

Modal Split Analysis: A Review Approach

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Abstract - In this era of urbanization, the population in the growing city like Ahmedabad is continuously increasing; the number of two wheelers and four wheelers are continuously increasing. And the public transport vehicles are also increasing. But at the same time the width of roads is not increasing and which causes heavy congestion at some places mainly in peak hours and this congestion is due to the more use of private vehicles and less use of public transport. So this paper reviews the choice of mode which the user wheel prefer is mainly depended on the various factors such as number of vehicles available, household structure, trip purpose, travel time, comfort, reliability etc. So modal split analysis helps to decide the mode of travel as bus, car, auto, railway, etc.

Key Words: Modal split, transportation planning, behaviour analysis, transport demand and supply, logit modal, mode choice, neural computing networks.

1. INTRODUCTION

Transport is an important part of India's economy but it is poor as compared to the other countries. Public transport is the basic mode of transport for the most of the people of the India. India's public transport is among the most heavily used in the world. Motor vehicle population in India is low by international standards, with only 24.85 million cars on the nation's roads as of 2013[1] and the number of two wheelers like motorcycle and scooter is considerably higher at 132.55 million[2]. In total, about 21 percent households have two wheelers whereas only 4.7 per cent of households in India have cars/jeeps/vans as per 2011 Census. [3][4] Bicycles, or cycles have ownership rates ranging from around 30% to 70% at the state level. However, recent developments suggest that bicycle riding is fast becoming popular in the metro cities of India[4][5].

Before doing transportation planning of any city, it is necessary to know the choice of mode that is used by the people of any particular area. Public transport modes make use of road space more efficiently than private transport, whereas public transport is having more flexibility and it is more convenient. So modal split analysis helps to decide the mode of travel as bus, car, auto, railway, etc. In modal

split analysis the total number of trips is expressed such as fraction, ratio, or percentage.

2. LITERATURE REVIEW

Minal, Ch. Ravi Sekhar[6]: This paper particularly emphasizes on statistical mode choice models such as multinomial logit and probit models as well as recent advanced soft computing techniques such as Artificial Neural Network models (ANN) and Fuzzy approach model that are employed for modal split analysis. This paper is to carryout detailed review on various modeling methods of mode choice analysis and bottlenecks associated with the same. After analyzing this paper, result of research is Hybrid models seem to be more promising in this regard. Hybrid mode choice models such as Neuro-Fuzzy models gives better results than the individual models.

Marko Matulin, dipl.ing. Ivan Bosnjak, D. Sc. Ljupko Simunovic, D. Sc[7]: This paper study about the modal split and different approaches to the modal split calculation. The development of new services such as Park & Ride systems, individualized public transport services as well as the plans like car-pool, car-share can significantly reduce the number of individual vehicles entering the urban area. So to apply the new strategies and transport plans, some indicators are required at each level. And among all the indicators, modal split indicator is one of the most relevant and most useful indicator. This paper concludes that the probability of various situations inside one journey and in addition inside one transport mode a multimodal travel approach was explained. Utilizing this approach a few modular split computations were attempted, contingent upon various sort of situations and distinctive kind of parts in single transport mode.

BONNEL Patrick[8]: The paper focuses on the choice of mode through aggregate modelling. In France, the behavioural data from household survey is collected at every ten years, and the same data will give socio economic characteristics which will include both individual and household data to which they belong

and the same data is depended on the choice of mode. Some model matrices are made that contain more than 10,000 cells with less than 50,000 trips. So it will contain large number of empty zones so it will not be possible to provide level of zoning. So the solution to this is providing aggregate zones.

Aruna Sivakumar and Chandra Bhat[9]: This paper approaches to the modeling of inter regional commodity flows volumes in a city. It includes the percentage of commodity that is consumed at each destination zone that originates from alternative production zones. The resulting model will give a fractional split model that is more common than the gravity model used today for statewide freight planning. In an assessment of information fit, the outcomes demonstrate that the proposed partial split structure outperforms the typical gravity structure used today in statewide freight planning. Generally, the outcomes demonstrate the value of the fractional split structure for commodity flow modeling. The structure is instinctive, moderately easy to appraise and is capable of accommodating a large number of factors influencing commodity flow demand.

M. Muthukannan and A. M. Thirumurthy[10]: In this paper the demand of mode is related to the three important factors as travel, travel time and accessibility. Mass rapid transit system (MRTS) and Metropolitan transport corporation (MTC) are selected for the study. Both the systems are studied out carefully and the model is prepared which will give the variation in the demand of travel which can also be used for demand estimation. The estimated MRTS requests for different situations in the affectability investigation show that the detailed mode decision seems to give reasonable results. The estimated MRTS demand matrix obtained from mode choice analysis can be utilized for arranging the feeder transport arrange. The reason for the less support like higher travel cost, more waiting time, poor feeder service, and physical availability has been distinguished and the arrangement is likewise proposed. The discoveries and arrangements might be experimented to optimize the urban transit system utility and for the benefits of public.

Hilmi Berk CELIKOGLU[11]: This paper includes the possibilities of obtaining better logit mode choice models for home-based work trip purpose in istanbul metropolitan and it includes the employment of feed forward-back propagation algorithm trained networks.

In this paper the two variable logit model with the trip cost and trip time variables is calibrated to split trips to private car and public transport. Calibrating modal use is vital to create safety measures before the forthcoming investments for an urban area. In this study an ANN utility capacity evaluating model and a LR equation model for utility function are created and compared. Among the performed calibrations, significant upgrades in the prediction are made by the neural network technique because of its adaptability to adjust to nonlinear relationships. Another advantage of the utilization of neural networks is being prepared with measurements, subsequently; the included propagation impacts are more reasonable. facing the local minima problem is a drawback the FFBP training algorithm. it can be said that different sorts of learning algorithms should be assessed during the training process to overcome this drawback.

Naveen Eluru, Vincent Chakour, Ahmed M. El-Geneidy[12]: The main study of this paper includes the effect of the performance of the public transportation system on the commuter travel mode and transit route choice. The multinomial logit model is used for the travel mode choice and mixed multinomial logit model is used for the transit route choice component. The detailed socio-demographic and residential location information is also collected for the same.

This paper mainly concludes the reason behind the high use of the automobiles by individuals and corresponding factors to the same and to analyze the transit route choice decision. The travel mode choice results clearly highlight the part of travel time, number of transfers, walking time, and initial waiting time on the propensity to pick travel. Further, reduction in travel times by transit mode will bring about increase in the extent of riders utilizing transit. Consequently, public transportation agencies must think about how possible it is of giving direct services to downtown from different parts of the city and consider implementing exclusive bus lanes or bus prioritized signals to improve transit times within the Montreal region.

C.Kumar, B.K Mangaraj & T.A.S Vijay Raghavan[13]: This paper mainly includes the study of significance of different parameters affects the choice of mode made by urban transport users such as time, fare, comfort, reliability and accessibility etc. the research includes the user behaviour among all the choices available to the user. The model is made through Analytical Hierarchy Process. Different eight by eight matrices are

developed according to different criteria and then model is developed.

Other than a group of people belonging to Mumbai, who use the bus who utilize the transport as the favoured mode and work in government service spending more than INR 100 per trip consistency was not found for the most part of the categories however, there remains a clear pattern of choice among the various group with affordability being the highest valued in all groups and a few groups valuing time, safety and reliability e.g. consultants, managers or people travelling by car respectively. For such a definite analysis 112 respondents don't appear to be large enough sample. Ideally, the analysis should categorize respondents first through cities, and then Subsequent sub-categorization should be based upon mode used, income, vehicle, ownership and distance travelled. These subcategories would require a data set of nearly 600 respondents distributed among these cities for a robust analysis. The use of the Likart type scale is also recommended.

Maja M. POPOVIC, Jadranka J. JOVIC[14]: This paper includes the study of transport planning based on the survey of experts opinions and their concerning relations in modal split based on the transport system demand and transport supply which is defined through public transport travel time and city size. This system is useful for both less experienced planners and well experienced planners to apply their knowledge at both operational level and strategic level.

Considering the way that expert systems include utilization of computers, i.e. utilization of particular projects and "shells" to build-in an expert system, the procedure displayed in this paper should be formalized and changed for working in into the expert framework. This implies it is necessary to, most importantly, in more detail and on additional samples, estimate parameter values influencing development modal split and additionally their conditions. After that, it is possible to define such dependencies regarding mathematical models which should be calibrated in accordance with specific characteristics of each domain, and built in into the expert system's knowledge base.

3. CONCLUSIONS

This paper reviews on the different principles of mode choice analysis in the transportation planning process. Mode choice modeling directly deals with the behavioral aspect of human nature and it is necessary

to know that which are the factors that affects to make a decision. The overall result shows that in the metro cities of the developing countries day by day the use of the private transport is considerably increasing and the use of public transport is decreasing. Which also affects the economy of the country as transportation is one of the most important factor for any country. A perfect modal should be developed so that which can be utilised to improve the existing transportation pattern and further formation of new transportation system which could encourage people to use public transport instead of private transport.

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