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Performance evaluation of public bus transport services in Amravati City

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Abstract — In most of the developing cities like India public transportation system is the primary mode of transportation However, in most of Indian cities quality of service of transport system is rapidly deteriorating because of the increasing travel demand and Poor supporting public transport facilities. There are various problems associated with public transport system such as overcrowding, traffic congestion, higher level of pollution, frequent stopping & starting, frequency of service & schedule is not strictly adhered. Therefore, there is an urgent need to evaluate the performance of public transport routes to improve quality of service. This study also develops a hierarchical structure to identify performance indicators for evaluation of quality of service of public transport routes. This can help to find solutions to the current problems such as increasing traffic congestion, and adjusting travel time values to reflect comfort and convenience and can increase the efficiencies as well as support for alternative modes of public transport, making them more acceptable by the people & achieving their equity objectives.

Keywords- *Comfort; Public transport system; Quality of service; Traffic; Travel time*

I. INTRODUCTION

All the million plus cities in India facing a serious urban transport problems, due to the increases in population in urban areas as a result of both - the natural increase and migration from rural areas and smaller towns. The rapid population growth urbanization, coupled with increasing activities and opportunities in cities result in rapidly growing travel demand, both for private as well as public transport. A flexible, safe, comfortable, economic, easily available and reliable bus service may encourage shift from private vehicles to public transport.

This study is concerned of assessment of public transport demand for Amravati and identifies the major factors for performance evaluation of public transport routes based on the identified performance indicators. In this study, a methodology is proposes develops a hierarchical structure to identify performance indicators for evaluation of quality of service of public transport routes. The rout is taken as 1) Amravati University to Badnera Railway Station 2) V.M.V to Moti nagar 3) Badnera Railway Station To Amravati Bus Stand. 4) Kondeshwar Colony to Bus Stand 5) Badnera Railway Station To Navsari The data collected from user perspectives of public transport service like comfort level, safety level, travel cost, travel time, accessibility, user facility etc. these data were analysed by formulating a graphical form which give the information about public demand related to travel cost, travel time, comfort, safety, accessibility, user facility.

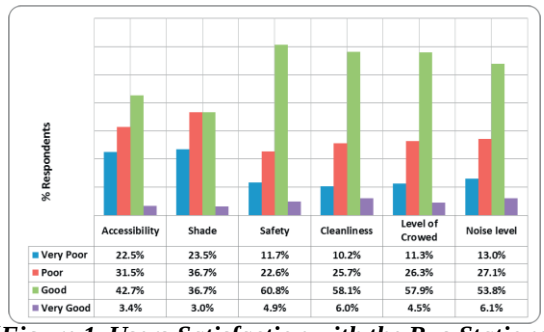
II. LITERATURE REVIEW

1 Investigating the Customer satisfaction of the bus services in Qatar:

Khaled S, Khalil R, et al. [1] a significant challenge facing the infrastructure planning in Qatar is the increase in population. As the country is going through a considerable development phase and constructing many mega projects, companies tend to recruit massive amount of the labor force for these projects. Thus, accelerating the population rate has a major effect on the existing road network. For instance, roads are going through serious traffic jams throughout the day. This study had identified the key issues facing the local public buses as an important mode of transportation. In order to encourage public transportation and public buses in particular to support the national vision 2030, public buses need to improve to compete with other modes of travel such as private cars and taxis. One of the main challenges in the city is to attract more users to the only public bus service available since 2004. This paper investigates the quality of service and passenger perception regarding many factors such as comfort convenience, safety, and cleanliness. Data was collected through administered questionnaires to investigate the quality of the existing service and the future of bus service in Qatar. Finally recommended that aim to maximize the use of bus service as public transportation in the city of Doha was suggested. The findings help to understand the shortcomings of the existing public bus service and provide the responsible authorities with suggestions that can enhance the quality of service and attract more users to the public bus service.

Data Collection and Analysis

Questions included user's general information, other modes of transportation they use, and their perceptions regarding the quality of Doha bus service. The researchers had chosen Old Al Ghanim Bus Station (main bus station for the service) to run the administered questionnaire survey.



"Figure 1. Users Satisfaction with the Bus Stations"

It was found that the main category of users that use the service is the low-income category. This situation has created a poor local image of the service and driven other population categories away from using the service. Not surprisingly, female commuters in Qatar do not use the service. In addition, it also seems that school children do not use public buses in general. Children go to and from schools mainly using private cars, taxis, and buses.

According to the survey results, it was also found that the bus system in Doha mainly, if not completely, serve the expatriate community but not to nationals. The nationals use special buses that are institution based and personal vehicles for most of their trips. Users argued that the bus company in Doha should introduce a new typology of public buses in order to encourage people of other social classes to use the bus. Public bus users do not regard the existing public bus transportation services satisfactory. The passengers noted that the bus service was not very reliable; yet, affordable and clean. When asked, a typical commuter in Doha would be willing to pay half hourly wage to avoid an hour on the bus. Based on the survey results, service improvements that decrease walking and waiting time will result increase in ridership. Users recommended providing separate female waiting areas, prayer areas, and toilets at all main stations. Buses are timed to run at thirty minute intervals, requiring passengers to wait under the hot sun much longer than taxis.

2. Quality of Service and Passenger's Perception –A Review on Bus Service in Kota Bharu:

Yaakub N., Napiah M [2] Quality of Service is a very important measure for public transportation service in Malaysia since its service performance is low than other developed countries. A questionnaire survey on public bus passengers in Kota Bharu, Kelantan reveals that the passengers are not satisfied with the city bus service provided due to lack of punctuality (60.5% respondents) and low in frequency (67.7%). Using this information, a study is carried out on the public bus service in Kota Bharu to review the way this service is operated, and to check whether the passenger's claims are true.

This paper is basically a review on city bus service in Kota Bharu, Kelantan. From the review, it is found that the city bus service in Kelantan consists of six routes covering service area of 30.92 square kilometers (area of about 8% of Kota Bharu population). A questionnaire survey is conducted to tabulate the passenger's demographic and the finding indicates that majority of city bus users are students (75.0%), majority of age range 13 to 17 years (50.6%), with zero monthly income (83.3%) and using the bus service to go to school or classes (57.6%). From the questionnaire survey, the passenger demographic is analyzed using cross tabulation analysis to find relationships of respondent's age, occupation, and reasons for using the public bus. This review and survey is intended to evaluate the quality of bus service and resulting passenger's satisfaction (as graded in level of service perceived). The evaluation is limited to information discovered during data gathering and questionnaire survey.

III. PROPOSED METHODOLOGY

A. General

The main objective of this study is to develop a rational approach for performance evaluation of public transport routes. As outlined in the literatures there is a need to develop a comprehensive methodology so that methodology can be useful in simple way to evaluate the performance of public transport service. Therefore, this chapter provides a methodological framework for evaluation of quality of service of public transport routes. Further, based on the framework for proposed methodology there are four major stages are identified i.e. development of a hierarchical structure for identification of performance indicator, Identification of parameter, Questionnaire Survey, evaluation of Public Transport Routes. This chapter also provides the brief introduction and purpose of the identified major stages for evaluation of quality of service of public transport routes.

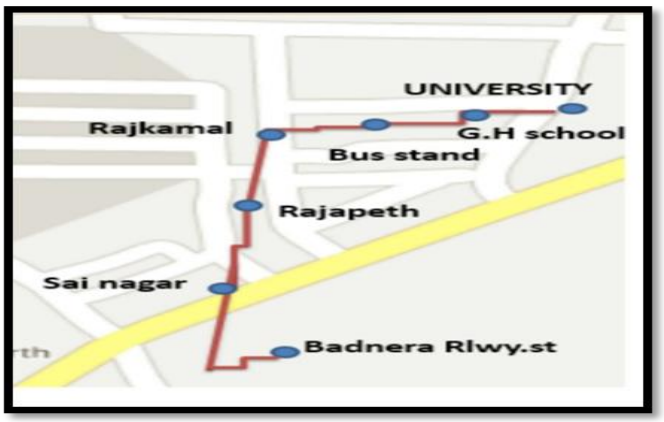
B. Data Collection for Identified Public Transit Routes in Amravati City

The data is collected for all five routes selected for analysis. Five routes have been selected for service connecting different important areas of city. The data has been collected by survey conducted during peak hours. The Data should be collected by note down the waiting time, boarding and alighting time, and also note down the

number of passengers boarding and alighting at each bus stop also the no of curve and speed breaker. The data related to safety level, comfort level, service level and Facility is collected by giving profarma to the people using the Public services and the information about number of trips per day, travel cost is collected by conductors.

Route 1: Amravati University to Badnera Railway Station

The route starts from Amravati University to Badnera Railway Station connecting important locations. Table shows list of bus stops on routes. The route has total number of stoppage from Amravati University to Badnera Railway Station



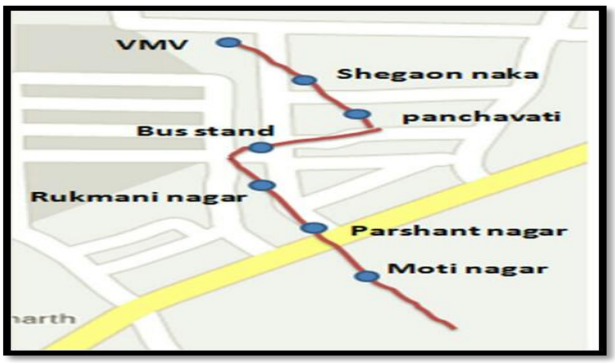
"Figure 2. Map of Amravati City Amravati University to Badnera Railway Station"

"Table 1. Details of Collected Data"

Sr. No.	Description of Particulars	Details
1	Number of Bus Stop	15
2	Number of Stoppages	17
3	Number of Intersections with signal	4
4	Number of Curves	13
5	Number of Speed Breakers	15
6	Total Travel Time	60-65min
7	Average journey speed	40-45
8	Total Route Length (origin to destination)	15.3Km
9	Travel Cost	18

Rout 2: V.M.V To Moti nagar

The route starts from V.M.V To Moti nagar Connecting important locations. Table shows list of bus stops on routes. The route has total six number of stoppage from V.M.V To Moti nagar.



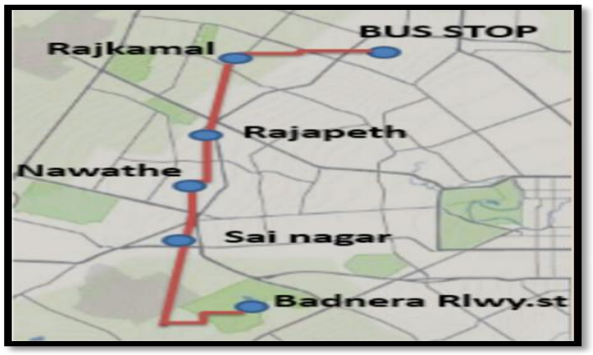
"Figure 3. Map of Amravati City V.M.V to Moti Nagar"

"Table 2. Details of Collected Data"

Sr. No.	Description of Particulars	Details
1	Number of Bus Stop	5
2	Number of Stoppages	8
3	Number of Intersections with signal	1
4	Number of Curves	5
5	Number of Speed Breakers	8
6	Total Travel Time	25-26 min
7	Average journey speed	40 – 45 km/h
8	Total Route Length (origin to destination)	8Km
9	Travel Cost	12 Rs

Rout 3: Badnera Railway Station to Amravati Depo

The route starts from Badnera Railway Station to Amravati Depo connecting important locations. Table shows list of bus stops on routes. The route has total fourteen number of stoppage from Badnera Railway Station to Amravati Depo.



"Figure 4. Map of Amravati City Badnera Railway Station to Amravati Bus Stand"

"Table 3. Details of Collected Data"

Sr. No.	Description of Particulars	Details
1	Number of Bus Stop	9
2	Number of Stoppages	14
3	Number of Intersections with signal	2
4	Number of Curves	6
5	Number of Speed Breakers	8
6	Total Travel Time	30 min
7	Average journey speed	40 – 45 km/h
8	Total Route Length (origin to destination)	10Km
9	Travel Cost	13 Rs

Rout 4: Kondeshwar Colony to Amravati Bus Stand

The route starts from Kondeshwar Colony to Amravati Bus Stand connecting important locations. Table shows list of bus stops on routes. The route has total eleven number of stoppage from Kondeshwar Colony to Amravati Bus Stand.

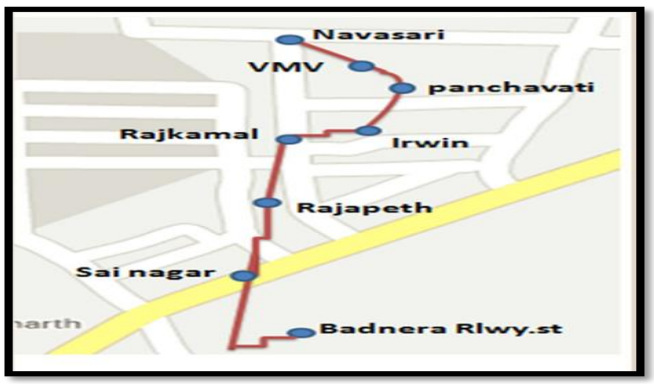
"Figure 5. Map of Amravati City Kondeshwar Colony to Amravati Bus Stand"

"Table 4. Details of Collected Data"

Sr. No.	Description of Particulars	Details
1	Number of Bus Stop	5
2	Number of Stoppages	8
3	Number of Intersections with signal	1
4	Number of Curves	5
5	Number of Speed Breakers	8
6	Total Travel Time	25-26 min
7	Average journey speed	40 – 45 km/h
8	Total Route Length (origin to destination)	8Km
9	Travel Cost	12 Rs

Rout 5: Badnera Railway Station to Navsari

The route starts from Badnera Railway to Navsari connecting important locations. Table shows list of bus stops on routes. The route has total ten number of stoppage from Saturna to Navsari.



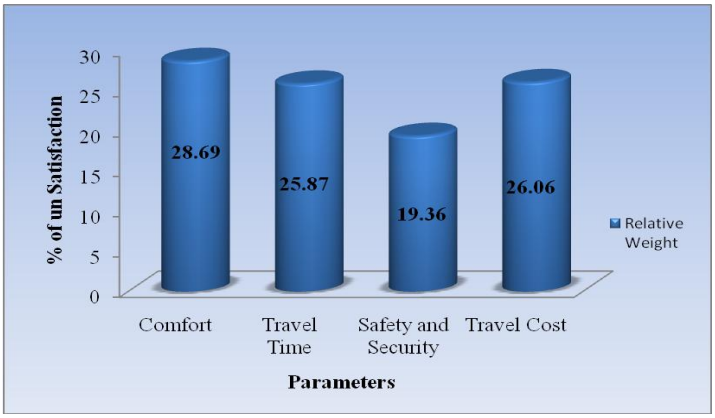
"Figure 6. Map of Amravati City Badnera Railway Station to Navsari"

"Table 5. Details of Collected Data"

Sr. No	Description of Particulars	Details
1	Number of Bus Stop	9
2	Number of Stoppages	10
3	Number of Intersections with signal	4
4	Number of Curves	6
5	Number of Speed Breakers	17
6	Total Travel Time	45 min
7	Average journey speed	40 – 45 km/h
8	Total Route Length (origin to destination)	16.2Km
9	Travel Cost	14 Rs

IV. RESULTS AND DISCUSSION

A. Result Based On Questionary Survey



"Figure 7. Results of Relative Weightage of all Parameters of five routes"

Table indicates that the average percent weight of four parameters comfort, travel time, safety level and Travel cost of all five routes were 28.69, 25.87, 19.36 and 26.06 percent respectively. From this graph which is average weight of all five routes indicate that the out of all parameters Comfort is the parameter in which people are not satisfied they want more improvement in the existing facility of bus services. And also the people are not satisfied with the present cost system considering age because there is no facility of reduction in cost considering age factor in route.

Thus it is clear that out of overall parameters comfort is the lowest parameter of the bus services and this can be minimize by using the following solution.

- Thus it is clear that out of overall parameters comfort is the lowest parameters.
- The parameter Comfort can be improved by providing bus services like other cities i.e. Star Bus, Green Bus etc

"Table 6. Determination of Relative Weightage of Performance Indicator depending upon age criteria"

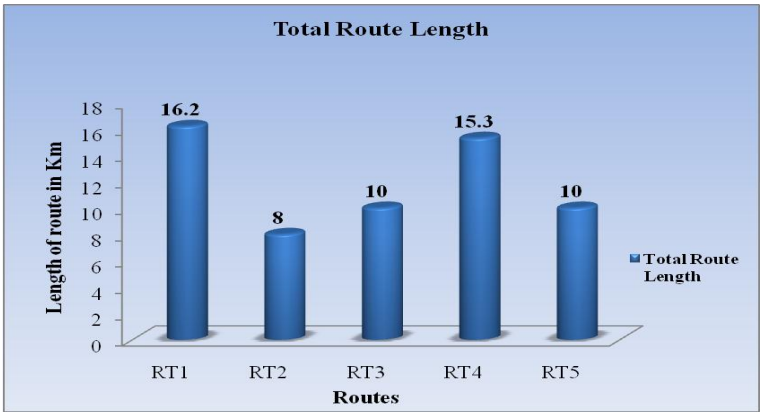
Age	Comfort	Travel time	Security	Travel Cost	Total
18-35	15	60	10	15	100
35& above	55	15	20	10	100

B. Determination of Weightage of parameter of Travel time of all routs

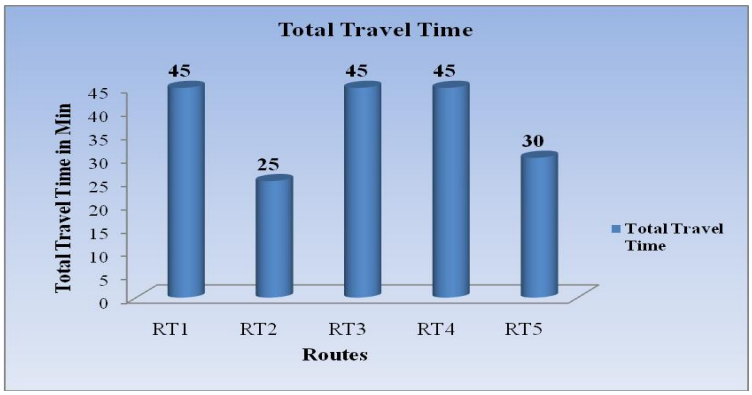
Comparative analysis for the travel time index on different routes has been carried out.

"Table 7. Represents the travel time index values for identified routes."

Routes	Total Route Length	Total Travel Time
RT1	16.2	45
RT2	8	25
RT3	10	45
RT4	15.3	45
RT5	10	30



"Figure 8. Results of Analysis of route for Total Route Length."



"Figure 9. Results of Analysis of route for Total Travel Time."

It is clear from the above table and figure that the total travel time value for route RT1, RT2, RT3, RT4 and RT5 are 45, 25, 45, 50 and 30min having the total route length 16.2, 8, 10, 15.3 and 10 respectively. From these values it is clear that route RT3 require more time to cover the 10 km route length as compare to other routs which shows that the quality of service of travel time of route RT3 is poor than other routes which indicates that special attention should be given to these parameters to improve bus service in Amravati city.

The total travel time of RT3 is higher as compare to others routes because Route RT3 has 5 number of stop but during journey bus takes total 14 numbers of stoppages. There are total 6 numbers of curves which affect travel time. Route RT3 has 8 numbers of speed breakers and congested areas. The performance of route RT3 is affected by more numbers of stoppages, speed breakers, intersections. So the overall performance of RT3 route is poor than other routes which indicates that special attention should be given to these parameters to improve bus service in Amravati city.

The performance of this route can be improve by minimizing some unnecessary speed breaker and also by using a single speed breaker instate of using Rumble strip. The total time is increase also due to the demolished speed breaker so

that the demolished speed breaker can be level in the level of pavement correctly which help to save the time. The total time is also be reduce by minimizing the total number of stoppage during journey. The delay in total travel time of the bus is also due to the congested area this can be minimize by providing the sufficient parking for the other vehicle so that they will not disturb the traffic and also by improving the width of road.

V. Conclusion

The basic objective of this study is to evaluate the quality of service of city bus routes in India. This study also presents hierarchical structure for identification of performance indicator of public transport routes of Amravati city.

- The performance of RT1 can be improving by minimizing number of speed breaker and by making proper planning in congested area also the performance of parameter Comfort and Travel Cost on RT1 can be improving by using the give solution.
- The performance of RT2 can be improving by making proper planning in congested area also the performance of parameter Comfort and Travel Time on RT2 can be improving by using the give solution.
- The performance of RT3 can be improving by minimizing Total Travel Time by reducing the Number of Stoppages and by making proper planning in congested area also the performance of parameter Comfort and Travel Cost can be improving by using the give solution.
- The performance of RT4 can be improving by minimizing number of speed breaker and by making proper planning in congested area also the performance of parameter Comfort and Travel Time can be improving by the give solution.
- The performance of RT5 can be improving Total Travel Time by reducing the Number of Stoppages also the performance of parameter Comfort and Travel Time can be improving by using the give solution.
- Base on the above study it is found that in Amravati the public transport systems has various problems such as high operating time, delays due to congestion, delays due to passenger stoppage, uncomfortable trips, higher waiting time at stops, delays due to unnecessary speed breakers and due to the improper demolition of speed breaker, due to un comfort and the un satisfaction about Travel Cost. Therefore there is an urgent need for performance evaluation of public transport routes and system in Amravati.

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