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INTRODUCTION

REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESIS (ES)

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

LIMITATIONS

SCOPE FOR FURTHER RESEARCH

REFERENCES

APPENDIX/ANNEXURE

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BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.

- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–23

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- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

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A REVIEW OF PUBLIC TRANSPORTATION SYSTEM IN AHMEDABAD WITH A FOCUS ON MANAGING URBAN TRAFFIC CONGESTION FROM PERSPECTIVE OF BEHAVIORAL ASPECT OF COMMUTERS

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ABSTRACT

With rising increase and development in the economy, urban traffic congestion has become a prominent problem with huge side effects like increased journey time, aggravated environment pollution, increased traffic and road accidents. The researcher aims to analyze reasons for the gap in the perception and expectations of commuters for public transport and thereafter suggest corrective actions to reduce gaps between commuters' expectation and their current experience. A sample size of 130 commuters was undertaken for the study wherein data was collected using a structured questionnaire and was analyzed using SPSS. Factor analysis and regression was run on the data and the findings of the research highlighted four prominent factors namely reliability, core service, tangibles and information which contributed to satisfaction level of commuters. The paper ends with a discussion on the implications of this study for policy makers in the domain of public transportation.

KEYWORDS
urban traffic congestion, commuters, public transport service, commuters' expectations, commuters' satisfaction, policy making in public transport.

JEL CODES
R41, L90, O18.

INTRODUCTION
Traffic Congestion
One of the major problems faced by any developing country today is the increase in urban population and automobile ownership which has in turn led to issues of traffic congestion in cities. Traffic congestion may be referred to the way the movement of vehicles is delayed by one another because of limited road capacity (Rahane & Saharkar, 2014). Alternatively, congestion is also caused when the demand for traffic nears or surpasses the capacity of the road network (Raheem et al., 2015). Traffic congestion means there are more vehicles trying to use a given road facility than it can handle. In major cities, this occurs mostly during certain times of the day usually called as peak periods or rush hours. (Kumarage, 2004)

Factors leading to congestion in developing countries may primarily be micro level factors like many people wanting to commute at the same time or large number of vehicles on road occupying limited space. Certain sporadic events like accidents and vehicle breakdowns, political rallies, mass gatherings and protests, etc. may also add to the micro level factors causing congestion on road. These micro level factors combined with macro level factors like rise in private vehicle ownership, employment and income levels, regional economic aspects, etc. explains the increase in traffic congestion. (Rao and Rao, 2012)

Importance of public transportation
For a developing country like India, its urban population plays a very important role in the growth. The UN estimates that by 2030, 40% of the Indian population will be residing in urban areas and 58% will do so by 2050. However, currently though only 30% of the total population live in urban areas, but they contribute to about 63% of India's Gross Domestic Product. With the urban population expected to rise dramatically in the years to come, it becomes imperative to have an efficient public transport system in order to avoid issues like severe traffic congestion, rise in road accidents and level of pollution, as well as a huge growth in the ownership of private vehicles.

The existing studies indicate that despite public transport facilities being operational in many urban cities, the commuters are largely dependent on private modes of transport, thus rendering public transport partially ineffective. Clearly, the public transport system is not able to keep pace with the auto boom which has resulted in commuters ditching public transport and are hopping on to their private vehicles.

Public transportation in Ahmedabad
The situation of traffic congestion in Ahmedabad is not very different from other metro and mega cities of India. Ahmedabad also belongs to the category of cities having its own fully developed public transport system namely AMTS (Ahmedabad Municipal Transport Service) and BRTS (Bus Rapid Transit System) and an upcoming metro rail which is expected to be fully functional by 2023. According to a study published in the Ahmedabad Mirror, the much-touted public transport in Ahmedabad should have led to an increase in the number of people opting for it. However, the reverse has happened wherein compared to 15% people using public transport in 2013, the percentage has gone down to 11% in 2019. The studies have also identified issues leading to the decrease in usage like first and last-mile connectivity and lack of integration between AMTS and BRTS on the bus routes. According to experts, integration of AMTS and BRTS in terms of routing, information sharing, and ticketing is a must for public transport to succeed in Ahmedabad (Dave, 2019). Thus, despite the efforts made by the local civic bodies, the usage of public transport is declining which can be interpreted as a failure of the transport system.

LITERATURE REVIEW
Factors leading to traffic congestion
Traffic Congestion is an unavoidable result of many factors like population increase, poor infrastructure, alternate routes and bottlenecks, as well as lack of efficient public transport (Thakur and Singh, 2016). However, the factors leading to traffic congestion differ based on the country. In India specifically, the major reasons for the traffic congestion are poor road conditions which can be attributed to road constructions, poor traffic sense among the citizens, inappropriate bus location and parking by the citizens. The remarkable increase in the number of vehicles on the roads as a result of rapid urbanization has also led to a rise in traffic volume, thus causing roads to be congested in every city in India. Whereas, in contrast to the factors in India, the major reason for traffic congestion in China is inefficient public transport service (Zhang 2011). Moreover, the increasing number mega cities in China also bring forth the disconnect between land use and transport leading to the generation of high motorized travel demand, ultimately leading to congestion on roads as well as public transport systems (Li, 2016 and Zheng et al. 2014). As stated in the report on study of road traffic congestion in Hong Kong (2014), the excessive number of vehicles on the roads is one of the primary reasons why traffic congestion arises. Yuan (1997) cited the major reason for traffic congestion in Singapore as small land space and large population during peak

hours of space. Besides this he also suggested that main reasons for the traffic congestion in Melbourne are increased road usage during morning and afternoon, underpricing of public transport, less alternatives for public transport. Thus, the factors for the traffic congestion can be divided into micro-level factors, which include the high number of people on the roads at the same time, and the overflow of vehicles on the limited road space; and macro-level factors, which include land use patterns, car ownership trends, and geographical economic development (Tilak and Reddy, 2016).

At times, as the population of a country increases, the demand for road travel also grows which is not complemented by the construction of new roads thus giving rise to congestion (Raheem et al., 2015). Some of the other contributors to traffic congestion are ineffective management of public transport (Harriet et al., 2013) and narrow as well as poorly constructed roads (Jain et al., 2012). Also, incidents such as roadworks, prompt the occurrence of bottlenecks and accidents, which in turn cause traffic congestion to take place (Schwietering & Feldges, 2016). Few researchers also explored possible ways to identify and measure metrics for urban arterial congestion hoping that awareness for the level of congestion might help in managing it better. Amudapuram Mohan Rao, Kalaga Ramachandra Rao (2012) carried out a systematic review based on measurement metrics such as speed, travel time/delay and volume and level of service. The review covered distinct aspects like definition; measurement criteria, strengths and weakness followed by different countries/organizations.

Adverse effects of traffic congestion

Other than causing inconvenience, congestion has also been found to reduce productivity of the city as mobility is restricted due to congestion, causing excessive travel delays, particularly, during peak hours and negatively affecting productivity (Takyi Harriet, Kofi Poku, Anin Kwabena Emmanuel, 2013). Therefore, expanding transport infrastructure as well as improvement in the traffic management and control system should be given attention to improve the transportation system. This would enhance worker productivity and ultimately increase GDP. M. Absar Alam and Faisal Ahmed (2013) studied the traffic scenario in select Asian cities and the policy measures undertaken by their respective governments. They revisited the relevant policies in India and assessed the gaps that deter the desired impact of such policies on reducing traffic congestion. Thereby suggesting policy measures to overcome these gaps and the way ahead. Dorina Pojani and Dominic Stead (2015) critically reviewed the potential role and impact of nine commonly considered options for sustainable urban transport in cities in developing countries: (1) road infrastructure; (2) rail-based public transport; (3) road-based public transport; (4) support for non- motorized travel modes; (5) technological solutions; (6) awareness-raising campaigns; (7) pricing mechanisms; (8) vehicle access restrictions; and (9) control of land-uses.

Various side effects of traffic congestion like waste of time, delayed movement, accidents, inability to forecast travel time, increased fuel consumption, road rage and environmental pollution have been identified (S. B. Raheem, W. A. Olawoore, D. P. Olagunju, E. M. Adeokun, 2015). Several strategies like road widening, providing contra-flow lanes, infrastructural changes, increasing the occupancy factor of vehicles and creating awareness among travelers have also been suggested for preventing the traffic congestion (Soham Sarda, Janhavi Chavare, Rohit Bhosale, 2018). Makino et. al (2018) proposed methods for the utilization and intro-duction of ITS (Intelligent Transport Systems) technologies to solve urban traffic issues in various countries, based on the lessons learned from the deployment of an ITS in Japan. A broad overview of the causes of urban transportation problems has been given which included the role of the public sector in urban surface transportation as well as the importance of policymaking (Terry Moore and Julia Pulidindi, 2018).

Importance of public transport

It is imperative that traffic congestion in urban areas be managed and reduced as the congestion leads to various negative consequences which hugely disrupts the working of an economy. The importance of public transportation cannot be undermined as one of the steps being taken to curb congestion. The quality of public transport can be determined from five major factors namely reliability, comfort, service, safety and affordability (Sahney, Pagano & Paaswell, 2004). These factors have been popularly referred to as RECSA, which is a modification of RATER (given by Parasuraman et. al in 1988). Certain internal and external factors which form the service quality, affects the commuters' perception towards public transport system (Middleton, 1998). Factors like service quality standards (Mid-dleton, 1998) and customer complaints handling system (Kotler & Kavin, 2008) consist of the internal factors, where as availability of alternative services (like own vehicles, autorickshaws) (Evans & Shaw, 2001; Michel, 1999), convenience and comfort (Regis, 1996) and social status as well as profession (Sanchez, 1999) form the external factors.

Therefore, it is very essential to identify the parameters of public transport which are favored by the commuters. Through this study, the researcher aims at identifying the importance given to various public transport parameters by the commuters and in turn how satisfied are they with the current state of public transport in Ahmedabad city. A study on past articles and research papers suggest that various studies have been undertaken for development of public transport systems in India and across the world. However, the factors contributing to the preference of public transport system by citizens have not been paid due im-portance, which has led to people not using public transport systems as they were expected to. A gap exists between expectations of citizens from a public transport system and delivery of the same by government, thereby leading to inefficient usage of public transport and increasing the congestion caused due to private vehicles on road.

OBJECTIVES
1. To identify important factors related to usage of public transport services by commuters
2. To explore underlying dimensions based on the set of such factors
3. To study effect of these dimensions on commuter's satisfaction towards public transport services

RESEARCH DESIGN, SAMPLE AND DATA
The research design is divided into two parts, the first part being exploratory in nature and the second part being descriptive. In the exploratory study the variables affecting the usage of public transport were found from the existing literature by review of the same. These variables have been taken into consideration while designing the questionnaire. 150 commuters were contacted for the study, out of which 130 questionnaires were considered valid for further analysis. For data collection, Ahmedabad city was divided into five geographical zones and data was collected from each zone thereby providing an apt representation of population. The commuters were contacted at respective bus terminals which were used by them for their daily commute.

ANALYSIS AND DISCUSSION
Sample profile has been shown in the Table I. From the total 130 respondents, 62% are from the age group 15 to 35. Majority of the respondents (80 %) are using the public transport for going to their workplace or school/college. Further, 58% of them are daily commuters 19% of them are using public transport on special occasions only. 70% of the respondents have acquired higher education and 80% of the Commuters are having family income of less than 5 lacs per year. The commuters have given almost equal preference towards the two major public transport services available in Ahmedabad (i.e. AMTS & BRTS).

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TABLE I: SAMPLE PROFILE & USAGE BEHAVIOR

		Frequency	Percent
	15-25	49	37.7
	25-35	41	31.5
Age group	35-45	19	14.6
	45-55	13	10.0
	55-65	5	3.8
	>65	3	2.3
Marital Status	Married	64	49.2
	Single	66	50.8
	Student	36	27.7
	Housewife	16	12.3
Occupation	Self Employed	5	3.8
	Service	68	52.3
	Retired	5	3.8
	< 2Lac	17	13.1
Family Yearly Income	2Lac - 5 lac	86	66.2
	5 lac - 10 lac	23	17.7
	> 10 lac	4	3.1
Educational Qualification	Undergraduate	17	13.1
	Graduate	67	51.5
	Postgraduate	29	22.3
	Professional	3	2.3
	Others	14	10.8
	< 1year	11	8.5
	1-2 years	41	31.5
Years of Usage	2-3 years	35	26.9
	3-4 years	18	13.8
	4-5 years	14	10.8
	>5 years	11	8.5
	Daily	75	57.7
	Once a week	25	19.2
Frequency of Usage	once a month	5	3.8
	Only on special occasions	25	19.2
	Car	13	10.0
	Two-wheeler	47	36.2
Mode of Travel	Rickshaw/Taxi	37	28.5
	Public Bus	32	24.6
	Walk/Bicycle	1	.8
Preferred Public Transport	AMTS	59	45.4
	BRTS	71	54.6
	Total	130	100.0

EXPLORATORY FACTOR ANALYSIS

To explore the underlying dimensions from the 16 factors affecting commuter's behavior towards public transportation services, exploratory factor analysis (EFA) was performed using SPSS software. EFA is widely used data reduction technique to identify factors from a set of correlated variables. In this study, 16 variables were identified from the literature review which commuters consider as important while using public transportation services like AMTS or BRTS. These variables were factor rotated using varimax rotation technique. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (*.760*) and Bartlett's Test of Sphericity (*Chi-Square = 458.160, df = 105, Sig.*
=. 000) provided evidence for suitability of the data to perform EFA. From initial 16 variables, based on low communality value, one variable (safety during travel) was dropped from further analysis and a final factor structure of 15 variables was identified as shown in the Table II.

TABLE II: RESULTS OF FACTOR ANALYSIS

Factors	Factor Loadings	Communalities
Core Service		
Fare collection system	0.807	0.706
Staff attitude	0.742	0.622
Route coverage	0.622	0.416
Accessibility	0.603	0.705
Safety	0.587	0.479
Convenience	0.492	0.465
Reliability		
Frequency	0.711	0.523
Comfort	0.632	0.469
Travel time reliability	0.607	0.394
Travel fare	0.523	0.451
Waiting time	0.508	0.624
Punctuality	0.42	0.478
Tangibles		
Physical condition of bus	0.774	0.665
condition of bus stop	0.73	0.633
Information		
Scheduling information	0.863	0.746

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.=.760

Bartlett's Test of Sphericity: Chi-Square = 458.160, df = 105, Sig. =. 000

Rotation Method: Varimax with Kaiser Normalization

As shown in table II, EFA resulted into a 4-factor structure which were named as *Core Service, Reliability, Tangibles, and Information* respectively. All the 15 variables loaded adequately on their respective dimensions as demonstrated by factor loadings (minimum factor loadings of.42 for punctuality). For a sample size of 130, minimum acceptable factor loading is 0.4 (Hair et al, 2007).

The dimension of "Core Service" covers the core benefits like ticket distribution and fair collection system, safety, convenience, easy access of the service, adequate coverage of different routes in the city, and behavior of the staff. For any public transport service, it is of prime importance to fulfil these aspects as they are considered as the central elements of the overall service. The second dimension of "Reliability" covers frequency of buses, punctuality of their arrival at the bus stop, reliability in terms of timings, minimum waiting time and economical fairs. The third dimension of "Tangibles" covers the tangible elements of the public transport service like physical condition of the bus and the bus stops. Poorly maintained and uncleaned buses as well as bus stops may prevent commuters from adopting public transport services as their regular mode of transportation within city. Providing adequate and detailed information about scheduling of buses made up the last dimension of "Information".

Further, to verify how the four dimensions identified through factor analysis, affects the overall satisfaction of the commuters towards public transport services, regression analysis was performed with overall satisfaction as dependent variable and the factor scores from factor analysis as independent variables. The results of the regression analysis are presented in Table III.

MODEL SUMMARY

R^2 = 0.399 F   =22.41   Sig.   = 0.000

TABLE III: REGRESSION ANALYSIS

Regression Coefficients		
	β	Sig.
Core Service	0.504	0.000
Reliability	0.305	0.000
Tangibles	0.243	0.001
Scheduling Information	-0.107	0.120

Dependent Variable: Overall Satisfaction

As shown in the Table, the model is fit (F = 22.41, Sig. =.000) and it explains 40% of variance of the dependent variable (as R^2 =.399). Out of four factors, Core Service (β =.504, p=.000), Reliability (β =.305, p=.000) and Tangibles (β =.243, p=.000) were found to have significant effect on overall satisfaction. Thus, the factors identified through factor analysis are found to be important predictors of commuter's satisfaction towards public transportation services.

IMPLICATION AND CONCLUSION

The findings of this study have significant implications for the policy makers in the public sector. Since the policies of public transport are designed for the residents, therefore it would certainly help to know the factors which they consider important for using a public transport as well as their satisfaction towards those factors with respect to existing public transport systems. A huge investment is made by any state government towards its public transport systems and it is only fulfilling that the systems are efficiently used by the citizens, thereby reducing the use of private vehicles on roads ultimately leading to decreased congestion. The study has identified four factors namely core service, reliability, tangibles and information, which are extremely essential for commuters to regularly use public transport. Thus, the local authorities or civic bodies can focus on the above-mentioned factors to increase the usage of public transport among commuters and get the non-commuters to start using the transport systems.

LIMITATIONS OF THE STUDY

The study has certain limitations. Firstly, since the sampling is done based on convenience sampling, therefore concrete conclusions cannot be drawn as the data might not be representative of the entire population. Secondly, the study focused only on the individual commuters thereby ignoring the viewpoint of other stakeholders like government as well as other civic bodies related to public transportation. Lastly, viewpoint of non-commuters has not been considered in this research.

DIRECTIONS FOR FUTURE RESEARCH

Since India is a developing country, therefore the public transport systems are still evolving. Hence, the study can be replicated in other cities and states where various public transport systems run by their respective authorities can be studied and the results can be generalized across the country. Secondly, since the current research considers only commuters as the sampling unit, therefore an extensive study can be conducted on the non-commuters and factors can be iden-tified which may persuade them to take up public transport for their commute. Moreover, research can be carried out with larger sample size to develop a

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conceptual framework wherein impact of traffic congestion on society and economy can be computed. More detailed analysis of the factors causing urban congestion can be analyzed. Various solutions leading to the mitigation of urban congestion in Ahmedabad can be another area of research highlighting the importance of alternative mode of transportation.

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