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Identifying Commuters 'Attitudes towards Public Transport using Multi-Criteria Decision Making: *a Case Study of Haryana*

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Abstract: With the significant transfer of passengers towards public transports from personal modes of transit can be proving an effective way to deal with the environmental as well as energy crisis that arises as the after effects of escalating utilization of transport sector. Therefore, to upgrade the public transport infrastructure as the priority service sector for the commuters, the policy makers must focused at the passengers' requirements and expectations. In the present study to identify the commuters' preference about public transport, field survey has performed and Analytical Hierarchy process or pair- wise weighing method applied to accumulate the information of different criteria priorities based on their views related to public transport. The five parent criteria have focused such as comfort, reliability, staff behavior, convenience and safety based on expert opinion and literature review. This data collected through questionnaire and observations during the period June 2019 to December 2010 from nearly 45 locations on five major districts of Haryana Province through stratified random sampling technique.

Keywords: Public Transport, Service Quality, Passenger's Satisfaction, Analytical Hierarchy process.

INTRODUCTION

Urban cities are plagued with unmanageable threats of traffic accidents, air pollution, noise pollution, congestion and increasing utilization of energy in transport sector (Jain &Khare, 2010). Mitigation these externalities related with transportation especially in the developing cities due to far rising vehicle growth rate than transport infrastructure has become a major confront globally. Similarly, in Asia, Haryana state is also experiencing extensive vehicle growth due to escalating population and migration. Haryana state being the industrial sector attracts the populace as they get economic and social benefits resulting in gigantic demand of commuter transport (Khanna, Jain, Sharma & Mishra, 2011). Expeditiously rising inhabitants as well as production activities generate manifold demands for road transportation, which creates an excessive burden on road network and infrastructure (Estrin & prevezer 2010).The number of total registered vehicle of Haryana has increased from 3.0 million in 2006 to 8.6 million by the year 2015-16 comprising 5.4 million two-wheelers and 1.7 million cars (MoRTH, 2016). In urban centers of developing countries, the escalating shifting towards motorized mode of transportation acts as participatory factor in increasing level of pollutants, energy consumption and congestion (Kumar et al., 2013). This enormous growth rate of personal vehicle is only because of indigent service quality of public transport delivered in the cities. The accessibility of reliable service rendered by public transport has immense influence on excellence as well as the mobility requirement of passengers to avail education, healthcare services, employment, and other productive pursuit (Mah and Mitra 2017). Therefore, the transport managers and policy makers' bears a great pressure of setting up the fare structure as per the economic and social equity. Subsequently, the revenue collection through fare is not adequate to manage the operational cost. Since the administrative investment is the only choice to provide, effective and efficient transport service quality to passengers (Singh, 2005). Public transit, score high sustainability comprises several features as lower travel cost, environmental deterioration and satisfies the social equity in contrast to personalized modes of transport. State run transits participate as the back bone in territory's economy considerably through limiting environmental trouble such as pollution, enhanced accessibility along with efficiency of transportation (Sanjeev Sinha et al. 2017) despite of service frequency, capacity and safety of travelers(Rohani et. al. 2013). However, the setbacks related to safety parameter in public vehicle had converted into an huge concern owing to over-aged and overloaded automobile, road design, weather circumstances and drivers' societal, financial and emotional condition (Liu and moini 2014) that directly connected with their professional and personal life contentment (Joewono and Kubota 2006). Accordingly, inferior service quality that provides by state transporters demoralizes and impels the commuters to travel through private transportations, as a result the share of state transport consistently declining. Consequently, the contribution of state buses are mains merely 1 percent and personal modes as like jeeps, cars and two-wheelers constitutes almost above 90 percent share(MoRTH, 2016) which is responsible as the major factors for congestion, deterioration of air quality, less average speed leading to increasing energy consumption and road accidents (RITES, 2010). Further, these problems augmented the average travel time 1 to 3 hours per day for their occupational trip. As per the study (RITES, 2010), Metro service in Delhi has been effectively competent to shift commuters about 46 percent from private modes of travel due to highly efficient quality of service than other public transport modes. Although, in other cities, the ratio of privatized modes of transport not declined, even with the initiation of Integrated Mass Rapid Transit System (IMRTS). For example, the research conducted in New York on public transport suggested that major cause of not shifting the commuters towards public

transport is the poor service quality specially frequent transfer between the travel network (Fellesson & Friman, 2008; Wener, Evans, Phillips and Nadler, 2003). However, more passengers may be attracting from private to public motorized transport only by satisfy their expectations. Hence, it has become essential to identify the perceptions of passengers' concerning public transport. The previous related studies found that the frequency of service, cleanliness, safety, assurance, comfort, seating arrangement, reliability, travel time, staff behavior, cost of travel and online information availability are some indispensable factors perceived as effective service quality parameters for public transport. (Friman & Garling, 2001; Hensher, Stopher & Bullock, 2003; Fellesson & Friman, 2008; Dell'Olio, Ibeas & Cecin, 2011; dell'Olio, Ibeas, Cecín, & dell'Olio, 2011; Diana, 2012; Redman, Friman, Garlingb &Hartiq, 2013; Sherestha, 2013; Jain, et al. 2014). The reliability attribute considers as key parameter to measure the efficiency of public transport service (Pucher and Kurth, 1995; Rietveld et al., 2001; Parkan, 2002; Hensher and Prioni, 2002; Filipovic´ et al., 2009; and Earl, 2010). Accordingly, the most frequent adopted attribute is reliability throughout the implementation of integrated public transport system, Bus Rapid Transits (BRT). In the study by Davison and Knowles, (2006) observed that with the objective to improve the bus transport reliability has considered as key target of service QBP (quality Bus Partnerships) and implement the priority lanes for those vehicles are less responsible for traffic congestion. The findings of QBPs in UK were increasing in bus investment from 7 percent to 50 percent from all aspects within the period of 5 years. In other study by Hensher et al. (2010) in Tyne and Wear town of United Kingdom (having population about one million) observed the impact of 40 additional bus lines 'Superoute' with the aim of implementation of priority bus lane and stoppage to enrich the trip punctuality. Outcome of above study exposed a consistent increment of 40 percent patronage with an upward trend during first two years whereas other lanes showed stagnancy. The researcher emphasized that enhanced ridership was not only credited to reliability, though quality measures also considered the travel comfort and vehicle frequency. In the determination of public transport service quality vehicle frequency and reasonable speed highlighted as an important attribute can minimize the waiting time considerably (Levinson et al., 2003; Pucher et al., 2005; Wall & McDonald, 2007; Walker & Donovan 2007; Federal Transit Administration, 2010a, c;). Moreover, the optimistic influence of modified fare structure either concession facility on ticket price, transferable ticket or free service (Webb et al., 2007) for students, women and senior citizen rapidly boost the patronage and create a positive customer response. Perone & Volinski, (2003) identified 75 percent up surging of ridership only because of free public transport service proposed in Austin, Texas, USA. Another research performed by Fellesson & Friman (2008) in European nine cities and highlighted the results of impact of comfort, frequency, security, staff behavior, safety, reliability on the satisfaction level regarding public transport service quality. Poudenx (2008) recommended that quality of transit modes service must be promoted to motivate commuter shift towards public transport from private. This would be happening only with high reliability and comfort irrespective environmental concerns. Subsequently, the success of public transport policy depends on the assuring public benefits before its implementation as a good strategy (Goyal & Sidhartha, 2003).

Largely purpose of this research is to recognize commuters' preference for different modes of public transport. The multi- criteria analysis has applied to evaluate the criteria weights assign by passengers to public transport service quality. For that purpose, a field survey conducted in Haryana state of India to collect a novel database related to the passengers perceptions and priorities about public transport.

Methodology

2.1 Study Area

The present study confined to Haryana state of India. Haryana State acknowledges as one of the emerging states in the field of education and excellence. As per the detail report published by Government of India(Census 2011),the Haryana state is the 16th largest state in the realm having an area of 44212 square kilometer with the aggregate populace 25,351,462.Out of which about two third (65.21 percent) population residing in rural areas and the remaining one-third (34.79 percent) in urban areas; the density is 573 per square kilometer. Furthermore, it appreciated as the third maximum per capita earnings in the nation following Delhi (capital of India) and Goa. It is an agrarian state and famous for wheat and milk production with a leading state in automobile manufacturing having much scope for the industries as well.

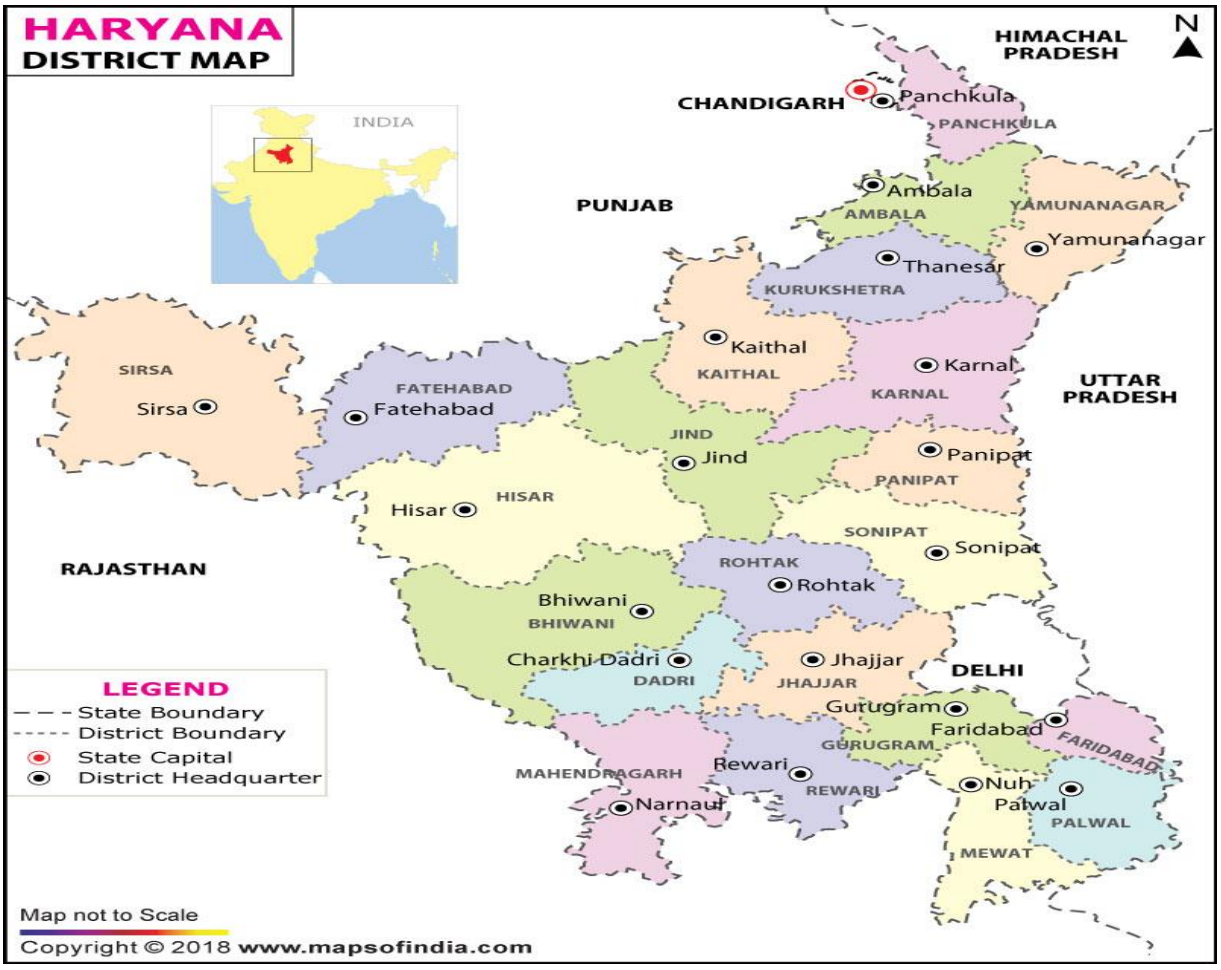

Figure 1

2.2 Data Collection

The state of Haryana divided into twenty-two administrative districts (Ambala**,** Panchkula, Yamunanagar, Kurukshetra, Karnal, Panipat, Kaithal, Rohtak, Jhajjar, Sonipat, Bhiwani, CharkhiDadri, Gurugram, Rewari, Mahendragarh, Faridabad, Palwal, Nuh, Hisar, Fatehabad, Sirsa, Jind**.** However, the present methodological study primarily focuses on five major districts of Haryana Province, i.e. (Ambala,

Gurugram, Faridabad, Panipat and Rohtak) which have population from diverse economic and social profiles. For collecting data, stratified random sampling method applied in its five districts.

Table 1Service Quality Dimensions

Dimensions	Parameters used	
Comfort	Comfort Quality of seats Level of passenger intake Cleanliness Condition of vehicle	Friman and Garling (2001), Stradling et al. (2005), Bhat & Sardesai (2006), Hensher et al. (2003), Eboli & Mazzulla (2007), Gatersleben & Uzzel (2007), Stradling, Carreno, Rye, and Noble (2007), Fellesson and Friman (2008), Tirachini and Hensher (2011), Sherestha (2013), Redman, Friman, Garling and Hartig (2013)
Reliability	Time-table of the vehicle is available at the terminus. Regularity of service Frequency of service Availability at convenient place Rate of Fare	Friman et al. (2001), Rietveld et al. (2001), Hensher et al. (2003), Stradling et al. (2005), Bhat and Sardesai (2006), Eboli and Mazzulla (2007), Stradling, Carreno, Rye, and Noble (2007), Gatersleben and Uzzel (2007), Fellesson and Friman (2008), Tirachini and Hensher (2011), Abou-Zeid et al. (2012), Redman, Friman, Garling and Hartig (2013)
Staff behaviour (RS)	Behaviour of crew members Dress code Punctuality	Friman et al. (2001), Hensher et al. (2003), Stradling et al. (2005), Eboli and Mazzulla (2007), Fellesson and Friman (2008)
Convenience	Control of air and sound pollution There is any alternate arrangement made by the crew for the passengers in caseof breakdown of vehicle. Violation of traffic rules Less Travel Time	Friman et al. (2001), Hensher et al. (2003), Stradling et al. (2005), Eboli and Mazzulla (2007), Fellesson and Friman (2008)
Safety	Speed Facility for handicapped, women, kids and senior citizen Facility for CCTV cameras in vehicle	Friman et al. (2001), Rietveld et al. (2001), Hensher et al. (2003), Eboli and Mazzulla (2007), Stradling, Carreno, Rye, and Noble (2007), , Fellesson and Friman (2008), Tirachini and Hensher (2011), Abou-Zeid et al. (2012), Sherestha (2013)

Source: Own Compilation

The proposed study is descriptive cum empirical and highly relied on primary information associated with observation of the public preference in the context public transport mode such as three wheeler, auto rickshaw, bus transport or local train available in the state of Haryana, which has been collected. A pre-tested, well-structured questionnaire framed cautiously after thorough consultation of available literature and having experts' discussions to fulfill the purposes of this study. To attain reliable data, questions framed with covering various phases of research problem such as socio-economic profile of their respective group members about their age, gender, geographical region, occupational status, type of vehicle own, purpose of travel, their preference, difficulties faced. Detailed information obtained through face-to-face interaction with the respondents. Care has been taken whether the respondents provide just (yes/no) type answers or useful perspective. To remove the wrong information which was given by commuters, correct information were collected through personal observations by conducting interviews between June 2019 to December 2019 from about 45 locations comprises bus depots, bus terminals, fuel pumps, shopping complexes auto stand, parking areas and taxi stand of five districts (Ambala, Gurugram, Faridabad, Panipat and Rohtak) as shown in Fig. 1. The surveys for data collection were organizing on weekdays and weekends also. Likert approach with 5-point dimensions (one= highly satisfied to five= highly Dissatisfied). Survey questionnaires circulated and threw light on questions individually to acquire exact facts. Out of total 400 forms, required information provided through 384 questionnaires and considered valid for the process analysis while left over rejected caused by inadequacy. Thismechanism incorporate three segments comprises demographic section and others two associatedwith preference and satisfaction of passengers regarding the service quality.

Table 2Pair –wise comparison scale for AHP

Numeric Rating of Importance	Reciprocal	Description	Explanation
1		Equally important	Both factors equally contribute to objectives
3	1/3	Somewhat more important	Experience and Judgement to some extent support one criteria more than other
5	1/5	Highly importance	Experience and Judgement strongly support one criteria more than other
7	1/7	Much more important	Experience and Judgement highly support one criteria more than other
9	1/9	Highly importance	The facts supports one criteria more than other is utmost feasible
2,4,6,8	1/2, 1/4, 1/6, 1/8	Intermediate between the above values	When compromise is needed

2.3 Assigning weights to parameters using Analytical Hierarchy Process

The Analytical Hierarchy Process (AHP) originated by Thomas L. Saaty in 1970s, as multi-criteria decision-making technique that help to provide inclusive hierarchy of preference choices from high to low preferred.

In the multi- criteria decision-making method, review the Pohekar and Ramchandran (2004) found AHP as the most prevalent method for solving multiple objectives problems. The AHP also arrange the alternative in a hierarchy into qualitative and quantitative aspects based on a common set of criteria (Yedla & Shrestha, 2003) consists of some following steps given by Saaty, 1980.

1. Define the decision problem,
2. Developing a conceptual framework and determine the criteria and sub- criteria
3. Collecting data from experts
4. Create the matrix of pair-wise comparison
5. Calculating the consistency test If CR < 0.10, then comparison consistency is appropriate.
6. Estimate relatively local and global weights to each criteria and sub- criteria.

In this paper, typical decision problem structure is considered and consist criteria (M) and decision sub criteria (N). Each criterion can calculate in terms of relative weightage. Let Matrix A= (*aij)*where aij(i=1,2,3,4,.....M) and (j=1,2,3,4,.....N) specified the service quality value for*i-th* criteria (C*i*) in the period of *j-th*sub-criteria (S*j*). Further, Wj denote as the weightage of criteria Cj. Therefore, basic problem of multi-criteria decision-making (MCDM)can be demonstrated through decision matrix (fig 2). For the purpose of evaluation of each level, compare the both parameters from top criteria. In framing its preference, the decision maker can use scale of binary comparison in table-.

	S_1	S_2	S_3	.....S_N
Criteria	W_1	W_1	W_1	.....W_N
C_1	a_{11}	a_{12}	a_1	.....a_{1N}
C_2	a_{21}	a_{22}	a_{23}	.....a_{2N}
C_3	a_{31}	a_{32}	a_{33}	.....a_{3N}
.....				
CM	a_{M1}	a_{M2}	a_{M3}	.....a_{MN}

Figure 2

Under this method, the pair wise matrix comparison is normalized so this can be explained as normalized arithmetic averages. Subsequently, matrix B= [b_{ij}] is prepares from matrix A= [a_{ij}]. Matrix B calculated as

$$b_{ij} = \frac{aij}{\sum_{i=0}^{n} aij} \quad (1)$$

Calculating the prioritization vector w = [w_i] is through computing the arithmetic averages row-wise in this matrix as per the given formula:

$$w_i = \frac{\sum_{i=0}^{n} bij}{n} \quad (2)$$

For each comparison matrix of the AHP analysis the computation of consistency index (CI) and then consistency ratio (CR) is necessary to determine the reliability of ratings given by an expert.

$$CR = \frac{CI}{CR} \quad (3)$$

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (4)$$

Where n is number of criterion and sub criterion, λ_{max} consider as the highest eigenvalue of matrix, where RI indicates the random index (Saaty, 1998) when CR ≤ 10 percent, the comparison results are supposed to be internally consistent.

After the preparation of decision matrix, the priorities weights divided and the final weights $A *_{AHP}$ of all criterions combined as per the given formula:

$A *_{AHP} = \sum_{j=0}^{n} a_{ij} X w_i$ For, $i = 1,2,3, \ldots \ldots \ldots M$

To identify the significance level between two parameters a pair wise comparison matrix method used in AHP process. Every criterion given a priority weight provide by experts of state transport undertaking in Haryana, specifically assistant director of ASRTU. This study constituted 5 criteria at level 1: comfort, reliability, staff behavior, convenience, safety and 19 criterion at level 2: quality of seats, level of passenger intake, cleanliness, Condition of vehicle, Time-table of the vehicle, Regularity, Frequency of service, Availability at convenient place, Rate of Fare, Behavior, Dress code of crew members, Punctuality, Control of pollution, alternate arrangement in case of breakdown of vehicle, Non-violation of traffic rules, Less Travel Time, Over speed, Facility for handicapped, women, kids and senior citizen and Facility for CCTV cameras in vehicle to determine the service quality of state transport undertaking of Haryana state.

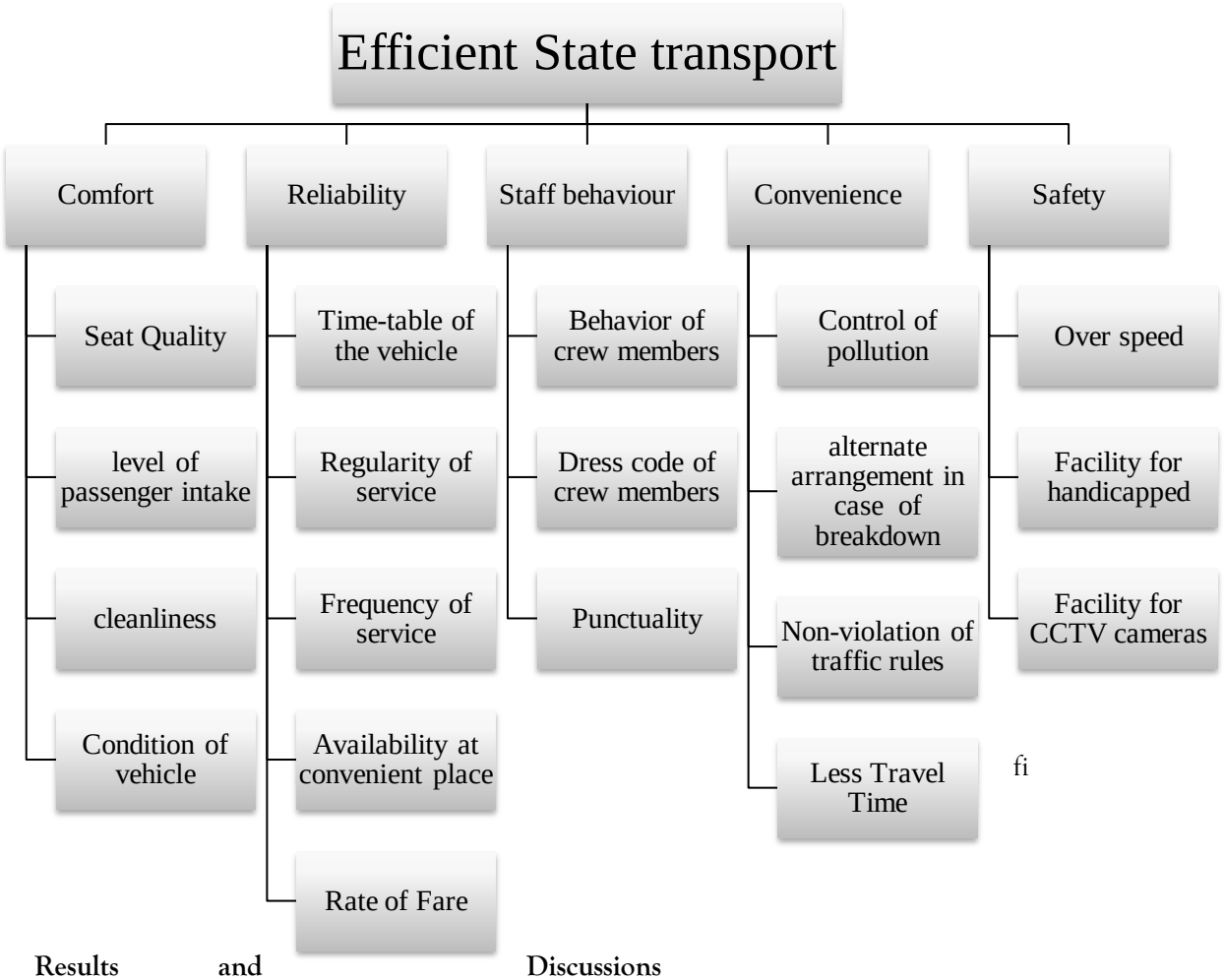

Figure 3

Results and Discussions

Table 3Social andMonetary Summary of Respondents

Social and Monetary Summary of Respondents	Respondents (in %)

Geographical region	
Urban	66
Rural	27
Semi-urban	7
Gender	
Female	42
Male	58
Age	
Below 20 years	7
21 to 30 years	39
31 to 40 years	23
41 to 50 years	14
Above 50 years	17
Occupation	
Service	30
Business	31
House wife	16
Student	23
Type of Vehicle Own	
No Vehicle	20
Two- wheeler	62
Car	18
Purpose of Travel	
Social Purpose	23
Professional Purpose	37
Educational Purpose	40
Frequency of Travel	
Daily	48
Frequently	40
Occasionally	12
Preferred mode of transport	
Public	38
Private	62
Preferred mode of public Transport	
Local Train	20
Three Wheeler	11
Auto Rickshaw	26
Bus	43
Reasons of Preference	
Easy Availability	22
Having no personal vehicle	24

Traffic congestion	26
Cost Effective	28
Difficulties Experienced by Passengers in the Public Transport	
Non-availability at convenient time and place	14
Long waiting time at bus stops	21
Long travel time	22
No cleanliness	23
Non-availability of Night Bus Service	20
Willingness to move towards Public Transport	
Yes	86
No	14

3.1. Study Validity

Validity analysis applied to determine the feasibility of the instrument as well as to assess the respondents' reactions as stated by purpose of this paper. For that, Pearson- Correlation assessment implement and view as valid if value of 'r' higher than r -table value as well as positive.

3.2. Normality Experiment

Normality Examination also applied to recognize the structure of data dispersal that be supposed to normally circulated. In this research paper, the data of null hypothesis is normally distributed. In case of figures, below 2000 observations, Shapiro- Wilk analysis applied, or else Kolmogorov -Smirnova. At this point, Shapiro- Wilk analysis applied with 108 observations and, as a result the p-value is 0.390> 0.05. Consequently, null hypothesis is acceptable where indices represented as normally dispersed.

Table 4 Resulting weights computed with AHP

Criteria and Sub- Criteria	Geometric Mean of Weights	λ_{max} CI and RI	CR
Comfort	1.838		
Reliability	0.644	λ_{max} = 5.438	
Staff Behaviour	3.159	CI = 0.079	CR =0.070
Convenience	0.999	RI = 1.12	
Safety	0.266		
Quality of seats	0.346	λ_{max} = 5.075	
Level of passenger intake	0.232	CI = 0.018	
Cleanliness	0.089	RI = 0.90	CR = 0.016
Condition of vehicle	0.204		
	0.269		

Time-table of the vehicle is available at the terminus.	0.290		
		λ_{max} = 5.339	
Regularity of service	0.105	CI = 0.084	
Frequency of service	0.747	RI = 1.12	CR = 0.075
Availability at convenient place	0.142		
Rate of Fare	1.127		
Responsiveness of crew members	0.136	λ_{max} = 3.056	
Dress code	0.427	CI = 0.028	
Punctuality	0.305	RI = 0.58	CR = 0.048
Control of air and sound pollution	1.637		
There is any alternate arrangement made by the crew for the passengers in case of breakdown of vehicle.	0.222	λ_{max} = 4.229	
		CI = 0.076	
		RI = 0.90	CR = 0.084
	0.139		
Non-violation of traffic rules	0.496		
Less Travel Time			
Speed	1.825	λ_{max} = 3.102	
Facility for handicapped, women, kids and senior citizen	0.250	CI =0.051	
		RI = 0.58	CR = 0.088
	0.346		
Facility for CCTV cameras in vehicle			

Table 5Service Quality Dimensions

Dimensions	Parameters used	Local Priority weight	Global Priority weight
Comfort		0.1991	0.1740
	Quality of seats	0.1949	0.0010
	Level of passenger intake	0.0908	0.0086
	Cleanliness	0.0104	0.0186
	Condition of vehicle	0.1598	0.0184
Reliability		0.3498	0.4011
	Time-table of the vehicle is available at the terminus.	0.0046	0.0007
	Regularity of service	0.0468	0.0156
	Frequency of service	0.1219	0.3661
	Availability at convenient place	0.0091	0.0013
	Rate of Fare	0.0028	0.0138

Staff Behaviour		0.1781	0.0497
	Responsiveness of crew members	0.0491	0.0070
	Dress code	0.0138	0.0017
	Punctuality	0.1541	0.1541
Convenience		0.7895	0.1420
	Control of air and sound pollution	0.2092	0.2879
	There is any alternate arrangement made by the crew for the passengers in case of breakdown of vehicle.	0.2589 0.2377	0.0792 0.0588
	Non-violation of traffic rules	0.2941	0.0297
	Less Travel Time		
Safety		0.9995	0.5319
	Speed	0.0583	0.2683
	Facility for handicapped, women, kids and senior citizen	0.2965 0.6451	0.0988 0.0751
	Facility for CCTV cameras in vehicle		

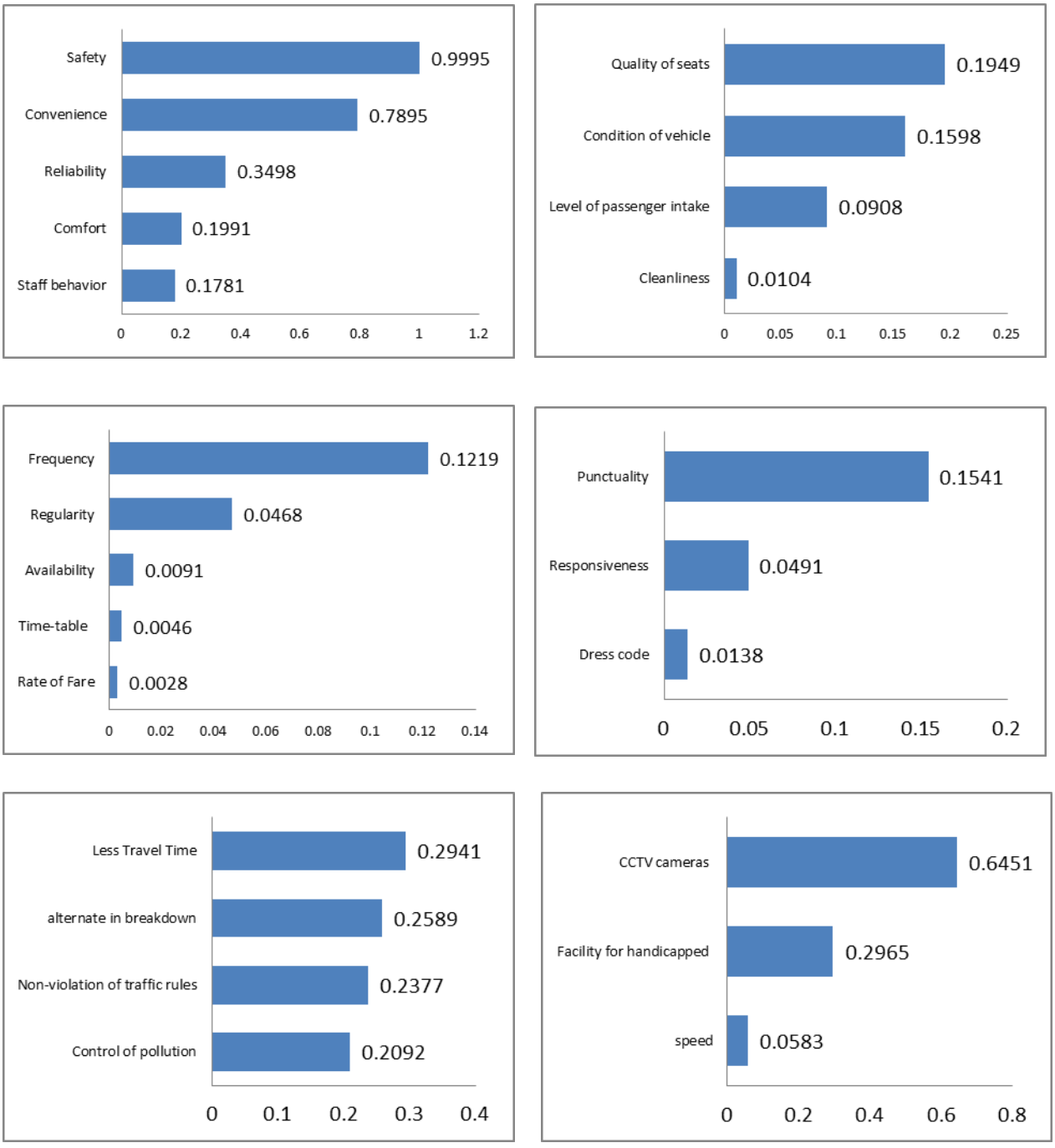
Safety
0.9995
Convenience
0.7895
Reliability
0.3498
Comfort
0.1991
Staff behavior
0.1781
0
0.2
0.4
0.6
0.8
1
1.2
Quality of seats
0.1949
Condition of vehicle
0.1598
Level of passenger intake
0.0908
Cleanliness
0.0104
0
0.05
0.1
0.15
0.2
0.25
Frequency
0.1219
Regularity
0.0468
Availability
0.0091
Time-table
0.0046
Rate of Fare
0.0028
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
Punctuality
0.1541
Responsiveness
0.0491
Dress code
0.0138
0
0.05
0.1
0.15
0.2
Less Travel Time
0.2941
alternate in breakdown
0.2589
Non-violation of traffic rules
0.2377
Control of pollution
0.2092
0
0.1
0.2
0.3
0.4
CCTV cameras
0.6451
Facility for handicapped
0.2965
speed
0.0583
0
0.2
0.4
0.6
0.8

Figure 4

3.3. Commuters preference for criteria related with public transport

The indicator for passenger's preference associated to public transitincorporated in the investigation were comfort, , staff behaviour, convenience, reliability and safety as revealed through Table 5. Safety parameter was established as approximately ~1.3 and ~2.9 times highlysignificant than convenience along with reliability correspondingly. However, in the determination and implementation of effective transport policy, transportation cost identified as one of the most critical factor (Goodwin, 1992). Furthermore, convenience was ~2.3 and ~3.9 times as essential as reliability and comfort. Whereas, reliabilty was ~1.8 and ~1.9 times more important as comfort and staff behaviour that was ranked as leastnoteworthy. Likewise, Bhat and Sardesai (2006) reported in the relevance of Austin, that travel time and reliablity were most significant factor that can influence the commuter's decision. Similarly, Sherestha (2013) found in her study based on Kathmandu (Nepal) that transportation cost, voyage period and comfort considered as effective facet in increasing array that encouraged passengers headed for public haulage. This study as well expressed that voyage period as well as comfort was more essential factor than transportation cost.

3.4. Commuters preference for sub-criteria related with public transport

The survey result analysis for a range of associate -criteria is represented through Table 5.The analysis results illustrated so as to quality of seats (0.1949) is the most significant factor followed by condition of vehicle (0.1598), level of passengers intake (0.0908) and cleanliness (0.0104) as shown in fig. 4.Quality of seats was ~1.2 and ~2.1 times more important than condition of vehicle, level of passengers' intake respectively and quality of seats was ~18.7 times more required from cleanliness. In the context of reliable service of public transport frequency of service (0.1219) and regularity of service (0.0468) has been given preference over availability at convenient place (0.0091) as well as availability of vehicle schedule (0.0046) and rate of fare (0.0028) as demonstrated in fig 4.Therefore, passengers desire regularity, good frequency and availability for public transport as greater rank specified through commuters to this subordinate -parameters above availability of vehicle timetable. Nolan (2007) specified regarding adherence to journey timetable and reliability regarding departure and arrival was one of the key feature dispiriting public for utilize state run vehicle. Rietveld et al. (2001) identified concerning the majority of the commuters given priority to reliability and abidance to journey timetable over less travel time. In this study, less travel time was prefered as the most significant factor (0.2941) which is ~1.13 times, ~1.23 times and ~1.40 times more important than alternate arrangement in breakdown, non-violence of traffic rules, and control of pollution respectively.

However, under the parent- parameter staff behavior, punctuality (0.1541) was given priority ~2.17 times and ~11.16 times over the other factors like responsiveness (0.0491) and employee dress code (0.0138) as shown in the figure. Moreover, CCTV camera (0.6451) was given priority ~3.13 times and ~11.06 times over the other factors like facility for handicapped, women, kids and senior citizen (0.2965) and over speed (0.0583). Similar findings reported in the study related United Kingdom by Gatersleben and Uzzel, (2007) that longer travel time due to congestion and irregularity made the journey stressful through public transport (Greene & Wegener, 1997). Therefore, efficiency and accessibility have recognized as the main factor to enhance the investment of state run transits system (Murray, Davis, Stimson &Ferrira, 1998; Murray 2001)

The Table-5 demonstrates the local weights and global weight for each criterion. The results shows that at the second level of criteria safety (0.9995) prioritized and followed by convenience (0.7895), reliability

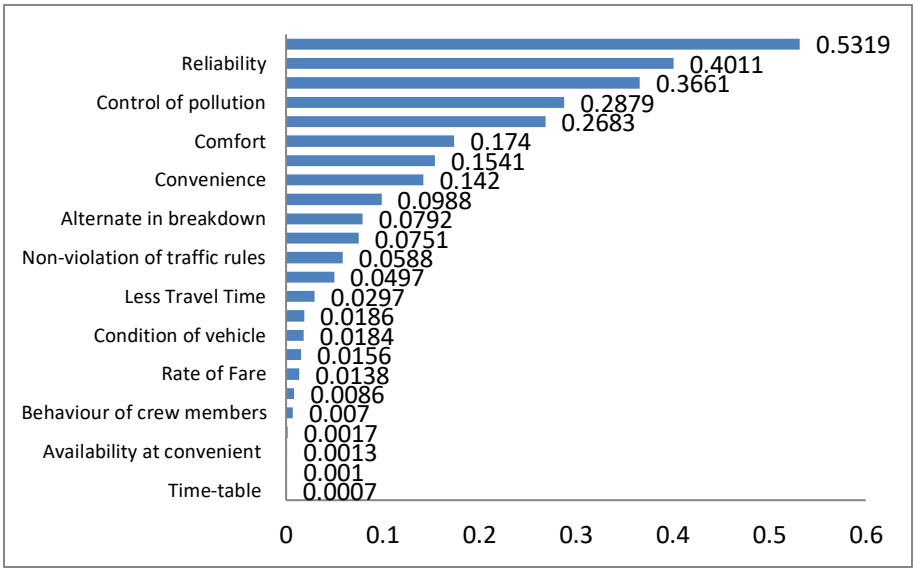

Figure 5

(0.3498), staff behavior (0.1991) and comfort (0.0771) relatively their local weighs. Further, the global weights evaluated by multiply the criteria weight with local weights and the sum of priority weights of criteria or sub criteria must be equal to one. At the third level of sub criteria quality of seats (0.1949), Frequency of service (0.1219), punctuality (0.1541), less travel time (0.2941) and facility of CCTV camera (0.6451) prioritized. The "safety (0.5319)", "reliability (0.4011)", "frequency of service (0.3661)" and "control of pollution (0.2879)" are identified as the four most significant criteria followed by speed, comfort, punctuality, convenience and so on to determine the service quality process through AHP.

3.5. Commuters experience and expectations

In this study, one question was also dicussed with commuters about experience regarding existing different mode of public transport service. Passengers feel that out of various mode of public transport bus service is most serving facility for the Haryana commuters. However, survey analysis represented as the result that commuters are not contentedwith the public transport specially bus service provided through haryana state known as State Road Transport Undertaking of Haryana. There is a huge gap between perception and satisfaction level of commuter only because of some factors including comfort, long travel time and reliability. It was also found that average waiting time is also a contributory factor for the discourging people from using public transport over private mode. As per the research of Edinburg by Stradling et al. (2005) and found that walk time from source to bus stop and frequency of bus service were mentioned as the major causes of rarely commuting throughbus transport other than often.

3.6. Forthcoming Procedures for recuperating Public Transportation Facility

Charted bus system, high capacity buses and supplementary frequent bus service should be implemented for a guaranted seating arrangement where commuters ready to pay extra fare for journey from public transport with more comfort (Tirachini, 2013). Despite of reliability and proximity as per the

recommendation of (Murray et al, 1998) socioeconimic factors should be assimilated in the public transport policies to improve the accessibility. The facility of IMRTS for displaying arrival as well as departure schedule information through helpline number, travel book and internet. Likewise, feeder transit facility usually expand the accessility opportunities. Right of Ways (ROWs) is another technique for various modes of public transport makes it more reliable by avoiding congestion and delay. Unlike classification of means of transport –auto- rickshaw, mopeds, cars, buses, scooters, taxis, bicycles, tractors, vans, trucks, carts, tankers, along with pedestrians be required to carve up the similar highway gap (Currie, Sarvi, & Young, 2007). Further, the intelligent traffic management and implementing Close Circuit Camera Television (CCTV) at stations as like dehli metro including helpline numbers specially for senior citizen and women could be more helpful to make sure the passengers' safety. Efficient service quality comprises friendly environment, punctuality, clean in addition to safe state runtransitbe able to shift as a prefered mode of commuter' choice (Poudenx, 2008). Moreover. Differential tarrif system should be applied based on service quality would enaple the passengers of avail the better service quality through paying extra charge. Abrate, Piaceenza, Vannoni, (2009) reported in their study regarding Integrated Tarrif System that single ticket system for extended network and implementation of zonal tarrif schemes works as effective method in increasing the number of public transport commuters.In the same way, different tarrif structure and card payment scheme at lower cost makes beneficial for both companies and users (Sampaio, Neto, Sampaio, 2008). Awaring the public concerning socio-economic and environmental advantages of travel trough public transport can encouraged the shifting from personal mode of transport. As an efficient public transport, system should facilitate seamless travel between systems if appropriate infrastructure is accessible and commuters are able to travel with a single fare ticket. This can be possible with the single agency authorized all the coordination responsibility of transport management. Although the Public Transport industry is constantly being induced to improve its cost efficiency through minimization of production costs and by boosting revenues to become entirely self-financing a substitute way like promotion of fiscal incentives.

CONCLUSION

Keeping in view mass population of the country and limited wealth, immense up-gradation is required in transport infrastructure of India; however, due to certain reasons the necessary funding not pooled in this sector. The largest part of buses administer as well as run through the guidelines issued by Indian government including center and state, that are aged, disappointingly configured, ineffectually maintenance, over- crowded, corruption along with having low productivity. Additionally, improved government authorized transport amenity should render at reasonable ticket price is also to be tackled on priority.

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