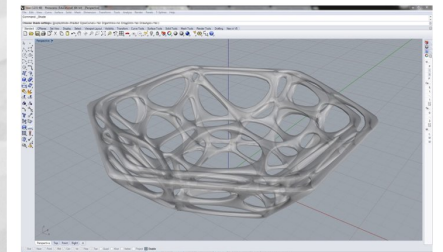
Voronoi dimples and structures were generated using Grasshopper plugin for Rhinoceros to emulate the randomness seen nature.



Dappled light



Tempestuous sea

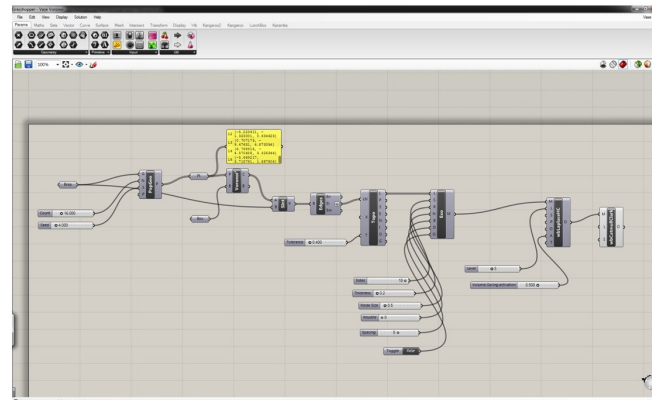


Voronoi dish

10 CONCEPT DIRECTIONS

10.2.1 Generative design

Generative design is a design method in which the output – image, sound, architectural models, animation – is generated by a set of rules or an algorithm, normally by using a computer program. [1]



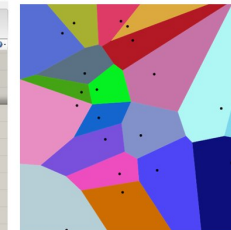
Grasshopper
algorithm

10.2.2 Voroni diagram

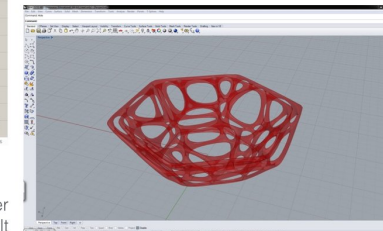
In mathematics, a Voronoi diagram is a partitioning of a plane into regions based on distance to points in a specific subset of the plane. [2]

[1] https://en.wikipedia.org/wiki/Generative_Design

[2] https://en.wikipedia.org/wiki/Voronoi_diagram



Voronoi
diagram



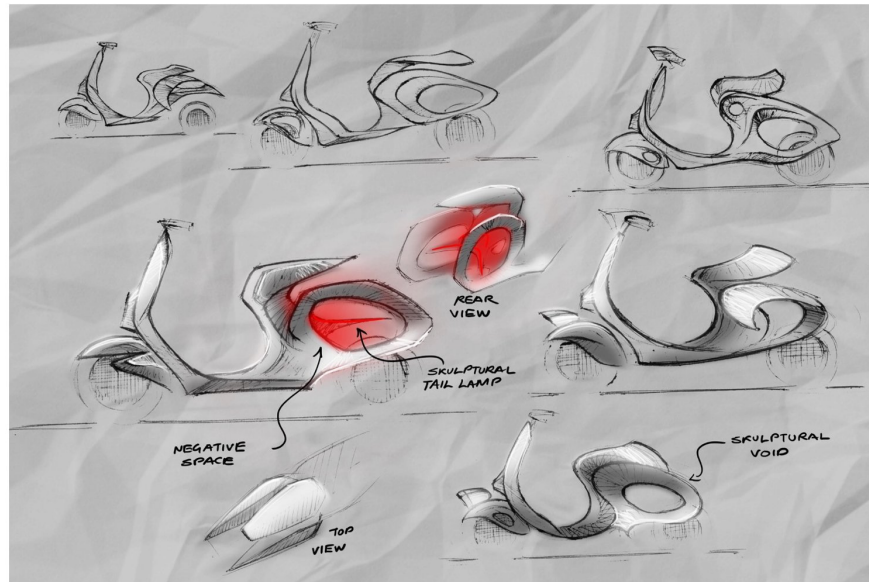
Grasshopper
end result

10 CONCEPT DIRECTIONS

10.3 Hollow

Hollow concept direction is a new interpretation of the Chetak engine cowl inspired by contemporary architecture.

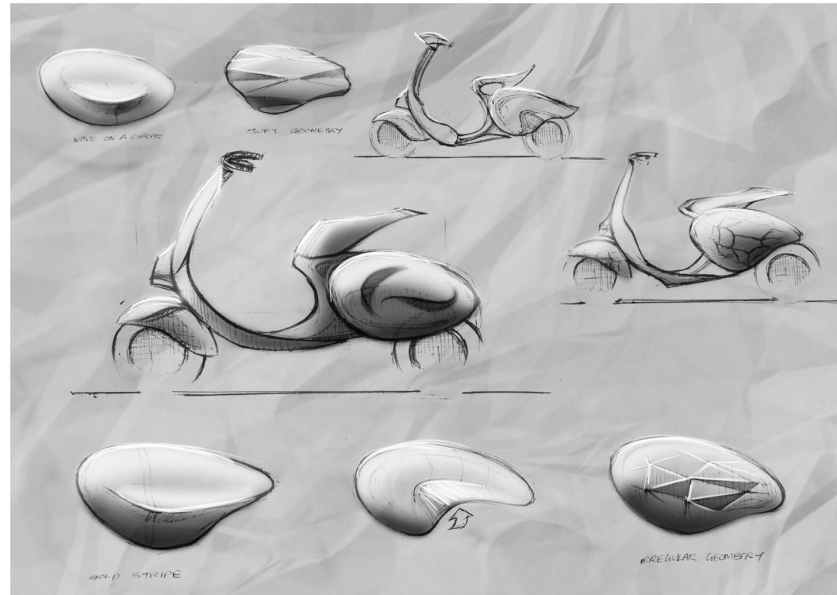
The engine cowl graphic is represented in the negative space created by the wings, introducing a new interpretation of the iconic design.



10 CONCEPT DIRECTIONS

10.4 Ceramic

Ceramic concept direction intends to bring soft and supple surface language as seen ceramic design, creating a calming composition.

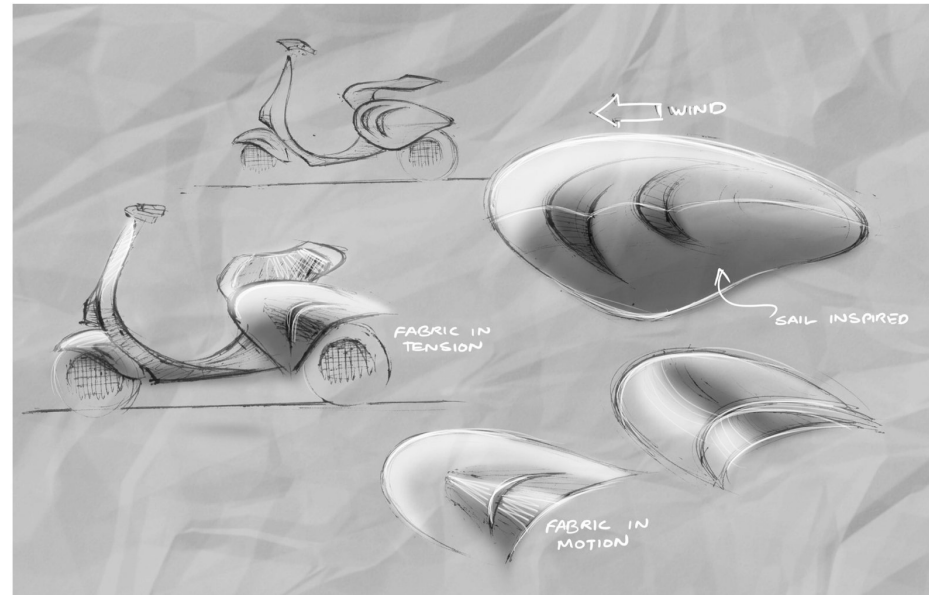


10 CONCEPT DIRECTIONS

10.5 Sail

Sail concept direction tries to express the subtle yet powerful movement of air at the sea. The sail is the perfect yet controlled mirror of the air's movement.

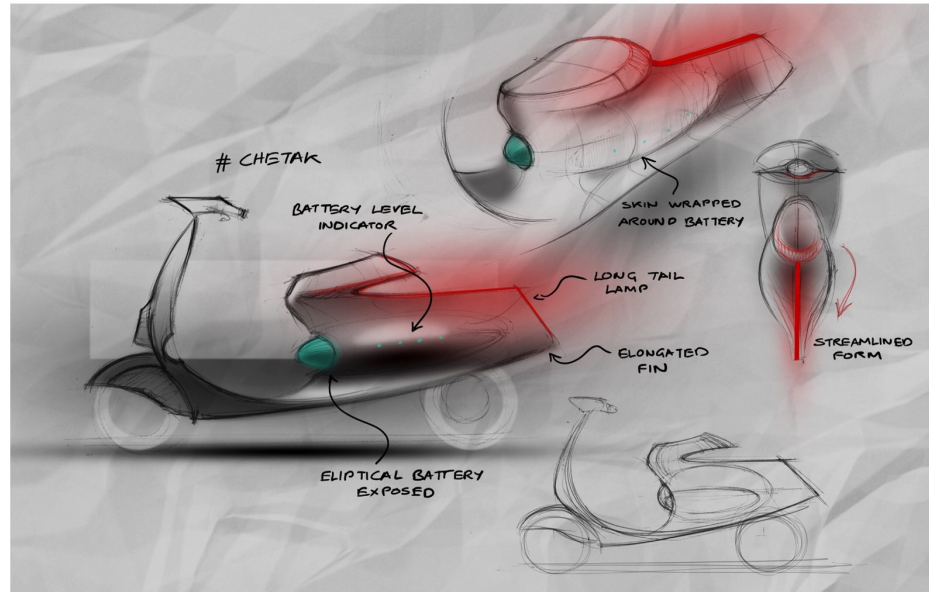
The surfaces of the scooter convey movement like that one sees on sails of a sailing yacht in the middle of a warm calm sea. The movement of air creates a gleeful atmosphere.



10 CONCEPT DIRECTIONS

10.6 Long fin

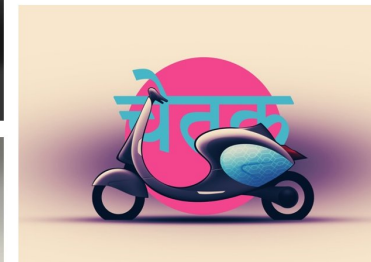
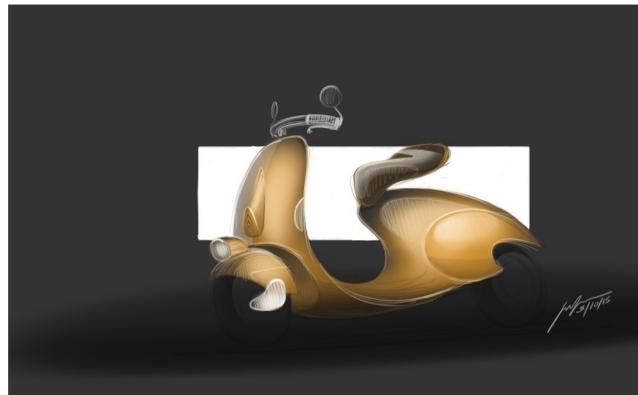
Long fin is an alternative interpretation of the sail concept direction. This direction tries to suggest forward movement through elongated tail fins.



11 CONCEPTS

11.1 Early concepts

These concepts are based on free sketches made at early stages of the project for warmup purposes only.

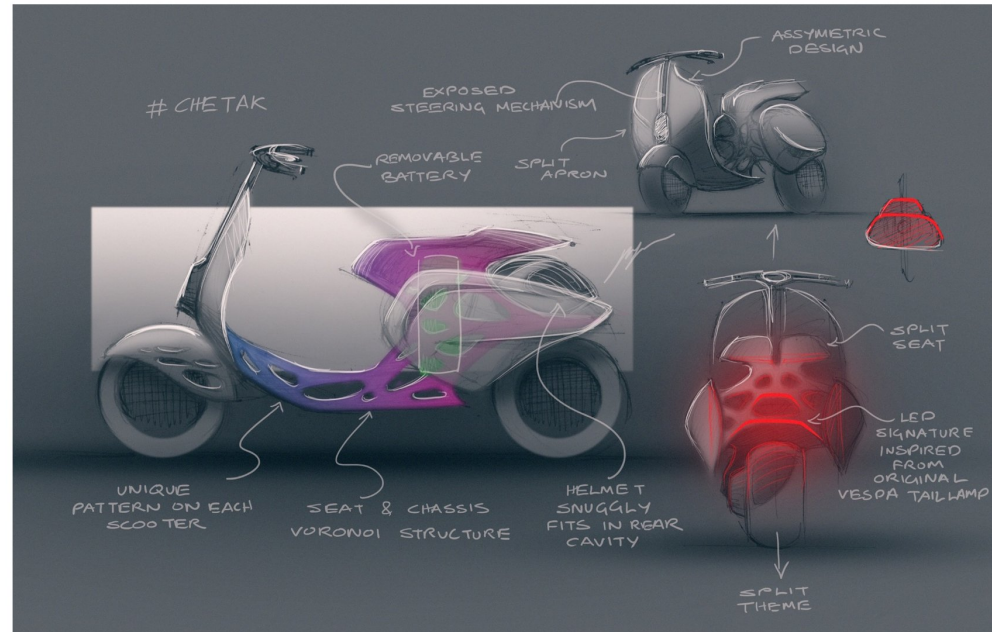


11 CONCEPTS

11.2 Concept 0.1

This concept is the further evolution of the generative form concept direction.

The concept features an exposed Voronoi central structure and floating side panels. The concept evokes a sense of airiness and freedom. The Voronoi patterns also cast interesting shadows.

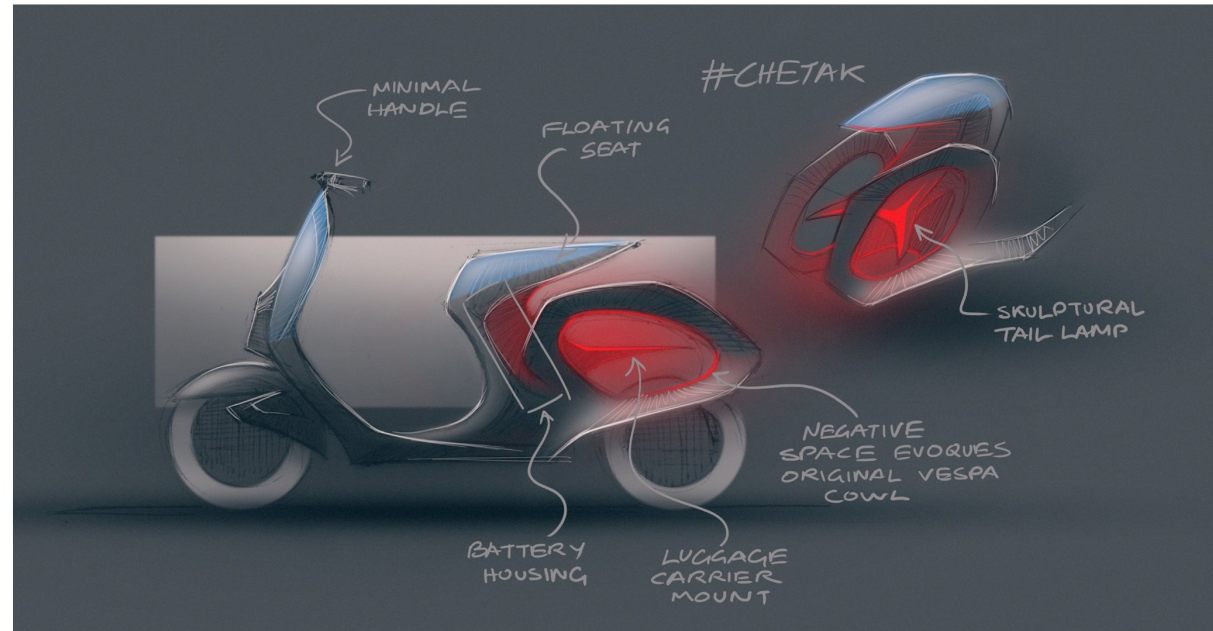


11 CONCEPTS

11.3 Concept 0.2

This concept is the evolution of the contemporary hollow form concept direction.

The hollow concept has a negative space that reflects back to the engine cowl of the Chetak. Floating LED taillamps illuminate the void with bright red light.

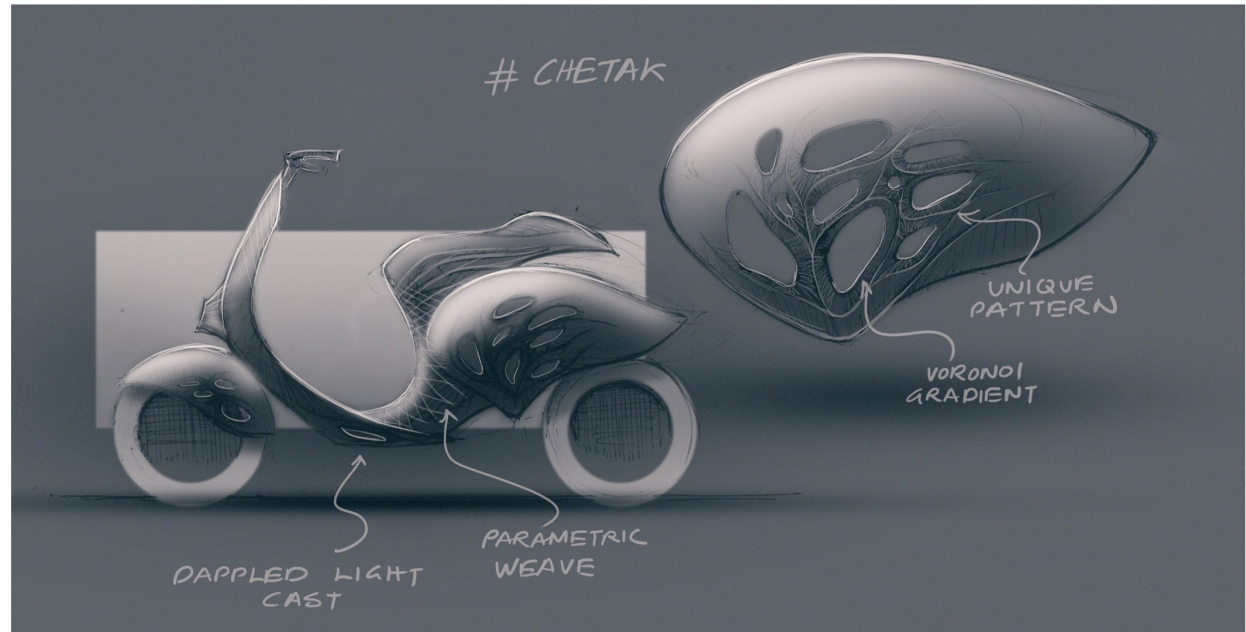


11 CONCEPTS

11.4 Concept 0.3

This concept explores organic forms generated by parametric modelling.

The engine cowl features a gradient like organic pattern that emulates hollow bone structures. The centre structure consist of a parametric weave that resonates with the flow of the form.



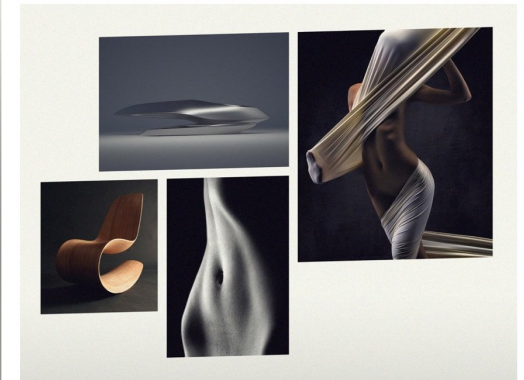
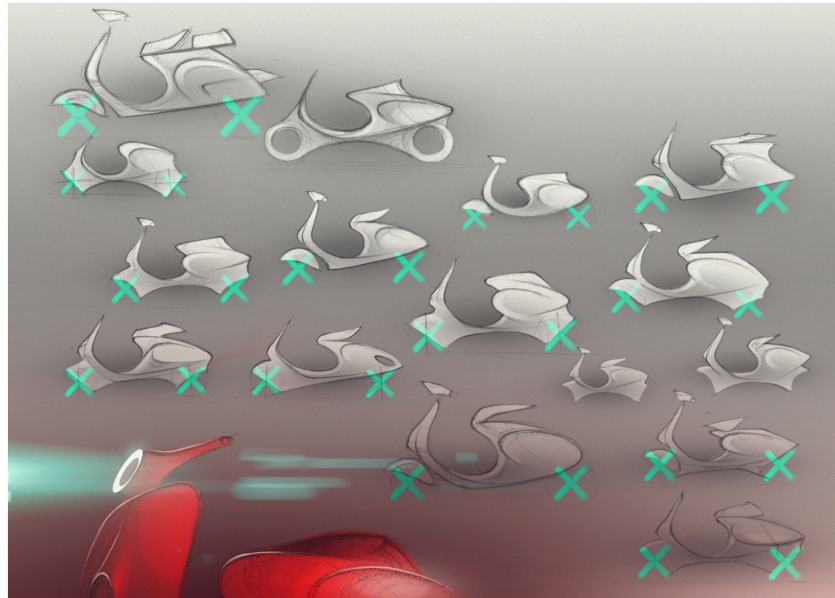
11 CONCEPTS

11.5 Concept 1

Seduction

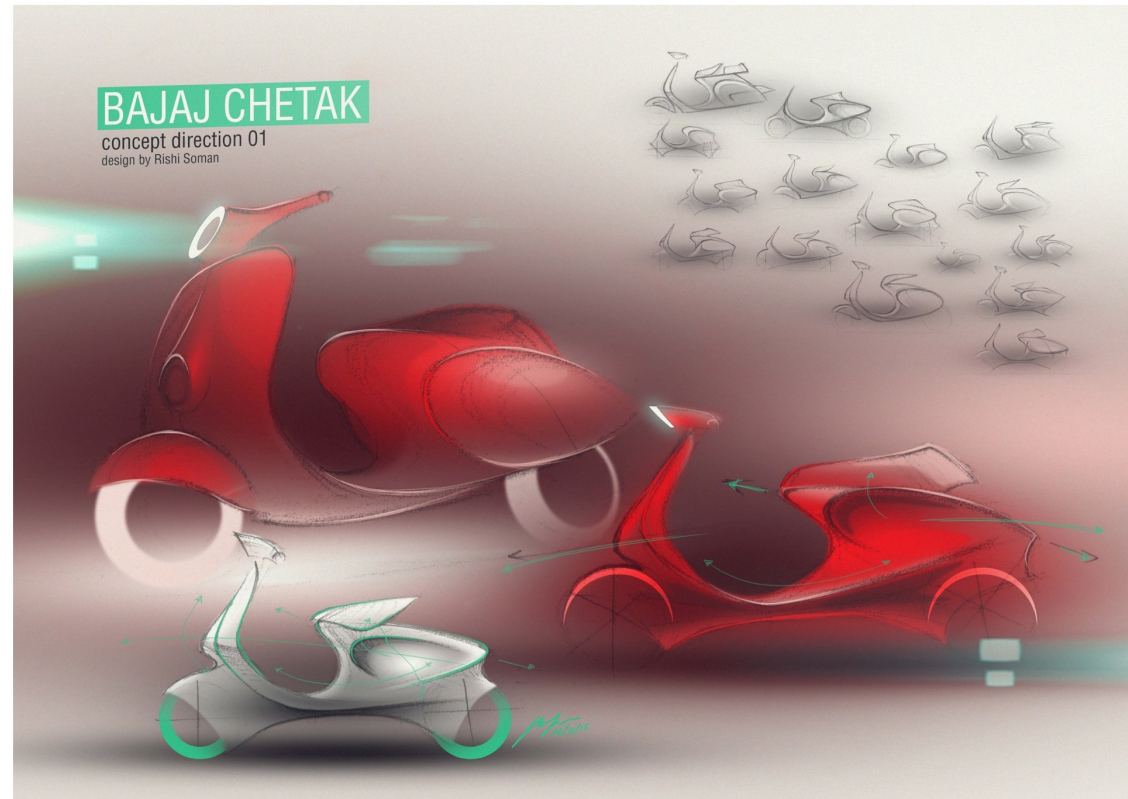
Classic vehicles had sexy volumes.

Many of the classic designs were inspired from female anatomy, because it is the most attractive form known to man since the dawn of civilisation. Tension of fabric teases the rider, adding an element of excitement to the design of the scooter.



Design motif

11 CONCEPTS

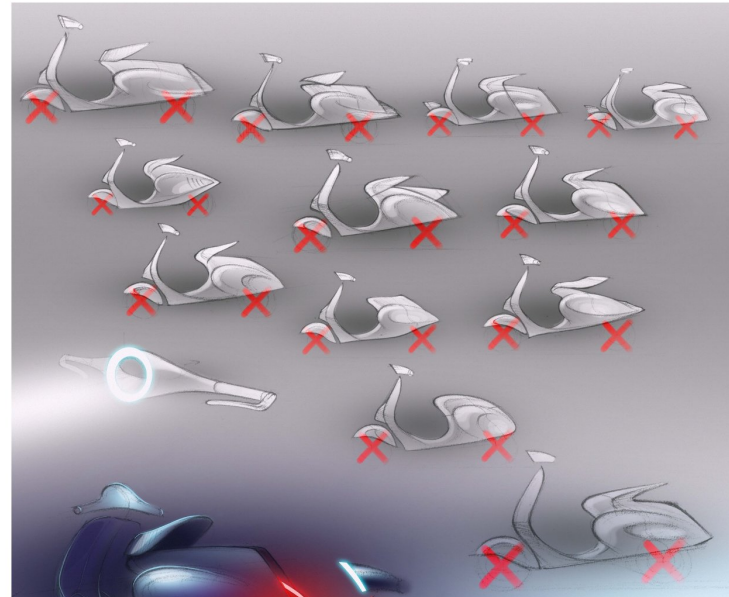


11 CONCEPTS

11.6 Concept 2

Aeronautical

The original Vespa's design was a reflection of Piaggio's aeronautical history.

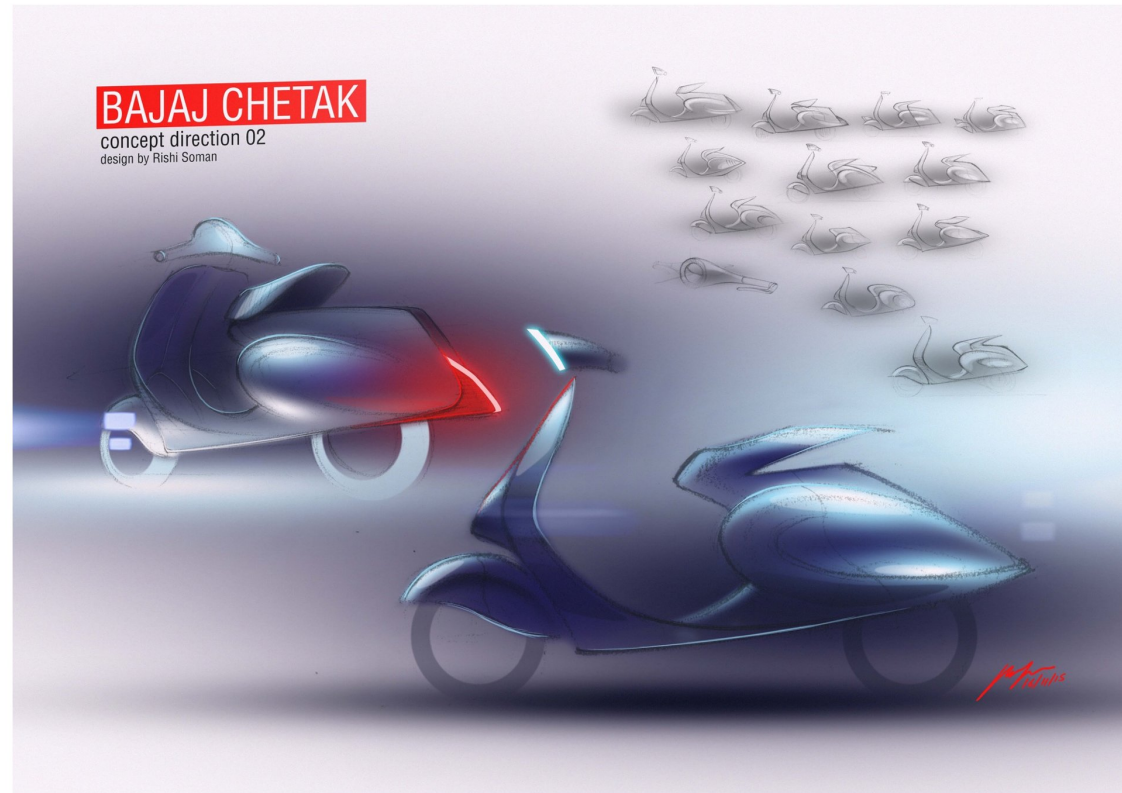


The new Chetak draws inspiration from aeronautical forms. Well defined volumes blended gracefully create a new design language for the Chetak.



Design motif

11 CONCEPTS



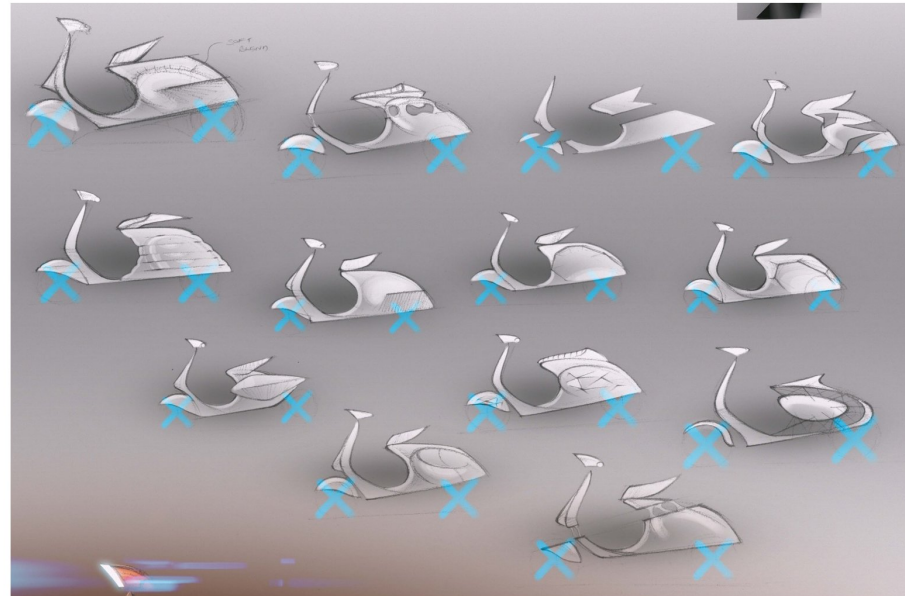
11 CONCEPTS

11.7 Concept 3

Juxtaposition of sharp geometry on the clean volumes of the Chetak delightfully surprises the rider.

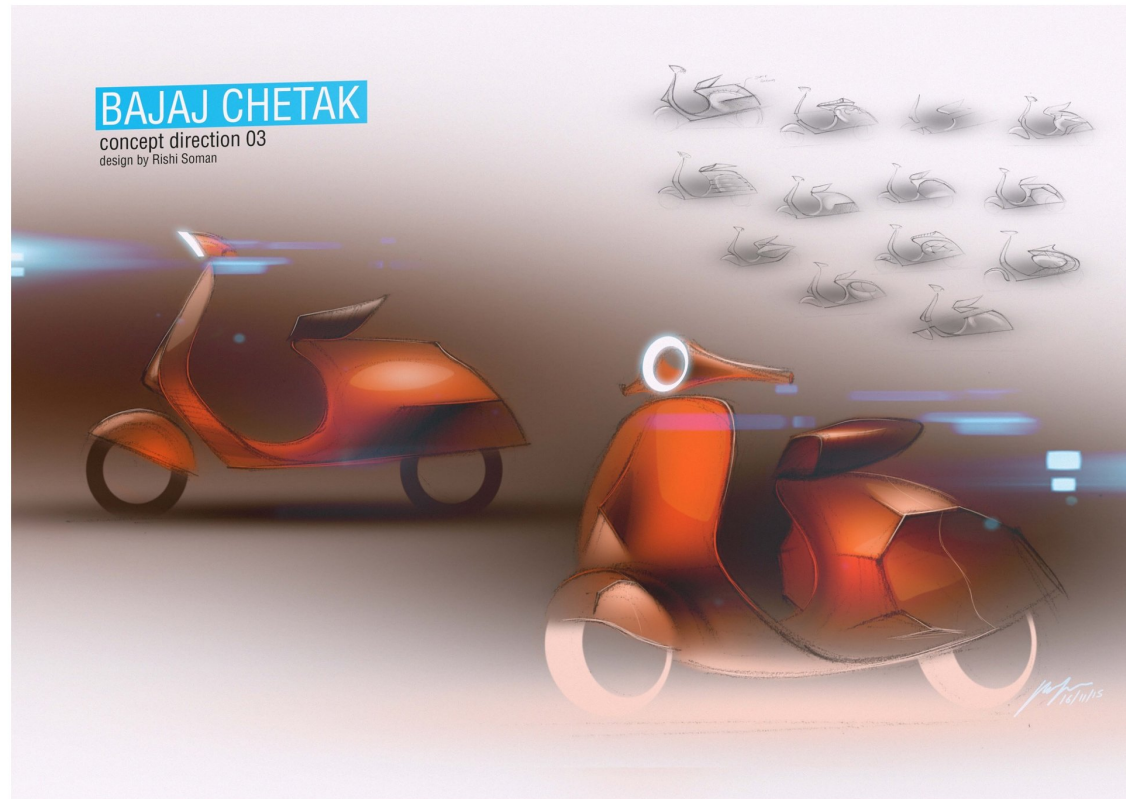
Surreal form

Unrealistic and unconventional forms that escalate the character of the Chetak.



Design motif

11 CONCEPTS



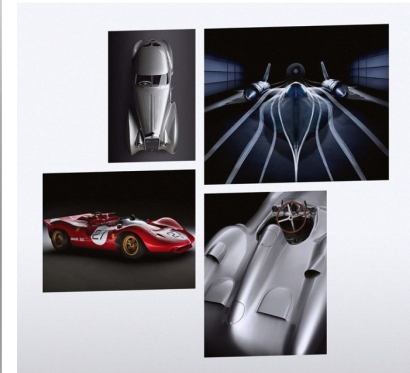
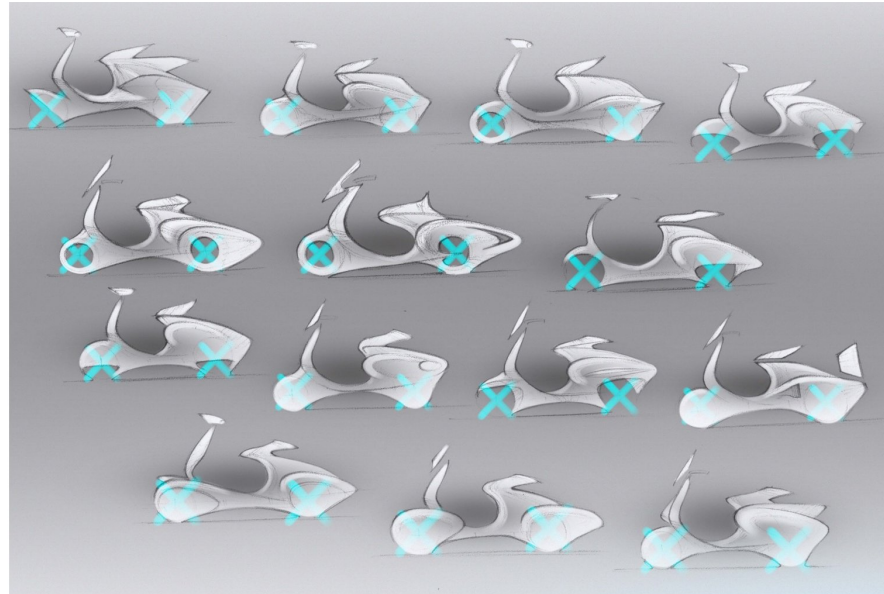
11 CONCEPTS

11.8 Concept 4

Aggressive aerodynamics

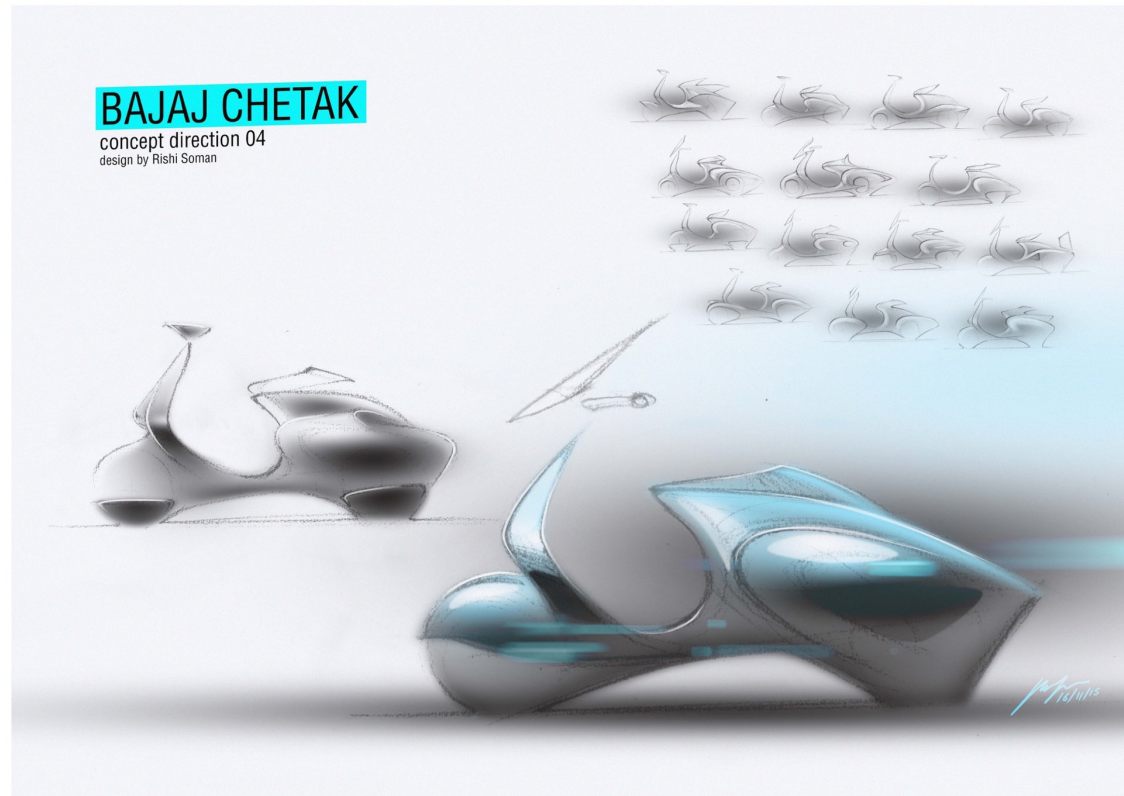
Aggressive aerodynamic design is inspired from classic race cars and aircrafts.

Aerodynamic design adds purpose to the overall design while staying true to the original design intent of the Chetak.



Design motif

11 CONCEPTS



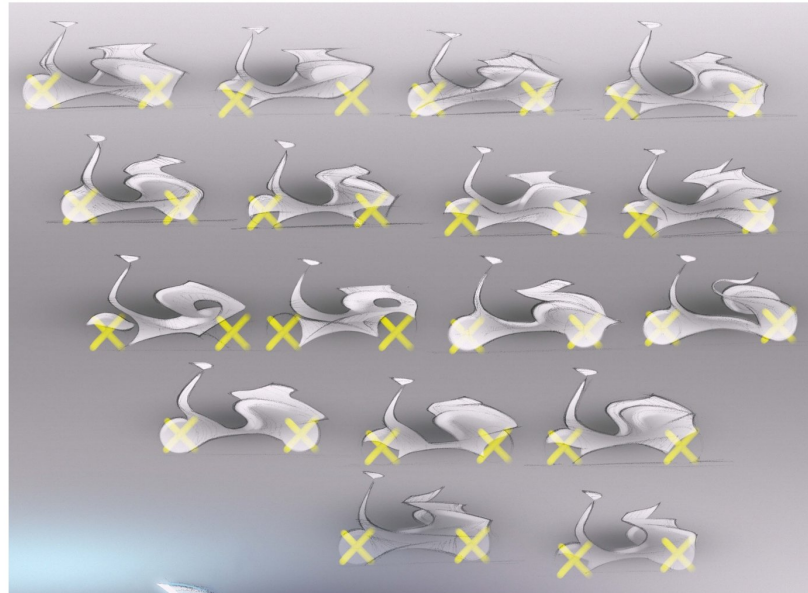
11 CONCEPTS

11.9 Concept 5

Dynamic movement

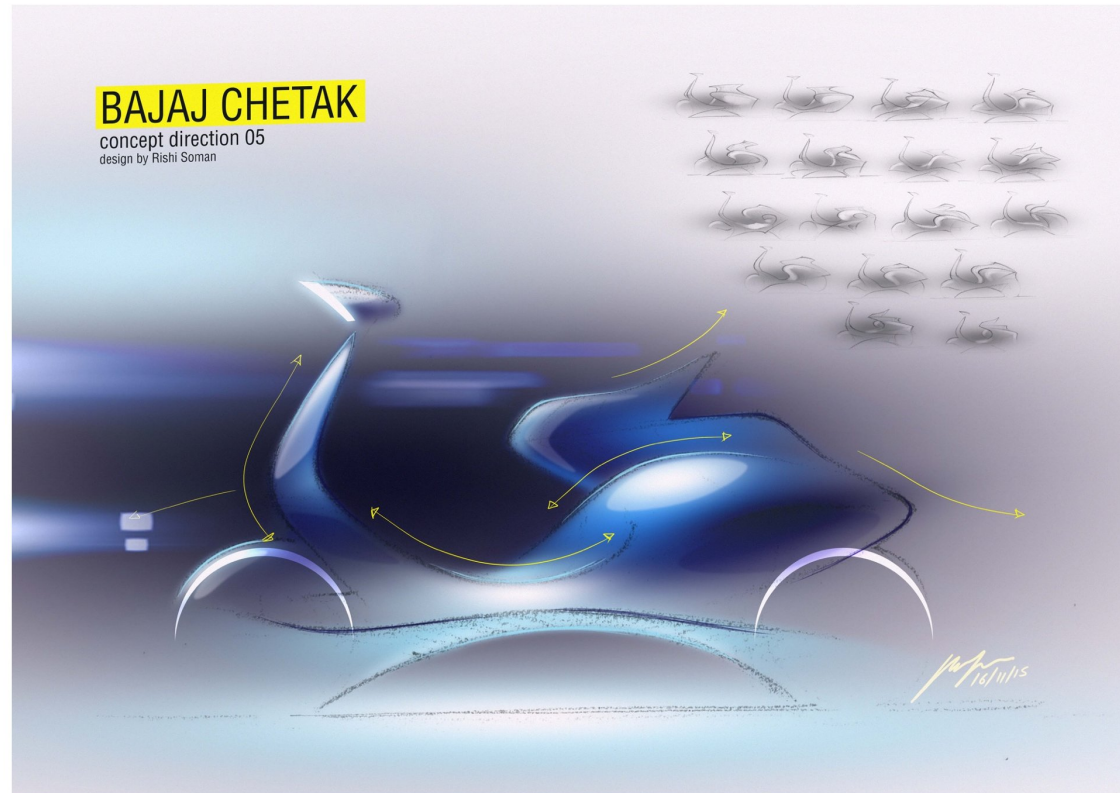
Movement conveyed through dynamic lines and volumes.

The design intends to show forward motion even when the vehicle is static.



Design motif

11 CONCEPTS



12 CONCEPT EVALUATION

For the sake of a just concept evaluation, prospective users with an understanding of form and design were asked to react on each of the final five concepts. Original Chetak users were also accounted for, so as to evaluate the relevance of the concepts to the

original design. Scaled down thermocol models were also provided to the users, so as to give them a clearer understanding of the design. Users were asked to highlight features that they felt work or didn't with colour coded stickers.



12 CONCEPT EVALUATION

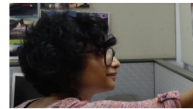
11 users were selected who both represented the target audience of urban youth and also original Bajaj Chetak users to gauge the success of the restyle project.



Kuldip Singh
24
Sound Engineer



Alice Kerketta
27
Fashion Designer



Ira Anand
24
Graphic Designer



Uday Athavankar
60+
Architect/Professor
Original Chetak User



Sridhar Gaddala
27
Product Designer
Original Chetak User



G V Sreekumar
50
Graphic Designer/Professor
Original Chetak User



Kiran Gangadharan
29
Product Designer



Amar Kler
27
Transportation Designer

12 CONCEPT EVALUATION



Sean
26
Transportation Designer
Bajaj Super User



Patrick John
22
Product Design Student



Aniket Gupta
22
Product Designer

12 CONCEPT EVALUATION

12.1 Concept 1

Keywords uttered by users

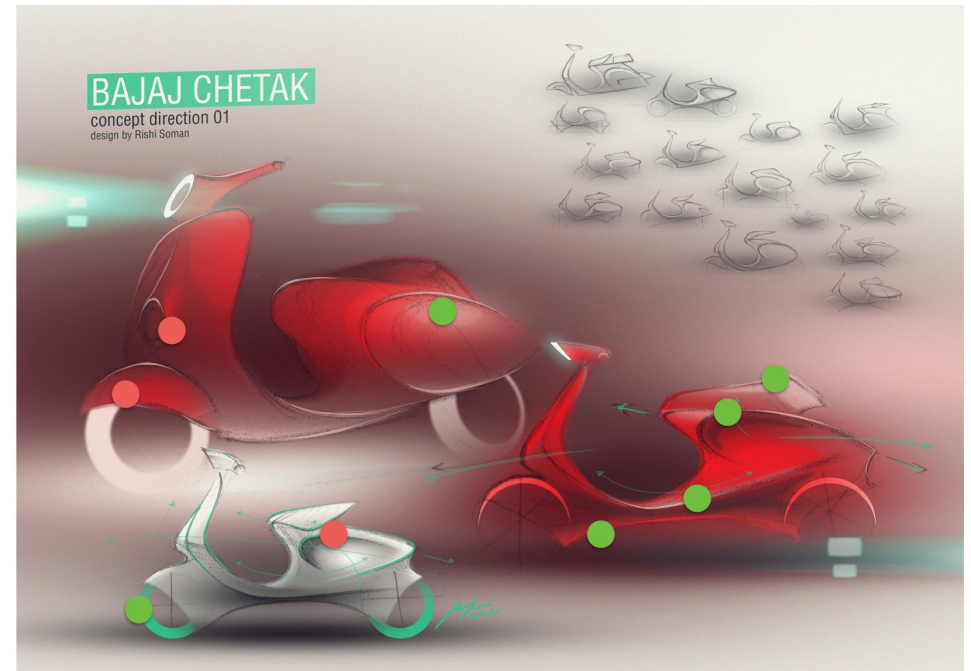
Pleasing lines
Contemporary
Executive office goer

The good

Resolved
Lovely seat
Futuristic

And the bad

Concave engine cowl doesn't
have Chetak DNA



● Like ● Dislike

12 CONCEPT EVALUATION

12.2 Concept 2

Keywords uttered by users

Subtle

Unisex

Falls between contemporary and retro

The good

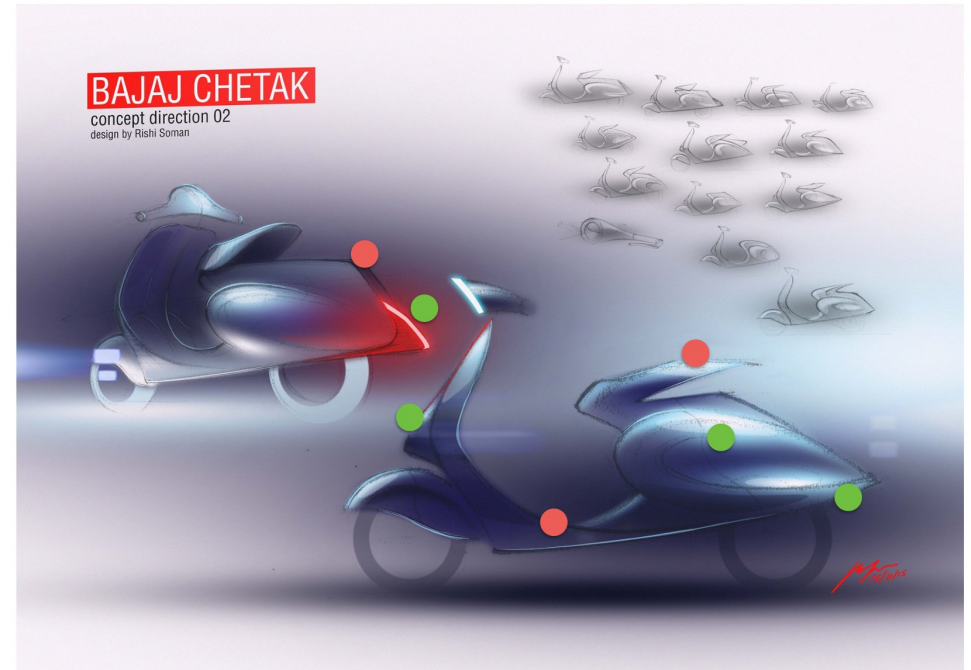
Restrained

Love the nose design

And the bad

Regular design

Can't tell if it's retro for sure



● Like

● Dislike

12 CONCEPT EVALUATION

12.3 Concept 3

Keywords uttered by users

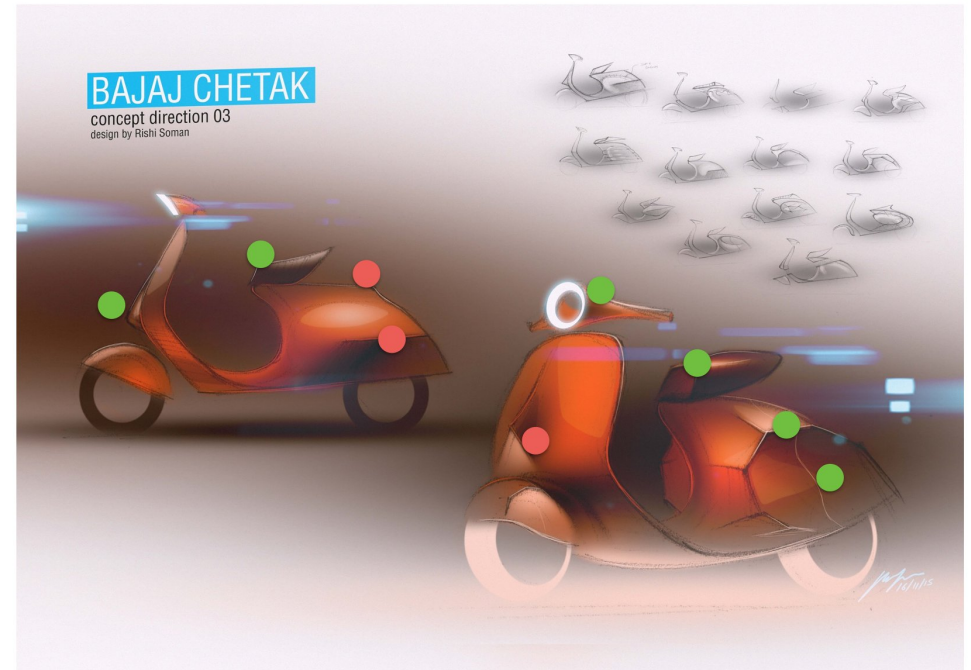
Simple pleasing design
Rigid in a good retro way
Looks masculine

The good

Pleasing proportion and stance
Unanimous liking for hollow headlamp

And the bad

Too robust looking
Doesn't look much different from original Chetak



Like

Dislike

12 CONCEPT EVALUATION

12.4 Concept 4

Keywords uttered by users

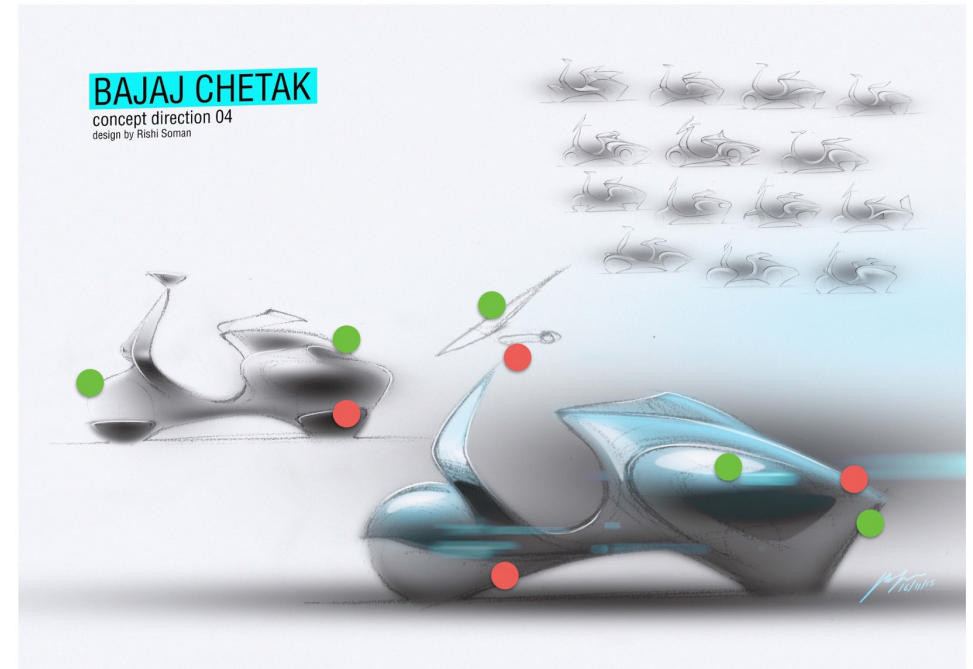
Sci-fi looking
Voluminous
Space age
Pure retro
Niche market

The good

Looks handmade and artistic
Rustic naked metal look

And the bad

Looks sculptural and hence static
Might be too niche and too futuristic for today's market



● Like

● Dislike

12 CONCEPT EVALUATION

12.5 Concept 5

Keywords uttered by users

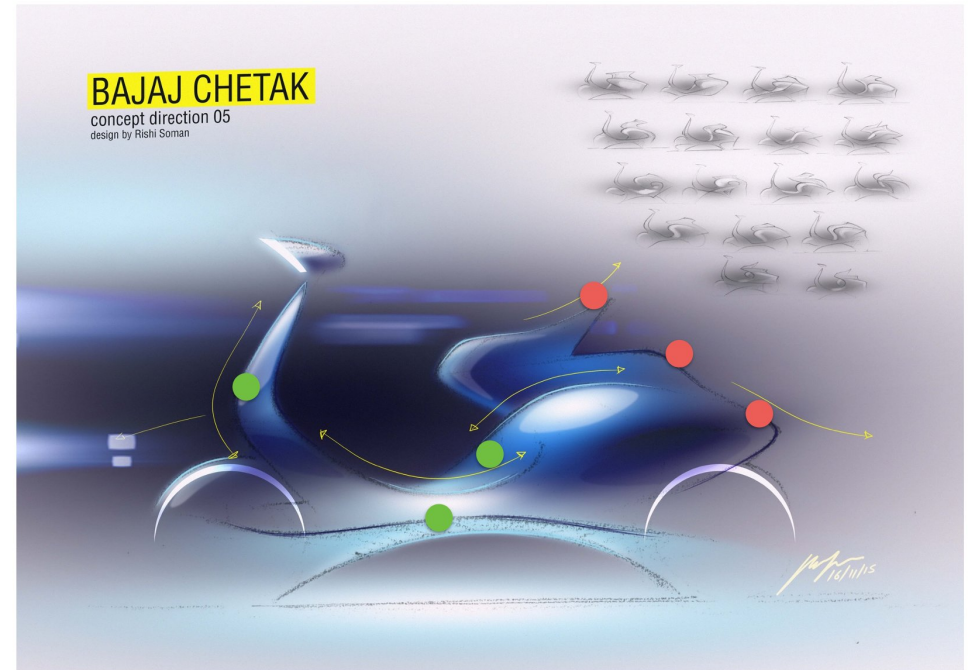
Lady's scooter
Looks like a peacock
Looks like a turtle

The good

Design looks dynamic and suggests movement
Looks like a woman's dress in motion

And the bad

Looks cosmetic and pretentious
Lines seem confused



● Like

● Dislike

12 CONCEPT EVALUATION

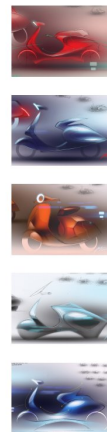
12.6 Concept preference by users

Users were asked to pick one concept on the following two basis

- Concept that best represents the Chetak

- Most aesthetically pleasing out of the 5 concepts

Majority users picked concept 4, felt that the volumes and the aerodynamic shape conveyed the Chetak DNA.



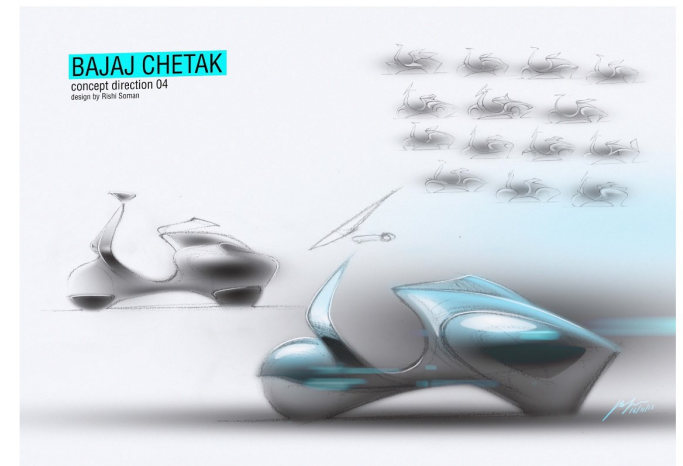
Concept 01 1 user

Concept 02 1 user

Concept 03 2 users

Concept 04 6 users

Concept 05 1 user



12 CONCEPT EVALUATION

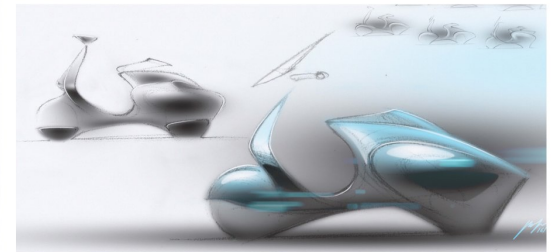
12.7 Concept evaluation inference

Through the concept evaluation stage, it is inferred that details such as chrome trim, front storage box and the spare tire would make the design much more Chetak like.

Also the headlamp and handle assembly where not detailed out in the concept direction.

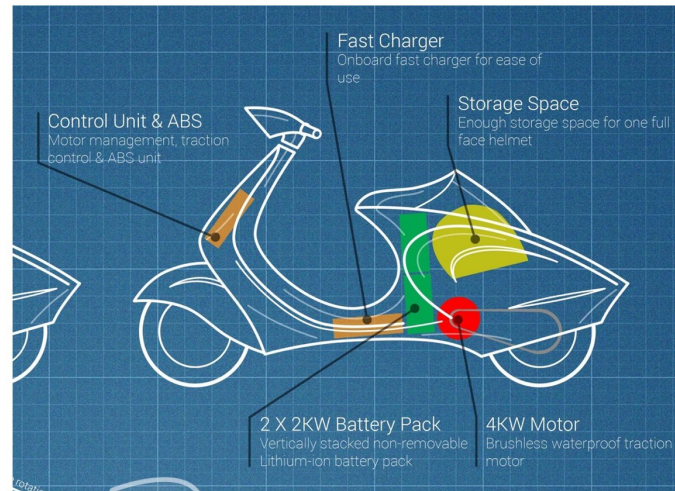
The design motif for concept 4, "aggressive aerodynamics" reflects back at the time period when the original Vespa design was penned.

Further development & detailing of concept 04 is a viable direction towards the final design of the restyled Chetak.



13 VEHICLE PACKAGE

Concept 4 was studied further and possible architecture of the vehicle was arrived at. The vehicle has an electric drivetrain, abandoning the original Chetak's side mounted two-stroke engine. The new package consists of 2 X 2KW lithium-ion battery pack under the rider seat. A 4KW brushless motor drives the rear wheels with a final belt drive. An onboard fast charger charges the battery off any wall electric socket. Storage space for a full face helmet is provided. Adequate to store shopping bags and hand bags and miscellaneous items.



Package diagram

A 4KW brushless motor drives the rear wheels with a final belt drive. An onboard fast charger charges the battery off any wall electric socket. Storage space for a full face helmet is provided. Adequate to store shopping bags and hand bags and miscellaneous items.

The wheel base, seat & handlebar height and relationship is borrowed off the Vespa 946 (2014 model.)



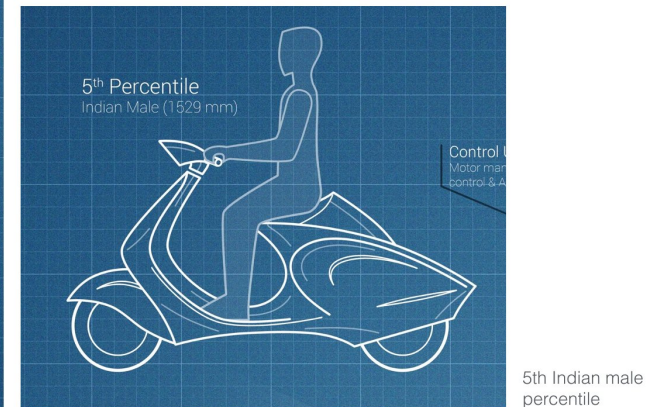
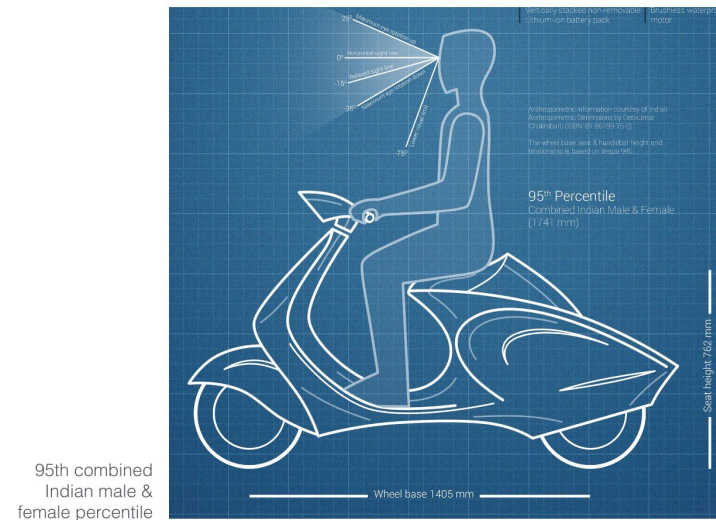
Vespa 946

13 VEHICLE PACKAGE

13.1 Ergonomic study

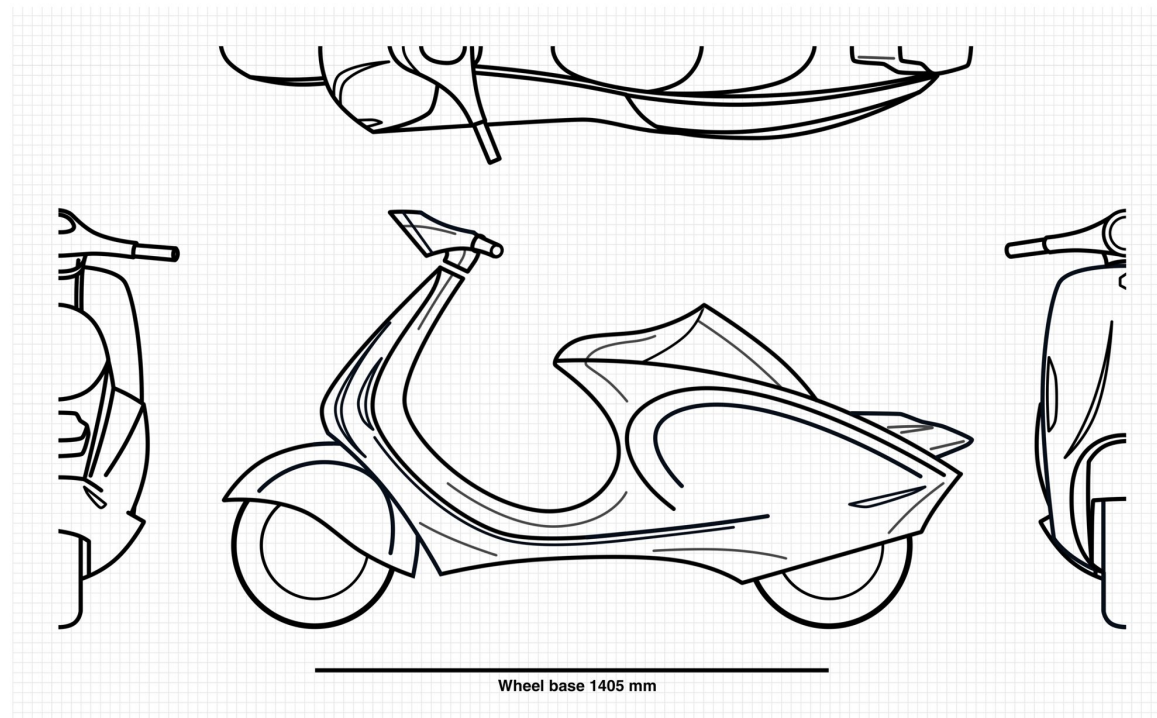
Indian anthropometric dimensions were referred from Indian Anthropometric Dimensions by Debkumar Chakrabarti (ISBN: 81-86199-15-0) and simulated on the Vespa 946. These manikins were later superimposed on package diagram of concept 4.

Male 5th and combined male & female 95th percentile were simulated on concept 4 to study the reach and clearance. The field of vision was also studied for optimum positioning of rider information display system.



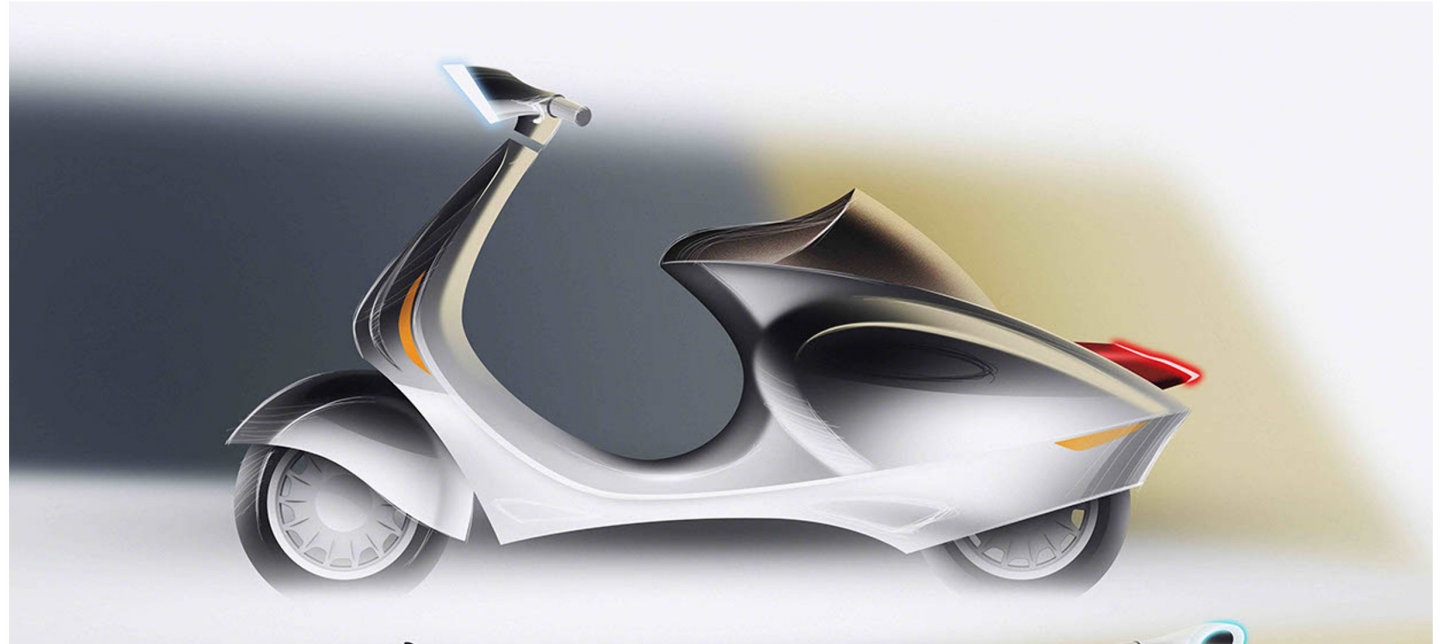
14 ORTHOGRAPHIC VIEWS

Following are the orthographic views of the final restyled Bajaj Chetak based on Concept 4.

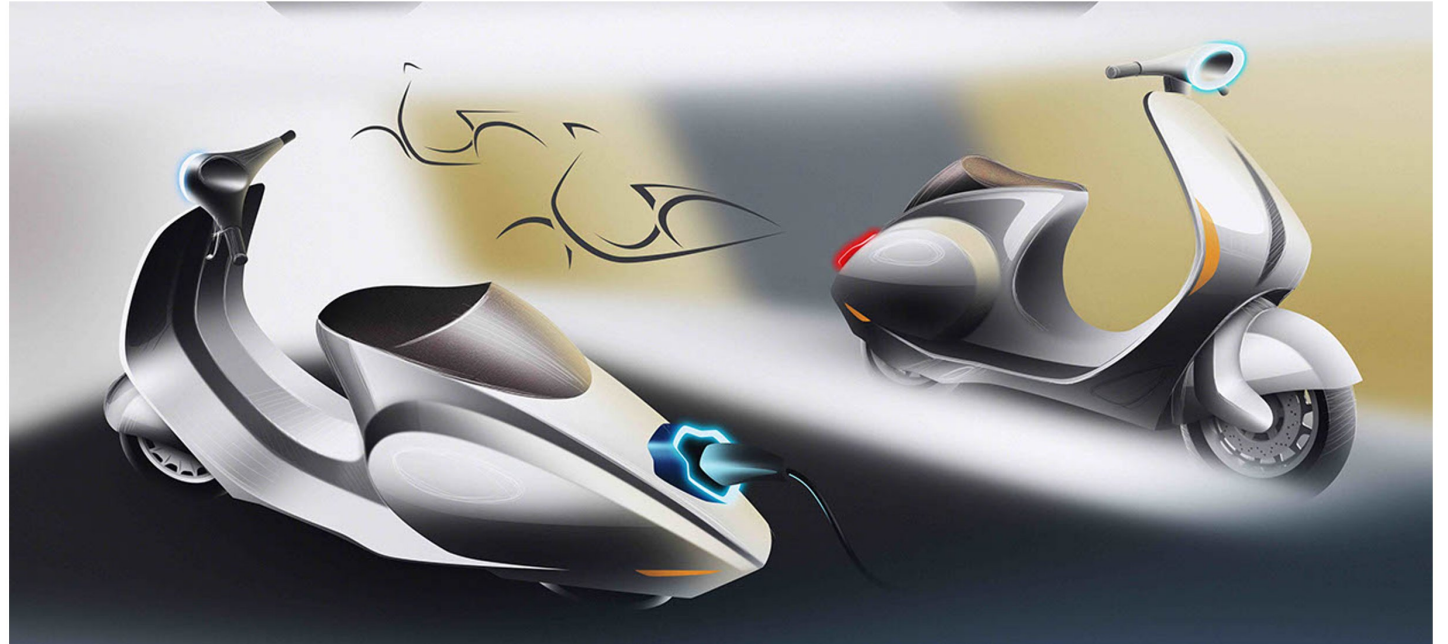


15 FINAL RENDERS

Following are the final renders of the final design.



15 FINAL RENDERS



16 FINAL MODEL

Final presentation 1:3 scale model was made with industrial clay. Detailed components like wheels were 3D printed. Following is the clay work in progress.



16 FINAL MODEL

Following are the images of the final completed model



16 FINAL MODEL



16 **FINAL MODEL**



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- <https://en.wikipedia.org/wiki/Vespa>
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- <http://www.scooterhelp.com/serial/VLB.manual.html>

RESTYLING THE BAJAJ CHETAK

MOBILITY & VEHICLE DESIGN PROJECT II
MVD II-27

BY

RISHI SOMAN

146390004

GUIDE

PROF. NISHANT SHARMA



**INDUSTRIAL DESIGN CENTRE
INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
2016**