

Paratransit Services in a Medium-size City: Users' Satisfaction about Easybikes in Rangpur City, Bangladesh

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Abstract: Easybikes are operating in many cities of developing countries as a form of paratransit and providing flexible or demand-responsive services. The main purpose of this paper is to provide users' opinions about existing easybike services in a medium-size city. A case study was conducted in Rangpur city of Bangladesh. Totals of 400 passengers of easybikes were randomly selected from 10 major points of the city for face-to-face interviews. Passengers were interviewed using a pre-determined questionnaire to know their satisfaction about the service and their major issues or difficulties related to easybike service. Likert Scale and RIDIT (relative to an identified distribution integral transformation) technique was applied to assess their satisfaction level. Around 74% of the respondents choose the easybike for their usual trips. Compared with other available travel modes of the city, passengers are very satisfied about the quality of easybike services. However, yet there is no policy guideline for the city to formalize the operation of easybikes.

Keywords: Easybike; paratransit; transport; Likert scale; RIDIT technique; satisfaction.

1. INTRODUCTION

Paratransit modes play a significant role in the urban transport of developing countries by providing transport services to a large number of people (Cervero & Golub, 2007; Godard, 2006; Joewono & Kubota, 2007; Rahman et. al. 2012; Tangphaisankun et al., 2010). A variety of forms and types of paratransits are available in many developing country cities (Rahman, 2013). Dependence on paratransit is mainly because either formal public transport service is not available or poor service quality of public transport (Rahman, 2013; Senbil et al., 2005). However, the quality of existing paratransit services in many cities is not very good (Tangphaisankun et al. 2009).

The term 'paratransit' refers to flexible transport services such as shared taxi, community transit, or jitneys (Orski, 1975). Schalekamp et al. (2016) define paratransit as a "*flexible mode of public passenger transportation that does not follow fixed schedules, typically in the form of small to medium-sized buses*". Behrens et al (2016) differentiates the term paratransit for services that may have a certain degree of regulation by public authority albeit minimally, and that all forms of paratransit originate from informal transport. Whatever, paratransit could be distinguished from conventional transport system based on the following features:

(i) *Absence or lack of efficient regulatory framework:* Informal transport often can be seen as a *laissez-faire* marketplace, with transactions according to the passengers' willingness-to-pay and service providers' willingness-to-provide where authorities allow very flexible regulatory environment or even deregulated environment (Cervero, 2000).

(ii) *Flexibility*: Paratransit provides flexible transport services in terms of charges, schedules or even routes (Orski, 1975; Schalekamp et al. 2016).

(iii) *Vehicle capacity*: Vehicle capacity of the paratransit depends on the country's context; for instance, can range between 1 to 3 for motorcycle taxis such as *zemidjans* in Cotonou, microbus of 10 to 15 seats, minibus of 16 to 25 seats, and midibus of 26 to 44 seats are common in West and North African cities, and shared taxi of 1 to 4 seats. Another term describing this is *transport artisanat*, the French term for *transport artisanal*, coined by Godard (2013) as it refers to *small-scale, private enterprise-based public transport services operating in developing world cities* (cited in Behrens, 2016). Nonetheless, Godard (2013) claims that the vehicle capacity is subjective depending on country's context and can be between as little as one (e.g. motorcycle taxis) to 50 (e.g. buses) passengers.

(iv) *Internal organization*: Operation of public transport vehicles on individual and private scale is largely fragmented by vehicle ownership. Ferro (2015) argued that the rules of organization and operations do vary depending on the associations.

Paratransit modes can be classified based on following four aspects (Ahmed, 2008):

(i) Type of usage: The paratransit services may be availed by different groups of users such as (a) fixed personalized mode of transportation (e.g. car rental and carpools); (b) semi-public paratransit (e.g. vanpools and subscription buses); (c) public (regular) paratransit (e.g. autorickshaw, cycle-rickshaw, tata magic).

(ii) Ownership of the vehicle or system: Paratransit vehicles may be owned and service provided by an organization not related to transportation (e.g. factory or school transport service), or by an individual who operates the vehicle (e.g. auto-rickshaw or cycle-rickshaw operator) or by an individual who does not operate but lease it to the operator (e.g. owner) or by an agency (e.g. taxi company or tourist agency).

(iii) Service type by routing: Generally, paratransit modes provide door-to-door services such as taxi, e-rickshaw and cycle-rickshaw provides. Sometimes they adjust the service partially to the user's destination (e.g. feeder service to the airport or bus terminal). A third group of mode has fixed routes but not fixed schedule (e.g. shared travel mode auto-rickshaw service).

(iv) Method of getting service: Users may have paratransit service available at fixed parking lots (auto rickshaw, cycle-rickshaw) or their trips may be pre-arranged (subscription paratransit) or they obtain it by hailing the vehicle on street sides, or calling it by telephone from the travel agencies.

It is important to assess the users' satisfaction so that the service providers can work out to improve quality for satisfying the users on a consistent basis (Das and Pandit, 2013). For paratransit services in many developing countries importance of users' perception has been emphasized (Joewono and Kubota, 2007a, 2007b). This research, thus, aims to identify the parameters of service quality for paratransit with a specific case of Rangpur city in Bangladesh by reviewing the service attributes considered in previous researches for developing countries. These service attributes are then prioritized based on users' perceived level of importance. Various tools and techniques have been developed by researchers utilizing the users' perception data (Rashid and Pandit, 2017). For example, Eboli and Mazzulla (2010) discussed the use of rating method and choice options to capture passengers' opinions on transit service quality. Lai and Chen (2011) applied Structural Equation Modelling technique to model the relationship between users' behavioral intentions and different service quality attributes. Joewono and Kubota (2007) applied the path analysis tool to identify the important determinants that influence overall satisfaction.

Easybikes¹ and cycle-rickshaws are the most common paratransit modes in all the major cities as well as in small towns of Bangladesh. Three major types of paratransit modes

¹ Easybike is the battery-operated electric three-wheeler, also called E-rickshaw or Auto-rickshaw or Auto.

namely cycle-rickshaws, battery-operated rickshaws, and easybikes are available and operating in Rangpur city (Pramanik and Rahman, 2019). Easybike has the highest percentage of passengers (or occupants) and trips among the paratransit modes. At present, there are legal permission for about 5,000 easybikes to operate in Rangpur City Corporation (RpCC), however, operating around 32,000 easybikes in and around the city (Pramanik and Rahman, 2019).

2. OBJECTIVES AND METHODOLOGY

The main purpose of this paper is to explore the easybike users' satisfaction about existing services in a medium-sized¹ city of Bangladesh. The detailed objectives are: to assess the satisfaction level of passengers; and to compare the quality of easybike services with other modes of travel.

A case study was done in Rangpur city of Bangladesh during September and October 2019. An inventory survey of existing traffic and transport infrastructure was conducted to identify the existing traffic condition and the major problems. Traffic volume survey was conducted in major intersections of the city. Furthermore, unstructured field observation was done to document descriptive and reflexive notes as well as photographic evidence to enrich the study. Totals of 400 passengers of easybike (at 5% confidence interval and 95% confidence level) were randomly selected from 10 major points of the city for face-to-face interviews. Passengers were interviewed using a pre-determined questionnaire to explore their opinions about easybike services, usages of easybike as a travel mode, the major problems and suggestions regarding the service. The field survey was conducted during sunny weekdays. Likert Scale and RIDIT technique were applied to assess the passengers' level of satisfaction.

The Likert scale is a unidimensional scale that researchers use to collect respondents' attitudes and opinions. It is a rating system, used in questionnaires, that is designed to measure people's attitudes, opinions, or perceptions. Subjects choose from a range of possible responses to a specific question or statement; responses typically include 'strongly agree', 'agree', 'neutral', 'disagree', and 'strongly disagree'. Often, the categories of response are coded numerically, in which case the numerical values must be defined for that specific study, such as 1 is 'strongly agree' and 2 is 'agree' and so on (Das and Pandit, 2016).

Relative to an identified distribution integral transformation (RIDIT) analysis is a simple and easy tool to obtain results from ordinal data (Rashid and Pandit, 2017). It is closely related to distribution free statistical methods. This method assigns a continuous quantitative value (between 0 and 1) to different categories of ordinal scale and to the attributes rated on the scale through empirical cumulative probability transformation of scale. Higher RIDIT value means higher importance of attribute and vice-versa; while 0.5 represents the mean RIDIT value. However, it does not mean that the attributes with RIDIT lower than 0.5 are not important. These attributes are also important, but less important than the attributes with RIDIT value greater than 0.5 (Rashid and Pandit, 2017). RIDIT analysis provides an alternative to rank order statistical analysis (Bikash et. al. 2010).

¹ Medium-sized city in this paper refers to a city with population between 3,00,001-10,00,000 in Bangladesh.

3. DESCRIPTION OF THE CASE STUDY CITY: RANGPUR

3.1 Geography and Population

Rangpur is the second largest city of the northern region of Bangladesh, located about 335 km North-West of the capital city Dhaka (Pramanik and Rahman, 2019). Rangpur is one of the newly established City Corporations (municipality) of the country. The city is situated on the bank of the river Ghagat- a moribund tributary of the river Teesta. Figure 1 show the location of Rangpur City in context of the country and the Rangpur City Corporation area.

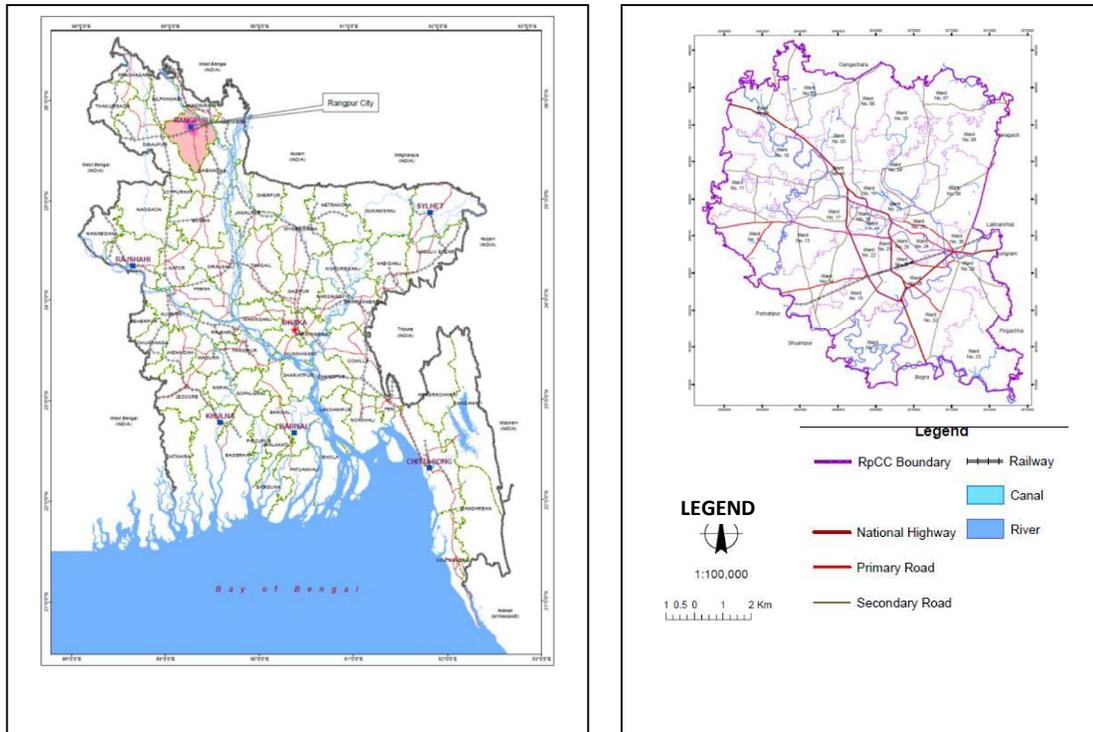


Figure 1. Location Map of Rangpur (left) and boundary of Rangpur City Corporation Area (right)

Table 1 shows the projected population of Rangpur city with the density both in the core and non-core area. The population in 2018 was 7,13,541 which is predicted to be 8,80,808 in 2023 and 11,37,599 in 2028 and 15,78,605 in 2033 (RpCC Master Plan, 2014). The population density in 2028 is 14 persons per acre while it is 10 persons in the non-core area but 37 persons per acre in the core area.

Table 1. Projected Population and the density in Rangpur City

Year	Core Area		Non-core Area		Total	
	Population	Density (per acre)	Population	Density (per acre)	Population	Density (per acre)
2013	206183	32.12	379439	8.57	585622	11.56
2018	237287	36.96	476254	10.76	713541	14.08
2023	274414	42.75	606394	13.70	880808	17.38
2028	314281	48.96	823318	18.60	1137599	22.45
2033	361692	56.34	1216912	27.50	1578605	31.15

Source: BBS, 2011 and RpCC Master Plan, 2014.

3.2 Road Network

Existing road network with different functional classification of the city is shown in Figure 2. There is a total of 1427 km long road network in Rangpur city. Considering the roadway hierarchy (functional classification), the roads are categorized in national highway, primary road, secondary road, tertiary and access roads (as seen in Table 2); where the majority (88%) are tertiary and access roads.

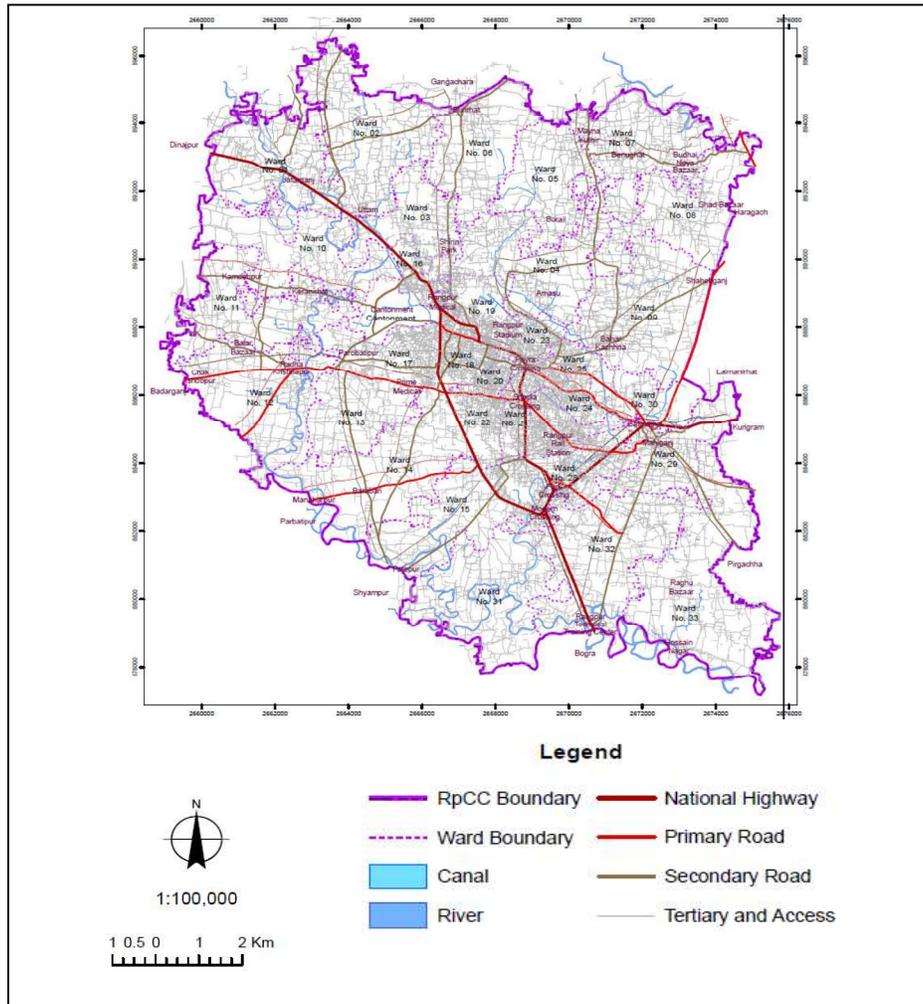


Table 2. Existing roads in Rangpur City

Functional Category	Length (km)	Length (mile)	%
National Highway	32.85	20.41	2.30
Primary Road	34.69	21.55	2.43
Secondary Road	99.98	62.12	7.00
Tertiary and Access	1259.93	782.88	88.26
Total	1427.44	886.97	100.00

Source: RpCC Master Plan, 2014.

3.3 Paratransit Modes

A large number of paratransit vehicles in Rangpur city are operating without being registered from the respective authority; which means they are operating as an informal (or illegal) mode. The total number of different paratransit vehicles of the city, both the registered and un-registered, is shown in Table 3.

Table 3. Total Number of Paratransit Vehicles in Rangpur City

Vehicles Name	Number of registered vehicle*	Total Vehicle** (Approximately)
Cycle-rickshaws	3,000	3,300
Battery-operated rickshaws	3,000	15,000
Easybikes	5,000	32,000

Source: BBS 2011*, RpCC*, BRTA*, RpMP**, Easybike Association**, 2019

There are six major road intersections in Rangpur city where a very high traffic flow is observed. The major congestion-prone intersections are: Jahaj Company Morr, Payra Chattar, DC office Moor, City Bazar, Town Hall, Medical Moor, and Lalbagh Chattar. In these intersections often overflow of rickshaws and easybikes cause traffic congestion particularly during the peak hours and traffic police often face difficulties in controlling and managing the traffic.

3.4 Traffic Composition

Traffic count survey in seven major intersections were done in order to identify the nature of existing traffic movement and the composition of traffic. Figure 3 shows the traffic composition; the esaybikes are highest (39%). Other significant portion of traffic are: rickshaws, motorcycles, and bicycles with 31%, 12%, and 9% respectively.

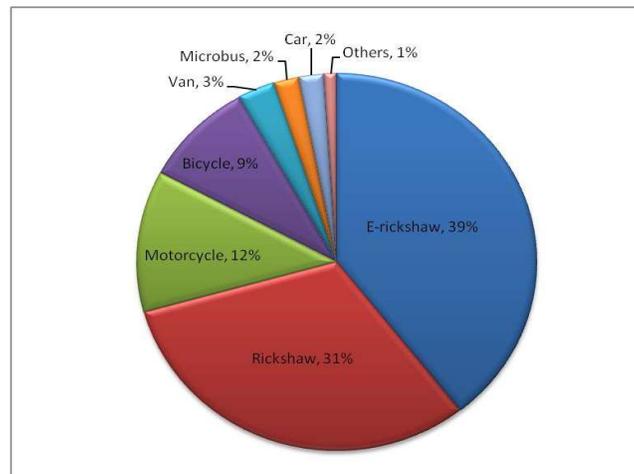


Figure 3. Traffic Composition in Rangpur City

Source: Traffic Volume Survey, 2019.

A wide range of other vehicles as public transport and paratransit modes are also found though the proportion is very minimal. All the vehicle types have a different seating capacity. According to the seating capacity of the vehicle, the paratransit can be categorized into following three distinct groups: low-capacity vehicles; medium-capacity vehicles; and high-capacity vehicles (Pramanik and Rahman, 2019).



Figure 4. Medium-capacity vehicle - Easybike (left) and auto-rickshaw/CNG (right)

Easybikes and the auto-tempos, as seen in Figure 4, are the medium-capacity vehicles with a seating capacity of 6-8 passengers and 5 passengers respectively. The easybike is powered by electricity reserved in 4-6 high-capacity battery attached with the vehicle. The auto-tempo is locally called Mahindra as it is manufactured by Mahindra Ltd. Auto-tempo is fueled by diesel. Auto-tempo is not widely available in Rangpur, operating only in some long-distance routes within the city.

4. PROFILE OF THE RESPONDENTS

The profile of the respondents is shown in Table 4. Most of the respondents are in middle age group; for instance, 31.5% are aged 31–45 years. Around 27% of the respondents are employed in services of government or private sector while 25.5% are students and 26% are doing small business or trading. Almost 90% of the respondents do not have any vehicle ownership while only 1% has a car and 9% has a motorcycle.

Table 4. Profile of the respondents

Characteristics of the respondents		Percent
Age	Below 20	10
	20-25	18.5
	26-30	21.5
	31-45	31.5
	46-50	13.5
	Above 51	5
Passengers' occupation	Service	27
	Small Business	26
	Student	25.5
	Daylabour	3
	Unemployed	0.5
	Self-employed	18
Vehicle Ownership	Motorcycle	9
	Car	1
	None	90

Source: Easybike Passengers' Survey, 2019

5. FINDINGS

5.1 Travel mode choice

Survey data on travel mode use reveal that around 74% of the respondents usually choose the easybike for their usual travel (Figure 5). Compared with other paratransit modes such as battery-operated rickshaw or auto-tempo, the proportion of respondents using the easybike is very high.

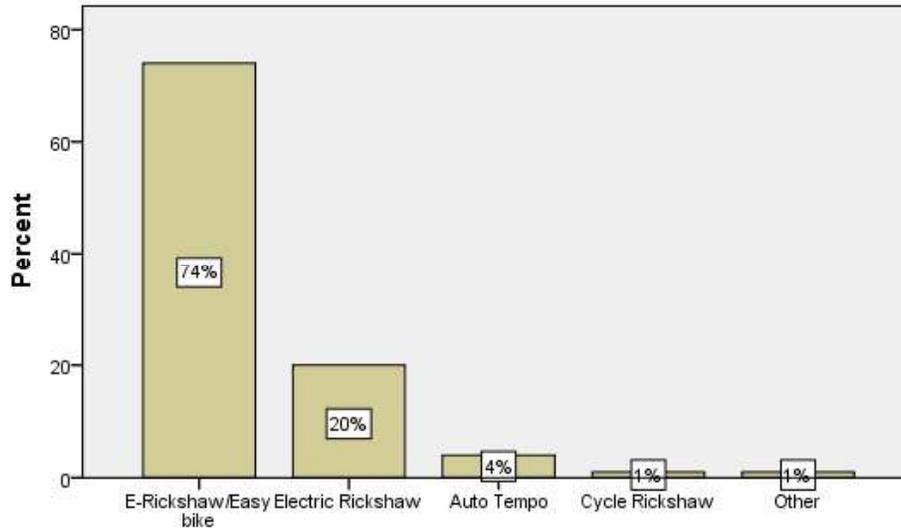


Figure 5. Transport Modes used by the respondents for commuting daily trip
Source: Easybike Passengers' Survey, 2019

The respondents were asked to provide their opinions regarding some of the attributes (e.g. availability, comfortable, reliable and fare rate) for different available modes operating in Rangpur city. The findings highlight that the users prioritize qualitative attributes than quantitative attributes in the study city. Perception data of the passengers have been analyzed with the RIDIT technique, as shown in Table 5, show that easybike scored the highest value among other modes available in the city. Easybikes are playing an important role to meet their travel demand with low-cost mode.

Table 5. Service quality attributes of available travel modes in Rangpur city

Mode	RIDIT Score				Mean score	Rank
	Availability	Comfortable	Reliable	Fare rate		
Cycle rickshaw	0.42	0.55	0.65	0.34	0.490	2
Battery rickshaw	0.52	0.43	0.56	0.38	0.473	4
Easybike/Auto	0.45	0.50	0.66	0.76	0.593	1
Auto-rickshaw/CNG	0.31	0.51	0.56	0.47	0.463	5
Bus	0.24	0.44	0.68	0.55	0.478	3

Source: Easybike Passengers' Survey, 2019.

5.2 Travel characteristics of easybike passengers

Figure 6 shows that more than half of the respondents, around 53%, avail the easybike because it's travel cost is lower than any other locally available travel modes and thus it is affordable. Only 14% mentioned that they choose an easybike for comfortable travel. Almost

10% of the respondents mentioned that except easybike they do not have any other travel mode.

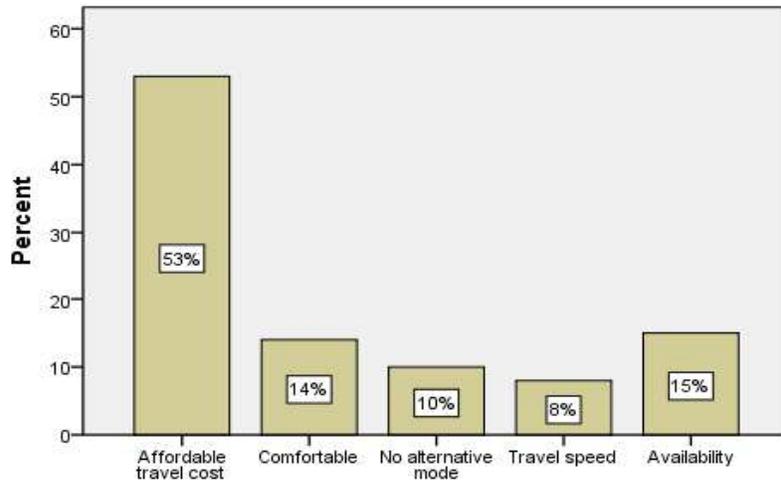


Figure 6. Reasons for choosing easybike for the trips
Source: Easybike Passengers' Survey, 2019

Almost 30-40% of the easybike users mentioned that regularly they use easybike for a trip to a fixed/specified destination. Figure 7 shows the major purposes of the easybike trips. The major purposes of the respondents are: work (31%), business (21%), education (24%), and shopping (8%).

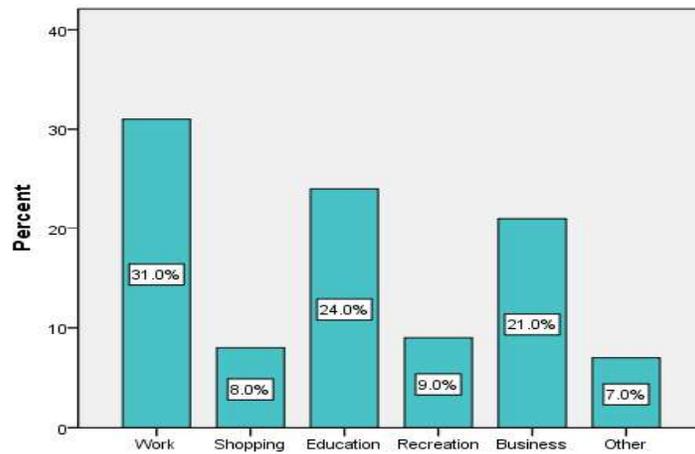


Figure 7. Purpose of trips by Easybike users
Source: Easybike Passengers' Survey, 2019.

5.3 Users' satisfaction about easybike services

Easybike users' opinions were collected on the following attributes: fare rate, travel time, comfort of travel, safety, travel speed, crowd, operators' behaviour, and the quality of service. The results are presented in Table 6.

Table 6. Performance of attributes based on opinion of easybike users

Attributes	Scale					Total respondents
	1 (strongly dissatisfied)	2 (dissatisfied)	3 (neutral)	4 (satisfied)	5 (strongly satisfied)	
Fare rate	0	0	20	336	44	400
Travel time	16	80	10	288	6	400
Travel comfort	50	112	18	220	0	400
Safety	156	190	8	46	0	400
Travel speed	0	30	130	230	10	400
Crowd	152	178	20	46	0	400
Operators' behavior	38	140	68	156	0	400
Quality of service	0	38	104	224	34	400

Source: E-rickshaw Passengers' Survey, 2019

Based on the opinions of the respondents, the performance index for the attributes is calculated, as seen in Table 7. The index for fare rate of easybike is 4.06 and ranked first which means the fare of easybike is excellent or users are satisfied. The quality of service for easybike is nearly satisfactory (Index 3.64). However, the easybike is unable to ensure safety (Index 1.86). Light weight of the mode and lack of skills training for the operators are major reasons for lack of safety associated with easybikes.

Table 7. Performance Index of attributes based on opinion of easybike passengers

Attributes	Performance Index	Rank
Fare rate	4.06	1
Travel time	3.47	4
Travel comfort	3.02	5
Safety	1.86	8
Travel speed	3.55	3
Crowd	1.88	7
Operators' behavior	2.87	6
Quality of service	3.64	2

Note: Performance Index = $\sum (\text{Value} \times \text{Scale}) / \text{Total respondents}$

The frequency of usage of easybike by the respondents are shown in Table 8. Around 51% of the respondents are using easybike for 5-7 times per week or almost every day. Frequency of easybike use 1-2 times per week and 3-4 times per week is by 17% respectively while 4% use rarely and 11% use sometimes. With the frequency of use by the majority, it is clear that the passengers are highly depended on easybike for their daily travel in Rangpur.

Table 8. Easybike use frequency per week in Rangpur city

Frequency of easybike use per week	Percent
1-2 times per week	17.0
3-4 times per week	17.0
5-7 times per week	51.0
Sometimes	11.0
No use or rarely	4.0
Total	100.0

Source: Easybike Passengers' Survey, 2019

Speed is one of the most important factors that influence users to choose easybike as a paratransit mode. The major portion of the respondents mentioned that the speed of easybike is either good (32%) or satisfactory (49%) as shown in Figure 8.

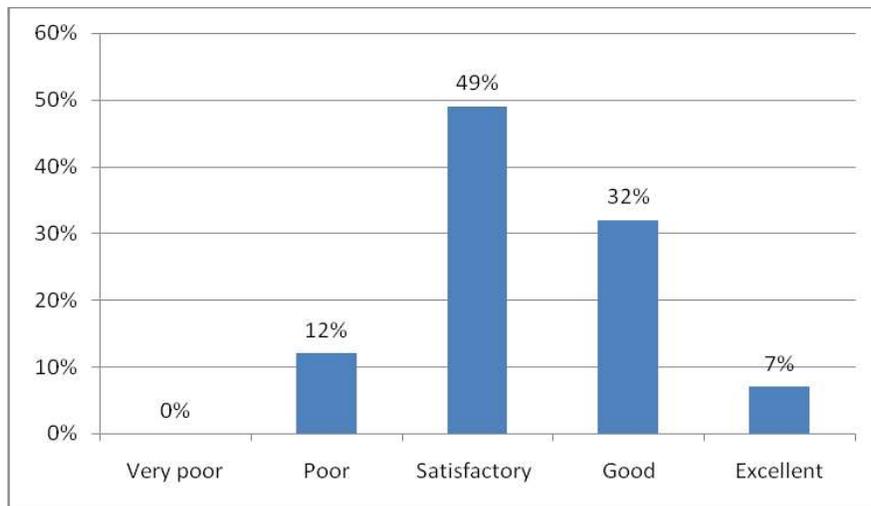


Figure 8. Users' perception on speed of easybike trips
Source: E-rickshaw Passengers' Survey, 2019

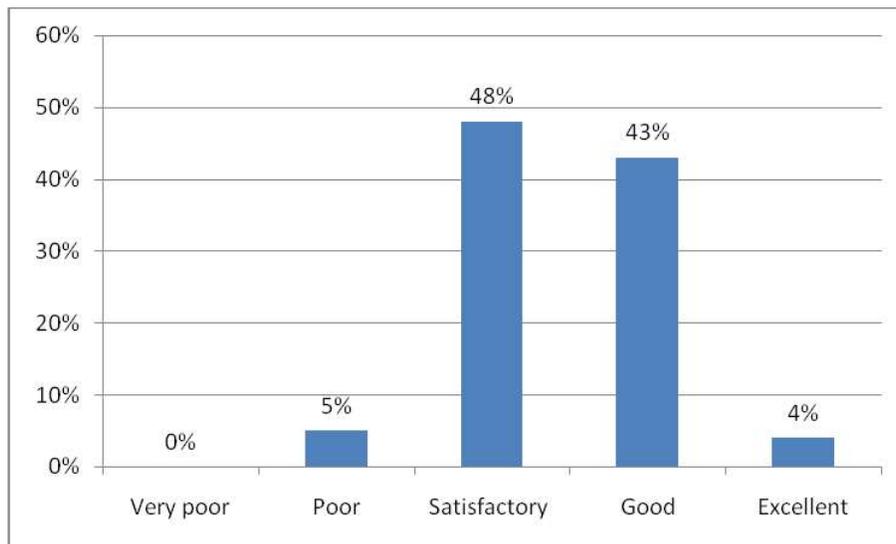


Figure 9. Users' opinions about availability of the easybikes in Rangpur city
Source: Easybike Passengers' Survey, 2019

Availability of the easybike varies with the demand during different hours of the day. Figure 9 shows that almost half of the respondents (48%) mentioned that the service quality of easybike is satisfactory whilst 5% mentioned poor in terms of availability of the easybike.

6. DISCUSSION

The easybikes are not registered by Bangladesh Road Transport Authority (BRTA) as per the Motor Vehicle Ordinance 1983 as a motor vehicle because they do not have engine number.

Rangpur City Corporation provides registration and license for easybikes to operate and they need to renew the license every year. The city corporation impose a fee for issuing the license for easybikes. New registration of the easybikes was terminated in 2012 though continued the yearly re-registration process for the previously registered one (Pramanik and Rahman, 2019). Yet, there are no policy regulations regarding the operations and services of easybikes neither in Rangpur city nor in Bangladesh.

Easybikes have been operating in all types of roads and all the areas of Rangpur city. There are no specific or fixed routes of service for the easybikes. However, the operators and their association (e.g. easybike union) have specified the starting points of the route. Almost 45% of the respondents consider that having several particular routes for easybike operation/services with a certain number of vehicles prevailing on that road will be better for the users (Figure 10). A large portion of the users want specific route for easybikes because the existing bus service route is only limited to the major roads and not accessible for many people. This result is similar to findings of Rahman (2012) which showed that passengers of paratransit modes in Siquijor (Philippines) expect specific route for operation.

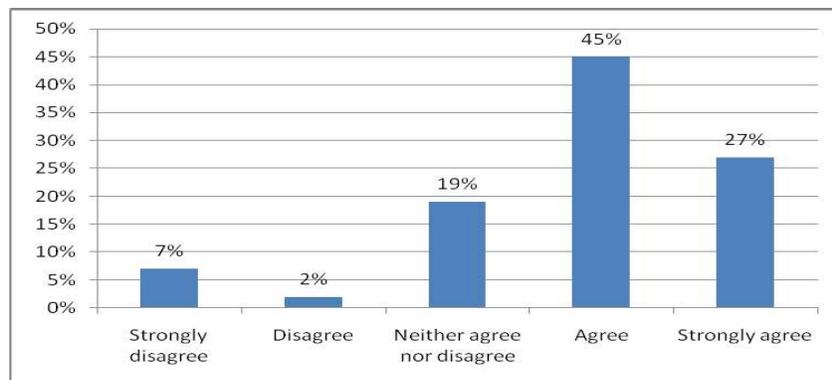


Figure 10. Perception on route fixation by easybike passengers
Source: Easybike Passengers' Survey, 2019

It is expected that if the bus services are available and extended to cover more routes in other areas, a substantial number of easybike users may shift to the bus service. Almost 89% of the respondents mentioned that they will shift from easybike to bus services if there is available a bus route. However, around 11% of the respondents claim that even if a bus service is available, they will continue for using the easybike services; therefore, the easybikes need to be preserved and integrated with the public buses.

It is very important to note that the easybikes usually provide transport services between two fixed nodal points of high travel density route. There is always a competition between easybike drivers to operate or serve in the area or route with high demand. Often some of the easybikes cannot get chance to operate in high demand routes because of poor management and some other operational or maintenance problems. In such case, for the time being they operate in the low demand areas and accept the low rate of return. This situation is often applicable for the newly registered easybike which is waiting for the approval of the owner's association of the respective routes.

Due to absence of formal public transport in Rangpur city, some specific routes of the easybike services are providing connectivity of the important nodes. The travel distance or travel time between residential areas and other facilities in the core area of city may reduce if public bus services are provided or available for connecting the areas of important traffic generating. The suggested public bus routes and the easybike stands are shown in Figure 11.

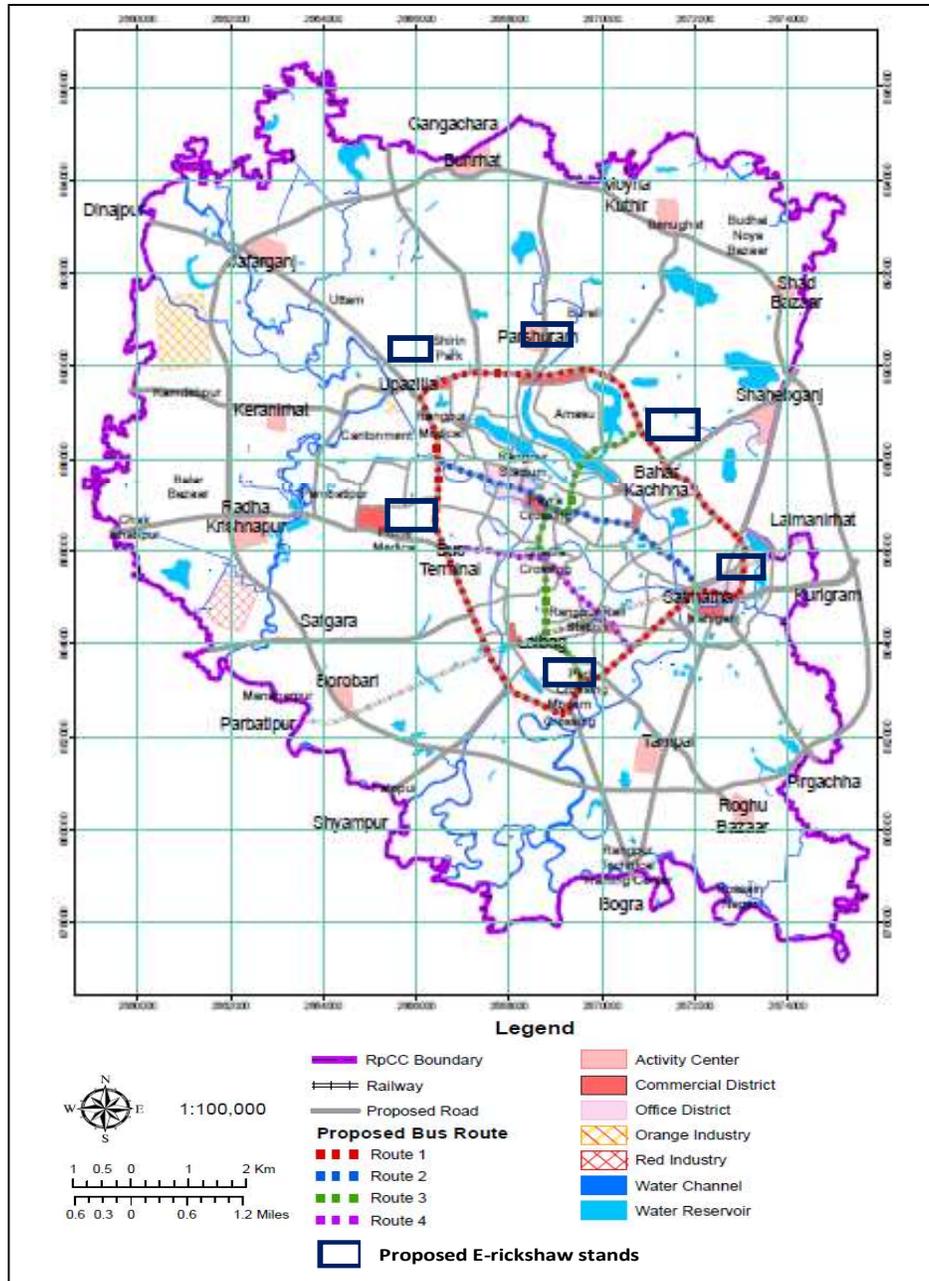


Figure 11. Proposed public bus route and easybike stands

Easybike as an intermediate mode of public transport could serve as a stop gaps in the areas where the conventional public transport systems or bus services are either inadequate or non-existent until the buses are provided or improved. Easybike could be a good option to operate as a feeder service for other transit modes where easybikes will carry passengers to/from the mass transit stops in the secondary routes to feed the transit system. Research (Rahman and Timms, 2020; Rahman et al 2012; Rahman, 2013) suggest an integrated multi-modal transport system where informal or paratransit serve as a feeder in narrow roads would have several benefits. The role of easybike will be rather complementary in nature in the primary roads. On the other hand, easybike should be encouraged to play as a supplementary role in the secondary roads.

7. CONCLUSION

A variety of informal and paratransit modes are available and operating in Bangladesh. The easybike is a common travel mode in many medium-size cities of Bangladesh. Easybikes are playing a significant role in transport of Rangpur city. This paper provides easybike users' opinions and satisfaction about existing services and the related issues or problems in Rangpur city.

Travel behaviour of people is a complex and multidimensional issue. Before selecting any particular travel mode, usually the trip maker often considers the characteristics, relative advantages, and costs of the mode compared with other travel modes. The choice of one specific mode may vary over time, for the types of journey and the nature of destination. It was found that compared with other available travel modes in Rangpur city, passengers are very satisfied with the availability and quality of existing easybike services. However, yet there is no policy guideline to formalize the operation of easybikes.

The result of this paper will be helpful to assist in recommending measures to improve the existing transport system, particularly the easybikes operation, in Rangpur city. The results might be helpful in formulating policy for easybikes as well as for other informal or paratransit modes. The findings could be helpful for transport planners and traffic managers of other secondary cities in Bangladesh. with necessary modification. Further research could be carried out on operational characteristics of easybikes, integrating easibykes with other modes to facilitate integrated multi-modal system, formulating policy regulations for easybikes, and analyzing financial aspects of easybikes.

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