Impact of Irregularity and Loss of Punctuality on the Performance of Public Transportation System

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Abstract :*Rapid growth and development had resulted into increase need of a mass transportation facility over the entire region for which different types of mass transit facilities are designed and provided. Such mass transportation facilities include GSRTC, AMTS, BRTS, CHARTEER BUSES, TRAINS, and TRAMS etc. The basic aim of such facilities is to provide safe, comfortable and timely services. But with rapid increase in traffic load and increase in the frequency of services provided, it had been observed that services are delayed or unable to maintenance a prescribed schedule. A study is conducted to quantify the causes and influence of such delays and irregularities in the services. Suggestions are made for appropriate improvement in services based on present study.*

The need for and importance of punctuality and regularity in public transport are outlined. Various performance indicators are defined. All the bus routes which connect Himatnagar city Depot in Sabarkantha district of Gujarat state to important locations like Ahmadabad, Mehsana, Deesa and Modasa is taken as study area. Here study is made to measure irregularity and loss of punctuality on the basis of which performance of depot, route is evaluated. Also causes for irregularity and loss in punctuality are highlighted with suggestions to improve transit system performances.

Key Words: Punctuality Index,Regularity Index, Dwell time, Bunching time, Headway, Actual arriving time, actual departure time, Embarking, disembarking, Service time, Coefficient of variation Holding etc

Problem statement

With the increase in travel demand and importance of time, it has been felt that there is need for maintaining the regularity and punctuality of services on the basis of which terminal and route performance can be evaluated. Also the losses sustained due to lack of punctuality and irregularity needs to be measured and quantified for bringing improvement in services. Hence, an attempt is made to conduct a study for finding the causes of such irregularities with an aim to suggest measures for mitigating those problems.

Objectives

The main objectives of this study are the following:

1) To define and formulate punctuality Index and irregularity index

2) To find major contributors to the loss of the punctuality and irregularity to services

3) To quantify the amount of losses (to passengers and to service provider)

4) To rate performance of route and bus terminal

5) Suggest suitable measures to overcome or reduce irregularity and other losses

Scope of Work

1) Route data and time schedule collection from GSRTC.

2) Questionnaires or feedback survey from passengers.

3) Survey to measure deviation from prescribed time schedule

4) Occupancy survey and passenger distribution along the route

5) Travel time survey and measurement of variation in travel time with causes like change in arrival and departure time, change in dwell time and holding time due to change in passenger volume.

6) Calculating punctuality index and regularity index on the basis of observed variation in route and terminal performance.

Study Area

As shown in problem statement, all the bus routes which connect Himatnagar city Depot in Sabarkantha district of Gujarat state to important locations like Ahmadabad, Mehsana, Deesa and Modasa is taken as study area. Here study is made to measure irregularity and loss of punctuality.

Methodology

The methodology adopted for the study is presented as a flow chart. The Methodology involves The following tasks:

1) Inventory of terminal and Inventory of routes

- Time schedule for transits

- Videography of embarking and disembarking passengers.

- Feedback from passengers

- Arrival and Departure timings

- Occupancy distribution along the route

2) Defining and formulating punctuality and regularity Index

3) Measuring punctuality and regularity Index for selected routes and terminals

4) Identifying causes for loss of punctuality and irregularity

5) Quantifying losses in time and value of money due to Irregularity and Loss of punctuality

6) Suggestions for improvement of services and conclusions

DATA COLLECTION & DATA ANALYSIS

Perhaps the strongest criticism of the entire concept of the passenger time saving and irregularities and loss of punctuality of GSRTC buses. Irregularity and loss of punctuality directly or indirectly affect the passenger's economical condition. Whereas a saving of one hour has fairly obvious benefits of passengers since much can be accomplished I the time fruitfully, the important of minor time savings, say , one minute or five minute or even ten minutes, is certainly a moot point. Time saving is an economic value only if is immediately put to use on realization. Can it be assumed that minor time saving of the order of 5-10 minutes can be immediately put to fruitful use on realization? Still doubtful is the concept of additive of minor time's increment. Another side if there will be a Irregularities of buses remains such as now then

Regularities of buses cannot be maintained properly. Due to irregularity and loss of punctuality people are used to find another options like private buses, jeeps etc.

Implementation of methodology requires data collection as well as having need for establishing regularity Index and punctuality Index of GSRTC buses, it is necessary to collect relevant data for carrying out the study. The various surveys which carried out and data which is collected is as bellow.

-Route data and time schedule collection from GSRTC
-Videography of embarking and disembarking passengers
-Questionary survey (Feedback from passengers)
-Arrival and Departure timings
-Occupancy survey & passengers distribution along the route
-Dwell time survey
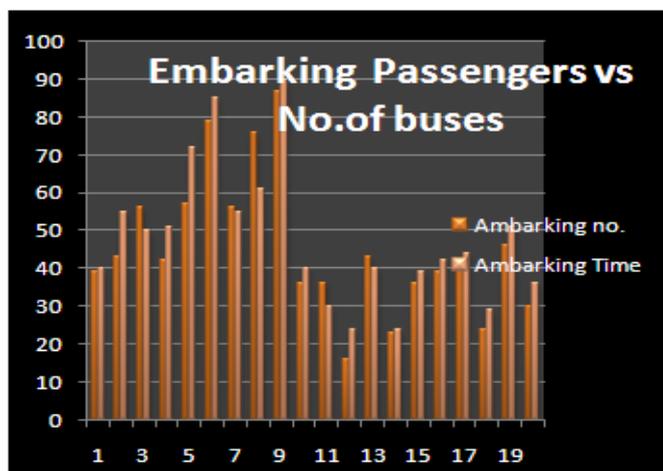
Graphical Representatio Of Embarking Passengers No. & Embarking Time
Definition of Punctuality Index and irregularity Index

Punctuality of bus operation can be defined as "timely operation of buses according to their operation schedules." It is often considered as one of the important measures of bus operation reliability in evaluating bus operation performance from the viewpoint of bus users. Passenger waiting times are severely influenced by the punctuality of bus operations. However, there exist many situations that predetermined schedules cannot be met. In these cases, other definitions of punctuality should be given. This project is to develop punctuality indexes of bus operation based on various bus operating situations.

Punctuality Indexes of a bus stop for a bus route:

- P1: Index indicating the magnitude of time gap between actual arrival time and scheduled arrival time (adherence)

- P2: Index indicating the magnitude of time gap between actual headway and scheduled headway (regularity)

- P3: Index indicating the magnitude of time gap between average headway of a day and each headway of successive buses (evenness)

P1 is the concept of variance that is not contained in on-time performance. P2 is a square of coefficient of variation that is the measure to estimate headway adherence. P3 is a new index that is developed in this paper to consider the condition that the number of actual operations differs from that of scheduled number of operations. P1 and P2 cannot be used if there is not a scheduled timetable and/or number of operations. The reason is that the actual arrival times should be compared with the scheduled arrival time and/or number of operations. In Seoul, most bus companies set up the times of only the first and last operating buses and, during the operation hours, dispatch buses according to scheduled headways only as far as buses to be dispatched are available. Strictly speaking, only P3 can be used as a punctuality index. The punctuality index P3 of a bus route can be calculated by averaging punctuality indexes of bus stops of the route and the punctuality of 50 bus-company also can be calculated by averaging the punctuality indexes of bus routes of the GSRTC.

If passengers arrive at the bus stops uniformly, the expected average waiting time of passengers considering the punctuality index is E(w) i.e. called average waiting time of passengers. If the punctuality index is 0 then maximum punctuality and if it goes to 1 or more than 1 t is called minimum punctuality index Punctuality index, P can be conversed into percentage value as follows.

P% = [Percentage value of Punctuality index P] = (1 – P) × 100.

5.4. Conclusion

HIMATNAGAR-DEESA WEEKLY PUNCTUALITY INDEX

1) From this project punctuality index is measured in different three ways like P1 ,P2 and P3 where P1 is Indicating the magnitude of time gap between actual arrival time and scheduled arrival time(adherence), P2 is the Index Indicating

the magnitude of time gap between headway and scheduled headway(Regularity) and P3 is the Index indicating the magnitude of time gap between headway of a day and each successive buses(evenness).

2) P1 is the concept of variance that is not contained in on-time performance, P2 is a square of coefficient of variation that is the measure to estimate headway adherence suggested and P3 is new Index that is developed in this project to consider the condition that the number of actual operation differs from that of scheduled number of operation.

3) Punctuality is a very critical measure in evaluating performance of GSRTC bus operation. A definition of punctuality was made and various punctuality indexes are developed here in this project, Specifically, bus arrival times to bus stops were collected and analyzed for several bus routes.

4) From the result of analyzing four different bus routes, it is obseeved that the punctuality index of Monday and Saturday having heavy traffic there is less
punctuality rather than the normal days of weekends so there is need for some extra buses.

5) The punctuality Index presented in this project can be used in evaluating the effect of some treatments on bus operation environment. Also the punctuality Index can be used to evaluate service quality of the bus routes and bus companies.

6) There are few major contributors which are directly or indirectly affect the performance of GSRTC buses as well it affects on the Regularity and punctuality like bad condition of buses, roads, irregularity of driver and conductors and sometime technical reasons like punctures in tyre, accidents, engine capacity etc.

7) Through the analysis , it was found that the punctuality of GSRTC bus operation is affected by many factors including:

- Traffic condition

- Road condition

- Route length and number of stops

- Evenness of passenger demand

- Transit performance treatment

- Operation control strategies

- Vehicle and staff availability

- Differences in operator driving skills.

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