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Survey on Socioeconomic Impact of Battery Operated Auto Rickshaw in Jessore City

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Abstract

In Bangladesh, unemployed problem is considered one of the major problems in recent time. Battery operated auto rickshaw helps in reducing this unemployment problem. In addition, environmental hazards including air pollution and sound pollution are another threat for the human being. Although, battery disposal is a concern for the manufacturer, these do not produce any harmful gasses like CO_2, CO, SO_2 and NO_2 etc. and run at a less vibration and noise. On the other hand, battery operated auto rickshaw causes serious traffic jam and consumes a lot of electricity which are considered the reason of serious headache for our country. This paper covers the social, economic and environmental impacts of battery operated auto rickshaw in Jessore city. This study also includes economic analysis of battery operated auto rickshaw and the comparison with other vehicle available in the city.

Keywords: Auto rickshaw, Jessore, payback period, socio-economic, environment.

1. Introduction

Battery operated auto rickshaw is the updated form of rickshaw which is locally known as easy bike. It has normally four to six seats for passenger along with the driver. Auto rickshaw is a three wheel vehicle which is suitable for transportation of people and goods in a small distance due to its small and narrow structure. The operators of this vehicle come from the poor society and belong the vehicle privately due to its low investment and operating cost [1]. Battery operated auto rickshaw was first introduced in Bangladesh in 2008 [2]. Recently, battery operated auto rickshaw has become one of the most environment friendly, time saving and the cheapest mode of transportation. However, it causes the increase of traffic congestion, high electricity consumption and small collisions with other vehicles in high ways which led to the banning of auto rickshaws in the major streets. Generally, it uses four or five 12 volt batteries with fully charged for running all the day. As it is operated by battery, it usually makes no pollution in the environment but leads to the huge amount of electricity consumption for charging the battery. The number of unemployed people in Bangladesh is near about 7 lacks where battery operated auto rickshaw reduces this problem in 2%. The aim of this paper is to analyze the role of battery operated auto rickshaw in socio-economic and environmental development in Jessore city.

2. Methodology

In this work we frequently asked various types of questions to the passengers, drivers, workers, businessmen who are related to the battery operated auto rickshaw that clarified the socio-economic condition of these people. For this survey, a set of questionnaires were developed and all the data related to the social, economic and environmental aspects were collected from different locations in Jessore City such as Palbari Mor, Daratana, Monihar bus stand, Dharmatala Mor, Arabpur Mor, New market bus stand, High court Mor. The payback period is calculated according to the equation 1 [3] for estimating quickly the initial investment would be recovered.

$$\text{Payback period} = I/(R - E) \quad (1)$$

Where, I: Investment, R: Return, E: Expenses.

3. Purposes of battery operated auto rickshaw

There are various types of vehicle normally people use for their transportation mode in Jessore town. In general, battery operated auto rickshaw is used for going to work, making social trip, shopping trip and going to school and college. From the survey it has been found that, almost 40% of total passengers use battery operated auto rickshaw for the purpose of going to school as presented in Figure 1.

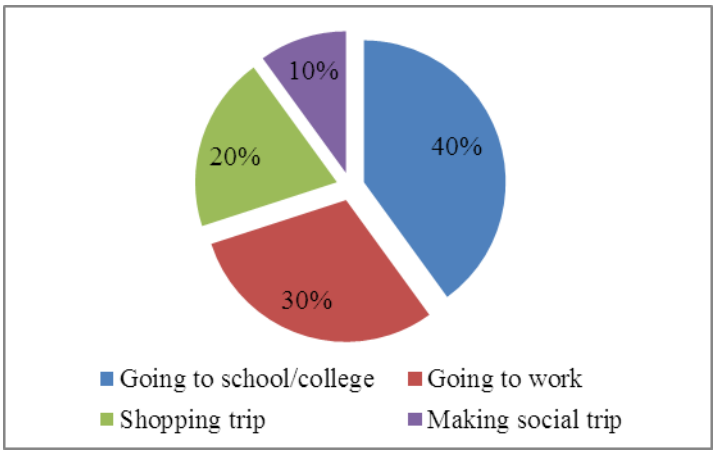

Figure 1: Purposes served by auto rickshaw

4. Positive aspects of auto rickshaw

4.1. Preferential choice of auto rickshaw

Distance, road condition, financial ability, availability of transport, time etc. make an impact on choosing the transportation mode for their movement. Several random passengers were asked to know about their preference of the transportation mode for movement. Figure 2 illustrates that approximately 53% of total passengers choose battery operated auto rickshaw for their movement in the city. On the other hand, 33% of total passengers use diesel operated vehicle and only 14% use paddle rickshaw.

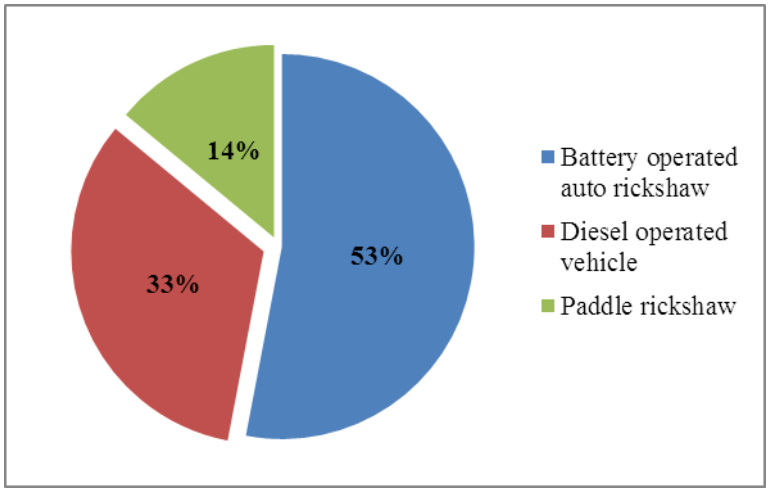

Figure 2: Preferential choice of different vehicle in Jessore city

It is clearly depicted from the survey that, the transportation cost per person in case of auto rickshaw is less than the other vehicle. Although, the fare for diesel operated vehicle is the same of auto rickshaw (Table 1), passengers have to wait for long time for this vehicle due to its limited number.

Table 1: Comparison of fare of different vehicle

Type of vehicle	Distance	Cost/person
Auto rickshaw	Palbari to Daratana (3 km appr.)	10 taka
Paddle rickshaw	Palbari to Daratana (3 km appr.)	20 taka
Diesel operated vehicle	Palbari to Daratana (3 km appr.)	10 taka

Therefore, passengers prefer battery operated auto rickshaw among the three wheeler vehicle available in Jessore city due its less traveling cost, time saving, easy going and comfortable feature. Almost 90% of passengers choose because of less travelling cost, while 60% choose for comfortable journey as presented in Figure 3.

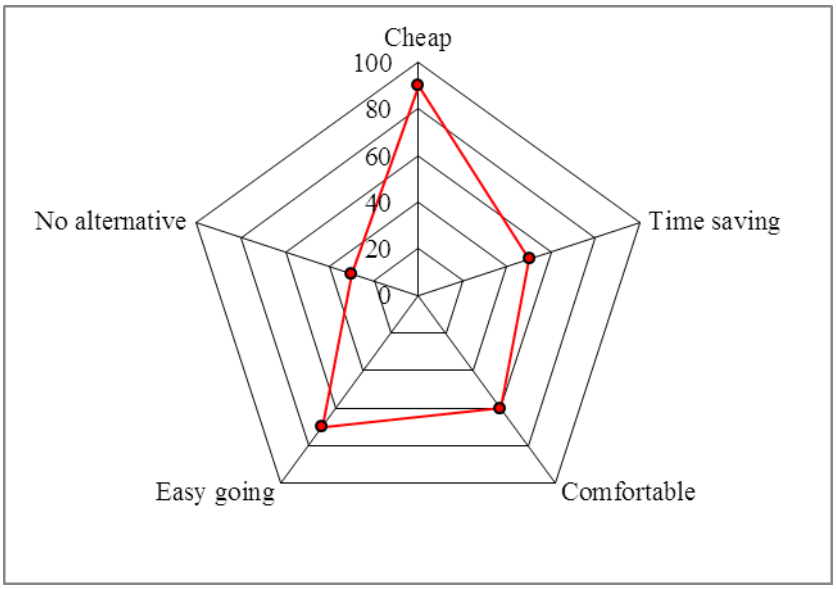

Figure 3: Reasons of choosing the auto rickshaw

4.2. Employment opportunity

4.2.1. Earning of the driver

Usually, the driver of the auto rickshaw drives his own auto rickshaw or hires it from the owner in daily basis. Normally, he earns BDT 800-1000 per day which depends on the size of the auto rickshaw and the charging of the battery. He has to pay BDT 300-400 to the owner according to the number of batteries in the auto rickshaw. Finally, he has BDT 400-600 in hand. Accordingly, a driver earns about BDT 12000-16000 per month which is good enough to run a small family in the rural area. But the problem is that the amount that does not remain constant every month for a driver of the auto rickshaw.

4.2.2. Earning of the owner

The owner of the auto rickshaw normally gets about BDT 300-400 per day for per auto rickshaw from the driver who hired. Accordingly, the owner earns BDT 9000-12000 per month for one auto rickshaw. On the other hand, he has to spend almost BDT 90 per day which is BDT 2700 in a month and BDT 500 taka for maintenance and repairing cost of the auto rickshaw. In addition, he has to spend according to the Table 2 for replacement of battery, tire and motor for long lifecycle of the vehicle. Therefore, considering all the profits and costs, the payback period is found about 3.48 years indicating the recovery time of investment.

Table 2: Replacement cost of accessories

Accessories	No. of unit	Per unit cost (BDT)	Total cost (BDT/year)
Battery	5	10,000	50,000
Tire	3	2200	6600
Motor	1	6000	6000

4.3. Social status of related family

From the survey it is found that most of the drivers of the auto rickshaw were unemployed before. On the other hand, some drivers are students and farmers who are taking this occupation as a part-time job to maintain his tuition fees and pocket money and in off season. Some hawkers have also come to this occupation. Approximately 20% drivers who were related to hawking or other similar occupation strongly agree that this occupation increase their social status and prestige, while, more than 46% drivers are strongly disagree. Besides, around 30% of the people say that their economic conditions have not been changed at all, whereas, about 70% of people say that their economic condition are better than before.

4.4. Pollution

There are various types of pollution caused by the vehicles running with diesel, petrol etc. in the streets. Typically a motor vehicle is responsible for over 70% of the total emissions of air pollutants [4] as well as sound

pollution. On the contrary, battery operated auto rickshaw does not emit any harmful pollutants and creates less sound comparing to other vehicles which is considered to be negotiable. Although, only lead from waste battery material pollutes the water and soil, it will overcome by proper management and disposal.

4.5. Accident

Battery operated auto rickshaw is commonly run inside the city. This transportation mode is low speed and lightweight and hence it does not produce fatal accidents.

5. Negative aspects of auto rickshaw

5.1. Electricity consumption

The auto rickshaw collects its power for the batteries from the electric supply line while charging. The charging time of the auto rickshaw is normally 10 pm to 8 am. It takes 8 to 10 hours for full charging of the batteries. It has been estimated that, battery operated auto rickshaw consumes approximately 300 MW electricity every day for recharging their batteries. As Bangladesh is electric power crisis country and this huge consumption for this purpose creates daily load shedding.

5.2. Traffic Jam

In recent days, traffic jam is one of the severe problems in many large cities in Bangladesh. Battery operated auto rickshaws are commonly parked in the busy road as well as foot path. In Jessore city, there are more than 7,000 battery operated auto rickshaw running in the street every day. Therefore, this creates traffic jam in a narrow road in Jessore city.

5.3. Unsuitability for heavy load

Battery operated auto rickshaw has low power capacity. Therefore, this mode of vehicles is not suitable for carrying heavy load and for hilly road or bad weather conditions.

6. Technical information and issues on auto rickshaw

6.1. Longevity of Battery

Usually each battery operated auto rickshaw consists of 4 to 6 batteries of different companies. Usually it runs about 120-140 km with full charge when it is in a good condition. But for the time being the performance tends to reduce. Normally, after 12 months, the battery condition seems to be very poor as it runs only 20-40 km with full charge. Then there arises a need to change the battery of the auto rickshaw to get the desired outcome.

6.2. Cost of auto rickshaw

6.2.1. Investment cost

Generally auto rickshaws available in the street of Jessore city are mostly imported from china and few from India. But China manufactured auto rickshaw is most popular for the buyer for their service and longevity. Now a day, some local workers are making the auto rickshaw in their workshop which is not as good as the product of china but still some people prefer this because of their low cost. Normally, a China imported auto rickshaw cost about BDT 1,50,000 to 2,00,000 with the battery according to the size and the battery capacity of the auto rickshaw where locally made auto rickshaw cost about BDT 80,000 to 1,00,000 with the battery.

6.2.2. Operating and maintenance cost

Every auto rickshaw has 4 to 6 batteries but most of them have 5 batteries. If it takes 10 hours to fully charge the 5 batteries and each consume 2 units for full charging then 5 batteries consume 10 (5×2=10) units. The unit cost of electricity for commercial electric supply line is about BDT 9 taka. So, the cost of charging of an auto rickshaw with 5 batteries is approximately 90 (10×9= 90) daily.

6.3. Road condition

The condition of road in Jessore city is so poor that it is almost impossible for run not only the auto rickshaw but also all type of vehicles used for transportation. This road condition is considered one of the main reasons of low performance of the vehicle and low lifecycle.

6.4. License of driver and auto rickshaw

The field survey shows a very strange matter that, there is no license or registration of auto rickshaw and driver at all. Therefore, to take proper actions against the driver and owner in case of accident, robbery, misuse etc. is impossible as there is no number in the auto rickshaw.

6.5. Auto rickshaw driver union

During the survey many auto rickshaw driver complain that they have to pay BDT 10 in several auto stand to the so called auto rickshaw driver union. But the reality is that, there is no government approved auto rickshaw driver union in the Jessore city. The drivers and owners of the vehicle are disturbed by this union.

7. Recommendations

- There should be a registration of the battery operated auto rickshaw and the driver should have the driving license.
- As the auto rickshaw is restricted in the highway there should be an individual lane for slow moving vehicle like battery operated auto rickshaw.
- There should be a government approved auto rickshaw driver union which works for the welfare of the drivers.
- Charging duration of the battery should be reduced as much as possible. This will reduce the charging cost as well as the load shedding. In the recent time, scientists of Purdue University invented a new alternative of graphite which is used as anode in Li-ion battery. This alternative is actually a material that made from tin-oxide nanoparticles. If it is used as anode in the Li-ion battery the charging duration will be reduced from multiple hours to minutes.
- Alternative sources such as solar panel or wind turbine should be introduced for charging the batteries.

8. Conclusion

The study reveals that battery operated auto rickshaw plays a vital role in socio-economic and environmental development of the Jessore city. The people related to this occupation not only the drivers and the owner but also the worker who work in the auto rickshaw garage, workshop and the seller who sells the auto rickshaw accessories are getting economic benefit. The economic analysis shows that the payback period of the vehicle is 3.48 years which indicates that his investment is risk free. The major issue of energy consumption can be reduced by incorporating renewable energy sources for battery charging or using tin-oxide nanoparticles as anode in Li-ion battery.

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