
Evaluation of Urban Bus Transport Failure in Gujranwala City of Pakistan

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ABSTRACT

This research work has evaluated the performance of urban public bus transport service operating in Gujranwala city of Pakistan. The assessment has been made in terms of financial viability, bus condition, operational performance and user perception. Based on the data requirements, various traffic/transport surveys were conducted including Passenger Boarding and Alighting Survey, Bus Count Survey, Bus Inspection Survey, Illegal Operations Survey and Public Transport User Interview Survey in consultation with concerned department/agencies. Field surveys were also conducted to get input from passengers and local people.

Initial investigation informed that out of four operational bus routes, only two routes are profitable. The overall bus operation is running in loss (only 0.3% net profit). It has barely any profit for the bus operator against its investment thereby making the urban bus operation financially non-viable. The whole revenue flow is dependent on passenger ticketing revenue only. Around 35% of the buses are in poor condition with major issues of quality of tyres, no speedometer, worse condition of seats, floor and ceiling, and display of route. Illegal operation of Qingqis/Rickshaws (as para-transit mode) along the bus routes is also decreasing the revenue by capturing the passenger volume. According to passenger opinion analysis, around 55% of the passenger are not satisfied with the service quality and prefer other modes of transport. Their major concerns are absence of facilities for disables and bus stops, bus seating and standing capacity, poor bus condition and pick pocketing. Collectively, these factors are contributing towards the failure of bus public transport in Gujranwala city.

Key Words: Public Transport, Urban Bus, Performance Evaluation, Gujranwala.

1. INTRODUCTION

Transportation facilities are deemed as backbone for the socio-economic development of a country. A country cannot thrive if its transportation facilities are not up to the mark. Scarcity of transport facilities bodes ill for the progress of a country and its

repercussions can be felt in every field of life. Transport systems are a very important aspect in the lives of people who live in cities as it provides mobility and access to most activities, but many transport systems are beginning to threaten the very livability of the cities they serve [1].

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With rapid urbanization and economic growth, motorization has been accelerating in cities in developing countries. For example, in the Asian region, the number of motor vehicles per one thousand people has more than tripled in the past 30 years. Owning a private car or a motorized two-wheeler is a major aspiration for people in these cities, in particular, where public transport service is often inadequate and unsafe [2]. The introduction of an efficient public transport can decrease these ascendant problems in the developing world's largest cities.

For an optimal working of any transport service in a city its evaluation and monitoring are the two most important factors. Stable and profitable revenue flows are the biggest challenges in transit services especially within the realm of public transport in larger cities. In order to raise more revenue from this sector, it is vital to introduce an optimal level of service within the sector and it is expected that alternative revenue sources can be generated this way [3].

Evaluation of urban transport can be measured in terms of benefits which can be viewed in different ways, and it is essential to distinguish between these approaches. Much of the debate about benefits stems from the chosen point of view. Three common viewpoints are financial, economic, or political. But the financial evaluation is most important one when it comes to fruitful and sustainable operation of public transport [4].

A financial viewpoint includes only those benefits that can be recovered as income. Benefits are those things that contribute to the rate of return on the investment in transit. Returns (benefits of transit) should occur directly to the agency to pay the expense of providing service. There are many factors which adversely effects the financial sustainability and viability of urban transport system. One of the common factors these days is the regular use of Para-transit modes like Qingqi/Rickshaws

which has a negative impact on the safe, efficient, timely and environment friendly movement of public transport. It also effects the revenue generation process by capturing the passenger volume thereby resulting in revenue loss and making it financially unviable in absence of some subsidy policy or enforcement by the Government Agencies [5].

For performance evaluation of bus service, condition of buses is also vital for successful bus operations as poor conditions of buses will compel the passengers to shift to other available modes of transport which will result in loss of passenger revenue. In addition, input of daily commuters can also contribute a lot in the improvement of urban transport system as they are the end user of this service. Thus, passengers satisfaction is necessary for sustainable operation of public transport.

2. STUDY AREA-GUJRWALA CITY

To carry out the research, Gujranwala is selected as model city because it is the only city after Lahore which has urban public bus transport network. No previous study has been conducted to analyze and assess the operation and performance of these buses. It is an industrial city in the north east of the Punjab province with a population of approximately 2,723,009. The average annual growth rate of the city is 3.79% and population density of 939 persons/kilometer square. It shares borders with several small cities, towns and villages including Ghakhar Mandi, Alipur Chatha and Kamonke. Due to extensive road and rail links, the city has flourished within the manufacturing and agricultural markets. The city is on the GT (Grand Trunk) Road, which allows logistical connections to the provincial capitals such as Peshawar and Lahore and also to the capital of Pakistan, Islamabad [6]. It is estimated that 640,423s vehicles are registered till June 2014 within the Gujranwala district which include 24,761 Cars, Jeeps and Station Wagons, 567,197 motorcycles and scooters,

1393 trucks, 2046 Mini Buses/Buses/Flying/Luxury Coaches, 5414 Pickups/Delivery vans, 1941 Taxis, 6,339 Auto rickshaws, 30,988 tractors and 344 other vehicles [7]. **Fig. 1** shows the map of Gujranwala city along with currently plying bus routes.

2.1 Public Transport in Gujranwala

Eight stage carriage routes were defined for Gujranwala in Punjab Gazette dated June 2006. **Table 1** shows the defined routes with their origin, destination and current status. Presently “City Tour” is the only bus company providing urban transport services in the city. They have a fleet of 83 buses which links Daska, Kamonki, Wazirabad, Gakkhar and WAPDA town with the Gujranwala city. These buses are the main source of passenger movement in the city. The company is allowed to operate along eight specified routes, however, only four routes (B1, B2, B4 and B5) are currently in operation due to certain limitations and constraints like merging and overlapping of routes, inadequate right of way, low vertical clearance at certain locations, sharp turns and some political

hindrances. The only source of income for operation of these buses is the revenue gained from passenger ticketing.

Beside these urban buses, the only other and major transport mode for intra-city travel of people is Qingqis which are running as para-transit mode. These Qingqis have no specified routes and is preferred mode of transport by locals due to its flexibility and availability for short distance travel or where there is no access by the buses. Around 16,000 passengers are using Qingqis/Rickshaws for their daily commuting along these bus routes.

3. PERFORMANCE EVALUATION INDICATORS

Performance indicators are powerful tools for monitoring and improving transit service. While there are many possible indicators that can be used, typically a small subset is used on a regular basis to monitor the important aspects of transit system performance. The

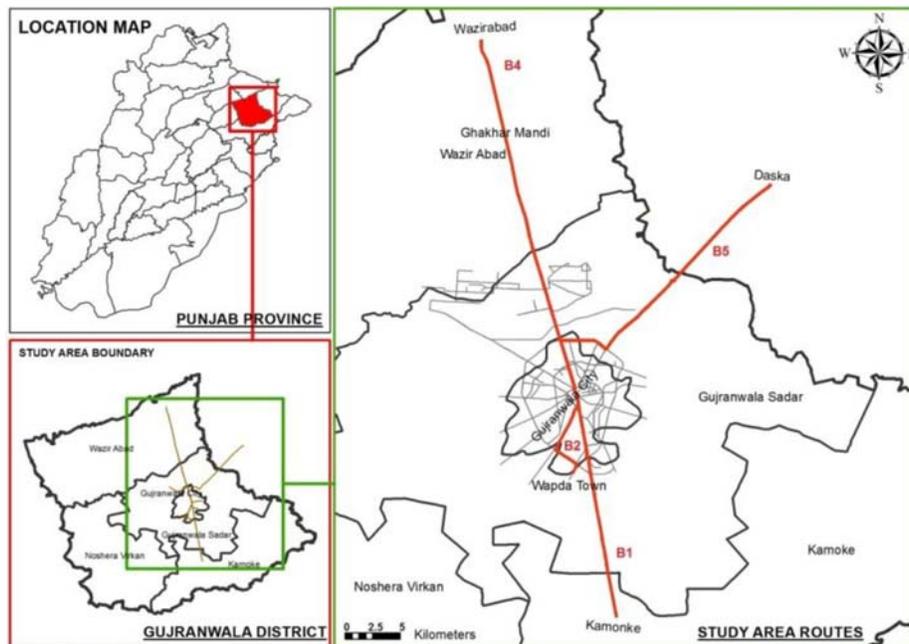


FIG. 1. STUDY AREA MAP ALONG WITH OPERATIONAL BUS ROUTES (SOURCE: AUTHOR)

approach for using indicators to assess performance is relatively easy to implement. Some of the indicators used to evaluate service performance are readily available in most systems and others can be collected and analyzed as conditions warrant.

In a system as complex as transit, there can be hundreds of measures to assess performance. However, experience has shown that in many situations a relatively small number of measures can be used effectively [8]. Following flowchart (Fig. 2) shows both financial and non-financial indicators used around the world to check the financial viability of an urban transport network. These evaluation parameters have been applied in various cities around the world including cities of America, India, Bangladesh and Srilanka [9-10].

4. RESEARCH METHODOLOGY

4.1 Data Collection

The data like operational and maintenance costs, salary of staff and the specified route along with their length and location of bus stops has been collected/gathered from District Regional Transport Authority Gujranwala and City Tour bus company. Whereas the passenger ridership, condition of buses characteristics of bus routes and public opinion has been obtained from different traffic/transport surveys like Bus Boarding and Alighting Survey, Bus Condition Survey, Bus Count Survey, Illegal Operations Survey and Public Transport User Interview Survey.

TABLE 1. SPECIFIED URBAN ROUTES IN GUJRANWALA CITY

Rout No.	Origin and Destination	Length of Route (km)	Status
B1	Kamonki to Aziz Cross	30	Operational
B2	Chan Da Qilla to Gakhar	24	Operational
B3	Aziz Cross (Pindi Bye-pass) to WAPDA Town	-	Non-Operational
B4	Sheikhupura Morr to Wazirabad Railway Station	34	Operational
B5	Daska to Gulshan Iqbal Park Mor	22	Operational
B6	Behari Colony to Rahwali Cantt	-	Non-Operational
B7	Zamindara Stand to Dharam Kot Chowk	-	Non-Operational
B8	Tatley Aali to Aziz Cross	-	Non-Operational

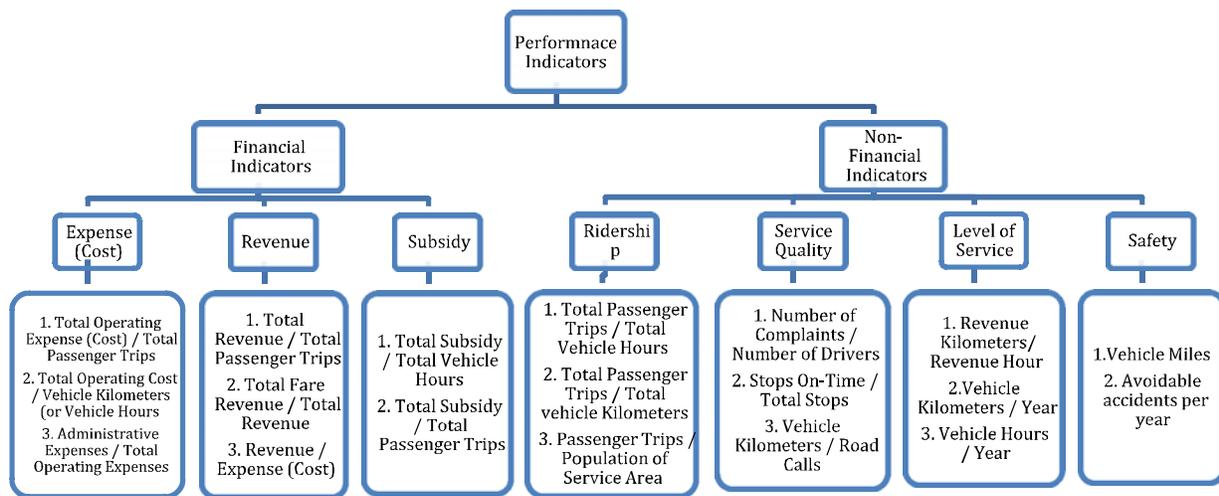


FIG. 2. PERFORMANCE EVALUATION INDICATORS [8]

4.2 Data Analysis

The collected data is coded, validated against the data provided by the bus company, digitized and analyzed using softwares like ArcGIS 10, Excel 2007 and SPSS 19. ArGIS 10 is used to draw to maps of each route along with the location of bus stop and other characteristics. Excel 2007 is for coding of data and cost benefit analysis of each route whereas SPSS 19 is used for analysis of user interview survey.

The basic data for the performance evaluation has been analyzed and aggregated to calculate the required measures. Before aggregating the raw data into the performance indicators, the time period of one year has been established for the analysis and the operational level being considered. The recommendations are then made on the basis of the analysis results.

5. RESULTS AND DISCUSSION

5.1 Characteristics of Operational Bus Routes in Gujranwala

The frequency of buses observed, average headway on each route, total number of trips per day, and total passenger volume travelled through the buses are given in **Table 2**. These results were achieved from bus count survey conducted at GBS (General Bus Stand) in both directions.

5.2 Cost Analysis of Operational Bus Routes in Gujranwala City

Operating cost on each bus route is calculated on the basis of some assumptions and the financial data obtained from the site visit and City Tour office whereas revenue on each route has been calculated from boarding & alighting survey performed for whole day and cross checked with available ticketing data.

For B1, average cost per trip is Rs.1,207/- against average revenue of Rs.1,221/- with a marginal profit of Rs. 14/- per trip. B4 is the most profitable route with average cost per trip of Rs.1,535/- against average revenue of Rs. 1,679/- and profit of Rs. 144/- per trip. Where route B-2 and B-5 are running in loss with average loss of Rs. 249/- and Rs. 93/- respectively against the average cost of Rs.1275/- and Rs. 1049/- per trip and average revenue of Rs. 1026/- and Rs. 956/- respectively. **Table 3** shows average cost and revenue associated to each route along with their profit/loss per trip.

When the analysis is expanded for total cost and revenue per day on each route, it is observed that only route B4 is profitable (9%) whereas the route B2 and B5 are running in total lose (20 and 9% respectively). Route B1 is nearly running on breakeven with a profit of 1% only. The overall operation of the buses is not financially viable as the operator is not getting any profit for this investment thereby making the operator least interested to improve

TABLE 2. CHARACTERISTICS OF OPERATIONAL ROUTES

Route No.	No. of Buses	Average Headway (Minutes)	Total No. of Trips/Day	Passenger Volume/Day
B1	35	8	235	18,051
B2	14	19	118	6,016
B4	22	10	198	17,435
B5	10	24	73	5,378

the quality of service. **Table 4** shows the summary of profit/loss on each route and in total.

It is in practice, that the authority set fare level of service on the basis of operating cost and bus ridership. Thus, more ridership is desirable by all operators to enhance profit/yield from fixed resources. Revenue is primarily derived through daily sales of passenger tickets only.

Some of the reasons associated with the losses on these operational bus routes are overleaping of bus routes, improper headway between the buses during peak and off-peak hours and fleet size mismanagement on each route. These losses can be minimized by adjustment of fleet size on each route based on the passenger volume and increasing/decreasing headways in specific time periods to cater the varying demand.

5.3 Illegal Para-Transit Operations

Illegal para-transit transport operation is the major issue that directly affects the operations and sustainability of legally operating bus public transport. The illegal

operations survey was conducted to determine number of illegal boarding along GT Road, Gujranwala through Qingqi rickshaws and modified illegally designed Auto rickshaws. However, it was not possible to carry-out assessment along the full length of GT road due to limited resources. **Fig. 3** shows the selected key locations to estimate the illegal boarding trend in the city and their percentage share.

The results from illegal transport assessment survey have indicated that more than sixteen thousand passengers daily use illegal transport along GT Road between Chanda Qilla and Pindi Bypass. Majority of passengers using para-transit transport; board between Sheikhpura Morr and Gondlanwala due to markets and shopping arcades. **Fig. 4** shows the total number of passengers boarding along GT Road.

5.4 Bus Condition Survey

There are total 83 buses in the fleet serving as public transport. 70 buses have diesel engine whereas 13 are running on CNG engine. **Fig. 5** shows percentage distribution of condition of buses in each category.

TABLE 3. COST AND REVENUE ON EACH ROUTE

Route No	No of Buses	Average Headway (Minutes)	Total No of Trips/Day	Passenger Volume/Day	Average Cost /Trip	Average Revenue /Trip	Profit/Loss /Trip (PKR)
B1	35	8	235	18,051	1,207	1,221	14
B2	14	19	88	5,580	1,275	1,026	-249
B4	22	10	198	17,435	1,535	1,679	144
B5	10	24	78	4,286	1,049	956	-93

TABLE 4. SUMMARY OF BUS ROUTES PROFIT / LOSS

Route No	Total No of Trips/Day	Total Cost/Day (PKR)	Total Revenue/Day (PKR)	Total Profit/Loss/Day (PKR)	Total Profit/Loss (%)
B1	235	283,645	286,997	3352	1
B2	88	112,200	90,272	-21928	-20
B4	198	303,930	332,423	28493	9
B5	78	81,833	74,555	-7279	-9
Total	599	781,608	784,247	2,639	0.3



FIG. 3. ILLEGAL TRANSPORT OPERATIONS ALONG GT ROAD

5.5 Public Transport User Interview Survey

The user opinion and characteristics are important to introduce any facility or make improvements to the existing condition. For this purpose, a PTUI (Public Transport User Interview) survey was conducted with a sample size of 386 users using random sampling.

The analysis shows the perception of the public regarding the current services of public transport. Majority reported little or no facilities for the disabled persons, poor seating and standing capacity of buses, inadequate bus timings, and adverse bus stops facilities. Most of the respondents are not satisfied with the condition of the buses, safety while travelling and travel time of the trips. In general citizens are dissatisfied with the quality of public transport services which promote the use of other transport modes like

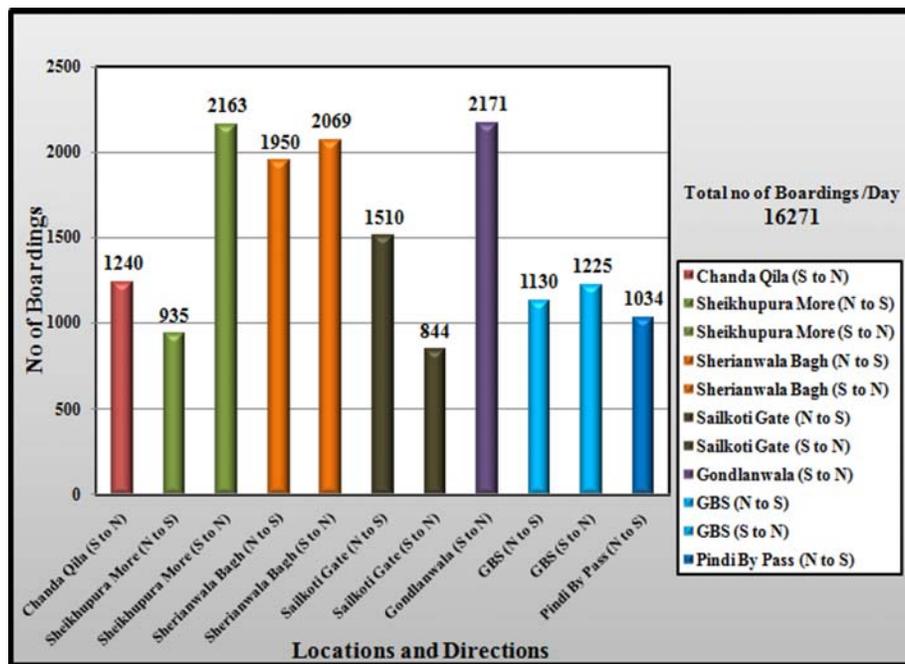


FIG. 4. ILLEGAL BOARDING AT DIFFERENT LOCATIONS ALONG GT ROAD

Qingqi or Rickshaw particularly for short travel distance. **Fig. 6** shows results of user opinion about public transport and facilities.

5.6 Summary of the Research Findings

Table 5 shows the summary of findings of this research work based on the analysis and results.

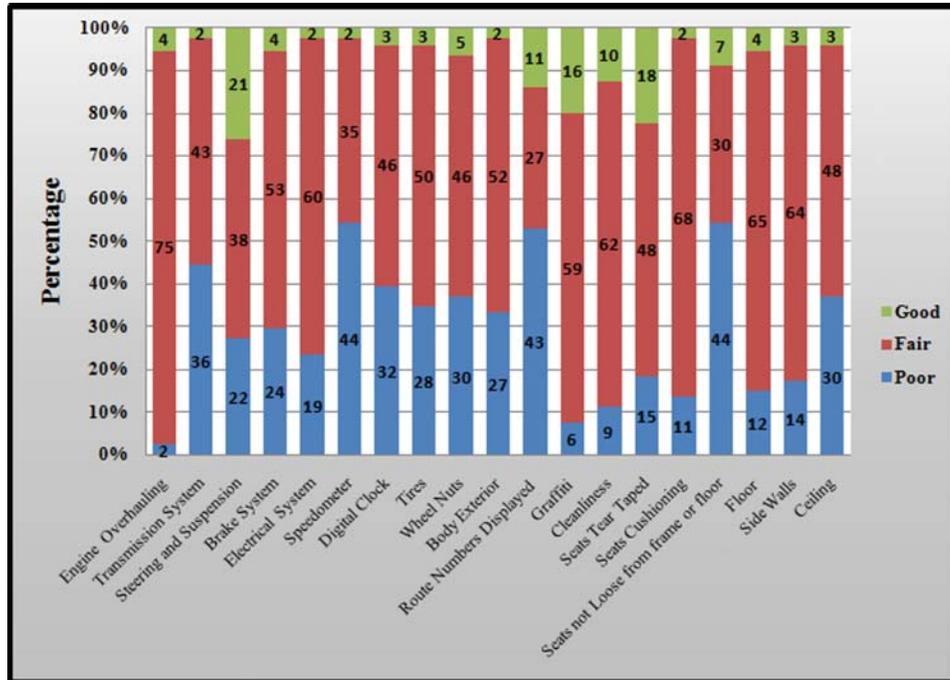


FIG. 5. BUS CONDITION SURVEY RESULTS

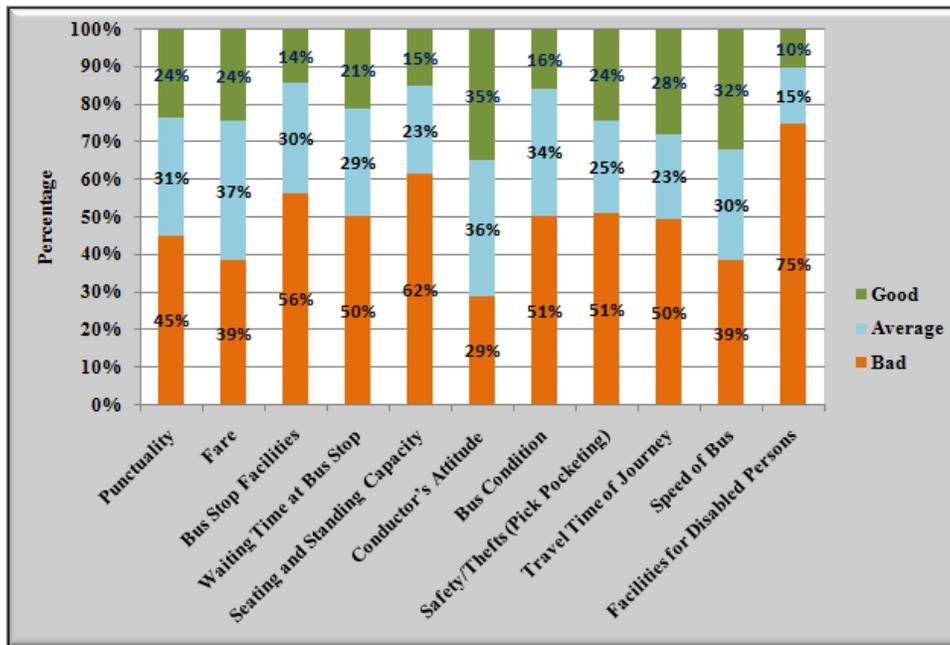


FIG. 6. USER OPINION ABOUT PUBLIC TRANSPORT AND RELATED FACILITIES

TABLE 5. SUMMARY OF RESEARCH FINDINGS

Financial Indicators			
Indicator	Problem Identified	Reason	Solution
Expense	Needless Expenses	Improper headway and frequency of buses and overlapping of bus routes	Bus headways and fleet size on each route can be adjusted during peak and off-peak hours based on varying passenger demand to reduce the expenses. Route B-2 and B-5 can be modified to reduce the overlapping.
Revenue	Reducing in revenue due to reduction in passenger volume	Illegal para-transit operations	Adjustment of headways in peak hours, improvement in condition of buses and enforcement from Government agencies regarding operation of illegal para-transit modes like Qingqi/rickshaws along the bus routes.
Subsidy	Absence of operational subsidy from the Government	No allocation of funds by the Government	Output based operational subsidy must be provided by the Government as the revenue is solely dependent of passenger ticketing and fare policy is also controlled by Regional Transport Authority to make the operation financially viable.
Non-Financial Indicators			
Bus Condition	Poor maintenance of buses	In absence of subsidy, where expenses are greater than the revenue; the operator does not care much about the timely maintenance of buses	Provision of output based subsidy from Government so that the operator will focus on operation and maintenance of buses rather than saving his cost.
Service Quality	Fixed Headways throughout the day	Improper fleet management	Headways can be adjusted on each bus route during specific time periods to cater varying passenger demand.
User Opinion	Passenger dissatisfaction which results in shifting of passenger to other modes of transport	No facilities for the disabled persons, poor seating and standing capacity of buses, improper bus headways, adverse bus stops facilities and pick pocketing	Provision of facilities for disabled, display of bus routes, proper maintenance of buses, safety inside buses and adjustment of headways can attract more passenger volume thereby increasing the revenue.

6. CONCLUSIONS

From the analysis of current situation of bus routes it is concluded that route B1 is almost at breakeven with net profit of 1%. B2 is in loss; this is mostly due to merging of two routes and overlapping of merging route with other bus routes. The bus route B4, is the most profitable route with 9% net profit. B5 is also in loss due to this partially shared route with other public service vehicles and low headway gap. When the whole scenario is expanded for overall bus operation per day it is evident that the current operation of urban buses is not financially viable with a bare marginal net profit of 0.3% against the recommended profit gain of 15-20%. Furthermore, poor condition of the buses are also encouraging the passengers to shift to other transport modes like illegal para-transit modes of Qingqi/

Rickshaws particularly for short travel distance thereby resulting in loss in form of decrease in passenger revenue. Around 16,000 passengers are using Qingqi/Rickshaws for their daily commuting along GT road.

It is also concluded that the performance of public bus transit in Gujranwala has also declined due to dissatisfaction of passengers from the quality of transport service thereby encouraging them to adopt other modes of transport. Overall, all these factors are contributing in the failure of successful and sustainable bus operations in Gujranwala city.

7. RECOMMENDATIONS

Based on the analysis and input from passengers and local people, following are some recommendations can

be adopted to improve revenue flows and improve public transport performance in Gujranwala city:

- (i) Adjust headway at certain times on specific routes to cope with passenger demand.
- (ii) Penalizing the commuters for travelling without tickets as approved under the Motor Vehicle Act 1965.
- (iii) Output based operational subsidy must be provided by the Government sector in order to make bus operations in Gujranwala city financially viable; which in result will make the operator interested in improving the efficiency and service of bus operations.
- (iv) The enforcement of the available acts and laws about illegal operations should be thoroughly implemented through traffic police, District Regional Transport Authority and Motor Vehicle Examiners to reduce revenue loss to bus operator.
- (v) The improvement and construction of quality bus-stops at busy locations may attract more passengers towards urban transport.
- (vi) Improved user information for example bus schedules, route information, bus arrival, & departure time to build passenger confidence and attract passenger towards Public transport use.
- (vii) The roadway infrastructure like bus stops, pedestrian underpasses/footbridges, bus lanes, footpaths, etc. should be constructed for passenger and public ease to promote public transport in the city.
- (viii) A public awareness campaign should be launched regarding safety threats and hazards associated with Qingqi (Motorcycle) rickshaws and other illegal modes of transport causing pollution, congestion, safety issues and other chronic diseases.

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