

IDENTIFICATION OF ATTRIBUTES AFFECTING MODE CHOICE MODAL FOR BUS RAPID TRANSIT SYSTEM

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Abstract - With rapid growing economies and population in the cities, there is increasing trend in the expansion of urban sprawl and mobilization. Sustainable transport modes are now-a-days considered to be a replacement to conventional public transport systems; which also give a hand in alleviating congestion with an integrated transport system which is affordable, space and resource efficient, and minimizes environmental impacts. It is generally believed that without exception; public transport modes make use of road space more efficient than use of private mode. It affects the general efficiency of traveling to urban areas and the amount of urban space devoted to transport functions. As a consequence, encouraging and improving public transport system in developing and the developed world has got wider attention and has become a central issue in transport planning.

As a consequence, rapid transit options; such as Bus Rapid Transport System has evolved as much affordable and sustainable mobility option. BRT is regarded as sustainable, environmental friendly transport mode and is being implemented in many cities of the world. For enhancing the transit ridership, identification of factors which significantly affect the modal choice modal is very important. Only after the identification of these factors, measures can be taken to improve the facility. In this paper, review of existing literature on mode choice modal has been done and significant factors are identified.

Key Words: Attributes, Bus Rapid Transit System, Mode Choice, Ridership, Logit Analysis

1. INTRODUCTION

The vehicle population is quickly increasing in our country as all over the world which reveals the high load on the roads beyond their capability. Rapid increases in the vehicle have put enormous strains in all urban roads in all million plus cities in India. High vehicle ownership and poor supporting public transport facilities are in particularly in the urban cities where the population is between 1 to 2 million [1]. The increase in urbanization, population, urban expansion, the economy also increases the travel demand, so the people shift to the private vehicle due to lack of level of

service in public transportation [2]. The inadequate level of inspection and repairs of public transportation leads people to use private vehicles so the number of problems like congestion, accidents, environmental degradation and urban sprawl has increased. Sustainable transport development plans are therefore replacing the everyday approach of constructing more roads to ease congestion with an integrated transport scheme which is affordable, space and resource-efficient, and minimizes environmental impacts and transport nuisances [3]. The concern of enhancing transit ridership for BRTS and to identify the major factors for poor ridership with estimation of the probable shift of private vehicle users to buses due to the gain in its layer of service also identifies ways to account for qualitative factors in the public transport project evaluation. The main aim of this paper is to analyze what are the attributes which affect the change in ridership from the private vehicle to BRT system through the review of existing literature.

2. LITERATURE REVIEW

This section presents the review of the literature including research papers and reports for identification of attributes affecting mode choice modal for bus rapid transit system. It has been found that there exists a gap in the literature regarding most effective attributes for the study of mode choice modal. In such a scenario, the available literature which deals with various attributes affecting mode choice has been reviewed in order to identify attributes affecting mode choice modal for bus rapid transit system.

Kumar et al. (2004) carried out a study on the disutilities of travel have been modeled based on stated choice data collected from trip-makers traveling along a rural bus route in Midnapur district, West Bengal, India. Multinomial Logit Model (MNL) is used to develop utility equations and the total disutility of travel is estimated in the form of generalized cost. The perceived values associated with in-vehicle travel time, service headway, and comfort level for the study route are estimated and found to be significant [4].

Alvinsyah et al. (2005) observed public transport user attitude due to the introduction of a new public transport

system. Due to the introduction of this BRT system, a significant change in all aspects are expected, include the people attitude toward this new system. Jakarta does not have any experience to predict people reaction toward the new mass transport system. For the new public transport system (BRTS), developed a binomial logit model based on Stated Preference (SP) data to study the response of the travelers using the proposed Jakarta bus way system. Travel time and travel cost were considered as the main variables to develop utility functions. Based on these modal characteristics and the different service strategies offered, people perception and their probability of selecting the proposed system is predicted. The results show a wide range of people's perception and their probability of choosing the best service [5].

Nurdden et al. (2007) carried out a study at Kuala Lumpur in Malaysia and observed the effect of transportation policies on the modal shift from private car to public transport. Car is Second (40%) most common mode of transportation in Malaysia, due to this number of the problem increases i.e. traffic congestion, accident, air pollution etc. In this study aims to discourage the use of private vehicle by providing efficient public transport system. For the policy making for attracting the private vehicle user to public transports, a state preference was conducted for 1200 car, bus and tram users were conducted in Kuala Lumpur city centre, A binary logit model was developed for the three alternative modes i.e. bus, train, and car. Travel time, travel cost, gender, age, income level and car ownership are significant in influencing car user's mode choice behavior. After the analysis following result were found gender for PTS was Comes out positive, implies that if gender was female they will prefer public transport instead driving of the private vehicle, travel time and travel cost for PTS was negative, implies that increase in travel time and travel cost [6].

Tejaswi et al. (2015) studied on factors influencing mode choice behavior in metropolitan city, Hyderabad. A multinomial logistic regression model was used for evaluation of influencing factors in mode choice behavior. A stretch of 10 km from Bachupally to Mallampet in Hyderabad city of Telangana State was considered for the study. The socio-economic data were collected by performing home interview survey on the sample basis. Factors like age, income, travel time and travel cost are considered in generating the model. It is observed from the results that preference to public transport is more compared to all other modes of travel. Increase in travel time and travel cost per distance travelled increases in the cost of operation which is the primary cause for commuters to switch from personalized transport to public transport facility [7].

Arkatkar et al. (2015) carried out a study to assess the impact of BRTS service on modal shift before-and-after introduction of cars in exclusive BRT lane. For these two cases, separate models are formulated and compared using the binary logistic method and Artificial Neural Network (ANN). The data on demographic and socioeconomic attributes (Gender, Age, Occupation) and trip related attributes (Travel time details, Cost saving per day) are collected using Revealed Preference (RP) survey. During this study, en-route survey data is collected on this corridor [8].

Muthukannan et al. (2008) carried out a study at Chennai city, In the study focused on shifting of bus user to MRTS and discuss about the factors which encourage the traveler to shift towards MRTS. The MRTS is designed in Chennai city to carry 6.03 lakhs passenger trips per day on its full capacity, when MRTS line becomes operational its demand reduced only half of forecasted demand. To understand the reasons for not using MRTS for that trip and the conditions under which a commuter can switch over to MRTS (Train) from MTC (Bus), a Commuter opinion survey is conducted at the different nodes among bus passenger survey it is found that following factors along the MRTS Corridor. After revealed preference it is found that the following factor influencing a commuter to switchover MRTS are reduction in fare, increase in frequency, Inter-modal facility, and the single ticket for Bus and Train and parking facility. There is much reason for not using MRTS are due to mainly not accessible, difference in the fare, far bus stops, more waiting time, more travel time and others. Hence the major reasons for not using MRTS are less accessibility, more travel cost, more travel time and waiting time. On the basis of the commuter opinion survey on selected parameters i.e. travel time travel cost and accessibility utility models are developed for two public transportation modes [9].

McFadden et al. (1973) carried out a study outlines a general procedure for formulating econometric models of population choice behavior from distributions of individual decision rules. A concrete case with useful empirical properties, conditional logit analysis, is developed in detail. The relevance of these methods to economic analysis can be indicated by a list of the consumer choice problems to which conditional logit analysis has been applied: choice of college attended, choice of occupation, labour force participation, choice of geographical location and migration, choice of number of children, housing choice, choice of number and brand of automobiles owned, choice of shopping travel mode and destination.[10]

3. ATTRIBUTES AFFECTING MODE CHOICE MODAL FOR BUS RAPID TRANSIT SYSTEM

From the review of the literature, the following attributes have been identified affecting Mode Choice Modal for Bus Rapid Transit System which may affect based on practical and logical reasoning:

1) Travel Cost: It represents the willingness of the potential user to pay for the journey as compared to what he will pay for the private mode. As such, this is the general perception that if the travel cost will increase in any of the modes, the demand for that mode of transport will decrease.

2) Travel Time: Travel time is an important factor in the mode choice analysis. It includes egress and access time, waiting time, and journey time. Many of the factors that affect perceived travel time and unit travel time costs have significant implications for transit project evaluation. More accurate analysis tends to increase the relative value of transit improvements over a period of time.

It basically means total journey time spent in a mode of transport as compared to the time incurred in private mode. A reduction in travel time not only adds to the value of the preferred mode, but also be evaluated in monetary terms in the form of Time-Cost analysis; as very often, the saved time on a preferred mode of transport can result in more of that transport productive gain for the user of that transport, making the mode more preferred over others. Also, travel time can be of very important step while determining the traffic management schemes for synchronizing the existing infrastructure with the proposed one for making the public transportation system most efficient within the optimized use of energy and infrastructure

3) Comfort Level: Comfort level emphasizes on the extent of inside and outside comfort. There are basically two type of comfort:

i) Inside comfort: including spacious and comfortable sitting, Air Conditioning, Information Display in Bus, Bus condition: Interior and Exterior of the bus, Crowd in the bus.

ii) Outside Comfort: Designing of waiting areas at bus stops, Cleanliness of bus stops, the lighting of bus stops, accessibility to bus stops, Information Display of arrival and departure of buses and parking facilities.

4) Safety: Similarly the safety emphasized on the attributes like the safety while driving, safety while sitting in bus, theft safety etc.

4. CONCLUSION

From the above discussion, theoretical background of mode choice behavior and study of stated and revealed preference survey approaches used in modal shift analysis. In these studies, it is clearly defined about the factor which influencing the mode choice, and methodology and approach for analysing modal shift study framework. Further, they also provide useful guidelines for assessing the impacts of modal improvements on other policy variables like pricing of new services and investments in new transport infrastructure. Some of the concepts outlined in these studies can also be used to make predictions and study the impact of policy implications to the modal shift After literature review study numbers of parameters are identified i.e. Socio-demographic characteristics of traveller, Trip purpose, Access, and frequency, parking, travel time, safety, convenience, cost etc., but most studied literature review find out travel time , travel cost, comfort level and are the most dominant factor for shift from private vehicle to public transport system.

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