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User Priorities for Mode Choice Factors: A Case Study of Bhopal

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Abstract *-Public transport systems are either under crowded or overcrowded implies the lack of appropriate procedure for selection of parameter important to public transit mode for a city with respect to customer perception. Inefficiency of public transport indicates inaccurate user priority analysis of public transit which in turn leads to overcrowded or under crowded system. Trip generation of public transit rely on specific properties of a city like land use pattern, city characteristics and travel behavior and these are the governing factors for mode choice for a city. Major city residents in Indian cities are so poor that they cannot afford private modes. So, Public transport system is only way to access various daily trips in Indian cities. Ridership of a mode depends on its capacity and user priorities. Moreover, public transport service has greatly influenced by user perception. So, due to lack of appropriate procedure for the design and regulation of public transport system, people have turned towards personal modes such as scooters, motorcycles, and cars. This study explores the user's priorities for the mode choice. It is a effective way to identify the user expectation or need. Revealed surveys among public transport users were conducted in three different modes of public transport system: Standard bus, Minibus, Magic. User asked to rank the given parameters affecting mode choice as per own demand. Weightage of each mode choice parameter is determined and identify the important parameters by user perception for each mode. So, planners should prefer these important parameters for improvement and proper regulation of a particular mode.*

Keywords: Public transport, Mode choice, User priority, Priority Weightage,

1. INTRODUCTION

Listen the voice of the customer is a common and effective way to identify the customer expectation or need and the way to satisfy them [Budiono 2009]. Major city residents in Indian cities are so poor that they cannot afford private modes. So, Public transport system is only way to access various daily trips in Indian cities. Public transit ridership completely relies on user priorities or demands. Inefficiency of public transport indicates inaccurate user priority analysis of public transit which in turn leads to overcrowded or under crowded system, in turn leads to congested roadways that slow down buses, and an operating environment that is often anarchic and completely uncoordinated [Pucher and Korattyswaroopam 2004].

There are various modes of public transport system available in these cities like BRTS, Bus services, Mini Bus services and Magic. Metro and standard buses provide comfort but on other hand demands high cost which in turn leads to ignorance by low-income commuters. Because of this, Metro and standard buses nowadays running under crowded which shows the ineffectiveness of public transport. Standard buses have a designed and standard (mainly major roads of city) routes, that why service area is limited e.g. nearby area to route and bus stop. That means every mode have some positive and negative points. Every mode has specific characteristics for giving the satisfaction to the user. Satisfaction of public transit relies on user priorities and these are the governing factors for mode choice for a city. Ridership of a mode depends on its capacity (passenger per hour) and user priorities (city characteristics). Past study shows that provision of only higher mode of public transport alternative e.g. Metro and BRTS cannot be the solution of transport problems. Identification of appropriate mode based on user perception for given city is the major concern for the improvement of public transport scenario. So there is a need of such kind of study which can determine the priorities of user for a particular public transit mode and based on the priorities, efficiency and feasibility of system can be increased for making cities more sustainable.

1.1 Study area

This study was conducted for Bhopal considering its public transport priorities of user's perception. Bhopal is capital and second largest city of Madhya Pradesh. Bhopal city is spanning over an area of about 285km^2 and located on a hilly terrain. BRTS is introduced in 2013 over a length of 24 km, which is operated by Bhopal City Link Limited (BCLL), to connect sub-urban parts of the city. Bhopal BRT system is passing through the main city and market areas supported by Trunk, Standard, Complimentary and Intermediate Para Transit routes. The existing Mini Buses & Magic services use the complementary and IPT routes to provide transport services for passengers from inner residential area to main trunk and standard routes i.e. BRT routes.

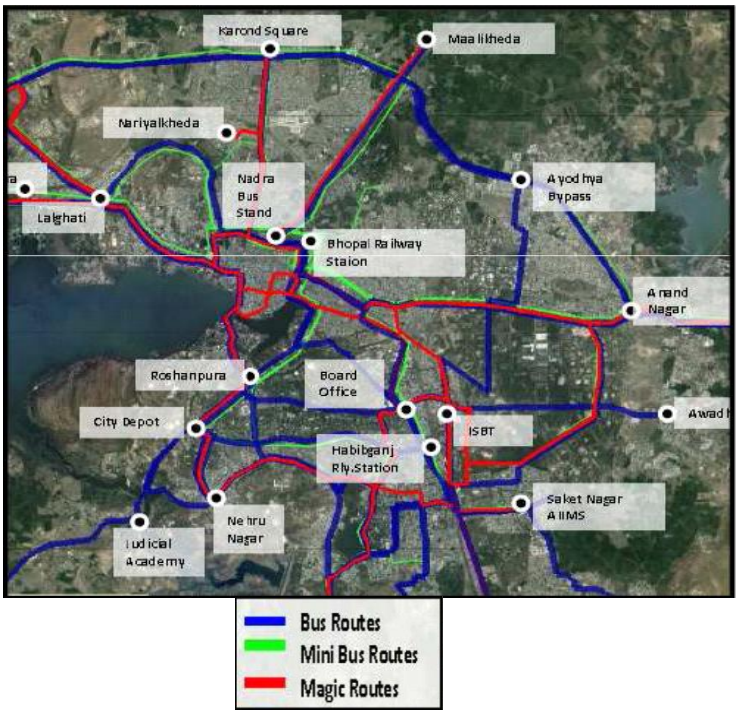

Fig 1- Various Public Transport routes

Source – BCLL

2. NEED OF STUDY

Public transport systems are either under crowded or overcrowded implies the lack of appropriate procedure for selection of a best feasible mode for selected city. As a result, people have turned towards personal modes such as scooters, motorcycles, and cars. There are various modes of public transport system available in these cities like BRTS, Bus services, Mini Bus services and Magic. Standard bus services facing the problem of lower passenger rate due to high cost and low accessibility. Whereas Minibus and Magic are plagued by overcrowding, anarchic routes and longer travel time. If we summarize the scenario of public transport, seems totally inefficient system. A proper study of priorities of customer a represents a very useful tool for ensuring continuous increase of the quality of the delivered transit services. So there is a need of such kind of study which can determine

the priorities of user for a particular public transit mode and based on the priorities, efficiency and feasibility of system can be increased for making cities more sustainable.

3. PREVIOUS STUDIES FOR SELECTION OF MODE CHOICE FACTORS

Racca and Ratledge (2004) uses data about individuals, their characteristics, the trips they make, and the fare and benefits of travel modes, to select factors that can be used in models for travel mode choice. Author select factors i.e. travel time, fare, income, captive users, parking availability and costs, age, accessibility, frequency, trip distance, service from literature and frame regression model to each category. In this study author selected the above factors from literature and frame a regression model for identification of factors influence on mode choice. After analysis some factors identified as major influencing factor. Influencing factors are captive user, age, income, accessibility, travel time, trip distance.

Klähn, Hall and Gerike (2014) investigates the use of public transport by visitors in the city of Munich, Germany. Questionnaire-based surveys are a standard method to research customer behavior and are also adopted in this study. Respondents were asked to indicate how satisfied they were with public transport with regard to 16 service dimensions. The results show that satisfaction with public transport was independent from most variables like demographic and trip-related characteristics except for country of residence. Six items were revealed as being most important factors to visitor satisfaction with public transport e.g. information, ticket price, service frequency, space on the vehicle, cleanliness of the vehicle, and ease of use.

Both public transport user and non-public transport users preferred to have LRT i.e. 56% for public transport users and 47% for non-public transport users. This was followed by choosing bus rapid transit (BRT) system i.e. 32% for public transport users and 28% for non-public transport users. The land public transport such as normal bus, mini bus and magic, ranked lowest with 5.6%, 3.4% and 8.2% respectively, chosen by public transport users and 9.1%, 4% and 11% respectively, chosen by non-public transport users respondents. [Ibrahim, Adji and Karim 2013]

The index, named Heterogeneous Customer Satisfaction Index, is inspired by the traditional Customer Satisfaction Index, but takes into account the heterogeneity among the user judgments about the different service aspects. The proposed methodology applied on a medium-sized urban area. From the outcome, the value of CSI is 7.63. By weighting satisfaction and importance scores on the variance, we obtain a value of HCSI equal to 8.04. The difference between the CSI and HCSI values are due to the different contributions of each service attribute to each index. . HCSI introduces heterogeneity into user judgments because importance and satisfaction rates are corrected according to dispersion from the average value. From the experimental results, HCSI can be considered a useful tool for measuring transit service quality to monitor transit agency performances and fulfill customers need. [Eboli and Mazulla 2009]

Public transport demand responses most sensitive on travel time, accessibility and convenience. That mean more effort require for reducing travel time and more convenience with proper accessibility to attract more public transport ridership. Other factors like comfort level, frequency, headway, feeder service and fare will also consider for optimization of public transport demand for Bhopal and similar million plus cities. [Jaiswal and Sharma 2012].

Metro systems have been planned to reduce congestion on the roads. However, systems planned in India shows that cost overrunning and under-utilization of capacity. Methodology used to justify these systems needs careful analysis. High capacity system does not necessarily generate high demand. Estimation of passenger demand for transit services should consider complete journey of commuters including access time. Since bus stops are on all arterial roads, which are about 1000 km long in Delhi. Therefore bus stops will serve higher accessibility compared to metro stations. [Advani and Tiwari 2011]

After review of literature we identified no. of factors for mode choice characteristics. Revealed preference method of field survey is also referred from literature. From factors given in literature we select eight factors. Eight factors are accessibility, comfort, reliability, fare, travel time, safety, customer services and frequency of service.

4. METHODOLOGY

Data were collected using Revealed Preference Survey, the most common tool to evaluate the similar aim (Budiono 2009). Priorities or ranking of frequency, travel time, reliability, fare, customer services, comfort, safety, accessibility asked from respondent. The age range between 15 to 60 years old chosen because this age group people have a routine commute travel behavior and probably has taken public bus transport as their mode of choice.

The questionnaire was divided into two parts:

(1) Demographics, the questioner item correspondent to age, sex, origin, destination, time of journey, fare and whether they have own vehicle or not.

(2) Priority or ranking to various factors, the related item concern about frequency, travel time, reliability, fare, customer services, comfort, safety, accessibility.

5. DATA COLLECTION AND ANALYSIS

In this survey users asked to rank or arrange the given eight parameters with reference to their demands. The respondents were asked to fill out the questionnaire at bus stops or in the bus in Bhopal. This data collection method (survey in buses) was used since it may be hard to find people that are willing to participate in the bus stop. People waiting at bus stops are often in a hurry and thus hesitant to fill out the questionnaire before the bus arrive. The filled out questionnaires were administrated and coded by one survey person.

615 samples were filled out and 589 were accepted for further analysis. The respondent consisted of 409 men and 180 women. So, 30.5% users are female. Age range divided in three categories. The age range of respondents consisted of 45% age of 21-40; 42% age of 40-60; and 13% age of above 60. 34.3% of the respondents were students; 17.2% working employee in different private and government firms; 37.14 % are for fun activities. 71.8% of total users are captive users.

5.1 Priority Weightage Analysis

Priority or ranking given by respondent is used to calculate the priority weightage. Respondent were asked to arrange given parameter in 1 to 8 ranking. In analysis we assign 1 rank to weightage 8, 2 to 7, 3 to 6, 4 to 5, 5 to 4, 6 to 3, 7 to 2 and 8 to 1. All data modified by these entries and weightage of each parameter is determined.

For standard bus

Total samples of standard bus are 206. Weightage of priorities calculated as 11.4% for accessibility, 11.7% for comfort, 13% reliability, 14.1% for fare, 14.3% for travel time, 12.8% for safety, 9.2% for customer services and 13.4% for frequency.

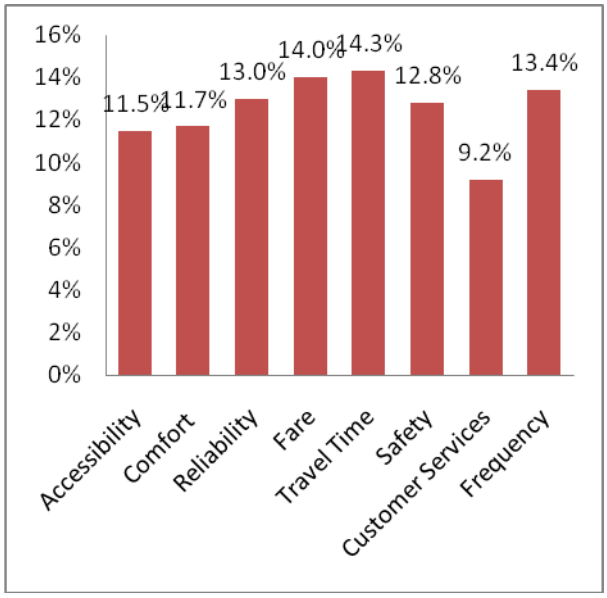

Chart 1- Showing weightage of mode choice parameter as per user perception

Rank	Standard Bus	Minibus	Magic	Importance
1	Travel time	Travel Time	Safety	Very Imp
2	Fare	Safety	Travel time	Very Imp
3	Frequency	Fare	Reliability	Very Imp
4	Reliability	Frequency	Frequency	Imp
5	Safety	Reliability	Fare	Imp
6	Comfort	Accessibility	Comfort	Imp
7	Accessibility	Comfort	Accessibility	Imp
8	Customer Services	Customer Services	Customer Services	Not Imp

Minibus

Total samples of standard bus are 194. Weightage of priorities calculated as 12.1% for accessibility, 11.6% for comfort, 12.8% reliability, 13.6% for fare, 14.7% for travel time, 13.7% for safety, 8.5% for customer services and 13.1% for frequency.

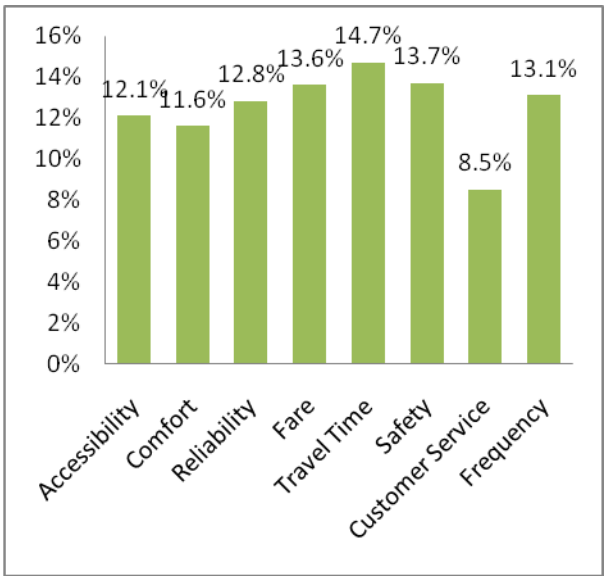

Chart 2- Showing weightage of mode choice parameter as per user perception

Magic

Total samples of standard bus are 188. Weightage of priorities calculated as 10.8% for accessibility, 11.7% for comfort, 13.2% reliability, 12.3% for fare, 13.9% for travel time, 14.8% for safety, 10.5% for customer services and 12.7% for frequency.

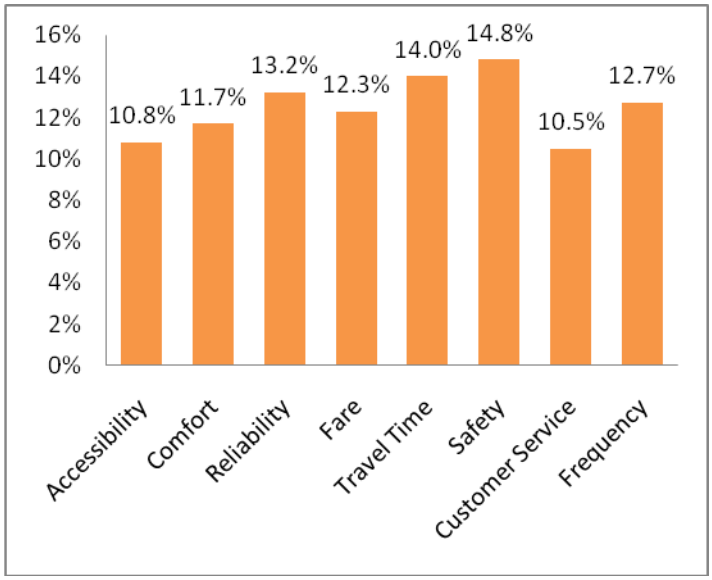

Chart 3- Showing weightage of mode choice parameter as per user perception

6. CONCLUSION

Weightage of parameters shows that every mode has some important parameter so that focusing on them result into increase in satisfaction and ridership. For standard bus reliability, fare, travel time, safety and frequency are the important parameters as per user perception. For Minibus travel time, safety, fare and frequency are important factors. Magic have safety, travel time, reliability and frequency as important factors.

Table 1- Rank of parameter with respect to weightage based on user perception

