

REDESIGN OF CYCLE RICKSHAW CONSIDERING THE NEEDS OF THE ELDERLY AND RICKSHAW PULLER

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1. ABSTRACT:

In India, Rickshaws are one of the most important means of transportation. In the past years, the changes that took place in the design of the vehicle have not been very prominent. The initial framing structure is still being followed where the seats are at a higher level creating ingress and egress problem, no head cover for the rickshaw puller and no place to keep the luggage. The faults or disadvantages of this design made it necessary for it to be re-designed, keeping in mind the elderly along with the needs of the rickshaw puller who may also be aging.

The basic purpose of this re-design was to develop some easy mode of transportation for the elderly. Taking into consideration the infirmity of old age, the first alternative proposed was a low floor and a low seating with proper framing structure to hold. This solved the ingress and egress problem. The next proposal was a head cover for the rickshaw puller for which the cover for the passengers was extended till the rickshaw pullers head. This was an important change required to safeguard against extreme climatic changes. To reduce the effort of the puller a small helping electric motor was installed in the front wheel. A safeguard was provided near both the parallel wheels to save the clothes of the passengers from getting entangled in the wheels while the rickshaw is in motion. The safety of the elderly was the most important requirement and for this the framing structure was designed in such a way that the head of the passenger does not hit the frame or the bar under any circumstance. Some other design alterations were also done like the backrest of the seat was made movable so that when not in use for carrying passengers, it could be used for carrying goods.

With the improved technology in the modern world making every aspect of life faster, easier and more accessible, the development of the most primary form of transportation for the aged people was only to be expected. Hence, it is to be hoped that it actualizes all the uses that were envisaged during its invention.

2. INTRODUCTION:

The word 'rickshaw' was originated in Asia where they were mainly used as a means of transportation for the social elite. Rickshaws are a mode of human-powered transport and it was first seen in Japan around 1868. A cycle rickshaw, also known as a pedicab, is often hailed as environment-friendly and an inexpensive mode of transportation. Since it is considered as Indian traditional ride they are almost used in each and every part of India which includes villages, small towns, metros, heritage sites etc. In metros these are used inside institutional areas, market places and also in narrow and crowded lanes where there is accessibility problem for vehicles.

3. KEY WORDS: Safe; Easy; Convenient.

4. PURPOSE OF THE STUDY

The basic purpose of the design was to make an elderly friendly three wheeler which serves the three important purposes: safe, easy and convenient.

5. METHODOLOGY:

5.1. Field survey / Observation:

Observations were made on how an elderly would climb up and down from the rickshaw. Lot of people faced ingress and egress problem. Since the footboard of the rickshaw is too high, it creates problem to climb. There is no proper support to hold while climbing up on the rickshaw. At other times when there are no passengers they can use it as goods carrier. But the framed structure of the passenger carrying rickshaw does not fit for this configuration, which becomes a problem.

5.2. Interview with Rickshaw puller:

Informal conversations with some of the rickshaw pullers provided crucial insights of the shortcomings of presently used design. The key points discussed are as follows:

- Get tired very soon in the scorching heat.
- Very difficult for the pullers when they are sick
- No roof cover for the pullers (rainy season is a nightmare)
- Frequent backaches.
- Maintenance is costly and frequent
- No proper storage space for the rickshaw pullers
- No proper resting space

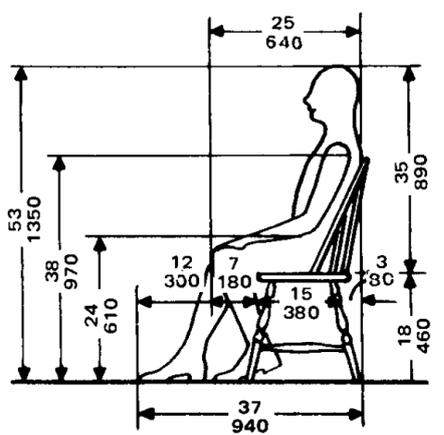
5.3. Interview with the elderly:

Discussion with the elderly concluded the following points to be taken care of:

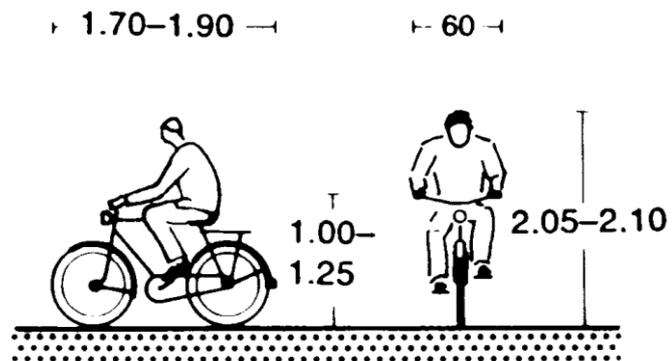
- Ingress and egress problem
- Physical and psychological safety.
- Uncomfortable seating space
- Requirement of proper luggage space.

5.4. Literature study:

Other than field study and observations made there were some anthropometric data that were studied based on which the making of the entire prototype depended.



Comfortable seating standard



cycle riding standards

6. DESIGN BRIEF

6.1 Aim: The aim of the project is to redesign the cycle rickshaw considering the needs of elderly and rickshaw puller.

6.2 Target user: Elderly passengers along with the elderly rickshaw pullers.

6.3 Design considerations:

- Ingress/ egress to be made easy
- Safety factor for elderly.
- Creating space for keeping luggage
- Protecting the rickshaw puller from extreme climatic conditions
- Configuring the design to include passenger carrier/ goods carrier

7. CONCEPT EVOLUTION:

From the basic concept of pulling rickshaw by hand till the present one, the designers have not undergone any major change in its design concept except for changing it into a tri-wheeler. They have focused basically on the common people (without considering any particular age group) as their passengers. They have never created anything in particular for the elderly. This very thing became the idea for my project - REDESIGN OF CYCLE RICKSHAW CONSIDERING THE NEEDS OF THE ELDERLY AND RICKSHAW PULLER. Hence the concept for the project evolved.

8. CONCEPT DEVELOPMENT AND DESIGN CONSIDERATION:

For making something for the elderly, one had to consider their movement, their psychology, their behavior, their mentality, their likes and dislikes and many more things. So studying the elderly was the first step taken. For a rickshaw, we had to consider two groups or categories of elderly people- one who is a passenger and the other- a rickshaw puller. So, the rickshaw to be designed had to consider both the groups and provide facilities for both of them.

Considering the first group as the passengers, the things that needed to be considered were their ingress and egress problem which included the seating height and the floor height of the rickshaw, their holding position, some provision that can help their garments not to get entangled in the wheel etc. For these things the design considerations that were made were- the seating height to be kept low along with the floor height so that the passenger can climb up and move down easily, a proper frame to hold and support, a proper safety guard that can keep their garments (saree or dupatta) from getting entangled.

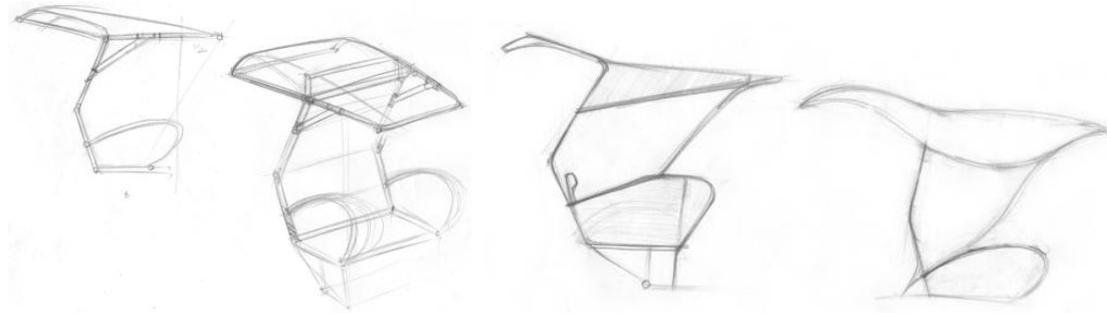
Then moving on to the second group of elderly- the rickshaw pullers themselves. Certain provisions were being made that can reduce their effort. This led to the provision of providing a motor in the front wheel which would help reduce their effort. This is also an added advantage if the puller (elderly or middle aged) is not well. Other than this some consideration is to be made to provide a top covering for them which can prevent them from the scorching sun and unpleasant weather. Hence for this the covering provided for the passengers could be extended till the puller.

The concept also developed taking into consideration the previously designed rickshaw. The positive points were taken into consideration and were kept constant. The negative points were studied and provision was made to convert them into positive points by changing the design.

9. CONCEPT TO FINAL DESIGN:

The final design thus had a low seating and a low floor, a proper frame for holding and supporting, a safety guard to protect the garments, a top covering for both passengers and rickshaw puller and a motor in the front wheel to reduce the effort. Adding to this more space is provided for keeping luggage of the passengers.

Though initially by making a rickshaw for elderly, it was also considered for carrying goods when not in use for carrying passengers. For this the backrest of the seat was made movable so that it can be put down or made straight. This increased the space (seat + back rest) for keeping goods.



Conceptual sketches



conceptual CAD model showing protection guard near wheels

10. DESIGN DESCRIPTION:

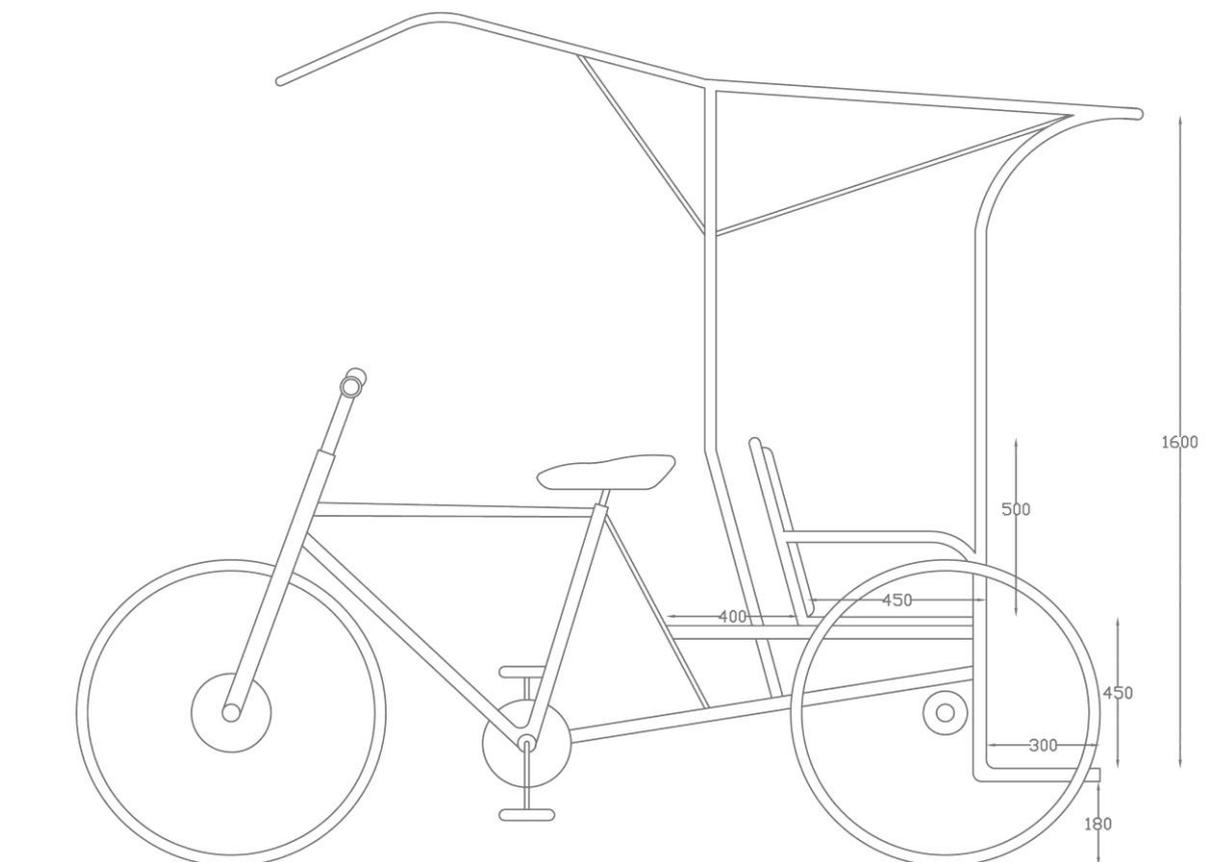
Rickshaw consists of mainly three parts:

- Front frame;
- Chassis;
- Seating and hood.

The front frame and the chassis remains the same as of the existing one, only the main body and the seating part were to be designed considering all the ergonomics and the anthropometry specifications. The design is for elderly safety and hence comfort is the first consideration that is to be taken care of.

- The foot board is made at a lower height considering the ground clearance.
- The seat and the backrest is designed using proper anthropometry data.
- Back rest of the seating is kept at a distance from the frame of the rickshaw to avoid head injury.
- Below the hand rest and near the leg space guard has been provided for safety purpose.

10. 1 Detail design:



CAD diagram showing detail dimensions of the prototype

10.1.1 Initial front framing: The framing design was made in such a way that minimum material could be used for making it. Iron was used for making the structure as used in the present cycle rickshaws. A triangular frame supports the seat which is connected to the back seating and the two wheels. Then two frames are connected to the triangular frame which tapers at the place connecting it to the handle.

10.1.2 Frame for holding and supporting:

A proper frame using the minimum material has been designed for supporting purpose. This frame is attached to the back seating which helps in holding when an elderly passenger climbs up or climbs down from the rickshaw. It also supports the backrest of the seat. The entire frame is also designed keeping in mind the aesthetics value.

10.1.3 Seating:

- For rickshaw puller: The seating is made like any other cycle rickshaw considering the proper heights as per ergonomics.

- For passengers: The seating for the passengers faces opposite to the rickshaw puller thus providing more space for the user to climb up and down from the rickshaw. And also the seating heights have been made low along with the floor height so that there is no ingress and egress problem. The seating height has been referred from the anthropometry of the human sitting posture and thus is kept at a height of 450 mm. The floor height has been kept at 180 mm from the ground which is convenient for the elderly to climb.

10.1.4 Wheels:

- Front wheel: The motor is attached to this wheel to reduce the effort of the rickshaw pullers. The front wheel is of usual thickness as of the other two back wheels. This wheel forms the tapering end of the triangle formed by the three wheels and is exactly at the centerline of the rickshaw. The wheel has proper mudguards.

- Two back wheels: These two wheels form the two opposite ends of the triangle formed by the three wheels. The design of these two wheels has been kept constant as is used in the present rickshaws also keeping the position same. These wheels also have proper mudguards.

10.1.5 Top cover:

The top cover is made in such a way that it covers both the passengers and the rickshaw puller. The design is made taking into consideration the direction of wind flow. The front covering is kept at such an angle that it saves the puller from the sun and rain. Though it does not completely save him from the rain (depends on the intensity and angle of rain) but his head and face do get covered or saved due to the cover. The cover is kept at such height that it is at a good distance above the passengers head and also the rickshaw pullers head. Even if the puller stands up while riding the rickshaw it does not touches his head.

10.1.6 Others:

There is no other major change in the design. For example the paddles are kept the same way as no further modification is required. The design of paddle is appropriate as per the current design and hence they are kept at the same place and at the same height convenient for the rickshaw pullers. The height of the handle is also kept at the same level as is in the present design. The present height is convenient for the puller to ride the rickshaw.



250w hub motor



protective guard near wheels



Backrest can be flattened.



Foot rest at lower level.



Luggage space at back of the seat

11. COMPARATIVE ANALYSIS:

The designed rickshaw for elderly was made after analyzing the disadvantages of all the earlier made designs. The main aim was to make a prototype especially for the elderly people so that there can be a convenient mode of traveling even for them.

The rickshaw was made in accordance to meet the specific needs of the elderly. The low floor of the new design helps the aged to get in or get down comfortably from the vehicle.

The prototype not only benefits the passengers but also the pullers. Unlike the normal rickshaws that are currently being used, the new prototype designed is more convenient and easy. It not only solves the problems faced by the aged but it has also eased the work of the rickshaw puller. The rickshaw pullers are now saved from the scorching heat in summers and rains in the monsoon as they have the top cover

to their rescue. The prototype has an aiding motor installed in the front wheel which saves the puller's energy into paddling the vehicle. The presently used models are non-adjustable whereas this prototype serves dual purpose i.e. of carrying passengers and carrying goods (when not in use for carrying people). For this the backrest of the seat is made movable which could be put down or straightened when used for loading or keeping goods.



Comparison of new design with the existing cycle rickshaw.

12. CONCLUSION:

Thereby, the model serves its basic purpose, i.e. of providing a more comfortable, convenient and safer mode of transportation for elderly passengers as well as for the rickshaw pullers. The modifications involved in its design make it stand apart from the currently used rickshaws. The new design is not only better but is also practically applicable.

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