DESIGN OF A QUADRACYCLE FOR VISITORS OF BOTANICAL GARDEN

J. Arjun¹, T. D.Karthik², Prakash Unakal³
1- (Engg.) Student, 2- Senior Lecturer, 3- Professor
Product Design Centre
M. S. Ramaiah School of Advanced Studies, Bangalore.

Abstract

Human Powered Transportation (HPV) is popular because of its low cost, for leisure rides, physical exercise and its environment friendliness. It is the only sustainable transportation or the only source of transportation in underdeveloped countries. Compared to all land HPV vehicles, bicycle is the most efficient one. Its efficiency can be variably increased by adding a set of gears or improving its aerodynamic characteristics.

In this project the need for an inexpensive private vehicle for visitors of botanical garden has been identified. In the research it was observed that other than walking, the only available means to visit the garden was an expensive electric golf cart. This runs a like public transportation stopping at few tourist spots to allow the tourist to take photographs. However, the tourists are unhappy with such arrangement. Introducing a bicycle to solve this problem was the initial idea, but it was understood that not all the people can ride a bicycle. Also the visitors on an average visit the park as a group/family/couple. Hence, the need was addressed by introducing a Quadracycle on which the visitors (family of 4) can have the pleasure of having a fun ride, interacting and pedalling together. This private mode of transport will allow the tourists to move around the park, using some of their physical energy, at their will, stopping where they want for however long they want in the fresh air atmosphere. The Quadracycle is an innovative, healthy and economic solution for visitors to have a pleasurable visit to the Botanical garden.

A literature study on quadracycles was carried out and the needs of the market segment were understood. Latest design trends were also understood and relevant data was collected. To explore the users’ requirements, an ethnographic study was carried out. To generate a form to the product the lifestyle board, mood board, theme board were created. With the help of these boards, 11 concepts were generated and best five were shortlisted. The final concept was selected by the customer rating and on the feasibility criteria. A mock-up model of the final concept was made and displayed to the user with illustrations for feedbacks and suggestions.

Key Words: Botanical Garden, Quadracycle, Healthy and Economic, Concept

Abbreviations

CAD  Computer Aided Design
HPV  Human Powered Vehicle
PD   Product Design
PDS  Product Design Specification
QFD  Quality Function Deployment

1. INTRODUCTION

The need identified here is the requirement of a low cost private vehicle for visitors of botanical garden. This need was addressed by introducing a Quadracycle for the visitors. The efficiency and quality of this product depends upon integrating the aspects such as better sightseeing, camping, minimising physical exertion by the user, saving time, improving safety and environmental friendliness. The product Quadracycle is a four wheeled human powered vehicle for four to six people. The vehicle tends to be generally pedalled by all the seaters in the vehicle. This is possible with the help of pedalling units provided to each and every seater. The product is value- driven by optimisation of the services and value to the user [1][2].

2. RESEARCH

The research process was carried out in three different stages- product study, followed by market study and then user study.

2.1 Product Study

The product research was done to understand the frustration and pleasure of using a product.

As it was understood in the literature review and the data collected, that quadracycles are owned by very few enthusiasts, it is generally taken on rent and people with physical disabilities find it difficult to use it.[3]

For this project the rental segment of the quadracycle was taken into consideration as this project was focused on the visitors of the botanical garden. Hence, a study was conducted on the rental quadracycles. It was understood that the parts of the cycle were less complicated in construction and could be repaired or replaced by any hardware bicycle technician.

2.2 Conclusion of Product Study

Quadracycles were generally constructed heavy and rigid to withstand rough rental usage.

Safety belts were provided for adults and infants.

Comfortable seating position, support handles and single (low) gear pedals were provided to experience an effortless ride.

Other than the sun roof, there was no structures in the vehicle to obstruct the vision of rider to allow the rider to experience and enjoy the environment.
2.3 Market Study

A market study was conducted to analyse the market segment and the available products and its competitors. It was found that there were several manufacturers who sell quadracycles of the same design. In the market, two common types of quadracycles, for domestic purpose and for rental purpose, are available [2]

2.4 Conclusion of Market Study

Quadracycles were generally popular at tourist spot and were provided to the tourists on rental basis.

They were manufactured heavy and stiff to sustain rough rental usage.

India is the second largest bicycle manufactures in the world and quadracycles are not yet manufactured here (as per 2009 market Data).

There are more that 50,000 popular botanical gardens and zoological parks in the country and none are provided with a quadracycle. Hence, a great scope for business was identified here.

2.5 User Study

For the user study, Lalbagh Botanical Garden, Bangalore was taken as a benchmark to conduct survey and research.

2.6 Conclusion of User Study

1. Total 18 tourist spots with well connected roads
2. For 90% of the visitors, without the electrical golf cart it was not possible to reach all the spots or a picnic.
3. The cost of a 45mins ride on electrical golf cart costs Rs.100 per head. This ride includes 5min stops at every photogenic spot. This is not liked by the user.
4. The electrical golf cart was a rental unit provided by MAINI company under a contract with Lalbagh park.

5. The electrical golf cart was the only option to take a quick look at the whole park.

Finally ergonomics study was done to understand the basic dimensions of human body, bicycle postures and car interiors.[4][5][6][7]

Product design specification (PDS) was developed based on QFD.

3. CONCEPT GENERATION

After the research study and the problems identified, concept generation was carried out, initially with some doodle sketches so as to explore the forms and shape. Some of the doodle sketches of 11 concepts are shown in Figure 1.

The selected best five concepts are described below.

3.1 Concept 1

This concept (Figure 2) was created from an inspiration of a frog as it is generally found in garden as they feed on insect there. The frog has an expandable body for its nature, so this concept will have an extendable roof for shelter and picnicking.
3.2 Concept 2

This concept (Figure 3) was created from an inspiration of a joy ride train which is generally found in parks/gardens. If there are more than 4 people in a group, this concept can be hooked on to the other to ride like train.

3.2 Concept 3

This concept (Figure 4) was created from an inspiration of Oxygen formula as one comes to a garden to inhale fresh oxygen. This concept can remind the passenger that they are in the process of inhaling fresh oxygen.

3.4 Concept 4

This concept (Figure 5) was created from an inspiration of a trekking jeep which is generally driven for adventure and exploration. This concept can create an experience of fun and adventure.

3.5 Concept 5

This concept (Figure 6) was created from an inspiration of a daisy flower which is generally found in parks/gardens. This concept can create/suit a theme in the park.

3.6 Concept Selection

Pugh’s concept selection method was used to select concept 1 as the final concept.

4. MOCK-UP MODEL

Mock up model (Figure 8) was manufactured with the dimensions created in the technical drawing.

5. CONCLUSION

5.1 Summary

In the first chapter literature was carried, and research was conducted on the product and the user and set of questionnaire were conducted with the user with which the QFD was prepared and the prominent features were finalised and PDS was prepared for concept generation.
Concepts were generated using various concept generation techniques by explaining the appropriateness and the variety of approach. The final concept was then selected by customer rating and justified. A detailed drawing of the final concept was generated with which a mock up model was made.

5.2 Conclusion

The project gave us the confidence and the experience of how it is being a product designer, about how to conduct an ethnographic study and to convert customer voice into technical voice and develop concepts and select a suitable concept to reach the customer. The project was totally an innovative learning experience where one could apply one’s creativity and skills developed.

6. REFERENCES

[1] Anonymous,  

[2] Anonymous,  

[3] Anonymous,  

[4] Frank Rowland Whitt and David Gordon Wilson,  
Bicycle science, Ergonomics and Mechanism, DGW. Bicycle Science,.1st ed. UK. 1998

[5] Deb Kumar Chakrabarti,  


[7] Anonymous,  