Performance Analysis of Public Transport in Khulna City: A Case Study on Journey to Work Purpose

Sanjida Rabbi[*]
Kazi Salman Hossain[**]
Saima Rahman[***]

Abstract

Public transport is one of the social facilities without which people's life turned into stagnation and on the contrary, life becomes cozy by providing this facility. It is important to focus on the performance of existing public transport to ensure sustainable transportation system, rather importing more transport. The study finds performance of public transport in Khulna city based on the users, who use it at a regular basis for work purpose. Therefore, to find the performance, Customer Satisfaction Index (CSI) has been developed based on some service indicators. An Importance Performance Analysis (IPA) has been done to find the most important services indicators. Therefore, indicators like parking system and safety got more importance according to the method and also by the expert. CSI for Khulna city is measured 0.47 which lies in less satisfactory level. Users of Mahindra (0.47), CNG (0.49), and Auto Rickshaw (0.47) are less satisfied where Baby taxi (0.39) and bus services (0.37) cannot satisfy the users. Separate and powerful institutional authority for transit, public bus with better performance, policy (tax, tariff) for the parking system, online information system/ kiosk and union for the user can be initiated for the improvement of the performance.

Introduction

Transportation is an issue of great concern for increased population of a country because the efficient transport systems are quite necessary in the cities to support the economy and the welfare of the city population (Pitician, 2011:155).A country has to supply adequate public transports according to its demand. But all time it creates complexity because supplied facilities are not able to fill up the user expectations due to many reasons. As Bangladesh is a developing country and most of its population is middle or low income earner (Siddique, 2010). So maintaining private transport is also impossible for almost all people. Hence it could be said that public transports are vital player for Bangladesh to keep the country running. In this sense performance of public transport is a catalyst for users demand. Because if the performance of public transport is good then demand of public transport will increase or otherwise decrease. Therefore, objective of the study is to examine the service performance of different public transports in Khulna city based on service indicators. By doing these, the study gives an overall idea of the user perception and their satisfaction of public transportation system in Khulna city.

[*]   Graduate, Department of Urban and Regional Planning, Khulna University of Engineering and Technology (KUET), Khulna, Bangladesh, Email: ushasanjida00@gmail.com

[**] Junior Urban Planner, Planning & Management Consultants, Dhaka, Bangladesh, Email: kazisalman057@gmail.com

[***] Assistant Professor, Department of Urban and Rural Planning (URP), Khulna University of Engineering and Technology (KUET), Khulna, Bangladesh, Email: rahman.saima@yahoo.com

Methodology

The study area has been chosen Khulna City Corporation. For the study four important nodes of Khulna city named Dakbanglamor, Shibbarimor, Shonadanga Bus Stand and Rupsha Ghat has been chosen for the O-D survey to identify mostly used public transports in Khulna city. Here the user (323 people based on Stratified Random Sampling) who uses the public transport for work purpose has been selected to collect best information as they are the regular user of this public transport. According to recently provided service, indicators have been selected and important performance analysis has been made to identify the indicator's priority and Importance. Finally the CSI has been developed for the Khulna city and for the individual public transport. Therefore a comparative analysis has resulted by the paper. At last the expert opinion has been gathered to cross check the findings. Here, CSI represents a measure of service quality on the basis of the user/consumer perceptions. CSI, which is calculated by means of the satisfaction rates expressed by users, weighted on the basis of the importance rates, according to the following formula:

$$CSI = \sum_{k=1}^{N}[S_K \times W_K]$$ …………………………………………… (i)

Sk is the mean of the satisfaction rates expressed by users on the service quality k attribute.

Wk (importance weight) is a weight of the k attribute, calculated on the basis of the importance rates expressed by users. Specifically, the ratio between the mean of the importance rates expressed by users on the k attribute and the sum of the average importance rates of all the service quality attributes (Mazzulla et al., 2009).

Service Performance Indicators

In Khulna city all of the public transports provide some common short of services. They are selected according to the observation survey. For Khulna city thirteen public transports service indicators have been selected shown by the table 1.

Table 1: Indicators for existing service facilities

No	Indicator	Properties
1	Availability	Service availability can be defined by service frequency (number of runs per hour or per day) and service time (time during which the service is available)
2	Service Reliability	It concerns the regularity of runs that are on schedule and on time
3	Accessibility	Accessibility means how easily the public transport can be get from user's home.
4	Service coverage	Service coverage concerns service availability in the space and is expressed through line path characteristics, number of stops, distance between stops, and accessibility of stops
5	Information	Information consists of indications about departure and arrival scheduled times of the runs, boarding/alighting stop location, ticket costs, and so on
6	Cleanliness	Refers to the internal- external cleanliness of vehicles, terminals and stops
7	Comfort on trip	Comfort refers to passenger personal comfort while transit is used, including climate control, seat comfort, ride comfort including the severity of acceleration and braking, odors, and vehicle noise

No	Indicator	Properties
8	Safety	Safety concerns the possibility that users can be involved in an accident and security concerns personal security against crimes
9	Pollution	Pollution creates by the transport is indicated here
10	Parking System	Checks the systematic way of parking system
11	Behavior of driver	One of the services of public transport.
12	Efficiency	It indicates how least time is needed for the public transport to reach the destination
13	Affordable Fare	It finds whether the fare is in affordable level or not.

Source: Observation Survey and Secondary Sources, 2015

Importance Performance Analysis of the Services

An importance query has been made for all of these services. Here the mean satisfaction score (MSS) is representing the present performance of the public transport and the Mean Importance Score (MIS) is representing the expectation/behalf of the services of public transport. All the corresponding values are shown in table 2.

Table 2: Position of indicators in IPA for Khulna city

No	Indicator	Performance		Behalf		Tki	Quadrant			
		X	performance	Y	Behalf		I	II	III	IV
1	Availability	187.75	0.58	271.25	0.84	69.22		*		
2	Service Reliability	179	0.55	279.75	0.87	63.99		*		
3	Accessibility	181.5	0.56	281.5	0.87	64.48		*		
4	Service coverage	173.25	0.54	275.5	0.85	62.89		*		
5	Information	87	0.27	256.25	0.79	33.95				*
6	Comfort on trip	160	0.50	272.25	0.84	58.77		*		
7	Cleanliness	142.5	0.44	273.5	0.85	52.10	*			
8	Safety	139.75	0.43	271.75	0.84	51.43	*			
9	Pollution	141	0.44	273.25	0.85	51.60	*			
10	Parking System	105	0.33	277.5	0.86	37.84	*			
11	Behaviour of driver	145.5	0.45	273.25	0.85	53.25	*			
12	Efficiency	152.5	0.47	267.5	0.83	57.01	At the avarage point			
13	Affordable Fare	169	0.52	222	0.69	76.13			*	
	total		6.08		10.82	56.18				
	Avg		0.47		0.83	56.18				

Source: Field Survey, 2015

The level of public satisfaction has been translated into Cartesian diagram for performance of public transport in the city of Khulna. This diagram illustrates intersection line on the average value of the observations at the level of interest and performance assessment in order to determine the specifics of each factor lies in which quadrant. Priority Quadrant I (high expectations and low performance), Quadrant II Maintain Achievement (high expectations and high performance), Quadrant III, Excessive (high performance and low expectations) and Quadrant IV Low priority

(low expectations and low performance) (Putra, 2013:2). More picture of the position indicator in the Cartesian quadrant can be shown in Figure 1.
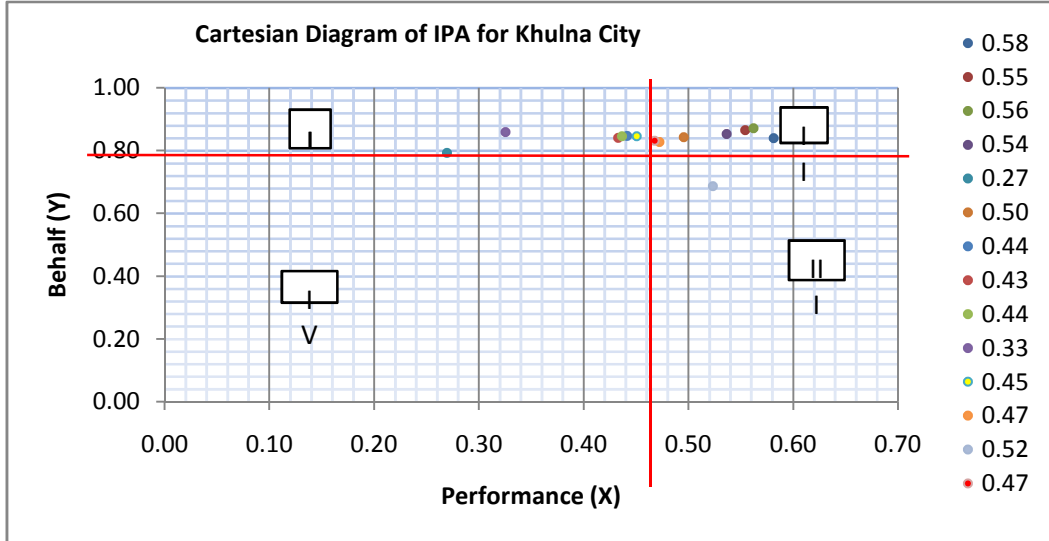
Source: Field Survey, 2015
Fig. 1: Cartesian Diagram of IPA for Khulna City

Based on the figure 1, it is identified that the indicators located in Quadrant I are the indicator of cleanliness, safety, pollution, parking system and behavior of driver. The indicator of availability, service reliability, accessibility, service coverage and comfort on trip are located in Quadrant II.Based on Cartesian diagram is known that the indicators of public transport services that can be maintained is availability, service reliability, accessibility, service coverage and comfort on trip. The indicators in this quadrant must be maintained because these attributes that have attracted the attention of the customers to take advantage of the product.

Importance of Service Indicator according to the Expert

Expert (Dr. Quazi Sazzad Hossain, Professor, Department of Civil Engineering, KUET) in the field of Transportation Engineering was asked to rank the service indicators according to their importance. Service availability, service reliability, accessibility, service coverage and safety on trip are the most important indicators for the Khulna city's public transport services according to Dr. Quazi Sazzad Hossain. Comfort on trip, cleanliness and parking system has to maintain properly and information, behavior of driver, affordable fare is also important but they do not remain in the most priority group

5. Situational Analysis and Findings

Performance analysis of public transports in Khulna city is measured by the Customer Satisfaction Index (CSI) based on the selected thirteen services indicators.

Table 3: Criteria for customer satisfaction index (CSI)

CSI Value	Criterion of CSI
0.81-1.00	Very satisfied
0.66-0.80	Satisfied
0.51-0.65	Quite satisfied
0.4-0.50	Less satisfied
0.00-0.39	Not satisfied

The results are interpreted according to the CSI criteria; given in table 3. Five criterions are selected based on the American Customer Satisfaction Index, Observation survey, expert opinion and other secondary sources.

Source: ACSI and Expert Opinion, 2015

CSI for Overall Khulna City's Public Transport: Customer satisfaction is a function of the difference between perceived performances to expectations (Putra, 2013:2). People are not satisfied with the indicator of information and parking system and the value of the CSI indicator lies among 0.00 to 0.39. In Khulna city there is no developed system for information about the public transport and the parking system is in worst condition. While people are less satisfied with the indicators of comfort, cleanliness, safety, behavior of driver, efficiency and affordable fare because the value of the indicator CSI in the range from 0.4 to 0.50. People are quite satisfied with the indicator of availability, service reliability, accessibility, service coverage. Overall CSI scores for public transport services in the city of Khulna is 0.47 (table 4 and figure 2).

Table 4: CSI of public transportation system in Khulna City

No	Indicator	Performance (MSS)	Behalf(MIS)	WF	CSI
		X	Y	MIS/AVG.MIS	MSS *WF
1	Availability	0.58	0.84	1.01	0.59
2	Service Reliability	0.55	0.87	1.04	0.58
3	Accessibility	0.56	0.87	1.05	0.59
4	Service coverage	0.54	0.85	1.02	0.55
5	Information	0.27	0.79	0.95	0.26
6	Comfort on trip	0.50	0.84	1.01	0.50
7	Cleanliness	0.44	0.85	1.02	0.45
8	Safety	0.43	0.84	1.01	0.44
9	Pollution	0.44	0.85	1.02	0.44
10	Parking System	0.33	0.86	1.03	0.34
11	Behavior of driver	0.45	0.85	1.02	0.46
12	Efficiency	0.47	0.83	0.99	0.47
13	Affordable Fare	0.52	0.69	0.83	0.43
	total	6.08	10.82	13.00	6.08
	Average	0.47	0.83	Total CSI	0.47

Source: Field Survey, 2015

CSI for overall Public Transport Performance
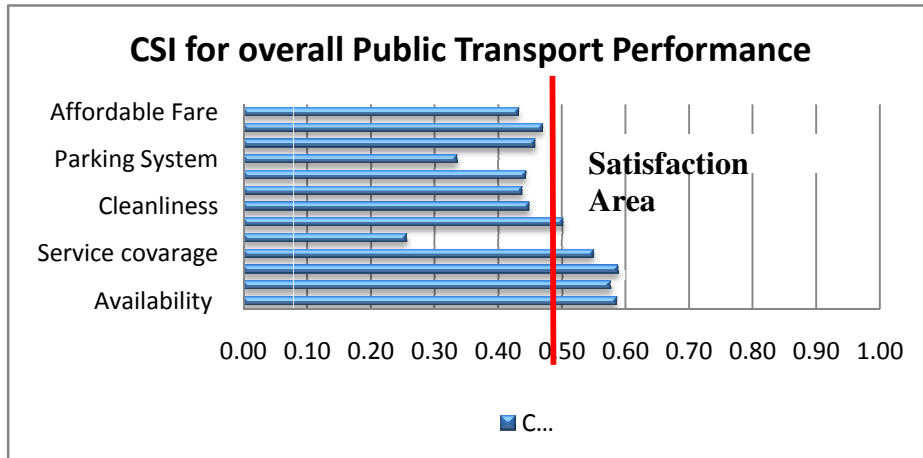
Source: Field Survey, 2015

Fig. 2: CSI for Public Transport Service in Khulna City

Comparative Analysis of the Performance

According to the thirteen indicators of services different performance has been evaluated for different public transports and a comparison has been made in this phase.

For a particular transport, satisfaction level is varying for different services. For an example auto rickshaw is satisfied for its accessibility but bus is not satisfied for this reason rather it is good for affordable fare. In figure 3, CSI for Mahindra, CNG, Baby Taxi, Auto Rickshaw and Bus is shown. CSI for Mahindra, CNG, Baby Taxi, Auto Rickshaw and Bus is 0.47, 0.49, 0.39, 0.47 and 0.37 respectively. Users of Mahindra, CNG, Auto Rickshaw, are less satisfied according to the criterion of CSI. Baby taxi and the bus services cannot satisfy the user.

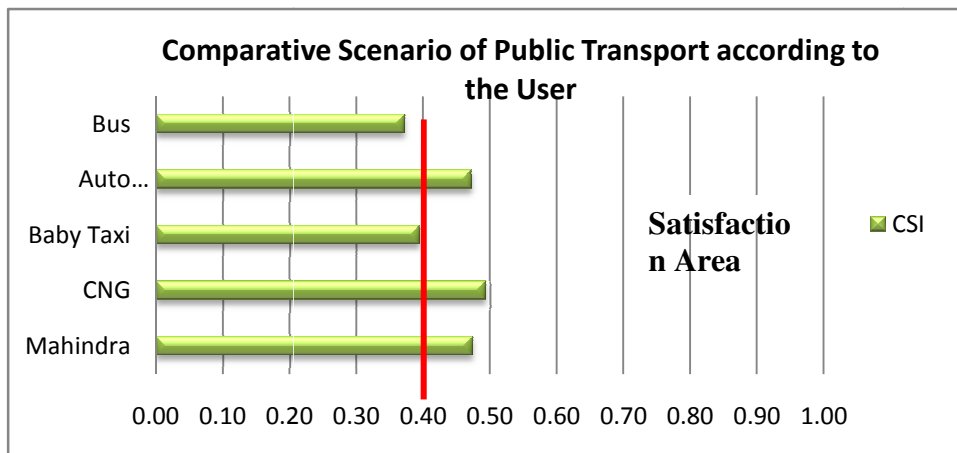**Comparative Scenario of Public Transport according to the User**

Fig. 3: Comparative Scenario of Public Transport according to the User

Users are satisfied with the CNG mostly as it is comfortable, faster, available, clean and low level of pollution. But the Bus services are not satisfied because it is not accessible for all people, less comfort, dirty, not available and so on.

> ***Expert Opinion for the Performance Analysis of Public Transport in Khulna City***
> *According to the expert CNG is the most suitable public transport for Khulna city as it performs better than other transport. CNG is more comfortable both in seating and riding. It also emits low smoke and its cleanliness is better. Expert also has agreed the overall CSI of Khulna city (0.47) which means the less satisfaction with the services. He has mentioned that information and parking system in Khulna city is in worst condition. Auto rickshaw is the transport which frequently committed with accident and Mahindra has less riding comfort as it run faster than the other vehicle. City bus services are the most congested and dirty in condition.*

Based on the results a qualitative summary has been made in Table 5.

Table 5: Qualitative summary of performance analysis

Public Transports	CSI	Satisfaction Level	Remarks
Mahindra	0.47	Less satisfied	- In the study 32% is user of Mahindra. They are less satisfied with its services. though it has availability, reliability and service coverage but it does not maintain proper parking system, its ride comfort is very low as it carry more people than its capacity and runs faster than others, it can cause accident. - According to the expert it is excessively faster in context of Khulna city.
CNG	0.49	Less satisfied	- Among the user 13% use CNG. Though it is comfort in riding and seating, it is not available and accessible for the user - Expert opinion is that performance of CNG is almost in the satisfaction level except its parking and information system
Baby Taxi	0.39	Not satisfied	- 3% among the total was baby taxi user. Baby taxi is now almost absent in Khulna city because of its low performance. It emits high rate of smoke, creates noise pollution badly and parking system is worst.
Auto Rickshaw	0.47	Less satisfied	- 48% was Auto rickshaw user. Most of them are satisfied with its seat comfort and low fare. - But overall condition of this transport is less satisfied because its safety issues make some question. Expert supports the user opinion
Bus	0.37	Not satisfied	- 5% was city bus user and they are not satisfied with the services as it is not available, accessible, reliable and comfortable in travel. - It is a transport of congestion. Its actual carrying capacity is 42 per bus but it carries almost 85 passengers per bus.

Source: Analysis of the Field Survey, 2015

Recommendations and Conclusion

According to the analysis cleanliness, safety, pollution, parking system and the diver behavior are in the priority sector which has high expectation but provides low performance. The indicator of affordable fare is given low priority by the users. According to the findings, users of Khulna city public transport do not satisfy with its services. CSI for public transport performance of Khulna city is 0.47 and the individual CSI is 0.47, 0.49, 0.39, 0.47 and 0.37 for Mahindra, CNG, Baby Taxi, Auto rickshaw and bus respectively. Expert has also agreed with the result. According to the expert, present condition of CNG is better than other public transport.

As city bus's services is not satisfied (CSI=0.37), user feel comfort to use other transit rather than bus. So to make congestion free Khulna city, public bus services is needed with more capacity and better performance. In this case, a proper route should be designed by the concern authority. There are two selected parking place (Dakbangla and Doulatpur) for Mahindra and CNG; most of the city buses park in the Rupsh Ghat and Dakbangla. But, because of the user demand and improper management they have to park here there. To overcome this problem some policy e.g. tax, tariff can be introduced. Auto rickshaws are less safe in the major transport routes of Khulna city as high speedy transports run there. So auto rickshaw should be allowed only for the local and access road. In Khulna city, information system for public transport is not developed which results suffering to the user. So with the help of service provider concern authority can build an online information system and kiosk can be provided in each terminal in this regard. To create a better picture, proper management of transportation is a must for Khulna city.

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