MODEL OF EXISTING INTERCITY PUBLIC TRANSPORTATION

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Abstract: Urban transport is a nightmare in India though most urban residents take it as a fait accompli. Indian cities, of all sizes, face a crisis of urban transport. Despite investments in road infrastructure, and plans for land use and transport development, all cities face the ever increasing problems of congestion, traffic accidents, air, and noise pollution. Bus Rapid Transit (BRT) is growing in popularity throughout the world. Urban Planners, Engineers and Urban Administrator have found Bus Rapid Transit (BRT) System as efficient, cost effective and simple as compare to other Light Rail Transit (LRT) and Metro Rail solution to provide 'life line' to city. Many cities around the world operating BRTS and getting positive results including so many Indian cities. BRT applications are designed to be appropriate to the market they serve and their physical surroundings and can be incrementally implemented in a variety of environments. The reasons adopting passenger BRT is because of its high performance and quality, and its ability to be built quickly, incrementally, and economically. BRT also provides sufficient transport capacity to meet demands even in the largest metropolitan regions.Hence these are applicable to any region effectively .The study is needed to develop a simplified model of the existing intercity public transportation and forecasting ridership. In turn, the model can be used to create a framework to assist policy –makers in the decision management process of public transportation.

Keywords: *BRTS, ITS, Ridership*, LRT

1. INTRODUCTION

Vijayawada the proposed capital city of the Andhra Pradesh The city is of area 61.8 Km^2 with a population of 10.58 Lakhs. Vijayawada is a gateway for the people travelling towards Hyderabad and Chennai. Nearly 1020 buses are operated through this city. This city is also important intersections for railways. The density of traffic is very high for bus and rail services. Hence there is a need for the alternative public transportation which creates lesser congestion, reduce journey time, safety and convenience.

A. Concept of Bus Rapid Transit System

Bus Rapid Transit System is a new form of public transportation which is an emerging approach to using buses as an improved high-speed transit system. Bus Rapid Transit involves coordinated improvements in a transit system's infrastructure, equipment, operations, and technology that give preferential treatment to buses on urban roadways.

B. Need for Present Study

In the context of rapid growth of Vijayawada city increasing mobility, high travel demand, increasing congestion, delays, accidents, need for conservation of energy, growing commun ity consciousness towards environmental quality and to addre ss a host of such other problems and objectives, public mass t ransport system of the city stands out as the most critical ele ment.

1.2 OBJECTIVES OF THE STUDY

a. To estimate optimum demand of BRTS in Vijayawada
b. To assess ridership profile of BRTS in study area
c. To analyze the existing system in view of performance and demand
d. To suggest for the improvements in the performance of the system

1.3 Major Elements Of Brt

a) Running ways
b) Stations
c) Vehicles
d) Fare collection
e) Intelligent transportation system (ITS)
f) Service and operational plan

2. LITERATURE

Badami and Haider (2007) explored the factors that contribute to and affect efforts to improve this situation, based on an analysis of the financial and operational performance of the public bus transit service in the four metropolitan centres and four secondary cities during the 1990s. Kathuria (2002) investigate d whether the enactment of policy instruments and the efforts have led to commensurate fall in air pollution in Delhi. The analysis

showed that the imposition had not resulted in concomitant improvement in ambient air quality. Rabl (2002) presented a life cycle assessment comparing diesel buses with buses fueled by natural gas. The data for the emission of pollutants were based on the MEET Project of the European Commission (EC), supplemented by data measured for diesel and gas buses in Paris. Mukherjee et al (2003) studied work exposure of drivers and conductors of special state buses in Kolkata, India to noise, heat, respirable dust and volatile organic compounds (VOCs). Equivalent noise exposures of drivers at work and in-bus noise were evaluated using a precision noise level meter. Mohan and Tiwari (1999) discussed the issues concerning public transport, safety and the environment and illustrated that unless the needs of non-motorised modes of traffic are met it would be almost impossible to design any sustainable transportation system for urban areas.

3. METHODOLOGY:

To be consistent with the general form of public transport simple demand models as depicted from the literature, statistical analysis and least square regression were used.

$Y=a_0+a_1x_{1+}a_2x_2+\ldots\ldots+a_rx_r$

Where Y = Dependent variable

Where X_1, X_2, and $X_{3\ldots\ldots}X_{n\ are}$ the independent variables

The following variables are taken for regression analysis

a. Population of the city.
b. Average Fare.
c. Average Travel time.
d. Accessibility.
e. Number of students.
f. Average travel distance.

Impact of above variables in the changes in demand is eval uated. Hence the demand is treated as dependent variable of remaining. The data of each variable for eight consecutive years is taken for regression analysis.

3.1 Choice Of Route For BRTS Implementation:

The route number 28E/28B which is most potential route in the city which covers important points shown in map is selected for the implementation of BRTS. The selection of this route is based on the fact of highest travel pattern, key points of city. The number of buses operated on this route is taken for evaluation and total demand analysis.

The present performance of these routes is as follows:

a. Number of buses operated -12
b. Earnings per km - Rs 19.60
c. Occupancy ratio (EPK) - 60
d. Vehicle utilization (VU) - 260
e. Earnings per bus (EPB) - 5096

After implementation of the BRTS the performances are expected to following values

a. Number of buses -16+2 spares
b. Number of schedules - 16
c. Route length -16 km
d. Frequency -5 minutes
e. Expected OR -70
f. VU -304 km
g. Number of BRTS shelters - 18

For analysis purpose the buses operated in the route are marked as 10A, 10B, 10C, 10D, 11A, 11B, 11C and 11D. For each service regression analysis is carried out. Finally total demand is calculated to the route.

3.2 Intelligent Transport System (ITS)

Role of ITS in BRT: -. ITS includes a variety of advanced technologies to collect, process and disseminate real time data from vehicle and roadway sensors. The data are transmitted via a dedicated communication network and computing intelligence is used to transform these data into useful information for the operating agency, driver and ultimately the customer. Different combinations of technologies combine to form different types of ITS systems. Automatic Vehicle Location (AVL) in combination with Automated Scheduling and Dispatch (ASD) and Transit Signal Priority (TSP) can improve schedule adherence and hence reliability as well as revenue speed.

ITS technologies provide many performance improvements and benefits. The remote monitoring of transit vehicle location and status and passenger activity also improves passenger and facility safety and security. ITS also can be used to assistoperators in maintaining vehicle fleets and aler t mechanics toimpending mechanical problems as well as ro utine maintenance needs.

3.3 Characteristics of ITS: There are many technologies and operational features that can be utilized for BRT systems. The various ITS applications that can be integrated into BRT systems are categorized in to seven groups.

a. Vehicle prioritization
b. Assist and Automation Technology
c. Electronic fare collection
d. Operations management
e. Passenger information
f. Safety and Security
g. Support technologies

4. TRAFFIC SURVEY AND DATA COLLECTION

The research forced on the intercity bus services of Vijayawada city. The data of the route where BRTS implemented is taken in the form of various parameters. These are the sub-urban areas up to which the services operated. But the limitation is that the overall concentration paid on the selected rout where the BRTS is to be implemented. Records of various public transportation agencies and bus companies. Data records of existing

intercity bus trips were collected from APSRTC. These data were weekly ridership, trip length (KMS), travel time (min), bus fare, and average number of trips, Earnings per km(EPK), occupancy ratio(OR), and vehicle utilization(VU).

The data is collected from the regional office of APSRTC, Vijayawada region in the form of primary and secondary data. The data is treated as independent variables data which is used for analysis. The data is analyzed with faired comparison of consecutive years. The impact of each individual variable on total demand is found by regression analysis. Route map of BRT is shown in fig. 1.

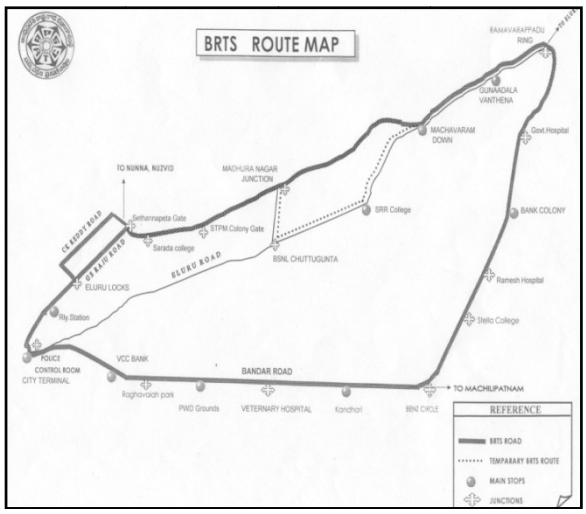
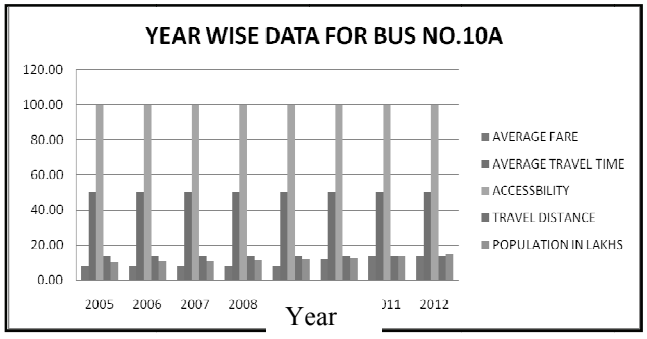


Fig. 1. Showing Route Map of B.R.T.S. corridors

5. DATA ANALYSIS

5.1. Regression Equation For Bus No.10A

Y=-5886.3- 64.61(average fare) + (travelling time) +3.91 (no of students) + (accessibility)+ (travel distance)-159.53 (population)



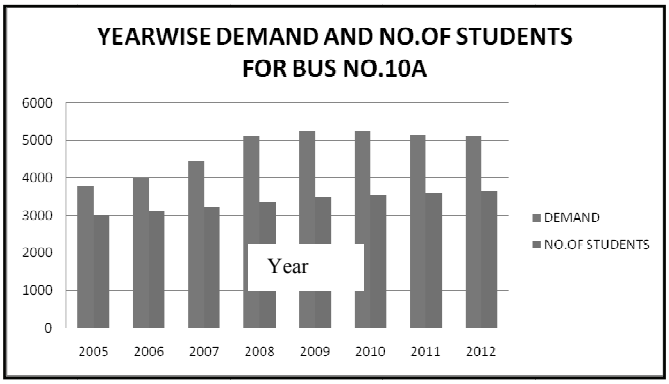
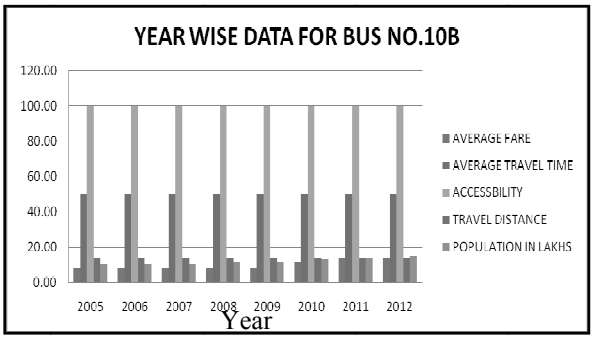


Fig.2. Year wise demand for bus no 10A

The above equation is validated by taking for average fare of Rs 14/-, average travel time 50 minutes, no. of students 4000,accessibility 100m,distance travelled 14 km and population of 15 lakhs the estimated demand using above equation is 6264.

5.2 Regression Equation For Bus No.10B

Y = - 2356.26+ 10.255 (average fare) + (travelling time) + 2.94(no.of students) + (accessibility) + (travel distance)- 267.052(population)



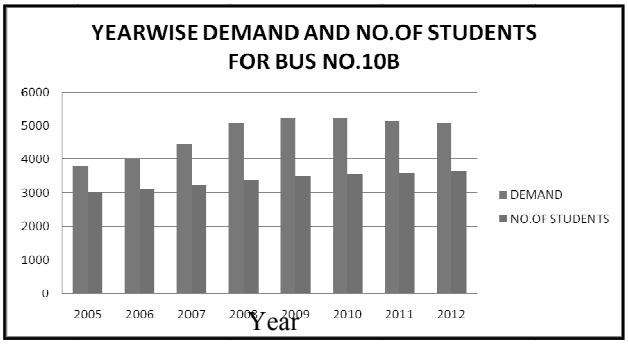
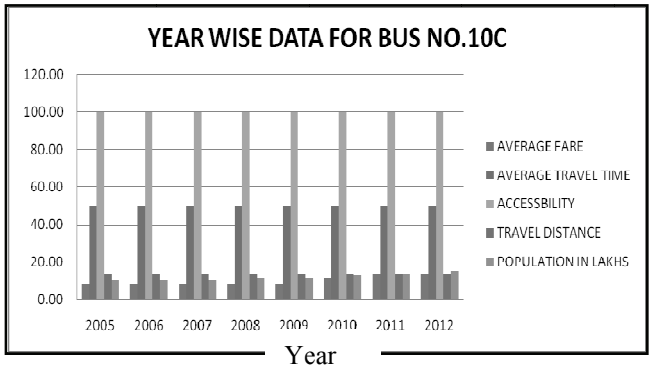


Fig.3. Year wise demand for bus no 10B

For this service travel demand is based on Average fare, No of students, and population. There is no change in Travel time, Accessibility and Average travel distances throughout the evaluation periods.

5.3. Regression Equation For Bus No.10C

Y=-4343.4-37.609 (average fare)+(travelling time)+ 2.35 (no of students)+ (accessibility) + (travel distance)-79.41 (population)



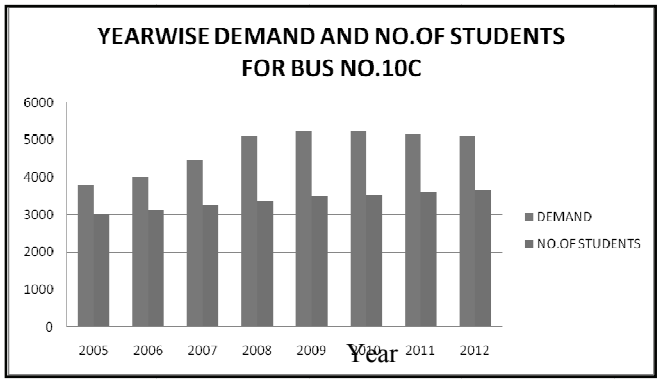
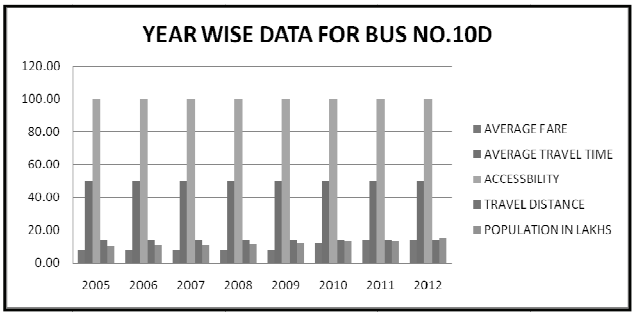


Fig.4. Year wise demand for bus no 10C

For this service travel demand is based on Average fare, No of students, and population. There is no change in Travel time, Accessibility and Average travel distances throughout the evaluation periods.

5.4. Regression Equation for Bus No.10D

Y=-12328.4-682.24(average fare)+(travelling time)+5.34 (no. of students)+(accessibility)+(travel distance)+498.06 (population)



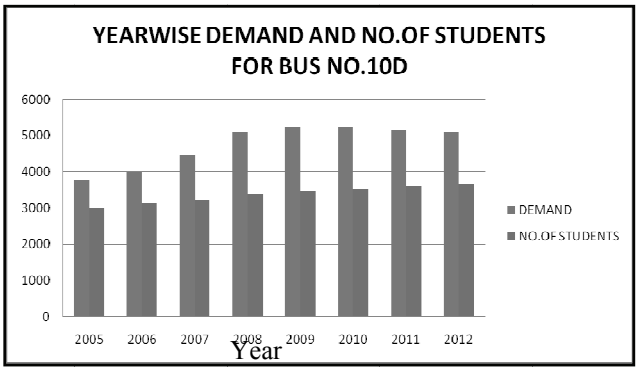
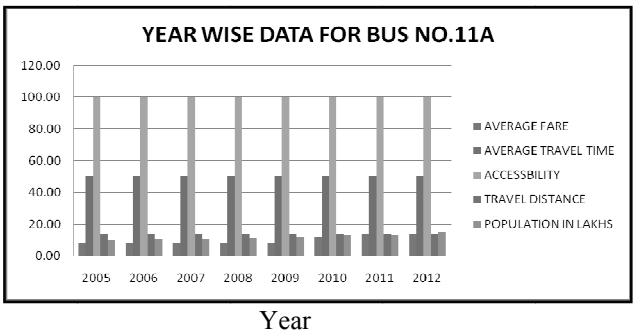


Fig.5. Year wise demand for bus no 10D

For this service travel demand is based on Average fare, No of students, and population. There is no change in Travel time, Accessibility and Average travel distances throughout the evaluation periods

5.5. Regression Equation For Bus No.11A

Y= - 4803.41- 213.78(average fare) +0(travelling time)+ 2.13
(No. of students)+0(accessibility)+0 (travel distance)+357.2 2 (population)



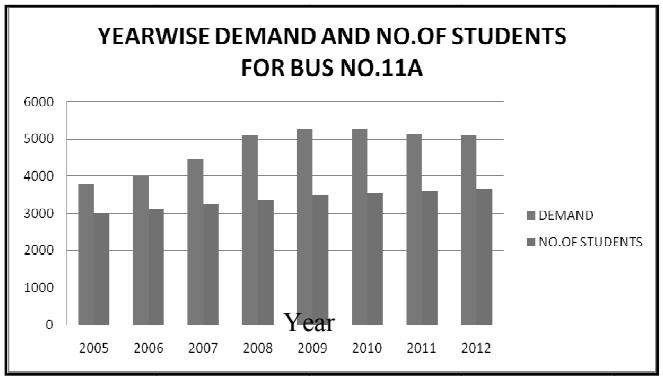
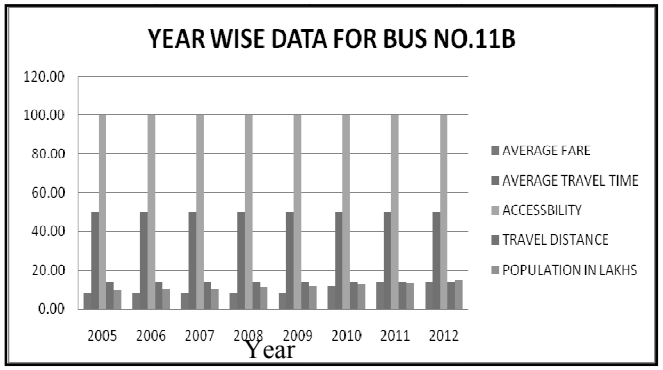


Fig.6. Year wise demand for bus no 11A

For this service travel demand is based on Average fare, No of students, and population. There is no change in Travel time, Accessibility and Average travel distances throughout the evaluation periods.

5.6. Regression Equation For Bus No.11B

Y= - 2175.39- 340.67(average fare) +(travelling time)+0.41 (no. of students)+(accessibility)+(travel distance)+975.07 (population)



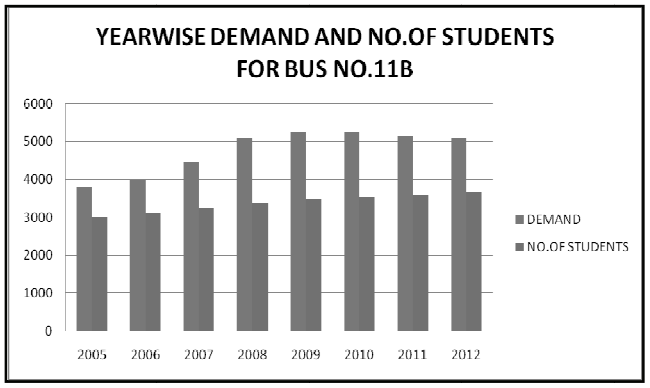
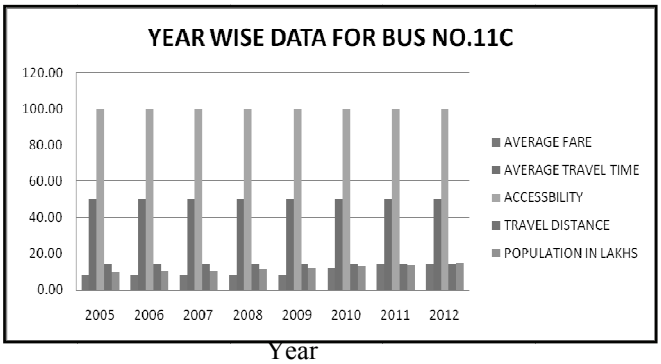


Fig.7. Year wise demand for bus no 11B

For this service travel demand is based on Average fare, No of students, and population. There is no change in Travel time, Accessibility and Average travel distances throughout the evaluation periods.

5.7. Regression Equation For Bus No.11C

Y= - 6124.05-
173.007(average fare) +(travelling time)+1.53 (no. of students)+(accessibility)+ (travel distance)+604.87 (population)



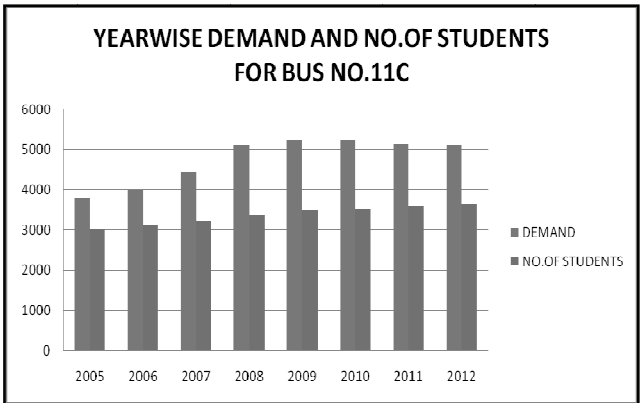
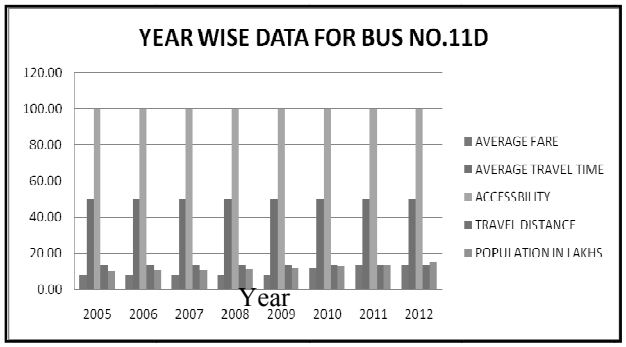


Fig.8. Year wise demand for bus no 11C

For this service travel demand is based on Average fare, No of students, and population. There is no change in Travel time, Accessibility and Average travel distances throughout the evaluation periods.

5.8. Regression Equation for Bus No.11D

Y= - 10545- 64.527(average fare) +0(travelling time)+0.41 (no. of students)+0(accessibility)+0 (travel distance)+255.5 1 (population)



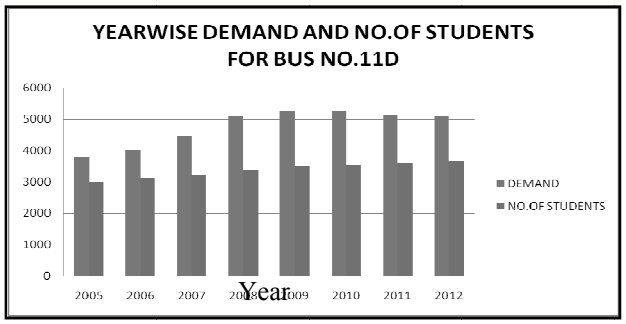


Fig.9. Year wise demand for bus no 11D

For this service travel demand is based on Average fare, No of students, and population. There is no change in Travel time, Accessibility and Average travel distances throughout the evaluation periods.

5.9 Multiple Regression Equation For Total Buses

Y= -3922.35-190.57(average fare) +6.48(travelling time) +1.18 (no. of students) +(accessibility)+16.4(travel distance)+255.5(population)

The correlation coefficient, for the above equation was 0.901.The statistics indicates that variables had a good signi ficance.

5.10 Discussion

The ultimate object of transport system is to provide the transport facility as per the changes in demand to all classes of people. The demand varies from class of people, their occupations, purpose of trip, density of population, efficiency of transit system.

a. There is a limiting capacity for containers (buses) to carry people.
b. Competition with other choices like private autos and two wheeler vehicles.
c. Roads having limited widths to carry the high capacity traffic.
d. Roads are allowed for mixed traffic and due to this reason there is less speed which leads to high travel time.
e. Traffic delays and congestions during peak hours.
f. Low occupancy and high maintenance costs

6. CONCLUSIONS

a. Travel demand increases with increase in population. As the demand increases modes of travel also increases.
b. As the traffic on road ways is mixed flow. This leads to delays, traffic congestions, low operating speeds, high travel time. But BRTS is having separately designed road ways, pavements for bus operation. These are only meant for BRT vehicles. Hence the travel time is invariably reduced.
c. People option on transport system depends on factors like Fare, Travel time, Comfort and convenience, Travel speed, Safety etc. On the service provider point of view profit maximization, operating efficiencies are important factors which are possible through high occupancy ratio.
d. If all of above objects are satisfied by a single system, it is the only convenient system to implement. So a single high capacity system is suitable to cater the raising transport demands.
e. Bus Rapid Transit System is only the system in present scenario which is having all the qualities of efficient transit system suitable for developed and growing cities.
f. Environmental balances are maintained with BRT buses due to their special eco-friendly design.
g. A Bus Rapid Transit System offers an opportunity for creating a system capable of meeting multiple needs of users and operators which combines facilities, equipment, service and intelligent transportation system (ITS) elements into a permanently integrated system with a quality image and unique identity.

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