MULTIMODAL TRASPORT SYSTEM: A CASE STUDY- SHAHIBAUGH TO VASNA

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Abstract : Ahmedabad is the largest and smart city of Gujarat state. The population of Ahmedabad city is estimated as 8.412 million (2018). High growth in number of vehicles has increased congestion on the road network and worsened air population in this city. There is a lack of parking space and road jam encroachment on road. To solve these problems we should introduce another mode for the road users. With the introduction of waterway transit system, we can provide the worth mode of transport to the users as it will decrease the travel time, travel cost, air and noise pollution and less traffic flow in study area.

IndexTerms **- Smart city, Population growth, Water ferry, Captive riders and Choice riders and Multimodal.**

I. INTRODUCTION

1.1 General

Ahmedabad city is one of the most important business centers in the western part of India. It also has well connected bus based public transport such as Bus Rapid Transit (BRT) system and city bus service. Metro rail is also under implementation in this city. The number of vehicles on roads is increasing in Ahmedabad. There were 2.38 million registered vehicles in the city in 2009-10. But now it has increased to 3.66 million (2016). As it contains the business centers, so it attracts the people for employment. Population is increasing day by day with that number of vehicles is also increasing. In the study area, there is no direct connectivity from Shahibaugh to Vasna. In this paper, another mode i.e waterway transit system is provided as a solution.

II. LITERATURE REVIEW

2.1 M. Steadie Seifi, NP. Dellaert, W. Nuijten, T.Van Woeseland, R. Raoufi. 2014 This paper presents a structured overview of the multimodal transportation literature from 2005 onward. They focus on the traditional strategic, tactical, and operational levels of planning, where they present the relevant models and their developed solution techniques.

2.2 AN Caris, Cathy Macharis & Gerrit K. Janssents. June 2008 The main study of this paper is about the intermodal freight transport which has received an increased attention due to problems of road congestion, environmental concerns and traffic safety. A growing recognition of the strategic importance of speed and agility in the supply chain is forcing firms to reconsider traditional logistic services.

This paper concludes that Intermodal transport has grown into a dynamic transportation research field. Many new intermodal research projects have emerged. An investigation has been made into planning issues in intermodal transport.

2.3 Dezhi Zhang, Runzhong He, Shuangyan Li & Zhongwei Wang. Plos oneSeptember 21, 2017 This paper focuses on the work which established a model to minimize the total cost of multimodal logistics service network design with time windows and environmental concerns. The proposed model incorporates CO_2 emission costs to determine the optimal transportation mode combinations and investment selections for transfer nodes, which consider transport cost, transport time, carbon emission, and logistics service time window constraints.

In this paper concludes with the proposal of a new model of a multimodal logistics service network design considering transport time, transfer time, and external CO2 emission costs. Based on the characteristics of the optimization model, two related algorithms, namely, GA and heuristic algorithm are provided to solve the problem.

2.4 Tejas Rawal, Dr. V. Devadas, Nand Kumar. ResearchGate In this paper author wants to say that with escalating nuisance of transportation demand and rapid urbanization in India, innovative solutions and methods are being evolved and borrowed from other countries. Over the last decade numerous Mass Rapid Transit Systems have come up in various cities like Metro Rails, Bus Rapid Transit Systems and Monorails.

This paper is an attempt to understand the Integrated Multi-Modal Urban Transportation for India. With the help of Delhi case study, efforts are made to identify the advantages, disadvantages and challenges of Integrated Multi-Modal Urban Transportation for Indian cities.

III. STUDY AREA
3.1 Briefing of the location

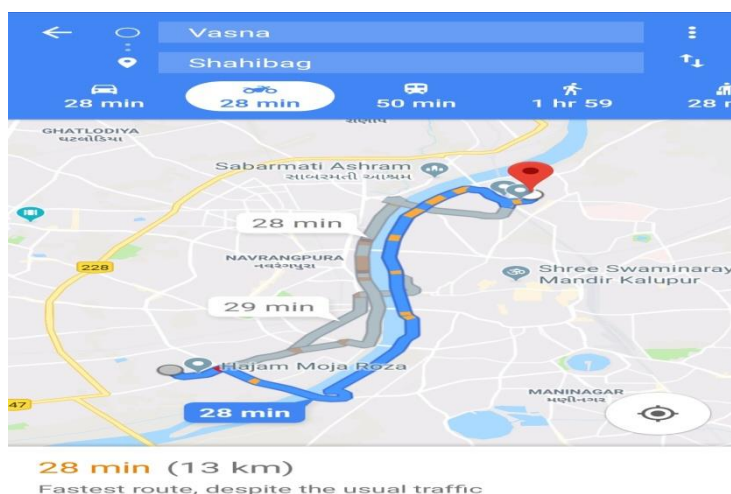In this research work, study area is from Shahibaugh to Vasna

Figure 3.1 Google map showing Route from Shahibaugh to Vasna

3.2 Modes of travel

In Ahmedabad, the number of trips by walk accounts for 32% of the person trips made daily. Two-wheeler has a share of 26% followed by public transport (11%) and car (8%) respectively. It is clearly seen that two-wheelers are the predominant mode of transportation in Ahmedabad. Public transport share is less than walk, cycle and two-wheeler based mode of transportation, whereas the Intermediate Public Transport (IPT) in the form of auto rickshaws has the lowest share among all the modes of transportation in Ahmedabad.

Table 3.1 Modal share in Ahmedabad

Mode	% Share
Public Transport	11
Car	8
Auto	7

IV. DATA COLLECTION FROM VARIOUS MODES

The static preference survey had been conducted for obtaining revealed preference based on questionnaire survey. A revealed preference questionnaire had been prepared for studying the behavior of commuters with respect to multimodal transportation system. The information required thus can be categorized into

- ❖ Personal information
- ❖ Household information
- ❖ Work – journey information

Normally there are four modes of transportation preferred by commuters in Ahmedabad for trip purpose.

- ❖ Private mode
- ❖ AMTS / BRTS
- ❖ Rickshaws
- ❖ Cab

As there is no direct connectivity of BRTS from Vasna to Shahibaugh no trips were observed for BRTS mode.963 interviews were carried out by road side interview method and work place interview method.

V. DATA ANALYSIS

5.1 DISTRIBUTION OF TRIPS BY MODE:-
- ❖ Mode 1:- Private vehicles
- ❖ Mode:-2:- Bus
- ❖ Mode:-3 Rickshaws

483 commuters were using mode 1, 297 commuters were using mode 2 and 183 commuters were using rickshaws.

5.2 USER'S INCOME GROUP:-
In this study commuters are classified into four income groups
- ❖ Group 1:- 0 - 2 lakhs – 12 commuters
- ❖ Group 2:-2 – 4 lakhs – 123 commuters
- ❖ Group 3:-4 – 6 lakhs – 408 commuters
- ❖ Group 4:- >6 lakhs – 420 commuters

5.3 AGE:-

Table 5.1 Age of Respondents

Age group (In years)	Commuters no.	Commuters %
<21	330	34
21-35	321	33
35-50	192	20
> 50	120	13

5.4 SEX:-

Table 5.2 Sex of Respondents

Sex	Commuters no.	Commuters %
Male	672	70
Female	291	30

5.5 PROFESSION:-

Table 5.3 Profession of respondents

Profession	Commuters no.	Commuters %
Student	363	38
Housewife	36	4
Business	93	10
Government sector	171	17
Private sector	300	31

5.6 TRAVEL TIME IN VEHICLES (TTIV):- Travel time in vehicles means the commuter's time consumed while he/she was in the vehicle for one way journey.

Table 5.4 Travel Time In Vehicles

Sr No.	TTIV (Minutes)	No. of commuters	(%)
1	0 – 15	165	17.2
2	16 – 30	301	31.3
3	31 – 45	158	16.5
4	46 – 60	264	27.5
5	>60	75	7.5

5.7 TRAVEL TIME OUT OF VEHICLES (TTOV):- Travel time out of vehicles means the commuter's time consumed while shifting from one mode to another mode, walking and waiting time for one way journey.

Table 5.5 Travel Time Out of Vehicles

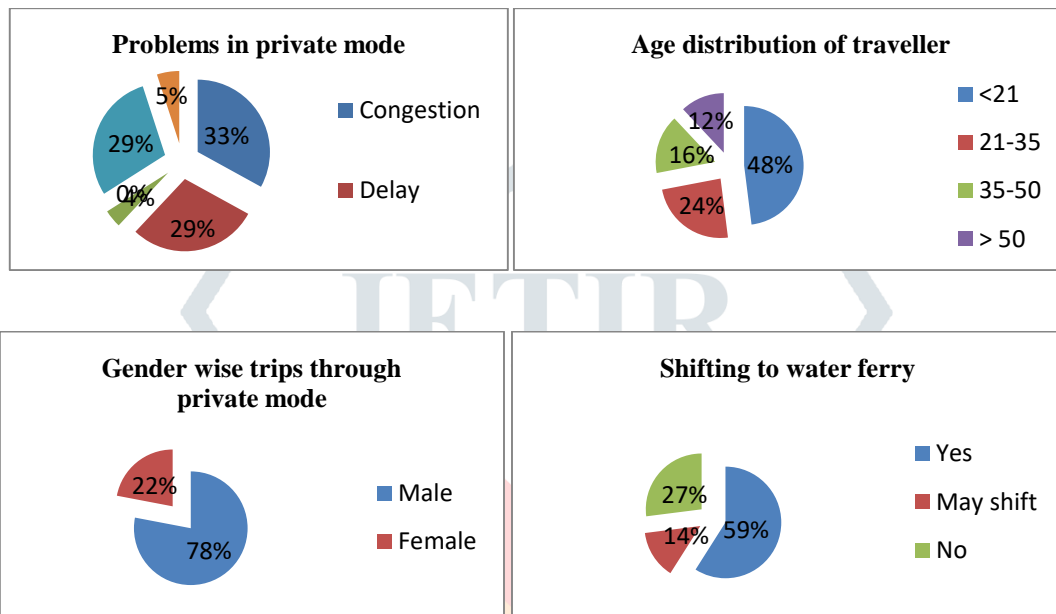| Sr No.	TTIV (Minutes)	No. of commuters	(%)
1	0 – 10	514	53.4
2	11 – 20	206	21.4
3	21 – 30	131	13.6
4	41 – 40	75	7.8
5	>40	37	3.8

5.8 TRAVEL COST:- Travel cost consists of overall travel cost for one way journey.

Table 5.6 Travel Cost of Respondents

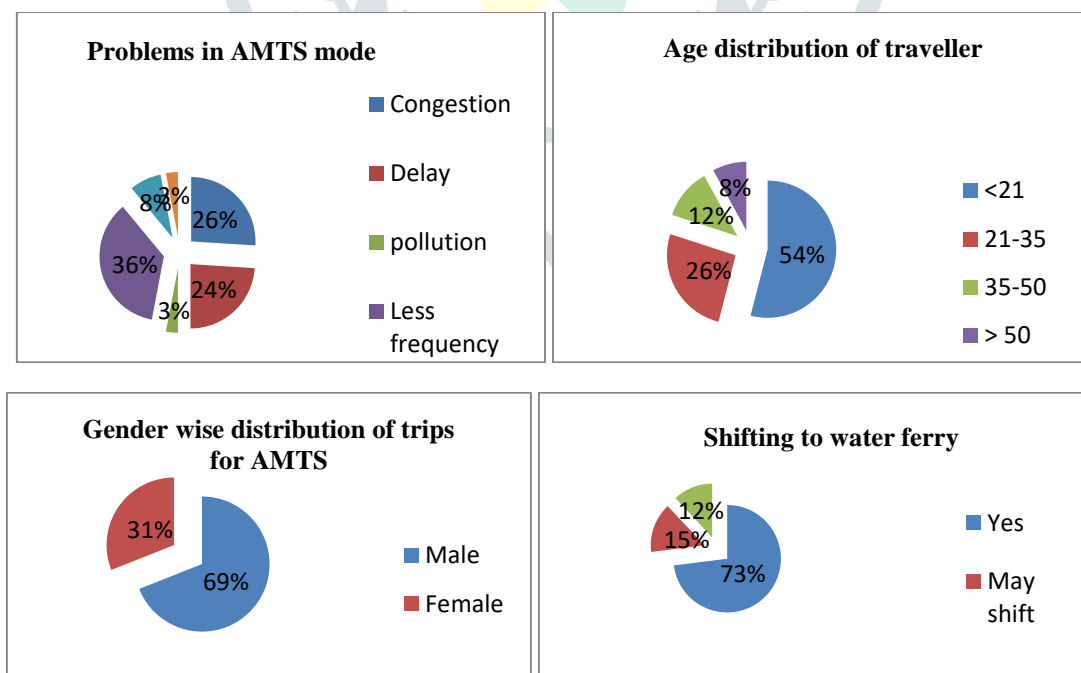| Sr No.	Cost (Rs.)	No. of commuters	(%)
1	0 – 20	229	23.77
2	21 – 40	317	32.91
3	41 – 60	183	19
4	60 – 80	125	12.98
5	>80	109	11.34

VI. WILLINGNESS TO PAY & SHIFT SURVEY
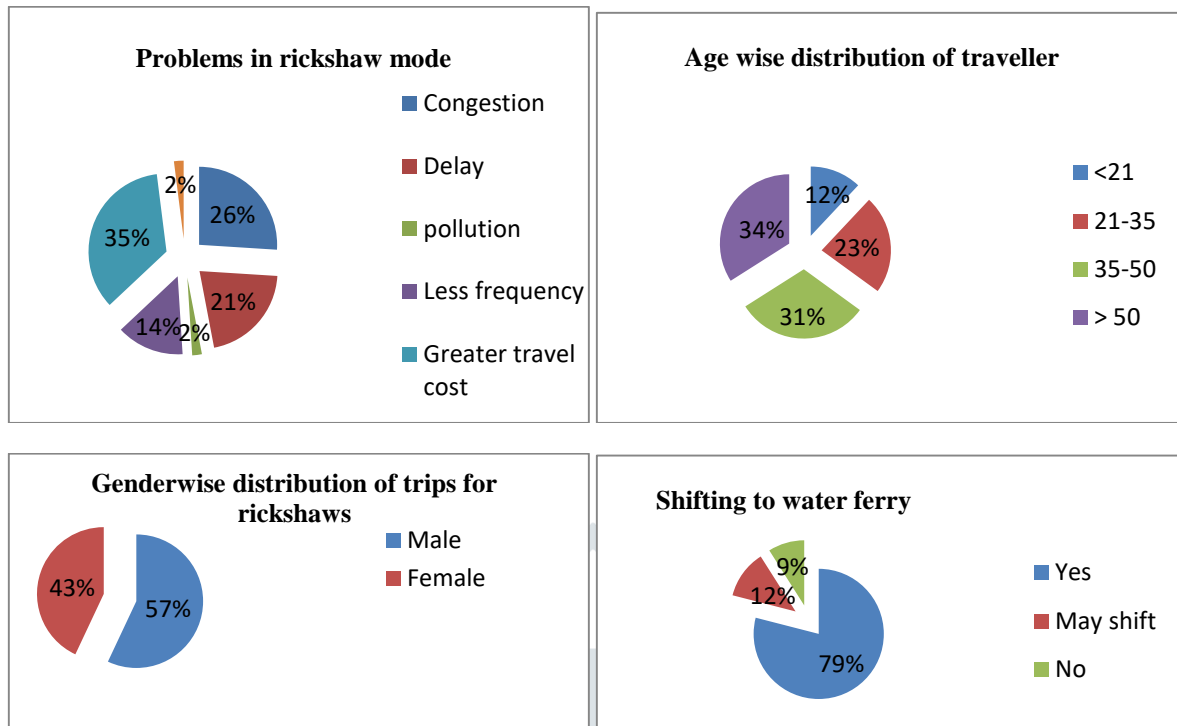
6.1 PRIVATE MODE:-

Graph 6.1 Private Mode

6.2 AMTS MODE:-

Graph 6.2 AMTS Mode

6.3 RICKSHAW MODE:-

Graph 6.3 Rickshaw Mode

6.4 CHOICE RIDERS AND CAPTIVE RIDERS:- The commuters having zero number of vehicles in family are normally considered as captive riders because they don't have choice between private transport and public transport. Choice riders are those who have at least one vehicle so they have choice between public transport and private transport.

Out of sample of 963 there are 189 commuters who don't have any vehicles. So we can say that there are 20% captive riders and 80% choice riders.

VII. SUMMARY OF DATA ANALYSIS

1.   Three modes are considered for present study purpose. They are private vehicles, bus mode and auto mode.
2.   Total 963 interviews were carried out by road side interview method at bus stand, auto stand and work place interview method
3.   50% trip makers were using private mode, 31% were using bus mode and 19% were using auto mode.
4.   Out of sample of 963 there are 189 commuters who don't have any vehicles. So we can say that there are 20% captive riders and 80% choice riders.
5.   85% respondents are having income more than 3 laks.
6.   Majority of respondents are students and employees working in private sector.
7.   If we consider commuters reply shifting and may be shift, average 84% respondents are willing to shift.
8.   The major problems faced by commuters are of frequency in AMTS mode, congestion in delay mode and cost in auto mode.

VII. ACKNOWLEDGEMENT

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