

Measuring Attitude of a University's Employees Towards Carpooling

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Abstract: Growing traffic congestion has slowed down the movement of traffic in India cities and the congestion has been attributed to growing population resulting in growth in number of vehicles plying on the road, poor infrastructure and non compliance of traffic rules along with other factors. Single driver driven cars and four wheelers have increased on Indian roads due to increase in car and four wheeler ownership thereby contributing to more space being occupied on roads but with less number of people being transported in the process. This has necessitated initiatives by government to promote car/taxi sharing. Many taxi aggregators have also sensed business opportunities and have introduced sharing taxi as a method of transport. Many of the organisations have also tried to inculcate the habit of carpooling among their employee's with varied degree of success. This research study was conducted to measure the attitude of employee's of a university towards carpooling with an intent to propose a plan to introduce carpooling for its campus. The researched location of the Bangalore based university is characterized by knowledge workers, connected by public bus transport largely to central business districts but only for a few residential locations. The campus under consideration is situated in an industrial manufacturing zone of Bangalore. Focus group discussions were conducted to understand the perception of employee's towards carpooling and variables that influenced carpooling have been selected both from focus group discussions and literature review. Data was collected from 165 employee's through a questionnaire designed after conducting the focus group discussions. Exploratory factor analysis was used to understand the attitude of the employee's towards carpooling. Six factors were discovered namely-core benefit seekers, implementers, travel companionship, role neutrality, walk the extra mile and security. Discriminant analysis was used to discriminate between potential car poolers from avoiders and to predict the willingness of employees to adopt carpooling. Willingness to initiate the car pool and commitment towards carpooling were the key discriminating variables between potential carpoolers and avoiders. The analysis revealed that potential to implement carpool was high in the university. Further research could lead to propagation of carpooling across various institutions. This research explored the possibility of carpooling by studying the attitude of employee's of an university in Bangalore. The literature revealed that there are few studies that has been done to explore attitude towards carpooling and research in India is scant. Since, there are sufficient number of universities and institutions in urban metros in India this research offers scope to explore and propagate carpooling which can decrease congestion on roads and make driving less stressful and protect the environment to some extent.

Key words: Carpool, India, attitude, institution, university, employee's

INTRODUCTION

Congestion on roads is a major road traffic management issue across different cities of the world, especially, the metropolises. Congestion can be defined as the condition in which vehicles travel slower than designed capacity of roads (Downs, 2004). Congestion is a major traffic management issue, especially, in the metropolises. Road congestion leads to slow movement

of people, goods and vehicles impacting work and personal life. Traffic congestion causes environmental pollution, increases stress in people who are traveling and decreases productivity. Traffic congestion is caused by micro level factors and macro level factors (Rao and Rao, 2012). Micro level factor refers to circumstances happening on the road at a specific time instance. The factors could include many vehicles trying to move during certain time periods, accidents, poorly planned

traffic signals, unexpected events leading to clogging of roads. Macro level factors include road infrastructure, employment levels, income levels of the city and its surrounding regions, car and other vehicle ownership. Urban sprawl has led to increase in car ownership leading to more number of cars on road. This has been a phenomenon across different parts of the world (Schrack and Lomax, 2005; Chadchan and Shankar, 2012). Along with urban sprawl another phenomenon that is adding to the problem of congestion is the way cars are being used. Most of the cars have single occupancy and this has been observed across different countries (Chan and Shaheen, 2012). One of the popular methods across different countries to reduce the number of cars on the road has been carpooling. A car pooler is one who shares his or her vehicle with other worker/workers. People staying and working in close proximity use their vehicles one at a time and share their vehicles with their fellow travelers thereby improving the vehicle occupancy.

Carpooling across various developed countries in the world has given a good number of advantages in terms of savings in cost on fuel, reducing the traffic congestion, reducing the dependency on public transportation. A considerable proportion of population have adopted to carpooling across different countries (Bonsall, 1981; Vincent and Wood, 1979; McCoomb and Stuart, 1981; Richardson and Young, 1980). A car pooler is one who shares his or her vehicle with other worker/workers. People adopt carpooling due to various reasons like reduced expense on fuel, reduction in travel time, attitude towards carpooling explained by control over one's vehicle, reduction in stress levels, benefits to society, safety have often been studied (Jorge and Correia, 2013). However, carpooling has seen limited success across different parts of the world and some of the key issues points towards the attitude of potential car-poolers and car-poolers (Jorge and Correia, 2013; Chen *et al.*, 2012). Trust is one of the key elements in attitude formation towards carpool.

It has been pointed out (Prentice *et al.*, 1994; McKnight *et al.*, 1998) that trust is one of the key attributes that can influence people to carpool and people who share their organizational affiliation are more likely to trust one another and form personal bonds which can influence carpooling. An institution brings people together from different parts of the city wherein many of employees could be staying nearby thereby offering them an opportunity to travel in a carpool to their workplace.

Indian cities have been suffering from traffic congestion and it has been envisaged that carpooling could be one of the solutions to ease traffic congestion. Much of the research covering the Indian carpool has focused on using technology to improve efficiency and effectiveness of carpooling but not on studying the attitude of Indians and institution specific carpooling. Zhou (2013) has studied carpooling in university and has found that a high success rate could be achieved in university carpooling system. The other key observations are many females and employee's earning less than median salary are benefited and not many number of vehicles are required to implement carpooling system. This again reiterates the fact that single occupancy vehicles can be considerably reduced.

This study explores the possibility of implementing carpooling in an Indian University which is located in Bangalore by studying the attitude of employee's. For achieving this a web survey was conducted to get data across employee's of this university and a factor analysis was conducted to explore the underlying dimensions of attitude and a discriminant model was built to differentiate between potential carpool adopters and non-adopters. The next study reviews the carpool literature in terms of car pool adoption across different parts of the world why people carpool, success and reasons for failure of carpool, study of attitude in carpool and institutional carpooling.

What influences people to carpool: The three types of attitudes that in general are known to have an influence on the outcome (exhibited behaviour) are perception (also known as cognition), referring to evaluation of some attributes of an object/concept, feelings, referring to liking or affect and conation, encompassing one's motivation, the intention to performing a behaviour (Golob, 2001).

The research on attitude and travel behaviour has predominantly focussed on first two categories of attitudes, i.e., perceptions and feelings (Dobson *et al.*, 1978; Golob *et al.*, 1977; Levin, 1976; Koppelman and Lyon, 1981; Mokhtarian and Salomon, 1997; Mokhtarian and Salomon, 2001; Golob, 2001; Choo and Mokhtarian, 2004; Ory and Mokhtarian, 2005). In one of the early studies on attitudes and travel behaviour, perceptions are an overall evaluation of travel modes based on their characteristics, feelings refer to the liking and personal norms of travel modes (Koppelman and Lyon, 1981).

Perceptions of carpool relate to the ease of finding a carpool partner, save travel time brought about by presence of High Occupancy Vehicle lanes (HOV) and

reliability of the ride (Burris *et al.*, 2007) and reduction in stress levels (Painter *et al.*, 2007). Feelings of carpool include enjoyment of the journey (Li *et al.*, 2007) and the benefits that accrue towards society and the environment (Li *et al.*, 2007).

Bento *et al.* (2013) have established positive relationship between carpooling and fuel prices. In this longitudinal study, it has been established that carpooling increases, especially, in high occupancy vehicle lanes when the fuel prices increases and people prefer driving high occupancy vehicles rather than totally give up driving and switch to other modes when fuel prices increase. Reduction in cost is one of the key variables influencing carpooling (Li *et al.*, 2007; Painter *et al.*, 2007).

Barriers to carpool: Correia and Viegas (2011) have argued that carpooling has never been successful due to reasons like losing the flexibility of using one's own vehicle. Drivers prefer their solitary personal space and prefer to have control over driving their vehicles (Gardner and Abraham, 2007). Fear to ride with strangers been a deterrent to some extent for carpooling (Canning *et al.*, 2010; Correia and Viegas, 2011).

Technology and carpooling: Chan and Shaheen (2012) have studied the history of ridesharing in North America and brought out the importance of technology and various algorithms being used to bring in a critical mass to ridesharing and there has been continuous efforts in this space due to growing concerns about climate change, congestion and fluctuating costs of fuel.

Congestion and carpooling adoption in India: Malodia and Singla (2016) have found that extra time spent in traveling to carpool has been a discouraging variable to carpool and cost savings has encouraged carpooling. Extra time spent includes waiting time at the particular spot, walking time to reach the meeting point and extra travel time.

Rao and Rao (2012) in their research in methodology to measure urban traffic congestion have reported that Indian cities are congested in traffic flow and carpooling is a good option to reduce congestion.

Focus of this study: Much of the research conducted in the study of carpooling have concentrated on studying the variables that influence carpooling positively or negatively and research has also focused on the usage of technology to bring in greater adoption of carpooling. Riding with strangers, finding ride partners, matching ride time, saving travel time cost savings involved, reduction in stress levels, socialization and enjoyment of journey,

benefits that accrue to the society (climate, traffic congestion) have been reported as variables that influence carpooling behavior. India is also a country whose services economy is growing and Bangalore being one of the top contributors of GDP of India boasts of public sector undertakings of national importance, information technology clusters, garment clusters, educational institutions and universities, manufacturing clusters amongst others. Traffic congestion has been high and various initiatives by government, private taxi operators and individuals have been in progress to take advantage of traffic congestion by tapping into business opportunities and also to ease the traffic congestion. Bangalore has 50 lakh vehicles on road and it is a big challenge for mobility on Bangalore roads.

With many institutions having a known work commencement time and known work concluding time, people knowing one another directly or having access to the employee database of the organization thereby bringing in some levels of trust having a system where in the starting points of co-workers traveling from can be made known, makes it an interesting opportunity to study the attitude of such employee's of an organization towards carpooling. Moreover, research studying intra-institution carpooling that are specific to a particular institution is sparse and this could hold promise, if carpooling intra-institution is implemented.

Carpooling in university: Zhou (2013) has studied the carpooling in the context of a university and has mentioned that there is a high degree of carpooling can be achieved among the university employee's and this can be a niche business opportunity.

Our research focusses on understanding the attitude of a single Bangalore based university which has knowledge workers (Teaching faculty and non-teaching faculty who are predominantly knowledge workers). This educational institution (University) has been selected due to its specific attributes like being situated in a manufacturing cluster-Peenya, reasonably well connected by public transport, non-availability of university transport and availability of enough parking space. This research is an effort to understand the attitude of employee's who are knowledge workers, towards carpooling, so that, it can be implemented. The outcome of this research would provide insights into attitude and might pave way for a niche segment opportunity.

Research scope and objectives: Carpooling has been studied in the context of a single organization with majority of its knowledge workforces stationed at Peenya campus. This university has another smaller campus in

Gnana Gangothri on new BEL road which predominantly houses administrative staff and office of vice chancellor and pro vice chancellor. Many of the employee's have their own cars and two wheelers or sometimes both are used for commutation alternatively. They travel to their workplace from different parts of the city.

Objectives:

- To study the attitude of employee's of the university towards carpooling and to segment them based on their attitude
- To understand and predict the success of carpooling before implementation

MATERIALS AND METHODS

Being an exploratory research, a combination of focus group interview and a structured questionnaire has been used. Focus group interview was conducted for three groups of employee's and each group consisted of six to eight employees spanning across departments, responsibilities and positions held. Semi-structured questions were posed to the group to get an idea on their commute to work, difficulties faced while commuting to work, attitude towards carpooling and their willingness to adopt carpooling and responses were recorded.

The focus group discussions were chaired by a moderator who posed semi structured and open-ended questions to the panel whose size ranged from 6-8 members. The focus group discussions were conducted to get a perception of employees towards carpooling and also to find, if any new variable merged that was not there in the literature.

We conducted 3 focus group discussions across the university. Based on voluntary basis, members were called in for discussions and were provided the agenda for discussion. Care was taken to involve both teaching and non-teaching employee's of the university.

The first focus group discussion comprised of 7 members of faculty of management and commerce and discussions went on for about 40 min. Members of the panel were of the opinion that carpooling was a positive step forward would reduce cost, increase in availability of parking area. They had few concerns such as different time slots available for teaching faculty and non-teaching faculty to report to work. The time slots for reporting could be 8:30, 9:00 or 9:30 a.m. and different time slots were maintained for start of Bachelor's degree classes and master degree classes. They were ready to walk the extra mile after being picked up or dropped off at a location convenient to the car pool and thus, expressed their willingness to make carpool a success.

Hence, their major hindrance was different time slots and another marked observation is that none of them were ready to alter their time slots, if they had an option but were ready to walk to or back from their pickup and dropping points, respectively. Some were ready to car pool with colleagues from other departments and some were ready and cited communications as a hindrance. They also brought out the reason that hesitation to volunteer or ask for a car lift as one of the reasons behind non-carpooling. Life style and life stage also played an important role in people opting for carpooling. Employee's with child/children had to attend to their child's/children's requirements and hence, preferred self-driven and single occupancy vehicle. Employee's had to attend to shopping for necessities on their way back home or to attend to other activities and hence, preferred driving alone. Unmarried had other aspects of life to attend to. Hence, it appeared like lifestyle and life stage elements also influenced an employee to opt for or to avoid carpooling.

The second focus group discussion was held with non-teaching employee's from different departments and the group discussion lasted for around 50 min. One of the primary reasons for keeping this group separate was to ensure confidentiality of responses. Many of the non-teaching employees used two wheelers and hence, they rode alone. The person driving a two-wheeler felt uncomfortable to share a ride with an opposite gender and vice versa. But this was not the case to be if the vehicle was four-wheeler. Deterrents were cited in form of time mismatch and lack of. A non-teaching staff felt at odds to approach a teaching faculty for a ride but if offered by the teaching staff they would have surely accepted the offer. This panel emphasized on the importance of initiation on carpooling. They suggested that there was enough of discussions about carpooling but implementation would be the key success factor of carpooling.

The third focus group discussion was held with Faculty of Engineering and Technology. The duration of this group discussion was 30 min. This discussion had the shortest duration in time as discovered many similar aspects and variables in the earlier discussions. Hence, we stopped at the third round of panel discussions. Panel members were of opinion was that commuting to Peenya was tough only for someone who was traveling from a distant residential area. They were of opinion that road infrastructure was not conducive for comfortable travel. This panel also said that carpooling would be more beneficial during monsoons and during city shut downs due to "Bandhs" (closure of activities) called by various groups. An opinion was the some of the employee's might not want to carpool with others due to their

position or status in university. Another reason cited was about being possessive about their vehicles. Panel members cited their previous experience that some fellow colleagues did not want to share the fuel expense and hence were negative towards carpooling. Some of the new variables discovered during the process were distance from workplace.

From these certain variables that were not a part of literature were included in the study. The questionnaire developed was a combination of demographic and psychographic variables (Attitude, interest and opinion about car pooling). The questionnaire was circulated using Google Docs to everyone at the university and received 165 responses. Total number of employee's in Peenya campus was = 330 out of which teaching staff are 220 and non-teaching staff are 110. Sampling adequacy has been maintained considering the usage of exploratory factor analysis and discriminant analysis to satisfy the objectives. The 33 variables were used in the questionnaire and minimum sample size is taken as $33*5 = 165$ (Krishnaswamy *et al.*, 2006).

Demographic data collected was age group, gender, marital status, number of children, area of residence, data regarding their current mode of transport and number of seats vacant in their vehicle was also collected. Institutional variables were department, position and working time slot. Some lifestyle and demographic variables that were related to travel behaviour like marital status, number of children, combining chores or other important tasks while driving was collected.

The attitudinal variables are: attitude towards resolution to traffic problems, commuting to work place is tough, carpooling reduces environmental issues, reduces travel stress, need for carpooling, proper routing will help carpool, safety, dependence on colleagues, comfortable to carpool with opposite gender, willing to walk the extra distance, willing to drive the extra mile, carpooling would make travel more productive, traveling with others is not a problem, awareness about location of colleagues, preference to university carpool over private carpool services, tolerate own vehicle being used for carpool, comfortable to carpool with either teaching or non-teaching staff, alternate between being driver and driven ready to share costs, willing to bear some delays, willing to implement carpool and willing to commit to car pool. These variables were measured on likert five point scale.

Descriptive data: Out of the employees surveyed, 110 were men and 55 were women. The sample predominantly elonged to age group 25-29 years followed by 30-34 ears Table 1. The 43 employee's used car as primary mode of transport to university followed by

Table 1: Demographic description of sample (in numbers)

Genders	Age group (Years)	Currently into car-pool (Vehicle pool)	Modes of transport
Women = 55	20-24 = 18 25-29 = 47	138 = not into a carpool or a vehicle pool	Car = 43
Men = 110	30-34 = 28 35-39 = 26 40-44 = 20 45-49 = 10 50-54 = 12 55-59 = 1 60-64 = 3	27 = in a vehicle or a carpool	Other modes of transport = 122

Table 2: Distance employees travelled every day to university

Distance to university (km)	No. of people
0-10	49
11-20	57
21-30	37
31-40	9
41-50	11
50 above	2

Table 3: Expenditure for travel to work place

Monthly expense incurred in Indian Rupees (INR)	No. of people
0-1000	40
1001-2000	63
2001-3000	27
3001-4000	12
4001-5000	4
5001 and above	19

Table 4: Modes of transport to university

Transportation used to commute to university	No. of people
Bike	75
BMTC (Public transport bus service)	36
Ola/Uber (Private cab service)	6
Car	43
By walk	5

Table 5: Status of employee's with child/children

Employees and children	No. of people
Employees with child/children	113
Employees without child	52

two-wheeler at 75 and the rest by other modes Table 1-4. The 138 employees were not into any kind of vehicle pool (car pool or pooling two wheelers) Table 1. About 57 employees travelled between 11-20 km everyday (one way) to travel to university followed by 37 employees who travelled between 21-30 km Table 2. About 63 employees spent 1001-2001 Indian rupees for travel to university followed by 27 employees who spent between 2001-3000 rupees Table 3 About 113 employees had child/children whereas 52 employees did not have a child Table 5. The data indicated that more number of employees used two-wheeler and other modes of transport and majority of them travelled more than 10 km to reach university. Employees felt increased traffic, high level of environmental pollution, ready to share traveling expense with car poolers that pointed towards the perceived benefits of carpooling Table 6. Hence, there

Table 6: Mean values of attitudinal variables

Variables	Mean
Increased traffic	4.76
Reduce environmental pollution	4.39
Routing would help carpooling	4.24
Share travelling expenses with car owner	4.21
Travel with teaching and non-teaching staff	4.16
Knowing who stays where	4.14
Need for carpooling	4.12
Reducing travelling stress	4.08
Preference of university carpool over alternatives	4.08
Carpool helps in rainy season and strikes	4.05
Security is not an issue	4.03
Carpooling to solve problem	4.02
Benefits leads to success	3.99
Travel with different cultures	3.90
Comfortable with opposite gender	3.89
Not a boring journey	3.87
Good companionship	3.84
Initiate carpool	3.81
Travelling expenses be shared	3.79
Create awareness	3.73
Make more productive	3.70
Commitment to carpool	3.67
Professionalism	3.65
Alternate between drive or driven	3.62
Walk the extra mile	3.50
Tolerance towards usage of vehicle towards carpool	3.44
Willing to take diversion	3.40
Willingness to bear latencies	3.39
Possessiveness towards vehicle	3.36
Dependence on one colleague	3.36
Willing to tolerate unlike minded people	3.07
Commuting to university not a tough task	3.02

Table 7: Objectives and methods to achieve them

Objectives	Methods
To study the attitude of employee's of the university towards carpooling and to segment them based on their attitude	Identification of variables from literature review, focus group discussions, interviews with employee's and exploratory factor analysis
To understand and predict the success of carpooling before implementation	Two group discriminant analysis

was enough opportunity to check the feasibility of carpooling among the employees. To study this their attitude towards carpooling had to be understood (Table 7).

RESULTS AND DISCUSSION

Results from exploratory factor analysis: Exploratory factor analysis was conducted using SPSS and six factors were discovered that totally explained 66.75% of total variance Table 9. KMO measure was 0.831 Table 8 and is an acceptable measure with significance levels for Bartlett's test of sphericity at 0.000. The data was found conducive to conduct factor analysis. Six factors were extracted with a total variance of 66.75% and the factors were named as core benefits seekers, implementors, travel companionship, role neutrality, walk the extra mile and security. These factors ranked descending order of variance explained Table 9. Core benefit seekers sought

Table 8: Bartlett's test and KMO statistics

KMO and Bartlett's test	Measure
Kaiser-Meyer-Olkin measure of sampling adequacy	0.831
Bartlett's test of/Approx. Chi-square	1500.771
Sphericity/df	210.000
Sig.	0.000

Table 9: Total variance explained

Factors	Variance explained
1	17.61
2	16.38
3	10.77
4	7.92
5	7.25
6	6.79
Total variance	66.75

the real benefits of car pooling like reduction in traffic problem, reduction in pollution, reduction in driving stress. Implementors were those who were willing to initiate car pooling in university, willing to implement carpooling and willing to spread awareness about car pooling Table 10 and 11.

Travel companionship were those who were willing to travel with others and enjoy traveling together. Role neutrals are those who were willing to alternate between being driver or driven and comfortable to car pool with both teaching and non teaching staff. Walk the extra mile comprised of willingness to walk extra mile to catch the car pool and willingness on part of driver to take a diversion to pick up the waiting carpooling passenger. Safety consisted of toleration of co passengers and safety to oneself. These six factors form the six segments Table 11.

Variables that had insufficient factor loadings (<0.5) were dropped and factor analysis was re-run for the analysis (Krishnaswamy *et al.*, 2006). The variable that got dropped were resolution for traffic problem, commuting to office is not tough, proper routing will help carpooling, carpooling will help in many situations, dependence on one colleague, carpool with opposite gender, shared expenses, importance of starting point of driver, preference to university carpooling, time flexibility, possessiveness of vehicle, tolerance towards usage of own vehicle.

Results from two group discriminant analysis:

Discriminant analysis was conducted to discriminate two groups namely the carpoolers and non carpoolers and Wilks Lambda stands at 0.399 Table 12 and this value is closer to zero and signifies a good degree of separation between employee's who would like to car pool and employee's who are not ready to carpool (Krishnaswamy *et al.*, 2006). The group centroids Table 13

Table 10: List of variables and their factor loadings

Variables	-----Components-----					
	1	2	3	4	5	6
Carpooling to solve problem	0.816	0.053	0.047	0.008	0.095	-0.036
Reduce environmental pollution	0.660	-0.033	0.035	0.433	-0.277	0.138
Reducing travelling stress	0.773	0.106	0.008	-0.002	0.085	0.015
Need for carpooling	0.754	0.245	0.061	-0.035	0.224	0.036
Routing would help carpool	0.613	0.298	0.190	0.004	-0.111	0.104
Tolerate co-passengers	0.148	0.121	-0.068	-0.082	0.276	0.784
Safety	0.096	0.170	0.287	0.184	-0.125	0.758
Walk the extra mile	0.158	0.078	-0.017	0.176	0.792	-0.022
Take a diversion	0.027	0.149	0.175	0.076	0.715	0.161
Benefits leads to success	0.606	0.202	0.285	0.244	0.028	0.160
Become more productive	0.575	0.179	0.283	-0.074	0.197	0.262
Travel with different cultures	-0.062	0.011	0.719	0.399	0.071	0.161
Not a boring journey	0.240	0.105	0.744	-0.206	0.037	0.047
Travel with teaching and non teaching staff	-0.001	0.168	0.177	0.752	0.122	-0.038
Drive or driven	0.102	0.235	-0.134	0.668	0.162	0.077
Initiate carpool	0.168	0.783	0.074	0.278	0.084	0.038
Implement carpool	0.128	0.889	0.031	0.090	0.050	0.077
Commitment	0.224	0.808	0.085	0.057	0.135	0.160
Good companionship	0.235	0.390	0.666	0.066	0.069	-0.010
Professionalism	0.250	0.541	0.497	-0.014	0.114	0.071
Create awareness	0.128	0.733	0.343	0.162	0.070	0.105

Table 11: Factors and their component variables

Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Core benefits seekers	Implementers	Travel compani on-ship	Role neutrality	Walk the extra mile	Security
Carpooling to solve problem	Initiate carpool	Travel with different cultures	Travel with teaching and non teaching staff	Walk the extra mile	Tolerate copassengers
Reduce environmental pollution	Implement carpool	Not a boring journey	Drive or driven	Take a diversion	Safety
Reducing travelling stress	Commitment	Good compani onship			
Need for carpooling	Professionalism				
Routing would help carpool	Create awareness				
Benefits leads to success					
Become more productive					

Table 12: The value of Wilks Lambda

Test of function (s)	Wilk's Lambda	χ^2	df	Sig.
1	0.399	135.178	32	0.000

Table 13: Functions at group centroids

Are you willing to execute and implement carpooling in the university? (0 = No 1 = Yes)	Function (1)
0	-1.533
1	0.972

stand at -1.533 and 0.972 which are in opposite directions also signify considerable separation between two groups (Krishnaswamy *et al.*, 2006).

The main discriminating variables are intitiate carpool, commitment to carpooling, reduce environmental pollution and preference of university carpool. About 89.7% were correctly classified which is good level of classification Table 14. About 101 employee's of the total sampled were willing to car pool while 65 are not willing to carpool. Table 15 provides the discriminant function co-efficients of variables.

It appears from the discriminant analysis that initiation, commitment, concern for environment and preference for carpool by university employee's plays an

Table 14: Classification results

Are you willing to execute and implement carpooling in the university? (0 = No 1 = Yes)	Predicted group membership		Total
	0	1	
Original/count			
0	56.0	8.0	64.0
1	9.0	92.0	101.0
Percentage			
0	87.5	12.5	100.0
1	8.9	91.1	100.0

89.7% of original grouped cases correctly classified

Table 15: Discriminant function co efficients

Standardized canonical discriminant function coefficients	Function (1)
Initiate carpool	0.810
Commitment to carpool	0.635
Reduce environmental pollution	0.327
Preference of university carpool	0.210
Become more productive	-0.110
Possessiveness of vehicle	-0.111
Travel with teaching and non-teaching staff	-0.187
Expect travelling expenses	-0.215
Drive or driven	-0.253

influencing role for an employee to choose car pooling. The presence of this variable as one of the discriminating variables is enough evidence that employee's would prefer carpooling by colleagues.

CONCLUSION

Based on the potential to explore carpooling systems in institutions, we had started studying attitude of employees of a university in Bangalore. From the descriptive data of the sample collected, it was found that a large number of employees travelled more than 10 km to reach their workplace. A sizeable No. (122) of employees drove two wheelers and used other modes of transport to reach their work place whereas 43 employees drove their cars to reach their workplace. Most of the cars were single owner vehicles Table 1. From the literature we had identified a number of variables influencing carpooling and it was also found from literature that people trusted one another more within an institution rather than strangers and trust was one of the influencing variables for successful carpooling. This strengthened the assumption that university would be a good place to study the attitude of employees towards carpooling.

The results of exploratory factor analysis revealed six factors namely: core benefit seekers, implementers, travel companionship, role neutrality, walk the extra mile and security. Employee's valued the actual benefits of carpooling the followed by implementation and other factors. Security was accorded lowest levels of importance amongst factors and it was because employees knew one another to a fair extent. This strengthens our assumption based on literature that security is not a main issue in employee's seeking carpool.

IMPLEMENTATIONS

The number of employees who favoured carpooling were 101 out of total sample size of 165. Hence, majority of the samples favoured carpooling. Two group discriminant analysis was performed to understand what differentiates the car poolers from non-car poolers. The variables that differentiated were initiation of carpool, implementation of carpool, environmental benefits and preference for university carpool. This again reiterates the fact that employees place much importance on initiation of carpool, implementation and they favour university carpool. Hence, there seems to be a very good opportunity to adopt carpooling in this university and the similar scope can be explored among universities and institutions.

LIMITATIONS

This study was conducted in one university in Bangalore and other similar institutions are to be studied

to generalise the observations. Similar studies across different establishments would provide better insights as sample becomes more representative of the population.

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REFERENCES

- Bento, A.M., J.E. Hughes and D. Kaffine, 2013. Carpooling and driver responses to fuel price changes: Evidence from traffic flows in Los Angeles. *J. Urban Econ.*, 77: 41-56.
- Bonsall, P., 1981. Car sharing in the United Kingdom: A policy appraisal. *J. Transp. Econ. Policy*, 15: 35-44.
- Burris, M.W., K.F. Sadabadi, S.P. Mattingly, M. Mahlawat and J. Li *et al.*, 2007. Reaction to the managed lane concept by various groups of travelers. *Transp. Res. Rec. J. Transp. Res. Board*, 1996: 74-82.
- Canning, P.E., S.J. Hughes, E.E. Hellawell, B.C.M. Gatersleben and C.J. Fairhead, 2010. Reasons for participating in formal employer-led carpool schemes as perceived by their users. *Transp. Plann. Technol.*, 33: 733-745.
- Chadchan, J. and R. Shankar, 2012. An analysis of urban growth trends in the post-economic reforms period in India. *Intl. J. Sustainable Built Environ.*, 1: 36-49.
- Chan, N.D. and S.A. Shaheen, 2012. Ridesharing in North America: Past, present and future. *Transp. Rev.*, 32: 93-112.
- Chen, C., Y. Wang, L. Li, J. Hu and Z. Zhang, 2012. The retrieval of intra-day trend and its influence on traffic prediction. *Transp. Res. Part C. Emerging Technol.*, 22: 103-118.
- Choo, S. and P.L. Mokhtarian, 2004. What type of vehicle do people drive? The role of attitude and lifestyle in influencing vehicle type choice. *Transp. Res. Part A. Policy Pract.*, 38: 201-222.
- Correia, G. and J.M. Viegas, 2011. Carpooling and carpool clubs: Clarifying concepts and assessing value enhancement possibilities through a Stated Preference web survey in Lisbon, Portugal. *Transp. Res. Part A Policy Pract.*, 45: 81-90.
- Dobson, R., F. Dunbar, C.J. Smith, D. Reibstein and C. Lovelock, 1978. Structural models for the analysis of traveler attitude-behavior relationships. *Transp.*, 7: 351-363.

- Downs, A., 2004. Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion. Brookings Institution Press, USA., ISBN: 9780815719298, Pages: 455.
- Gardner, B. and C. Abraham, 2007. What drives car use? A grounded theory analysis of commuter's reasons for driving. *Transp. Res. Part F. Traffic Psychol. Behav.*, 10: 187-200.
- Golob, T.F., 2001. Joint models of attitudes and behavior in evaluation of the San Diego I-15 congestion pricing project. *Transp. Res. Part A. Policy Pract.*, 35: 495-514.
- Golob, T.F., A.D. Horowitz and M. Wachs, 1977. Attitude-behavior relationships in travel demand modelling. *Proceedings of the 3rd International Conference on Behavioural Travel Modelling*, April 3-7, 1977, Tanunda, South Australia, pp: 1-20.
- Jorge, D. and G. Correia, 2013. Carsharing systems demand estimation and defined operations: A literature review. *Eur. J. Transp. Infrastruct. Res.*, 13: 201-220.
- Koppelman, F.S. and P.K. Lyon, 1981. Attitudinal analysis of work/school travel. *Transp. Sci.*, 15: 233-254.
- Krishnaswamy, K.N., A.I. Sivakumar and M. Mathirajan, 2006. *Management Research Methodology: Integration of Principles, Methods and Techniques*. Pearson India Education Services Pvt. Ltd., Bengaluru, India, ISBN:9788131797709, Pages: 573.
- Levin, I.P., 1976. The development of attitudinal modeling approaches in transportation research. Master's Thesis, The University of Iowa, Iowa City, USA.
- Li, J., P. Embry, S.P. Mattingly, K.F. Sadabadi and I. Rasmidatta *et al.*, 2007. Who chooses to carpool and why?: Examination of Texas carpoolers. *Transp. Res. Rec. J. Transp. Res. Board*, 2021: 110-117.
- Malodia, S. and H. Singla, 2016. A study of carpooling behaviour using a stated preference web survey in selected cities of India. *Transp. Plann. Technol.*, 39: 538-550.
- McCoomb, L.A. and G.N. Steuart, 1981. The automobile passenger-a forgotten mode. *Transp. Res. Part A. Gen.*, 15: 257-263.
- McKnight, D.H., L.L. Cummings and N.L. Chervany, 1998. Initial trust formation in new organizational relationships. *Acad. Manage. Rev.*, 23: 473-490.
- Mokhtarian, P.L. and I. Salomon, 1997. Modeling the desire to telecommute: The importance of attitudinal factors in behavioral models. *Transp. Res. Part A. Policy Pract.*, 31: 35-50.
- Mokhtarian, P.L. and I. Salomon, 2001. How derived is the demand for travel? Some conceptual and measurement considerations. *Transp. Res. Part A. Policy Pract.*, 35: 695-719.
- Ory, D.T. and P.L. Mokhtarian, 2005. When is getting there half the fun? Modeling the liking for travel. *Transp. Res. Part A. Policy Pract.*, 39: 97-123.
- Painter, K., E. Jessup, M.H. Gossard and K. Casavant, 2007. Demand forecasting for rural transit: Models applied to Washington State. *Transp. Res. Rec. J. Transp. Res. Board*, 1997: 35-40.
- Prentice, D.A., D.T. Miller and J.R. Lightdale, 1994. Asymmetries in attachments to groups and to their members: Distinguishing between common-identity and common-bond groups. *Personality Soc. Psychol. Bull.*, 20: 484-493.
- Rao, A.M. and K.R. Rao, 2012. Measuring urban traffic congestion-a review. *Intl. J. Traffic Transp. Eng.*, 2: 286-305.
- Richardson, A.J. and W. Young, 1980. The spatial structure of carpool formation. *Proceedings of the PTRC Summer Annual Meeting*, July 7-10, 1980, University of Warwick, England, UK., pp: 135-152.
- Schrank, D. and T. Lomax, 2005. The 2005 urban mobility report. Texas A&M Transportation Institute, College Station, Texas, USA. <https://mobility.tamu.edu/>
- Vincent, R.A. and K. Wood, 1979. Car-sharing and car-pooling in Great Britain: The recent situation and potential. Master's Thesis, Transport Research Laboratory, Wokingham, Berkshire, UK.
- Zhou, J., 2013. Study of employee carsharing on the university campus. *J. Urban Plann. Dev.*, 139: 301-310.