

Design of Futuristic Indian Public Transport for the Year 2030

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Abstract

India is a large and diverse nation with more than 1.3 billion people, ranking second most populated country in the world. The current population trend shows the cumulative population in urban areas when compared to rural areas where a proper public transportation system and infrastructure must be established and maintained properly for the movement of people from one place to the other. In India, metro rail transport is considered one of the fastest and smoothest modes of transport when compared to any other mode of transport. Bus is the generic mode of transport, due to the wide network and economical rate of travel. The objective was to design a futuristic public transport in India for 2030 focusing on aesthetics and usability. The study highlights the population trend, increasing demands, different modes of transport and ergonomic factors which were considered to design "Flyway 2030". The scope of study includes adaptation to softwares like Photoshop for making 2D concepts, Autodesk Alias for surface modeling and Catia for 3D modeling and Key shot for rendering the new motorcycle. Also, scale down prototype of 1:80 ratio was made using PU foam focusing on the aesthetic quality of the model.

Key Words: Public Transport, Concept Design, Aesthetic Model

1. INTRODUCTION

India is a large and diverse nation consisting of more than 1.3 billion people, ranking second most populated country in the world. Around 33.6% of the people are living in urban India. Indian population is increasing day by day, as per the population trend [1].

In order to meet the needs of such a huge population, a proper public transportation system must be established and maintained properly. For the proper growth of the Indian economy, there should be a physical connectivity between the rural and urban areas. With the increasing population and rising Indian economy, the need for transportation services and infrastructure has also increased. The transportation sector is not able to keep up with the increasing demand, thereby affecting the economy. Improvements in transportation sector will result in economic growth of the country [1].

1.1 Introduction to Indian Transportation

In a developing country like India, to have a better public transportation system, maintaining and upgrading the existing one with the new ones need proper financial resources. The urban transportation system is the worst affected part due to the overcrowded, congested roadways and often a chaotic filled environment. Considering the current scenario in urban cities, public transportation system is not able to fulfil the rising demands of the urban people. With the increasing population in urban areas due to the migration of people in search of job, the population and the number of vehicles in the metropolitan cities like Delhi, Bangalore, Mumbai, Hyderabad, Kolkata are increasing day by day. Around 22 percent of the Indian urban population is living in poverty, thus forcing India to keep the public transport fare as low as possible [5]. There is a huge set of people who cannot afford even this lower fare. As the income obtained by the public transportation system is less which eventually becomes difficult for the government to carry out the regular maintenance work and replacement of the older vehicles. With this lower

Financial resource, the expansion of the public transport system is a difficult process. [2].

1.2 Literature Survey

India's automobile market is one of the fastest-growing markets with an annual production of more than 4.5 million vehicles, and even this volume is expected to increase in the near future [3]. For the past decade, Indians had experienced an immense change in urbanization, growth in population and economy. One-third of India's population are found in urban areas and day by day people are migrating too. By 2050, half of Indian population is expected to settle down in cities [4].

With the increasing urbanization and population, the demand for vehicle ownership, travel and freight transport will also increase. Between the period of 2010 and 2050, it's expected that India's intercity travel demand will be increasing which can only be met through either road transport or air transport, resulting in higher energy demands and thus raising the challenges of greenhouse gas emissions. In cities like Bangalore, Delhi, Mumbai and Kolkata, increasing travel demand will make the people rely more on the private vehicles rather than the public transportation systems, which also will result in the increased energy demand and thus leading to high toxic emissions to the environment. Policymakers should also be able to come out with solutions to tackle these issues for the development of the transportation sector.

1.3 Summary of Market Study

In India, transportation sector is carried out by means of land, water, and air. The majority of Indian citizens prefer public transport and are one of the most heavily used ones in the world and road transportation being the major contributor to the country's Gross Domestic Product (GDP). With India's growing economy, demand

for transportation services and infrastructure have also increased in the past decade. A strong connection must be developed between urban and rural transportation system for the development of the transportation sector. However, the government has not been able to fully keep up with the rising demands and for sure major improvements are required in this sector to support the economic growth of our country.

1.4 Summary of Literature Survey

From the data collected and the literature survey carried out, as for the study, in context with the Indian scenario, it is actually a pretty difficult task for the government and the policymakers to come up with the different policies in order to meet the demands of the growing population. India ranks second in the world in terms of population count of around 1.3 billion people living in India [1]. Some of the issues found out from the literature review are as follows:

- Traffic congestion
- Interconnectivity between different modes of transport
- Nonavailability of fuel
- Increasing environmental concern

2 PROBLEM DEFINITION

In order to understand the problems faced by public transport commuters, an ethnography study and critical survey were conducted and the gaps existing are as listed below:

- Provision for more seating accommodation
- Online ticketing system for the ease of travel
- Safe parking for private vehicles
- Frequent metro feeder services for the passenger travel comfortability
- Design of the current metro rail can be improved to make it aesthetically better and attractive
- Ticketing rate allowance for students and senior citizens
- Provision for beverages inside the metro in case of emergencies
- Charging ports, exciting offers like free internet, ticket discount, etc. for attracting more passengers

3 METHODOLOGY

The strategy engaged with taking care of the issue includes:

- To conduct a literature survey on the public transport system
- To derive aesthetic design language based on the futuristic theme
- To generate ideations, concepts, personas
- To develop concept renders, a three-dimensional model with digital render
- To develop a 1:80 scale down prototype of the model

3.1 Quality Function Deployment (QFD)

QFD is a technique used to convert the customer voice into a technical voice and helps in prioritizing customer needs. Results obtained from Quality Function

Deployment (QFD) have been adopted for the development of the product, which is discussed below:

- Aesthetically appealing
- Increased connectivity and frequency
- Average seating capacity
- Lesser travel time
- Low travel fare suitable for all commuters
- Lower emissions thus making it environment-friendly
- Provision for luggage space

3.2 Concept Generation of Futuristic Indian Public Transport

On the basis of the parameters obtained from the literature survey, customer requirements and Quality Function Deployment (QFD), the following six concepts were generated.

3.3 Concept 1

Concept 1 was purely designed for a smaller passenger capacity vehicle around 10 people functioning on a single rail system. The structure and design elements of the model were inspired by the aquatic species named blue whale with exoskeleton structural elements with glass rooftop for better sky view for passengers as shown in figure 1.

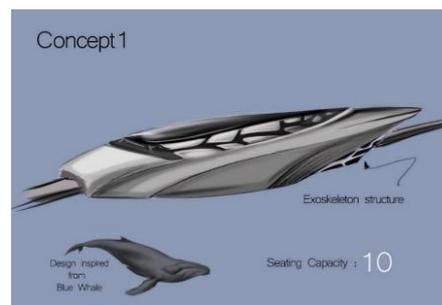


Fig. 1 Concept 1

3.4 Concept 2

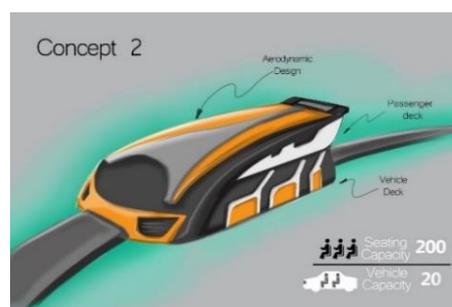


Fig. 2 Concept 2

This concept was based on a double deck-based design where two separate decks are available, top deck for passengers and bottom deck for vehicles. Concept 2 designed for 200 passenger capacity and 20 vehicle capacity as shown in Figure 2.

3.5 Concept 3

Concept 3 was designed to accommodate 3600 passengers. The form was based on a floating based design, with glass sunroof. This concept has a wider

body in order to have more seating capacity as shown in Figure 3.

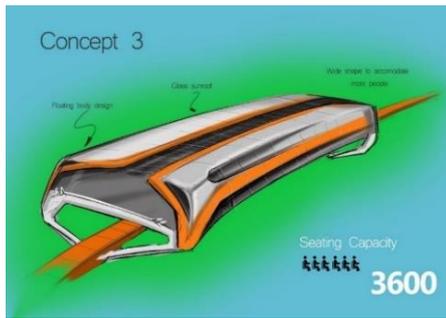


Fig. 3 Concept 3

3.6 Concept 4

Concept 4 design was based on a modular design, with a small pod form. Each pod has a seating capacity of 20 people. So, this concept is not based on a single mass transit design. With small pod design, it can be easily accommodated in the cities even in the congested areas as shown in Figure. 4.



Fig. 4 Concept 4

3.7 Concept 5

Concept 5 inspired to give the looks of a futuristic and aerodynamic design. The concept was designed to have a seating capacity for 60 people. This conceptual model's form has a simplistic design, with less space required to accommodate the whole transport vehicle. This concept works on normal rail as shown in Figure. 5.

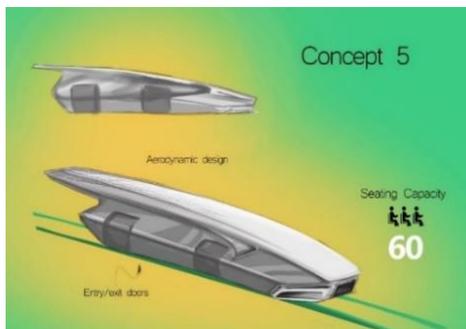


Fig. 5 Concept 5

3.8 Concept 6

Concept 6 design is a slight variation in the design of concept 5 with a seating capacity for 60 passengers. This concept was designed like a semi-floating with a support system provided to the rail for guiding the directional

movement of the vehicle. Propellers provided will lift the vehicle as shown in Figure. 6.

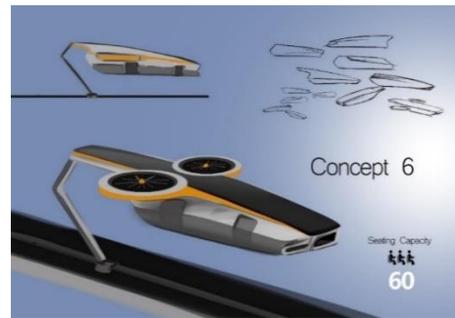


Fig. 6 Concept 6

4. RESULT AND DISCUSSION

Concept 6 has the highest score, out of the six concepts generated, based on the different parameters listed in the weighted ranking method. Ranking for each parameter was given out of 5. Concept 6 had a total weightage of 38 when compared to other concepts, which was selected as the final concept as shown in Table 1. The selected concept was finalized for digital 3D modelling using Autodesk Alias and rendering in KeyShot.

Table 1: Concept selection using weightage ranking method

Features	Concepts					
	1	2	3	4	5	6
Futuristic form	4	4	5	3	5	5
Aesthetics	4	4	4	4	4	4
Functionality	3	3	3	4	5	5
Capacity	1	4	5	2	3	3
Maintenance	3	3	2	3	4	4
Safety	4	3	3	3	4	5
Weight	4	3	3	5	4	4
Cost	3	3	4	4	3	4
Environmental Friendly	3	4	3	3	3	4
	29	31	32	31	35	38

All weightage is measured out of 5.

4.1 The final concept “Flyway 2030”

The features that will make Flyway 2030 stand out from other modes of transport has been discussed below and the digital model as shown in Figure 7.

- Flyway 2030, being an unconventional design, which people may not have experienced earlier, will make the people choose to travel with public transport over private transport.
- Faster and hassle-free travelling from the source to destination.
- Services provided with intervals monitoring at the congestion of people in the stations, rather than the metro rail services which can be seen operational with fewer passengers, even if though it is designed to accommodate 200 to 250 passengers.
- Flyway 2030 has been designed with the color schemes for desired routes, so that the passengers can recognize them in a short time.

- Functioning on the latest magnetic levitation technology and propellers for the lifting and forward movement of the vehicle.



Fig. 7 Flyway 2030 Digital Model

4.2 Packaging and Vehicle Dimension

Packaging design for the final concept is as shown in figure 8. The basic dimensions of the selected model are length of 25770mm, height of 4890mm and width of 3900mm.

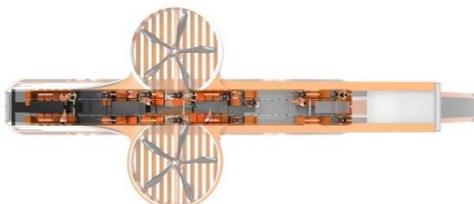


Fig.8 Packaging

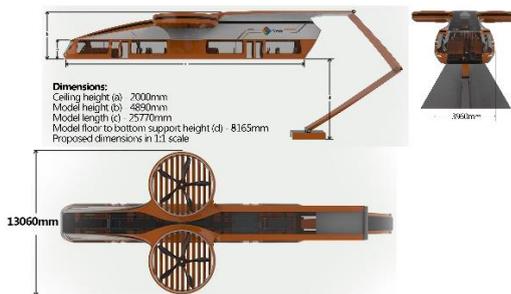


Fig.9 Vehicle Dimension

4.3 Ergonomics

Ergonomics parameters considered includes parameter 3, stature, considered for the ceiling height and entry/exit doors. Parameter 137, hip breadth, considered for seat width. Parameter 121, popliteal, considered for the reach of foot to the floor. Parameter 110, cervical, considered for seat back support. The proposed dimensions were decided considering the 50th percentile group.

4.4 Prototyping



Fig. 10 Final Prototype Model

The prototype of the model was basically made out using Polyurethane (PU) foam. The prototype model has been made in 1:80 ratio model as shown in figure 10.

4.5 Product Validation

Product validation was carried out with a group of 10 people in order to understand the feedback of them towards the designing and functionality of the model. After the model was crafted, the user group was asked to give their valuable suggestions on what they think about the project. Valuable feedbacks like

- integrating the usage of concept model with the current metro services
- to design a more attractive interior
- to increase the seating capacity of the vehicle in order to accommodate more passengers
- to designing the model to feel it more futuristic
- to find an alternate method for propeller-driven were suggested by the user group.

5. CONCLUSION

The concept model 'Flyway 2030' was designed in order to stand out from the existing public transport vehicles. Inspired to make it as compact as possible, and a design that the passengers might feel exciting to travel and have never experienced before. Ethnography study, market study and literature survey were conducted. The proposed concept was designed considering factors like aesthetic quality, ergonomics, etc. The concept was modelled in Autodesk Alias and rendered in Key Shot rendering software. The scale-down aesthetic prototype model was also modelled using PU foam and appropriate materials.

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