

# Designing Electric Cafe Racer Prototype Called Mbret Using Product Development Method

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**Abstract** - MBRET ECR-one of the most stylish, powerful and affordable electric motorcycle ever to be offered on the market. ECR aka Electric Cafe Racer is designed as a perfect daily commuter or weekend cruiser. From teenager to veteran. For women and for men. From cruising to racing. Equipped with a mind-blowing array of features, it comes complete with on-board fast charger, Safety lights and Fully-Adjustable Suspension. MBRET ECR is a serious performer driven by a powerful 24Kw mid-drive motor reaching a top speed 160kph/99mph. By the help product development method we found the system of defined steps and tasks such as strategy, organization, concept generation, marketing plan creation. where we found out our benchmarking competitor RE650 with the units sales of 15,000 over 10 months. Our evaluation, and commercialization are planned according to the competitor of a new product. It is a cycle by means of which an innovative firm routinely converts ideas into commercially viable goods or services where we ended up with the ECR concept design to make it process of bringing an original product idea to market.

## INTRODUCTION

Product development encompasses the technical activities of product research, engineering and design.

Thus, product development is the next step to product planning. It is the process of finding out the possibilities of producing a product. It includes the decisions such as whether it would be feasible or not to produce the product.

### *Methods of product development:*

Product development is one of the important aspects of industrial research. Product can be developed in one of the three methods:

By imitation: Product development by imitation consists of marketing another product similar to on in the market.

By improvement or adaptation: Product development by adaptation refers to developing an improved product for an already existing market.

By innovation or invention: Product improvement

consists of modification and improvement in the existing quality, size, form or design of the existing product so that it may appear almost like a new product. It includes the following:

- Improvement in quality.
- Improvement in features.
- Improvement in style.
- Improvement in packing.

Finally, the product development by invention concerns itself with the development of entirely a new product resulting an increase in the product line. Product innovation is essential also to diversify the risks of business.

Cafe racer - A lightweight, powerful motorcycle optimized for speed and handling rather than comfort and for quick rides over short distances. With bodywork and control layout recalling early-1960s Grand Prix road racing motorcycles, cafe racers are noted for their visual minimalism, featuring low-mounted handlebars, prominent seat cowling and elongated fuel tank and frequently knee-grips indented in the fuel tank.

Cafe racer styling evolved throughout the time of their popularity. By the mid-1970s, Japanese bikes had overtaken British bikes in the marketplace, and the look of real Grand Prix racing bikes had changed. The hand-made, frequently unpainted aluminium racing fuel tanks of the 1960s had evolved into square, narrow, fiber glass tanks. Increasingly, three-cylinder Kawasaki two-strokes, four-cylinder four-stroke Kawasaki Z1, and four-cylinder Honda engines were the basis for cafe racer conversions. By 1977, a number of manufacturers had taken notice of the cafe racer boom and were producing factory cafe racers, such as the well-received

Moto Guzzi Le Mans and the Harley-Davidson XLCR. A special version of the Honda XBR thumper with wire-spoked wheels, the Honda GB500 TT, sought to emulate BSA and Norton café racers of the 1960s. In the mid-1970s, riders continued to modify standard production motorcycles into so-called "café racers" by simply equipping them with clubman bars and a small fairing around the headlight. A number of European manufacturers, including Benelli, BMW, Bultaco and Derbi produced factory "café" variants of their standard motorcycles in this manner, without any modifications made to make them faster or more powerful, a trend that continues today.

Manufacturers have noticed that there is a lot of recent consumer interest in café racers. While this approach was not new to the industry, manufacturers have realised the market appeal of this type of ready-to-ride café racer. During the past decade, over 50% of the larger motorcycle manufacturers have adopted the trend. In 2004, Triumph produced a turn-key retro with their Thruxton. Another modern café racer is the Ducati Sport Classic, made from 2006 till 2009.

*Why electric?*

They can reduce emissions and even save you money. Fueling with electricity offers some advantages not available in conventional internal combustion engine vehicles. Because electric motors react quickly, EVs are very responsive and have very good torque. EVs are often more digitally connected than conventional vehicles, with many EV charging stations providing the option to control charging from a smartphone app. Just like a smartphone, you can plug in your EV when you get home and have it ready for you to use the next morning. Since the electric grid is available almost anywhere, there are a variety of options for charging: at home, at work or on the road. By charging often, you may never need to go to a gas station again! But EVs provide more than just individual benefits. EVs can help the United States have a greater diversity of fuel choices available for transportation. The U.S. used nearly nine billion barrels of petroleum last year, two-thirds of which went towards transportation. Our reliance on petroleum makes us vulnerable to price spikes and supply disruptions. EVs help reduce this threat because almost all U.S. electricity is produced from domestic sources, including coal, nuclear, natural gas, and renewable sources. EVs can also reduce the emissions that contribute to climate change and smog, improving public health and reducing ecological damage. Charging your EV on renewable energy such as solar or wind minimizes these emissions even more. See the difference in emissions between a conventional vehicle and an EV using the calculator on the right. Learn more about how EVs reduce pollution and their lifecycle emissions.

India unveiled the 'National Electric Mobility Mission Plan 2020' in 2013 to address the issues of National energy security, vehicular pollution and growth of domestic manufacturing capabilities. Reiterating its commitment to the Paris Agreement, the Government of India has plans to make a major shift to electric vehicles by 2030. E-commerce companies, Indian car manufacturers like Reva Electric Car Company, and Indian app-based transportation network companies like Ola are working on making electric cars more common over the next two decades.

**PRODUCT DEVELOPMENT PROCESS**

New product development is the process of bringing an original product idea to market. Although it differs by industry, it can essentially be broken down into five stages: ideation, research, planning, prototyping, sourcing, and costing.

Here's how to develop your own original product idea and what to consider at each stage.

**2.1 IDEATION**

Many aspiring entrepreneurs get stuck on ideation, often because they're waiting for a stroke of genius to reveal the perfect product they should sell. While building something fundamentally "new" can be creatively fulfilling, many of the best ideas are the result of iterating upon an existing product.

As the result of ideation we have ended with substitute the internal combustion with electric motors.



Fig1.1  
Saietta 119r motor

Saietta Motors are highly-efficient permanent magnet D.C. Motors in India. The Saietta motor gives low shaft speed and high torque, enabling the use of a simple and very efficient transmission in many applications. The high power to weight ratio makes the motor suitable for lightweight high-performance vehicles, boats and even aircraft. The high efficiency (about 93% maximum) minimizes electricity cost and heat generation, and where the motor is run from batteries it also minimizes the capital and depreciation cost of the batteries.

*Motor specs*

MODEL	119R - 68RPM/V				
VOLTAGE	12V	24V	36V	48V	60V
RATED POWER	1.0kW	2.6kW	4.9kW	8.8kW	11.1kW
PEAK POWER	2.8kW	7.6kW	12.3kW	17.0kW	21.6kW
SPEED (rpm)	748	1539	2329	3103	3919
CONT. CURRENT	90A	120A	150A	200A	200A
RATED TORQUE	12.1Nm	17.6Nm	20.3Nm	27.2Nm	27.0Nm

## 2.2 RESEARCH

With your product idea in mind, you may feel inclined to leapfrog ahead to production, but that can become a misstep if you fail to validate your idea first. Product validation ensures you're creating a product people will pay for and that you won't waste time, money, and effort on an idea that won't sell.

There are several ways you can validate your product ideas, including:

- Talking about your idea with family and friends
- Sending out an online survey to get feedback
- Starting a crowdfunding campaign
- Asking for feedback on forums like Reddit
- Researching online demand using Google Trends
- Launching a “coming soon” page to gauge interest via email opt-ins or pre-orders

However we decide to go about validating our idea, it is important to get feedback from a substantial and unbiased audience as to whether they would buy your product. We are aware of overvaluing feedback from people who “definitely would buy” if we were to create our theoretical product—until money changes hands, we can't count someone as a customer.

Validation research will also inevitably involve competitive analysis. If our idea has the potential to take off, there are likely competitors already operating in that space. Visiting our competitors' website and signing up for their email list will allow us to understand how they attract customers and make sales. Asking our own potential customers what they like or dislike about our competitors will also be important in defining our own competitive advantage.

The information compiled from doing product validation and market research will allow us to gauge the demand for our product and also the level of competition that exists before our start planning. From the research and online survey to get feedback we came to know about a motorcycle sales figures and interest of different age groups which we ended with our competitor RE 650 motor bike.

Fig1.2

RE 650 TWIN CROSSES 15,000 SALES UNIT IN 10 MONTHS

SALES ANALYSIS OF 500 TO 800CC BIKES	UNITS
RE 650 TWINS	1027
HARLEY STREET 750	93
HARLEY STREET ROD	31
KAWASAKI ZX-6R	24
KAWASAKI NINJA 650	16
SUZUKI GSX S750	15
TRIUMPH STREET RS	13
KAWASAKI VULCAN	10
SUZUKI V-STROM 650	9
KAWASAKI VERSYS 650	5
KAWASAKI ZX650	3
TRIUMPH TIGER 800 XRX	2

The research is not only done for product and aftermarket sales. The research is also done for the performance, handling and the important objective is to avoid the cornering accidents like skidding, wheel spin, etc.

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There are technologies to improve braking like ABS, EBD but the accidents occurs till date research says.

To avoid these accidents we are introducing the first ever HCS aka hub-center steering electric cafe racer in India. We are one to introduce in India.

### 2.2.1 HUB-CENTER STEERING (HCS)

The hub-center steer concept is a very old one used as early as 1910 by the British James Cycle Co. Where one of several different types of front end suspension/steering mechanisms used in motorcycles and cargo bicycles. Hub-center steering is characterized by the steering pivot points being inside the hub of the wheel, rather than above the wheel in the headstock as in the traditional layout. Most hub-center arrangements employ a swing-arm that extends from the bottom of the engine/frame to the center of the front wheel.

The advantages of using a hub-center steering system instead of a more conventional motorcycle fork are that hub-center steering separates the steering, braking, and suspension functions.

With a fork the braking forces are put through the suspension, a situation that leads to the suspension being compressed, using up a large amount of suspension travel which makes dealing with bumps and other road irregularities extremely difficult. As the forks dive the steering geometry of the bike also changes making the bike more nervous, and inversely on acceleration becomes more lazy. Also, having the steering working through the forks causes problems like rigid, decreasing the effectiveness of the suspension. The length of the typical motorcycle fork means that they act as large levers about the headstock requiring the forks, the headstock, and the frame to be very robust adding to the bike's weight.

### HCS WORKING

Hub-center steering systems use an arm, or arms, on bearings to allow upward wheel deflection, meaning that there is no stiction, even under braking. Braking forces can be redirected horizontally along these arms, or tie rods, away from the vertical suspension forces, and can even be put to good use to counteract weight shift. Finally, the arms typically form some form of parallelogram which maintains steering geometry over the full range of wheel travel, allowing agility and consistency of steering that forks currently cannot get close to attaining. The hub center steering's Achilles heel, however, has been steering feel. Complex linkages tend to be involved in the steering process, and this can lead to slack, vague, or inconsistent handlebar movement across its range.



Fig 1.3  
Conceptual design of HCS

### 2.3 PLANNING

Since product development can quickly become complicated, it's important to take the time to plan before we begin to build your prototype.

When we eventually approach manufacturers or start looking for materials, if we don't have a concrete idea of what we want our product to look like and how it will function, it's easy to get lost in the subsequent steps. The best place to begin planning is with a hand-drawn sketch of what our product will look like. The sketch should be as detailed as possible, with labels explaining the various features and functions.

We don't need a professional quality drawing since we won't be submitting it to a manufacturer at this stage. However, if we are not confident that we can produce a legible diagram that will make sense of our product, it is easy to find illustrators for hire on Dribbble, UpWork, or Minty. Try to use our diagram to create a list of the different components or materials we will need in order to bring the product to life. The list does not need to be inclusive of all potential components, but it should allow us to begin planning what we will need in order to create the product.

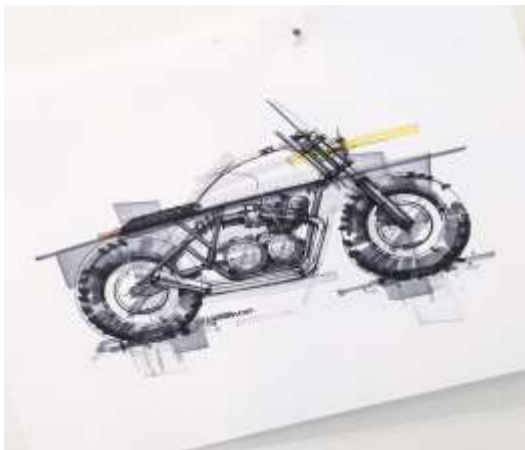


Fig 1.4  
Concept diagram drawn in illustrator

Along with the components, we should also begin to consider the retail price or category our product will fall into. Will the product be an everyday item or for special occasions? Will it use premium materials or be environmentally friendly? These are all questions to consider in the planning phase since they will help guide us through not only our product development process but also our brand positioning and marketing strategy. The packaging, labels, and overall quality of our materials should be considered as well before we continue to the sourcing and costing stages. These will have an effect on how we market our product to our target customer, so it's important to take these aspects of our product into consideration during the planning phase too.

### 2.4 PROTOTYPING

The goal of the prototyping phase during product development is to create a finished product to use as a sample for mass production.

It's unlikely we will get to your finished product in a single attempt—prototyping usually involves experimenting with several versions of our product, slowly eliminating options and

making improvements until we feel satisfied with a final sample.



Fig 1.5  
Prototype stages of electric bike

To get a 3D design turned into a physical model, makers used to have to get molds made for each part. Molds are typically expensive and involve set up fees, for things like tools and dies, that are used to cut and shape pieces of plastic and other hard materials.

Luckily, with the innovation of 3D printing, designs can be turned into physical samples at a much lower cost with a quicker turnaround time.

Rapid prototyping is one of the most common applications for 3D printing, which offers a great deal of flexibility in terms of speed and material selection. 3D printing allows the manufacturing of low-to-medium performance objects at a low cost, but it's not suitable for mass production. 3D printing is considered an additive manufacturing method, meaning material is added until a specific shape is formed. Depending on the level of accuracy required, there are different kinds of 3D printing processes.



Fig 1.6  
Rendered electric bike for 3d printing

### 2.5 SOURCING

Once we have a product prototype satisfied with, it is time to start gathering the materials and securing the partners needed for production. This is also referred to as building your supply chain: the vendors, activities, and resources that are needed to create a product and get it into a customers' hands.

While this phase will mainly involve looking for manufacturing-related services, we may also factor in storage, shipping, and warehousing into our choices at this stage.

In *Shoe Dog*, a memoir by Nike founder Phil Knight, the importance of diversifying your supply chain is a theme that is emphasized throughout the story. Finding multiple suppliers for the different materials we will need, as well as different

potential manufacturers, will allow us to compare costs. It also has an added benefit of creating a backup option if one of our suppliers or manufacturers doesn't work out. Sourcing several options is an important part of safeguarding your business for the long-term.

When looking for suppliers, there are plenty of resources both online and in person. While it may seem old-fashioned, many business owners choose to attend trade shows dedicated to sourcing. Trade shows like Magic in Las Vegas, provide the opportunity to see hundreds of vendors at once—to see, touch, and discuss materials and build a personal relationship with suppliers, which can be valuable when it comes time to negotiate prices. During the sourcing phase, we will inevitably come across the decision of whether to produce our product locally or overseas. It is a good idea to compare the two options, as they each have their own advantages and disadvantages.

The most commonly used sourcing platform for overseas production is Alibaba. Alibaba is marketplace for Chinese suppliers and factories, where we can browse listings for finished goods, or raw materials. A popular way of using Alibaba to find a manufacturer is to look for listings with similar products to our own, and then contact the factory to see if they can produce your specific design.

## 2.6 COSTING

After research, planning, prototyping, and sourcing is done, we should have a clearer picture of what it will cost to produce our product. Costing is the process of taking all of the information gathered thus far, and adding up what our cost of goods sold (COGS) will be, so that we can determine a retail price and gross margin.

Fig 1.7  
Cost spreadsheet

Begin by creating a spreadsheet with each additional cost broken out as a separate line item. This should include all of your raw materials, factory set up costs, manufacturing costs, and shipping costs. It is important to factor in shipping, import fees, and any duties we will need to pay in order to get your final product into the customers hands, as these fees can have a significant impact on your COGS depending on where we are producing the product.

SYSTEM	MATERIAL BOUGHT	PROCESSES	FASTENERS	TOOLING	TOTAL
FRAME SYSTEM	\$ 1200	\$ 50	\$ 70	\$ 50	\$ 1370
TRACIION SYSTEM	\$ 1500	\$ 80	\$ 50	\$ 100	\$ 1730
FRAME & BODY	\$ 400	\$ 70	\$ 17	-	\$ 487
SUSPENSION SYSTEM	\$ 1000	\$ 30	\$ 5	\$ 110	\$ 1145
WHEELS AND TIRES	\$ 800	\$ 20	\$ 50	\$ 50	\$ 920
SUSPENSION SYSTEM	\$ 400	\$ 200	\$ 70	\$ 50	\$ 720
WHEELS AND TIRES	\$ 1000	-	\$ 200	\$ 50	\$ 1250
LOW VOLTAGE SYSTEM	\$ 50	-	\$ 17	-	\$ 67

If we were able to secure multiple quotes for different materials or manufacturers during the sourcing phase, we can include different columns for each line item that compares the cost. Another option is to create a second version of the spreadsheet, so that we can compare local production vs. overseas production.

Once we have our total COGS calculated, we can come up with a retail price for our product and subtract the COGS from that price to get our potential gross margin, or profit, on each unit sold.

## CONCLUSION

Electric bikes are definitely more environmentally friendly than internal-combustion vehicles. Batteries are being engineered to have a long life. When the Electric vehicles become more widespread, battery recycling will become economically possible. Research into other energy sources such as fuel cells and renewable fuels make the future look brighter for electric vehicle.

The six stages of product development may seem like a long process but they are designed to save wasted time and resources. New product development ideas and prototypes are tested to ensure that the new product will meet target market needs and wants. Mbret the hub center steering electric cafe racer will hit the market soon.

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