A Factorial Evaluation of Commuters' Satisfaction on Urban Mobility – An Indian Perspective

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Abstract

Major Indian cities experience traffic choking from early morning, and commuters face extreme difficulty in reaching their destinations. Many surveys and empirical research results concluded with loads of suggestions for the government and transport agencies in India in terms of reducing traffic congestion and raising the commuters' satisfaction. It is observed that travelling during late night in major Indian cities is also equally precarious and problem-inviting. This paper explored the problems faced by commuters travelling during late night in Bengaluru. The paper brought out the main findings of a field survey (that was conducted during late night) on commuters travelling by cabs as well as by public and private transport. Convenience sampling was used to select 120 respondents, and the data were collected through a structured questionnaire. Responses were taken randomly from the commuters during the night from both commuters and drivers. The study observed 19 statistically significant variables out of 32 variables selected from previous studies and a pilot study that was conducted, which influenced the satisfaction of commuters travelling in the city of Bengaluru. These variables were further grouped under 10 factors. The study used multivariate analytical tools to obtain results regarding the perception of commuters on travelling satisfaction. Interestingly, the respondents were not found to be safety conscious in the city of Bengaluru and were found to be less aware about safety while travelling, especially at late night.

Keywords : **transport modes, commuters' safety, public transportation, road transportation, late night transportation**

JEL Classification: H54, H10, H11, H19, N7, R41

Paper Submission Date : July 23, 2018 ; Paper sent back for Revision : October 16, 2018 ; Paper Acceptance Date : October 25, 2018

Travelling everyday within a city is an important aspect of our lives that demands a lot of our valuable time. Commuting during odd hours in Bengaluru is even more difficult as travelling during the day. This paper analyzes the difficulties of the commuters travelling by road either by own vehicle or by rented cabs and public transportation during late night and early morning. Major Indian cities are not suitable for safe and comfortable commuting for the locals as well as for migrant workers. In Bengaluru, dwellers travel frequently between home and work-place either by government/private buses, metro trains, own vehicles, and taxicabs. Regardless of timings and destination of travel, it has been noted that individuals are exposed to differentiated levels of risk of crime (Hägerstrand, 1972). Transport nodes may be defined as roads and those places along the

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road where people come together to embark or disembark on transportation in order to reach their destination. Even after commuters opt for a means of transport, they have to encounter various hitches like safety issues for women or non-availability of necessary or emergency possessions as most of the stores in Bengaluru are closed after 11 pm. In Bengaluru, which is the hub of information technology and software business in India with a floating population, the transportation facilities are far from adequate. Night life in Bengaluru is extended, but there is an absence of a reliable transport system during the night. BMTC (Bangalore Metropolitan Transport Corporation) being a major public transport system in Bengaluru does not operate after 10 pm, which is a major hindrance to the night travellers of Bengaluru.

People in Bengaluru spend most of their time travelling. Bengaluru's IT and other industrial sectors are flourishing rapidly. These establishments require providing services to their clients all over the world 24 ×7, which requires employees in Bengaluru to work night-shifts. This brings the need for providing efficient transportation facilities round the clock. Absence of a reliable transport system during the night is a major problem, particularly for women commuters. Numerous surveys have been conducted around the world on commuters' problems during the peak hours. However, research on commuters' problems and grievances during the night is not documented, which encouraged us to select this relevant topic for survey and analysis. This study involves identifying the travel related expectations of road commuters during night time. The study involves suggesting the extended possibilities of measures that can be implemented to improve commuting at night in Bengaluru.

Review of Literature

Commuting has become inevitable for working professionals in Bengaluru. Due to heavy traffic and commuters wasting quality time, it leads to stress and loss of productivity. It also drives dissatisfaction from the residential location (Koslowsky, 1997) to the work place. In a study conducted by Bureau of Labor Statistics, United States, published in September 1999 , it was concluded that as transportation costs increase, family budgets come under strain. Regrettably, the nature of public investment and development patterns is not sufficient enough, due to which families have to rely on their personal vehicles to reach offices, stores, doctor's offices, and to run life's other daily errands. Even with relatively good density of public buses, private cabs, metro trains, and autorickshaws in Bengaluru, a middle income group family spends about 20% of its income on commuting costs. The situation becomes worse while travelling during late night or very early morning. According to a study, commuters report physiological symptoms such as tiredness, stiffness in muscles and joints, lower back pain, and various psychological symptoms such as anger, nervousness, tension, negative mood, and difficulty in focusing attention. For users of public transportation, these problems mainly arise from unreliability of services and delays. For car users, these problems generally arise from traffic volume and driving behavior of other road users (Koslowsky, Aizer, & Krausz, 1996 ; Lyons & Chatterjee, 2008).

In a city like Bengaluru, lack of proper time schedule of public transport, poor time management, and huge number of commuter rush every day is major drawback in the transport system. Around 48 lakh commuters use the public transport system in the city to commute every day and ,therefore, commuters in such a huge number need a common forum. Common forums are need of the hour due to a number of reasons, including high fares and sexual harassment of women while commuting. Emre and Elci (2015), in their empirical work, investigated the commuting related problems in the workplace, which revealed that commuters found long distance commuting very much stressful and it affected their productivity. Their study concluded that cost effective travelling always carried a positivity to the workplace. In various studies, it was found that stress level, travelling experience, driver and companion behaviours are some of the important factors, which influenced the commuters' satisfaction levels.

Goswami, Kumar, and George (2015) arrived at a conclusion that commuters found very less street light on the road which made them feel unsafe while travelling during the night. Also, implementing public transport during the night would motivate them to travel without any hesitation during the night. The authors signified the involvement of local government in improving the commuting experience.

Patankar (1991) identified major problems faced by passengers during their travel and concluded that the behaviour of the crew members was very important in improving the commuting experience. Cleanliness of the vehicle was also very important to improve the satisfaction level of the commuters. Along with this, punctuality was also another important factor, which influenced commuters, for example, a delay in pick up and drop affected commuters' perception towards the travelling experience. Advani and Tiwari (2005) determined that travel demand in India is increasing rapidly, but there are insufficient transport facilities available to meet the demand. Due to increase in private vehicles, the public transport providers are not able to provide good services to the commuters as the number of people using public transportation is decreasing. Evans and Wener (2007) examined the impact of environmental stress and concluded that exposure to stressors such as traffic congestion could have serious implications, such as causing motivational deficiency. The negative effects of an environmental stressor are more pronounced when there is no control or perceived control over the situation, as is the case with traffic congestion. Stress induced by traffic congestion has also been linked to increased absenteeism, which may lead to low productivity and low efficiency in tired workers (Bhat & Sardesai, 2006).

Professionals in major Indian cities today are living in quite a challenging environment. In major metropolitan cities, traffic blockades are very common, which affects the commuters' health and further leads to traffic accidents. In Bangalore and other major cities in India, traffic accidents have become a critical area of concern and pose a severe mobility hazard. In view of the above, trends and dimensions of road traffic accidents in India need to be addressed so that stressed road traffic management mechanisms can be improved to mitigate the risk on the road (Sandhu, 2012). Roy, Bandyopadhyay, Das, Batabyal, and Pal (2013) stated in their work the importance of innovative and creative technologies such as : monitoring systems using GPS technology, dynamic vehicle routing system based on online map service, etc. With innovative technologies, traffic congestion detection can be improved and unpleasant happenings on the roads can be avoided.

Sufficient literature on the problems encountered by night commuters is not available in the Indian context, especially with reference to the city of Bengaluru. To avoid traffic congestion, which leads to a bad experience for the commuters, the Police department in the city of Delhi is working on a four-point strategy: Improving implementation of traffic regulations, ensuring road safety education, developing engineering solutions, and formulating viable enforcement strategies with an object to make commuter's travelling a pleasant experience (Choudhury & Gupta, 2015). In view of the above empirical findings, it is imperative to research further on the commuter's satisfaction while commuting daily in a metropolitan city in India and come out with suggestions for solutions.

Based on the above research gap, three objectives have been selected for the current study :

(1) To study the existing literature on commuters' problems while travelling by public transport,

(2) To measure the impact of satisfaction with respect to mode of travel, purpose of travel, and companion to travel by road,

(3) To analyze and suggest the factors influencing commuters commuting by road during early morning and late night.

Research Issues and Hypotheses

Empirical evidence on demographic categorization on the basis of mode of transport, purpose of travelling, timing

of travelling, co - travellers has not been addressed considerably. Various attributes in terms of problems faced by commuters has been documented by previous researchers, for example, psychology related, stress related, safety related, but issues related to availability of basic amenities, basic medical emergencies, information-related services on vehicle and cab drivers, etc., need to be tested with reference to the city of Bengaluru. The present study needs to be viewed as a humble step in the direction of building reliable and valid database about the commuters' sentiments towards satisfaction while travelling during late night or early morning in Bengaluru. Assessment of the commuters' satisfaction with other constructs under investigation is also one of the major objectives of the present study.

A theoretical backdrop of the relationship between commuters' satisfaction with other constructs and the accompanying hypotheses are as follows :

- **$H0_1$:** Mode of transport does not influence the satisfaction level of passengers travelling during late night and early morning.
- **$H0_2$:** Mode of transport does not influence the safety perception of passengers travelling during late night and early morning.
- **$H0_3$:** Thirty-two variables as selected for the study do not significantly influence the satisfaction level of the passengers travelling during late night hours by road transportation.

Research Methodology

A pilot survey was done by considering cab drivers, night shift employees, as well as auto rickshaw drivers, including passengers travelling as respondents during late night and early morning hours in the city of Bengaluru. The data collected from the pilot survey was grouped under different heads based on the type of factor. Among the total respondents, 41% said that they faced safety issues while commuting in odd hours, 22% faced some kind of medical emergencies, 15% of the respondents faced some problems in availability of basic amenities, and 22% of the respondents felt that they wanted better commuter forums and some solution from the managements of the transport agencies. Based on the outcomes of the pilot survey, a final questionnaire was prepared to meet the objectives of the study. Primary data were collected from late night commuters who used public transportation, cabs, and those who were using their own vehicles. Responses were collected from highways, near railway station, bus stops, airport, major hospitals, Electronics City - where workers work for IT companies, and industrial areas - where workers travel to reach for the night shift. The study used convenient sampling method and responses were collected during January 10, 2018 to April 30, 2018. Selection of a sample was challenging since Bengaluru city has a huge population. Considering the cost and time constraints, a sample size of 120 respondents participated in the study. The data were collected for the study from 11 pm to 6 am. Based on the objectives defined, three hypotheses that have been created were tested with the help of the following statistical tools - descriptive statistics, ANOVA, principal component analysis, and multiple regression.

For the study, it is imperative to understand the late night travelers, which was very challenging in terms of getting appropriate reliable data. From various secondary sources, we collected data related to the number of vehicles plying in Bengaluru. We also considered the modes of transport and their presence on roads on a daily basis. On account of time, cost, and resource (people) constraints, a small sample size was considered, which may be taken as a scope for further research.

Defining demographics (refer to Table 1) is imperative to project the respondents considered for the study. Taking this further, the present study has categorized commuters, travelling during wee hours, according to the objectives. Based on the scholarly papers and news articles reviewed and opinions during pilot survey, it is summarized that problems to commuters travelling in wee hours are not affected by their age, income, and gender.

Table 1. Variables Explained

Sl.No	Independent Variables	Description
1	**SOS Option in an Application**	During early 2015, Uber Technologies Inc. (Indian division) introduced a technology which supports SOS option in cabs. This system is already coming in force in few developed nations. We received a very positive feedback from the respondents on SOS option in cabs while driving late in night.
2	**Vehicle's Comfort and Safety**	During pilot survey, commuters travelling during late night preferred comfort and safety inside and outside the vehicle and opined to make available a quality certificate for the passengers which will ensure the vehicle is safe and comfortable to travel. Gubbins (1988) defined quality within the context of public transport as specifically referring to the way in which a transport organization looks after the passengers in its care during a journey.
3	**Quality Check for Vehicle's Technical Soundness**	Technical soundness is vital in any journey by road, especially at night. Travelers shared their experiences and opined that their safety and satisfaction will significantly positively have influenced if they are provided with certificate of vehicle's technical soundness.
4	**Driver's Basic Medical Knowledge**	During pilot survey, when late night travelers were asked their opinion on the driver's basic (first-aid) knowledge and his skill on how to handle a minor accident, majority of the respondents agreed to include this variable in our research. Respondents felt that it will decrease the initial stress level of passengers after a minor accident.
5	**Drivers' Technical Knowledge**	Vehicle breakdown while commuting during 11pm to 6am can be a nightmarish experience, and which is happening too often. Driver's technical knowledge on change of tires, knowledge of minor repair, minor engine issues, and battery heat up-coolant issues can extensively effect the commuters' satisfaction.
6	**Driver's Locational Knowledge**	The driver's locational knowledge of Bengaluru city without relying on Global Positioning System (GPS) will be an added catalyst to drive commuters' satisfaction.
7	**Location Tracking Through Text Messages**	This option was used by the commuters who were not using smart phones. Transport services providers constantly send messages of the travelling location till they reach the destination.
8	**Cleanliness of the Vehicle**	Waiting time, cleanliness, and comfort are shown to be the public transport variables that users most valued, but the degree to which they are valued varies according to the category of user (Dell'Olio, Ibeas, & Cecin, 2010).
9	**Ratings of the Driver**	High ratings of a cab driver signifies the level of trust. Previous rating information availability is a major driver of passengers' satisfaction level.
10	**Driver Information (such as number of accidents encountered; health status of driver, etc.)**	Excess mental and physical stress of cab driver can influence driving performance and increase crash likelihood. The level of stress can also vary based on different driving conditions. Pilot survey findings also confirmed this factor as a significant one (Hill & Boyle, 2007).
11	**Private Pay and Parking**	Frequent night travelers, including drivers, voted for the option of parking their private vehicle safely on payment basis.
12	**Access to Nearest Food Stores**	Access to nearest authentic food stores during 11pm to 6am, especially while travelling for a long time would also drive the satisfaction level, as suggested by the commuters in the pilot survey.
13	**Availability of Petrol/ Diesel Cans in Emergency**	Sometimes, this nasty situation may give pain while travelling during 11pm to 6am. Some designated places within the network of the transporter may supply small quantity of petrol and diesel, which may increase the level of safety and satisfaction of commuters.
14	**Availability of Repairing Services**	Majority of the respondents mentioned that commuters' satisfaction will be influenced if vehicle repairing facility is available in case of emergency breakdown.
15	**Care Taker for Old and Disabled**	Many studies have focused on the disabled. However, less research has been devoted to the specific area such as public transport terminals. A person accompanying an aged person or disabled people while travelling alone during late night or early morning could be a very essential service, especially to unload the luggage, help to cross the road, and take care of them during long distance travelling (Soltani, Sham, Awang, & Yaman, 2012).

16	**Availability of Emergency Lodging Facilities**	Commuting during 11 pm to 6 am can be unpleasant in case the vehicle breaks down due to technical fault. Respondents suggested that transporters (cab service providers) should help to provide boarding and lodging facility within their network hotels.
17	**Rescue Service (Documents Forgotten or Lost)**	It surfaced from the interview with commuters that they may forget to carry important documents while travelling to airports/railway station, etc. In such circumstances, if a facility is offered by cab service providers to pick up and drop of those left out important documents, things, cards etc., it would greatly enhance the satisfaction level of night travelers.
18	**Public Urinals (Male and Female)**	This variable was included due to the responses from women travelers. While driving and commuting, locating the public urinals is difficult. Suggestions came in pilot survey that such facility arrangement by cab services partnering with other agencies will make the late night travel comfortable.
19	**Satellite Medicare**	If access to certain small satellite medicine counters are available throughout late night and are networked with cab services, then it will give the passengers a sense of security and safety.
20	**Emergency Access to Nearby Hospitals**	The option of access to the nearest specialty hospitals in case of emergency when majority of the medical centers are either closed or do not address emergency calls.
21	**Accessibility to Nearest Pharmacy**	During 11pm to 6am, majority of the pharmacies are found to be closed. Drivers and passengers both expressed that if transporters have network with 24 $\times$ 7 pharmacies, it will give them feel of safety and satisfaction.
22	**First Aid Box Inside Vehicle**	First aid kit is a mandatory requirement for any vehicle, but it was found to be violated by transporters, compromising with the safety of the passengers. This factor was found by authors influencing the present study.
23	**Availability of Doctors During Emergencies**	Commuters, especially kids and senior citizens, are always vulnerable and prone to face medical emergencies. During such circumstances, availability of doctors play a prominent role. Respondents shared their views on having network of doctors and nurses who are willing to accept the emergency calls. So, this is being considered for testing the satisfaction of night travelers.
24	**24/7 Ambulance for Passengers**	Based on the experiences of many late night travelers, it surfaced during pilot survey that availability of ambulance services in major highway / city junctions within the limits of Bengaluru city would impact the commuters' satisfaction.
25	**Availability of Calling Facility from Vehicles**	Majority of the women commuters voted for availability of calling facility within the commuting vehicle during odd hours. Though such facility has been implemented in developed nations, but still, in India, it is in the planning stage. This is found to be a variable to have a positive impact on the commuting experience.
26	**Government Transport Availability During Late Night and Early Morning**	Government transport in a city like Bengaluru has proved to a necessity for lower / middle class commuting population. This variable has been considered to capture the perception of those class of travelers.
27	**Prompt in Arrival After Booking**	In absence of government transport during late night and very early morning hours in Bengaluru city, the commuters have to depend on the private transport options like cab services. Pilot survey and initial recording of respondents' views concluded that prompt arrival of the vehicle at the right time and at the right place is very much required for women and aged travelers. Overall, PT users see the service attributes : on-time performance, travel speed, and service frequency as the most important, followed by personnel/driver behavior and vehicle tidiness. A generic policy aimed at achieving these attributes may yield favourable results with respect to satisfaction (Mouwen, 2015).
28	**Transparency of Prices**	It is evidently known that the service providers charge comparatively higher prices in odd hours to commuters as compared to people travelling when the sky is light. There is lack of transparency in pricing not only by unorganized autorickshaws plying in Indian cities like Bengaluru, but also by organized cab services organizations. This variable will exhibit how far it impacts the commuting experience of commuters during odd hours. Rothenberger (2015) proposed that fairness of service provider's prices affected commuter judgment and their satisfaction levels.

29	**Prepaid Auto/Taxi- Near Major Bus / Rail Stations/ Airport**	Prepaid cab options, as regulated by government rates, are very much helpful, especially for commuters coming to Bengaluru city via flight or trains from other states during late night.
30	**Increase in Night Patrolling**	In the recent decades, Bengaluru city has transformed into a pool of people who hail from vivid cultures and various parts of India. These people also form a considerable part of commuters commuting in odd hours within the city. Increase in night patrolling by police team will help drivers and commuters travelling during late night/early morning. Levitt (1997) suggested that a 10% increase in deployment of police officers during odd hours leads to reduction of around 3% in crime rates.
31	**Language Skills of Drivers**	In the recent decades, Bengaluru has transformed into a pool of people who hail from vivid cultures and various parts of Indian states. These people also form a considerable part of commuters commuting in odd hours within the city. Driver's knowledge of national and international languages will give the feel of satisfaction to commuters.
32	**Forum for Commuter Redressal for Improvement and Resolving Problems**	Harassment and exploitation of passengers is another problem faced by the commuters commuting during odd hours. These problems can be addressed by specific commuter's forums in association with Government of India and states.

The following are the demographic categorization of commuters. For the current study, (a) mode of transport, (b) purpose of travelling, (c) timing of travelling, and (d) co-travelers have been considered as demographic categorization.

Analysis and Results

A survey was conducted during January 10, 2018 to April 30, 2018 to analyze the reliability and confirm the internal consistency of the questionnaire. The questionnaire was subjected to reliability test using Cronbach's alpha scale. According to Matzler, Würtele, and Renzl (2006), the reliability and validity of a measurement instrument/scale can be tested by looking at the reliability of individual items and the convergent validity of the measures associated with individual constructs as shown in the Table 2 and Table 3. To achieve the objective number, Cronbach's α was used to measure the questionnaire's consistency. The overall coefficient was found to be 0.89, which exceeds the minimal recommendation, that is, 0.70. Therefore, the viability and validity of the instrument is deemed to be sufficient.

To examine the appropriateness and sample adequacy of data collected from commuters, Bartlett's test of sphericity and Kaiser-Meyer Olkin (KMO) test were applied. The approximate chi-square statistic is 1721.6 with 496 degrees of freedom, which is significant at 0.000 levels (Table 2). The KMO statistic (0.769) is also higher (>0.5). Hence, factor analysis is considered as an appropriate technique for further analysis of data. For testing of hypothesis $H0_1$, F - test (one tail) two-sample for variances has been applied as shown in the Tables 4 and 5.

Since F - statistics value (1.65) is more than F-critical value (1.35) with a degree of freedom of 119 and also as the p - value is less than 0.05, therefore, the null hypothesis ($H0_1$) is rejected. So, it can be interpreted that mode of transport significantly influences the satisfaction level of the commuters. With respect to testing the hypothesis

Table 2. Test of Validity and Reliability

		N	%	*N* of Items	Cronbach's Alpha
Cases	Valid	120	100	32 variables identified	.890
	Excluded	0	.0		
	Total	120	100.0		

Table 3. KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	1721.631
	Df	496
	Sig.	.000

Table 4. *F* - Test : Two - Sample for Variances (Between Mode of Transport and Satisfaction Level)

	Type	Sat
Mean	2.358333333	2.866666667
Variance	2.080602241	1.259383754
Observations	120	120
Df	119	119
F ratio calculated	1.652079626	
P(*F* < = *f*) one-tail	0.003279804	
F Critical one-tail	1.353610209	

Table 5. *F* - Test : Two - Sample for Variances (Between Mode of Transport and Safety Perception)

	Type	Safety
Mean	2.358333333	3.041667
Variance	2.080602241	1.687325
Observations	120	120
Df	119	119
F	1.233077402	
P(*F* <= *f*) one-tail	0.127284398	
F Critical one-tail	1.353610209	

$H0_2$, since *F* - statistics value (1.23) is less than *F* - critical value (1.35) with a degree of freedom of 119, and also, as the *p* - value is more than 0.05, therefore, the null hypothesis ($H0_2$) is accepted. So, it can be interpreted that mode of transport does not influence the satisfaction levels of commuters with respect to safety.

The total variance as shown in Table 6 conveys the results of initial Eigen values as well as the total variance values extracted from sum of squared loadings. Based on the Eigen value 1, 10 groups have been formed, which are highly correlated amongst themselves. The cumulative results show that 70.26% variance is explained by the 10 loaded factors (Table 6).

The component matrix table (Table 7) indicates the matrix results of the components as per principal component analysis. Only 10 factors out of 32 loaded variables have been extracted. The extracted 10 factors represent the most significant factors influencing the satisfaction perception of the commuters. Each statement is cross evaluated with these values to identify the best fit and 19 significant variables are as follows :

(a) Vehicle's Technical Soundness, (b) Driver's Technical Knowledge, (c) Driver's Location Knowledge, (d) Driver's Information, (e) Access to Food Store, (f) Availability of Petrol/Diesel Can, (g) Availability of Repairing Service, (h) Availability of Caretaker, (i) Emergency Lodging Facility, (j) Rescue Service, (k) Public Urinals, (l) Satellite Medicare, (m) Accessibility to Pharmacy, (n) First-Aid Box in Vehicle, (o) Availability of

Table 6. Variance Explanation Table

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.352	26.101	26.101	8.352	26.101	26.101
2	2.600	8.124	34.225	2.600	8.124	34.225
3	2.166	6.769	40.994	2.166	6.769	40.994
4	1.840	5.749	46.742	1.840	5.749	46.742
5	1.684	5.264	52.006	1.684	5.264	52.006
6	1.332	4.162	56.168	1.332	4.162	56.168
7	1.262	3.943	60.111	1.262	3.943	60.111
8	1.173	3.667	63.777	1.173	3.667	63.777
9	1.047	3.272	67.049	1.047	3.272	67.049
10	1.028	3.211	70.260	1.028	3.211	70.260

Extraction Method: Principal Component Analysis.

Table 7. Principal Component Matrix

	Components									
	1	2	3	4	5	6	7	8	9	10
	Vehicle Satisfaction	Driver's Profile	Basic Commo-dities	Service and Pricing	Helper Service	Emergency Rescue Service	Public Conven-ience	Health Care	Redressal	Govt. Support
1. SOS Option	.118	.404	-.221	-.214	.271	-.233	-.225	-.013	.156	-.163
2. Vehicle's	.202	.265	-.052	.089	.294	.111	.453	.001	-.231	-.009
Comfort and Safety										
3. Vehicle's Technical Soundness	.704	.114	-.072	.084	-.316	-.189	.084	-.191	.132	-.019
4. Driver's Medical Knowledge	.507	.223	-.025	.315	.120	-.228	-.171	.342	-.092	-.199
5. Driver's Technical Knowledge	.354	.783	-.289	-.127	-.172	.038	-.049	-.063	-.110	.244
6. Driver's Location Knowledge	.292	-.716	-.438	.527	.154	.091	-.108	-.099	.147	-.343
7. Location Tracking	.319	-.394	-.077	.451	.023	.293	.188	-.224	.000	-.026
8. Vehicle's Cleanliness	.429	-.591	.065	.063	-.153	-.147	.062	.104	-.055	.430
9. Driver's Rating	.527	-.361	.072	-.021	-.203	.459	-.084	-.155	.126	.106
10. Driver's Information	.506	-.735	.096	.023	-.302	.194	-.036	.220	.301	.024
11. Private Parking	.374	-.233	.016	.346	.248	.160	.200	-.061	-.184	.139
12. Access to Food Store	.314	.208	-.714	-.223	.017	.038	.020	-.201	-.092	.095
13. Availability of Petrol/Diesel Can	.209	-.282	.709	.029	-.175	-.383	.084	-.012	.160	-.161
14. Availability of Repair Service	.570	-.483	.129	-.759	-.054	-.389	.127	.008	.084	-.136
15. Availability of Caretaker	.237	.142	.293	.401	.397	-.128	-.146	-.005	.156	.681
16. Emergency Lodging Facility	.460	-.141	-.095	-.068	.767	.235	.263	-.193	.305	-.227
17. Rescue Service	.448	.027	.282	.055	.758	-.030	-.040	.187	.233	.076
18. Public Urinals	.319	.078	.264	.048	-.295	-.036	.097	-.020	-.802	-.041
19. Satellite Medicare	.476	-.232	-.675	-.189	.412	.656	.107	.172	-.111	-.174
20. Emergency Access to Hospital	.463	-.398	.196	-.246	.277	.204	-.233	-.012	-.328	-.040
21. Accessibility to Pharmacy	.331	-.275	.374	-.190	.099	-.757	.023	.111	-.395	-.079
22. First-Aid Box in Vehicle	.153	.272	.540	.326	.318	-.689	-.159	-.110	-.087	.102
23. Availability of Doctors	.233	.353	.547	-.387	.187	.170	-.083	-.247	.164	-.058
24. Round the Clock Ambulance	.458	.232	.539	-.239	-.085	.225	-.006	-.042	.018	-.157
25. Calling Facility in Vehicle	.385	.076	-.056	.266	.023	.340	-.339	.510	.017	-.118
26. Availability of Govt. Transport	.424	.032	-.426	-.211	-.018	-.005	-.640	.013	-.251	.080
27. Prompt Arrival of Vehicle	.749	.399	-.081	-.086	-.259	.129	-.045	.060	-.126	-.011
28. Transparency in Price	.547	.334	-.033	.780	.005	-.331	-.015	-.326	-.053	-.042
29. Prepaid Option	.125	-.188	-.424	-.291	.361	-.071	-.264	-.189	.233	.244
30. Increase in Night Patrolling	.220	.229	-.196	-.298	.287	-.013	.707	.414	.326	.174
31. Driver's Language Skills	.513	.490	-.051	.083	-.288	.078	.185	.190	-.009	.172
32. Commuter Redressal Forums	.502	.309	-.291	.067	-.036	.119	-.130	-.702	.000	.064

Note. Extraction Method: Principal Component Analysis. [a] 10 components extracted.

Govt. Transport, (p) Prompt Arrival of Vehicle, (q) Transparency in Price, (r) Increase in Night Patrolling, (s) Commuter Redressal Forums.

These 19 variables are averaged and grouped under 10 unique groups as per the principal component analysis results. With these 10 groups, multiple regression has been performed to find the significance of each influencing groups on the satisfaction of commuters in odd hours. Based on the *R*-square value of 0.88, it can be explained as 88% of changes in the level of commuters' satisfaction. Next, we test the null hypothesis $H0_3$. It is evident (Table 7) that 32 variables have been grouped under 10 factors, which have been further studied for level of significant influence upon the satisfaction levels of the passengers.

Considering the *p* - values in the multiple regression, out of 10, only eight factors are found to be significantly influencing the satisfaction levels (Table 9).The ANOVA results (Table 8) suggest that variables considered for regression are suitable. The following variables have been identified as independent for the multiple regression analysis : (a) Vehicle Satisfaction, (b) Driver's Profile, (c) Basic Commodities, (d) Service and Pricing, (e) Helper Service, (f) Emergency Rescue Service, (g) Public Convenience, (h) Health Care, (i) Redressal, and (j)

Table 8. Regression Model Summary

Model Summary						
Model		***R***	***R* Square**	**Adjusted *R* Square**		**Std. Error of the Estimate**
1		.938[a]	.880	.869		.34208
ANOVA						
Model		**Sum of Squares**	***df***	**Mean Square**	***F***	**Sig.**
1	Regression	93.611	10	9.361	79.995	.000[b]
	Residual	12.755	109	.117		
	Total	106.367	119			

a. Dependent Variable: Passenger Satisfaction

b. Predictors: (Constant), Redressal, Helper Service, Health Care, Govt. Support, Public Convenience, Driver's Profile, Pricing Service, Emergency Rescue Service, Vehicle Satisfaction, Basic Commodities

Table 9. Beta Coefficient of Passengers' Satisfaction (Dependent Variable)

Model		**Unstandardized Coefficients**		***T* Statistics**	**Sig.**	**Collinearity Statistics**	
		Beta value	**Std. Error**			**Tolerance**	**VIF**
1	(Constant)	-1.721	.234	-7.343	.000		
	Vehicle Satisfaction (VS)	.335	.057	5.894	.000	.373	2.684
	Driver's Profile (DP)	.124	.058	2.143	.034	.581	1.721
	Basic Commodities (BC)	.163	.065	2.485	.014	.323	3.092
	Pricing Service(PS)	.127	.051	2.508	.014	.468	2.138
	Helper Service (HS)	.037	.031	1.200	.033	.845	1.184
	Emergency Rescue Service (ERC)	-.012	.051	-.242	.809	.565	1.770
	Public Convenience (PC)	.073	.045	1.647	.103	.486	2.057
	Health Care (HC)	.119	.065	1.818	.002	.567	1.763
	Govt. Support (GS)	.092	.038	2.436	.016	.681	1.468
	Redressal (R)	.275	.047	5.886	.000	.478	2.093

Government Support. The dependent variable for the purpose of applying multiple regression model is "satisfaction of passengers."

The following groups (variable) considered for running regression are found to be significant because the *p* - values are less than 0.05. The intensity of the influence of the satisfaction level on the passengers can be identified by the unstandardized beta values. Considering the regression results, out of 32 variables, only 10 factors are considered for multiple regression analysis. The null hypothesis $H0_3$ is rejected, but Emergency Rescue Service (ERC) and Public Convenience (PC) are found to be accepted. Based on the outcome of the results, considering beta values and significance value (at 95% confidence level), the following regression equation can be formulated :

Regression Model for Passengers' Satisfaction :

Commuter's Satisfaction = -1.721+ 0.335*VS + 0.124*DP + 0.163*BC + 0.127*PS + 0.037*HS - 0.012*ERC + 0.073*PC + 0.119*HC + 0.092*GS + 0.275*R

Findings and Suggestions

The findings from the study epitomize safety, transparency in prices, comfort level of commuters, effective time management, and cleanliness of vehicle, a common forum for commuters to address their problems and find solutions. Factors that influence the satisfaction level of commuters commuting during night were extracted from the analysis. From this study, it is observed that public transportation in Bengaluru is required to be extended even during the night as night commuters felt safer commuting in a bus along with a crowd than in unknown cabs or autos. Particularly for women commuters during night, it is safer to travel by public transport. This would resolve the major problems of night commuting. The study identifies that one of the significant factors which influences the commuting experience of commuters during odd hours is the Availability of Public Urinals. Regression analysis confirms that Vehicle Satisfaction, Driver's Profile, Basic Commodities, Pricing Service, Helper Service, Emergency Rescue Service, Public Convenience, Health Care, Govt. Support, and Redressal in terms of implementation of traffic regulations are found to be imperative for overall satisfaction of passengers. The city administration must take necessary action in building sufficient number of public urinals. The analysis also exposes the lack of police surveillance during odd hours in Bengaluru city, which leads to many uncertainties and unhealthy experiences, majorly for women and lone commuters during odd hours.

Managerial Perspectives on Government Intervention

Commuters who were working in nights shifts and travelling in odd hours raised the issue of unavailability of public transport. Lack of government transport and sole reliance on private transport makes their commuting into interior areas much difficult. Hence, the government must take necessary action to provide connectivity to these interior areas. As observed during our interactions, drivers of public transport too agreed that a common complaint was over-charging of prices. This is an issue where the agencies must act ethically and charge nominal prices instead of overcharging commuters by taking advantage of the fact that it is an odd hour. Another significant factor which is said to influence the commuters commuting in odd hours are the commuter redressal forums, which would help them in raising their voice against uncertainties while commuting during odd hours. Therefore, the government must take necessary action in setting up more commuter forums. We derived an opinion that there could be a great possibility in exploring an entrepreneurial initiative to serve the commuters' community. The respondents at time of the interview opined that they were looking forward to an initiative either from a private or from state sponsored agency to address the range of issues while commuting late at night.

Limitations of the Study and Scope for Further Research

Only 120 respondents participated in the study at few places in the city of Bengaluru during late night. Future studies can be conducted in other cities with a larger sample of respondents from the commuter's fraternity - people who regularly travel at night - and studies can explore the range of problems faced by them. Overall satisfaction of commuters travelling in the night for official, business, and other purposes is very important for wholesome development of the economy without compromising on the social security concerns.

End Notes

(1) Auto rickshaws are three wheeler motorized cycles for transportation of goods and also carry passengers. They are available in South Asian countries and are also available in few African, European, and South American countries.

(2) Bartlett's test of sphericity indicates whether the correlation matrix is an identity matrix which would further indicate that the variables considered influencing the passenger's satisfaction.

References

Advani, M., & Tiwari, G. (2005). Evaluation of public transport systems: Case study of Delhi Metro. *Proceeding of International Conference on Structural and Road Transportation Engineering*, 3-5 January 2005, Indian Institute of Technology, Kharagpur.

Bhat, C.R., & Sardesai, R. (2006). The impact of stop-making and travel time reliability on commute mode choice. *Transportation Research Part B, 40* (9), 709 - 730.

Bureau of Labor Statistics. (1999). Tracking changes in consumers' spending habits. *Monthly Labor Review.* Retrieved from https://www.bls.gov/opub/mlr/1999/09/atissue.pdf

Choudhury, D. K., & Gupta, S. (2015). An in-depth study of traffic congestion detection and management in Delhi. *Prabandhan: Indian Journal of Management, 8* (5), 7 - 24. doi:10.17010/pijom/2015/v8i5/68762

Dell'Olio, L., Ibeas, A., & Cecin, P. (2011). The quality of service desired by public transport users. *Transport Policy, 18* (1), 217 - 227. DOI: https://doi.org/10.1016/j.tranpol.2010.08.005

Emre, O., & Elci, M. (2015). Commuting related problems in the workplace. *Journal of Business Studies Quarterly, 6*(4), 1-9.

Evans, G. W., & Wener, R. E. (2007). Crowding and personal space invasion on the train: Please don't make me sit in the middle. *Journal of Environmental Psychology, 27*(1), 90 - 94. DOI : http://psycnet.apa.org/doi/10.1016/j.jenvp.2006.10.002

Goswami, B., Kumar, N. A., & George, K. K. (2015). *Patterns of commuting for work. A case study of Kochi city* (RULSG Occasional Paper 2015: 5). Research Unit on Local Self Governments Centre for Development Studies Thiruvananthapuram. Retrieved from http://cds.edu/wp-content/uploads/2015/12/RULSG-5.pdf

Gubbins, J.E. (1988). *Managing transport operations* (3rd ed.). London, UK : Kogan Page Limited.

Hägerstrand, T. (1970). What about people in regional science? *Papers in Regional Science Association International, 24* (1), 7 - 24. DOI : https://doi.org/10.1111/j.1435-5597.1970.tb01464.x

Hill, J. D., & Boyle, L. N. (2007). Driver stress as influenced by driving maneuvers and roadway conditions. *Transportation Research - Part F : Traffic Psychology and Behaviour, 10* (3), 177 - 186.

Koslowsky, M. (1997). Commuting stress: Problems of definition and variable identification. *Applied Psychology: An International Review, 46* (2), 153 - 173.

Koslowsky, M., Aizer, A., & Krausz, M. (1996). Stressor and personal variables in the commuting experience. *International Journal of Manpower, 17* (3), 4 -14.

Levitt, S. D. (1997). Using electoral cycles in police hiring to estimate the effect of police on crime. *The American Economic Review, 87* (3), 270 - 290.

Lyons, G., & Chatterjee, K. (2008). A human perspective on the daily commute : Costs, benefits and trade-offs. *Transport Reviews, 28* (2), 181 - 198.

Matzler, K., Würtele, A., & Renzl, B. (2006). Dimensions of price satisfaction: A study in the retail banking industry. *International Journal of Bank Marketing, 24*(4), 216 - 231. DOI : http://dx.doi.org/10.1108/02652320610671324

Mouwen, A. (2015). Drivers of customer satisfaction with public transport services. *Transportation Research Part A: Policy and Practice, 78,* 1 - 20.

Patankar, P. G. (1991). Problems faced by passengers during their travel. In, *Urban transport in India in distress* (pp. 149 - 160). India : Inter-India Publication.

Rothenberger, S. (2015). *Fairness through transparency - The influence of price transparency on price fairness perceptions* (CEB Working Paper No. 15/008). Retrieved from http://www.solvay.edu/sites/upload/files/CEB/CEB_WorkingPapers/LastUpdate/wp15008.pdf

Roy, S., Bandyopadhyay, S., Das, M., Batabyal, S., & Pal, S. (2013). *Real time traffic congestion detection and management using Active RFID and GSM technology*. Retrieved from https://www.iimcal.ac.in/sites/all/files/sirg/5-2-smart-road-real-time.PDF

Sandhu, K. (2012). Mobility hazard on Indian roads: A consequence of inept traffic management. *Prabandhan: Indian Journal of Management, 5* (4), 39 - 44. doi:10.17010/pijom/2012/v5i4/60165

Soltani, S. H. K., Sham, M., Awang, M., & Yaman, R. (2012). Accessibility for disabled in public transportation terminal. *Procedia - Social and Behavioral Sciences, 35,* 89 - 96. DOI : https://doi.org/10.1016/j.sbspro.2012.02.066

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