

Form Development of a Two Wheeler (An Indian Preface)

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Abstract

India is second largest producer of two-wheeler in the world. In last few years, Indian two-wheeler industry has seen spectacular growth. Our country stands next to China & Japan in terms of production and sales respectively. The reason for this growth is very simple, majority of Indians especially the youngster prefer motorbikes rather than cars. Capturing a large share in the two-wheeler industry, bikes and scooters cover a major segment in the Indian market. Bikes are considered to be the favourite among youth, as they help in easy commuting. Also, people can afford the cost of two wheelers. In India bikes & scooters represent style and class for both men & women. Large variety of two-wheelers is available in the market. India is the manufacturer of some of the best bikes in the world. Hero Honda, Bajaj, TVS Motors etc; are some of the iconic bike manufacturers. This points out the importance of applying and analysing the latest trends in designing of two wheelers form development. This paper is focused on studying some techniques followed by the automotive companies to evolve external form development which would result in a quality output. The paper further discusses a method to develop an Indian form for two wheelers.

Key words: Motor bikes, Exterior styling, Design methods, Indian design.

1. Introduction

India is one of the rapidly growing country which has already marked wide span of accepting the emerging trends and style. People started recognizing 'Styling' very significantly amongst all other aspects related to the product. Styling aspects has undergone a massive boom in the current scenario. This points out the need of research in the field of automotive styling.

Now a day's exterior styling of products plays significant role in the customer's decision making process [1]. This becomes very specific in the case of automobile segment, whether it is a two wheeler or four wheeler or any other mobility system. Customers have come increasingly connected and trend savvy[2].

when it comes to owning vehicles. styling coupled with design has become all the more critical. Through this paper, The author attempts to express, design ideas related to "external form" development in two wheelers, specifically addressing an Indian taste. Few case studies of bike design are referred to, to formulate a methodological approach for bike design. On the basis of understanding thus developed, an Indian taste for design is conceptualised, using this conceptual design approach an Indian design in arrived at, for which a mock up model is developed.

2. Research And Analysis

It has been more than 50 years now that bikes have been ruling the Indian automobile sector.[3] In 1955, the Indian government needed sturdy and reliable motor bikes for its army and police to patrol the rugged border highways. The first batch of 350cc-Bullet "the super bike" in India of all the times, from the Royal Enfield Company, UK was received and assembled at Chennai. Since then, bikes in India have been flourishing. So also, the two-wheeler segment, and Indian bikes are gaining on popularity all across the world.

Referring to bikes CC, bikes with four-stroke engines, are thought to be more fuel efficient motor bikes. They are the main reason for the growth of motorbikes in India as a distinct segment. Indian bikes market share is about 81.5% of the total two wheeler market in India [4]. Three-Fourth of the total exports in the two-wheeler automobile industry is made in the motor cycle segment. In India there are economic motorcycles that falls in the commuter bike segment as well as luxury bikes (like sports bikes) for new age bikers. Every year a series of latest bike launch keeps the sector buzzing. Kawasaki Ninja, Bajaj Pulsar 135LS and Honda Dazzler are some of the latest motorcycle models that have made news in the recent past. Besides, there are also a number of new bikes in India that are awaiting a launch in the near future.

2.1. Study on existing popular segment motorcycle in Indian market:

Names	Maximum Speed
Pulsar 220cc	144kmph
Yamaha FZ/Faizer	125kmph
Yamaha R15	135kmph
Hero Honda Karizma ZMR	126kmph
TVS Apache RTR 180	125kmph
Enfield Thunder Bird 350cc	110kmph

Table 1: Existing Popular Segment Motorcycle in India.

Some interesting findings: Styling elements/features of bikes are evaluated based on the side profile view, Front 3/4th view, Rear 3/4th view. Here the development of side views are made, initially to get an idea regarding the development of new form. A consumer's buying decision is influenced by the look of the vehicle (especially for the youth). Here, the author discusses few case studies to throw light on design process of successful bikes.

2.2. Case study: Development of Bajaj – PULSAR Motorbike (220cc), Courtesy: SIAM Styling Conclave 2010.

Pulsar is one of the best selling bikes in India. Due to the success of 1st generation pulsar 150cc bikes, Bajaj Auto Ltd started upgrading the design features and produced a generation of bikes which have become iconic in the automotive industry. The Indian two-wheeler market was initially dominated by scooters, during the post-independence period. Mr. Rahul Bajaj was the chairman of M/s Bajaj Auto Ltd then. Later his son Rajiv Bajaj joined the company and he was not interested in scooters. He understood the changing trend and introduced some innovative reforms. A new plant was built and huge investment was made in R&D and Product development. *The birth of pulsar:* A team, consisting of 15 members, was interested with the production of a 200cc bike. It was envisaged to be the fastest bike then and a huge profit was expected. The R&D team was headed by Mr. Abraham Joseph, who can be termed as the brain behind pulsar. For the style and design development, Mr. Rajiv selected R&D division of M/s Glynn Kerr, Tokyo. His firm designed the sketch of pulsar. Seven designs got finalized in three months. The final design was completely reworked by Mr. Rajiv and his R&D team. The special feature about this project was that, even the initial

design renderings were done on computers, thus making it one of the first truly paperless project executed in Indian automotive industry. Today every second bike sold in performance segment in India, is pulsar. This shows pulsar's dominance in Indian market. *Achievement:* Bajaj Pulsar 220cc DTS-Fi had won "Motorcycle of the year (IMOTY) award 2008." [5]

2.3. Case study: Development of Unisex scooter concept- WEGO, Courtesy: SIAM Styling Conclave 2010.

TVS is 3rd largest among two-wheeler companies in India and has been in top ten motorcycle companies of the world. The company has a competent R&D team having styling group, for the design of the outer body cover & graphics. New project development flowchart adopted by M/s TVS motors Ltd is detailed below: Project planning, Conceptual stage, Detailed design plan, Quality checking, Manufacturing.

2.3.1. Design Process: TVS also follows a strong design methodology. At the onset, a survey is conducted. The design brief is discussed with the marketing team. Chassis design is initiated as the first step in the design process. A study of the Indian Scooter market is conducted to ascertain the current market scenario as well as to understand the latest trends in the automobile market. The scenario is analyzed and bench-marked 'look' is formulated as against the competitors', International bench-marks are also fixed.

2.3.2. Pure Research: Collection of video document, Studying of user group, Documentation of process. User profile study is given more importance at this stage.

2.3.3. Style Directions: Here, mapping of product & different parameters are done and analyzed. This gives a clear direction for further design process.

2.3.4. Layout & Proportion Study: Layouts and dimensions are very important while dealing with vehicles. Faulty proportions would make the design redundant. If the proportion goes wrong there is no meaning in designing anything. Proper ergonomics study is necessary.

2.3.5. Concept Sketches: Development sketches are made on a need basis. Based on the inputs got from the user group, different new concepts are created and discussed.

2.3.6. Concept Sketches –Evaluation: The selected concepts are displayed to the target user group at targeted areas. This process helps to narrow down to a single concept. Detailing and rendering of this concept is done by specific experts.

2.3.7. Modelling Stages: Full scale Clay model scooter is made after getting approval from the management. FRP mock-up full scale model of the concept is made to have the real feel of the vehicle. White light scanning method is used to get the 3D data and this output is given to the digital sculpting department for Class A surfacing. After digital style checking, one more full scale clay model (based on the digital inputs) is made. Further "Part detailing "is done such as; -Head lamp, Fuel cap, Wheel alloy, Speedometer, Floor matt (etc). Finally :Name & Logo design is done- WEGO. *Achievement: "Wego scooter has won scooter of the Year Award 2011" [5]*

2.4. Case study :Development of CBR 1000RR-launched on 2006, Courtesy: SIAM Styling Conclave 2010.

Honda follows a Design development process which consists of a design development cycle.

2.4.1. Formation of project team -The initial step is to get a development order "To design a sports bike." M/s Honda Motors India has a competent strong project team. The project team usually consists of -A project Leader, Professional Engineers, Testing team, Qualified Designers (designing tasks, modelling works, styling data collection).

2.4.2. Research stage-This stage includes major Market Research. Location where the similar bike segment is used are visited to get ideas for generating future similar concepts.

2.4.3. Conceptual stage-This stage includes collection of inputs & creative designing. A report is Prepared after getting inputs from the user. Survey results collected by the designer are analyzed. They develop concept board for "Concept visualization". For this the team would use - Keywords- it should be simple, Image picture/pictograph (Mood Boards)-explanatory, Value of customer.

2.4.4. Ideation & Concept generation- This stage starts with drawing of idea sketches, many different ideas are explored. Here the main aim is to create the design matching with concept. After this short listing of best ones are done and displayed. This stage is very important because this is the starting point of design works -one has to realize ones ideas, communicate to

the team members, more concentration is given to the creativity & drawing skills, with use computer (CG) & Markers.

2.4.5. Rendering stage- The best concepts are selected perfectly. This is the final sketch and rendering. Now discussion between engineering team is done. 1:1 colour printout is taken & displayed.

2.4.6. Digital modelling- SD & 3D models and software works are done. Feedbacks are collected and evaluated. At this stage also the design team is fully involved in the job.

2.4.7. Prototyping Process- Clay model of 1:1 scale is made. At this stage the relativity between the final rendering and the model made is checked. Also testing is done, riding posture; safety issues, construction layouts, fittings (etc) are taken into consideration. The clay modelling is done with experts besides the wall where the 1:1 rendering printout is pasted. At this stage also designer is involved in the process of modelling works. Thus the final clay modelling process is finished. Final model should look very close to the original proposed model.

2.4.8. Measuring process & 3D data collection- All the data's collected are checked, it is used to make the 3D data. "Data cloud" is taken from the clay model for making mock-up model in FRP. Further surface data treatments are conducted for processing.

2.4.9. Quality Check and detailing - Parts of the full scale prototype (FRP Model) are checked & Detailing of each parts are done properly at this stage.

2.4.10. Color and Trim - Colour and graphics is done based on the study of the place and what colour the design team wishes to have. At this stage the design team goes back to the user & selects the best colour for bike, as colour plays an important role in reflecting the emotions of the vehicle. Finally the placement of logo is done with proper care and precision (Brand identity is taken into consideration) *Achievement: "2006 Good Design Award in Transportation Design". [5]*

3. Methodology Adopted:

3.1. Understanding the selected segment:

The concept was explored for a sporty bike. Latest Trends were analyzed for styling of the bike which defined the need for the proposed study. such understanding at the initial stage is important as it sets the further processes in the design phases.

3.2. Research method

This stage involves user survey and analysis through interviews and questionnaires. In addition to this, benchmarking of existing products can be carried out to identify an existing expectation form a proposed product. Case studies involving the design and styling of successful bikes can also be referred to add value to the design process.

3.3. Design inputs

From the research conducted, primary design inputs are derived and analyzed for the project development resulting in “Key Concept”.

3.3.1. Key concept-“A sporty two wheeler which reflects all the emotions such as muscular, aggressive, robust and sporty.”

3.4. Design methodology

A design methodology is evolved from the inputs of case studies. As an outcome form the case studies, significant processes are understood for the approach to propose a new design. The stages then are formulated as follows



3.4.1. Idea Generation-A series of different ideas are generated through sketches. These sketches can be random keeping in perspective the key words as derived from previous stages of research. The idea generation phases undergo several review and checks so that the essence of proposed design do not deviate and is agreeable by the design team.

3.4.2.Final concept- The concepts thus developed in sketches are subjected to selection. Through a methodological approach and voting. The concept then undergoes through renderings and highlights to emphasise on the core inputs arrived at, through design.

3.4.3. Prototyping- To realise the proposed design changes, full scale prototype of the concept is developed and displayed. A full scale model gives a realistic feel of the design being proposed and decision makers can plan and be motivated for proposed investment.

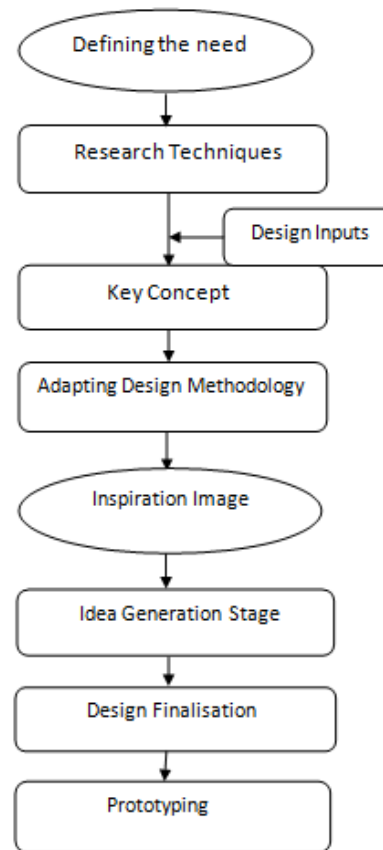


Fig1: Design Flow Chart

4.Research Analysis

A survey was conducted to know the reaction of people on the basis of questionnaire for getting the inputs from the user group. This survey helped to understand how the user reacts to the selected questions. The survey was conducted with a mass of 50 people within the age group (23-28).The result of this survey turned to be the best inputs for starting the new concepts. The feedback obtained from the user group were really valuable and informative. Survey was conducted in various places in college campus, shopping malls & other places in Delhi. The outcome of the survey was very impressive, from this data it was understood “What the youth really expect for a sporty bike?”. The outcome has become the foundation for further design process. As a result of this survey more importance was given to Design /styling process, especially in areas like Fuel tank, Headlamp, rear cowl etc.

Youth are more inclined to the “Stable and masculine looks” of the vehicle. They give more

preference for Dynamic / attractive shape & power of the vehicle. One of the interesting findings was that 70% of the user group wanted two-wheelers as the choice of mobility systems. This point motivated the author for further stages.

Most important for the sporty look is –the dynamic form/shape of the vehicle. New definition for latest trend is- Attractive, Very different, Uniqueness.

4.1.Product positioning

Product Positioning is done on the basis of mapping of existing products against various parameters and finding the position for the new entry. Here mapping is done on the basis of style and aggressiveness in the form of vehicle. Mapping gives an idea about the product positioning based on the plotted parameters.

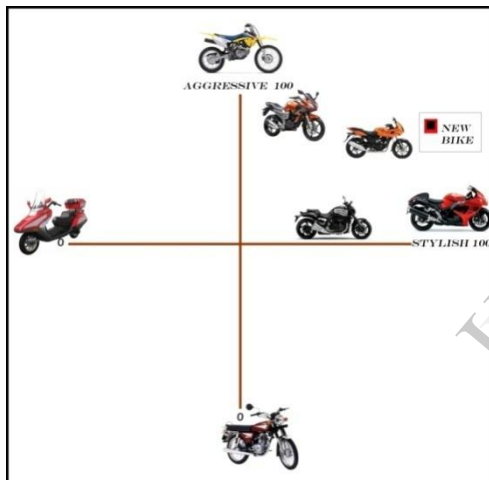


Fig 2: Product Positioning

4.2. Inspiration image and design keywords: Muscular, Aggressive, Robust, Sporty



Fig 3: Inspiration Image

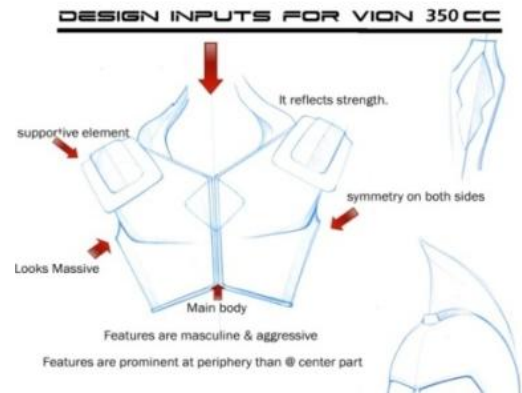


Fig 4: Design Inputs

Analysis result of image board: Symmetry on both sides is taken into consideration. The selected image reflects all the aspects of keyword such as Sportiness, Masculine feel, Strength, Aggressiveness, Stylish features. Most of the features are sharp & masculine. Also, the features are more prominent at the periphery than at the centre of the body.

Designing based on mood boards: A mood board is a type of poster design that may consist of images, text and samples of objects in a composition of choice of the mood board creator. Designers and others use mood board to develop their design concepts and to communicate to other members of the design team. Mood boards are not limited to visual subjects, but serve as a visual tool to inform others of the overall feel/flow that a designer tries to achieve. Sketching & Doodling works - New concepts were developed by sketching side views and perspectives based on the Inspirational Image picture. Here various designs of fuel tank, rear cowl, grab rail, supportive shroud are done.

4.4.Concept Finalisation

The final concept design is selected from the range of ideas, all the proposed concept are displayed with the relevant key aspects of the users for their feedback so that a check can be made on the match of proposed designs with the users expectations.

The most preferred concepts are finally rendering of the be viewed as a realistic model of the proposed design. Concept idea is rendered from different angles to cover the maximum proposed views in which user generally observes the Bike.

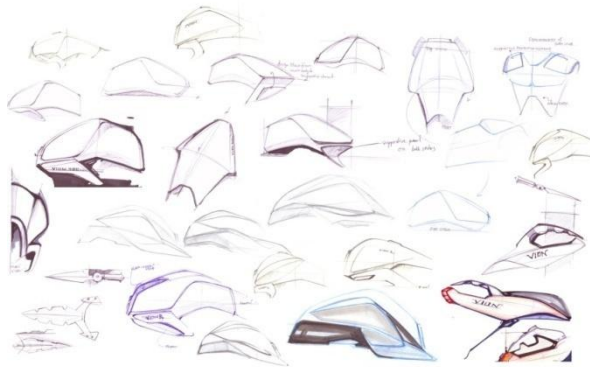


Fig 5: Concept Sketches



Fig 7: Left 3/4th View of Mock Up Model

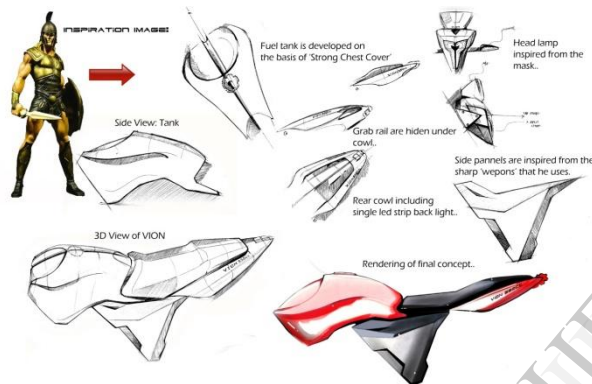


Fig 6: Product Renders

4.5. Prototyping & Modelling works:

A 1:1 model of the concept is done stage by stage; modelling work is done on Hero Honda "Ambition 125cc" bike chassis, first templates are made with proper dimensions. These are plotted over PU-form block and carved into the desired shape. After completing the design it is taken for making mould & FRP Model is done with the help of experts. Then painting of the whole body panel is done along with the chassis.

5. CONCLUSION:

Multiple stage process of motorbike styling for a selected segment is explored by following the design methodologies used in the automotive industries.

Also form exploration and development based on inspiration image and analogy is carried out successfully. Finally process of developing and realizing 1:1 prototype through alternate materials is successfully derived as an output of this project.

"A sporty segment bike developed as an outcome of the study and exploration of new forms and trend mapping, especially for new age bikers in India."

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