Influence of Travelers' Attitudes, Status and Auto Consciousness on Car Use Reduction Measures

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ABSTRACT

The rapid increase in private vehicle ownership and usage results in traffic congestions on road networks and increases social costs. Reducing traffic congestions by introducing demand management strategies should be part of transportation policies in the developing world. Therefore, this paper aims to evaluate the influence of people's attitudes and lifestyles on intentions to reduce use of private vehicles. A questionnaire was designed which included respondents' socio-economic characteristics, statements on attitudes, lifestyles and intentions to reduce the use of private vehicles. This questionnaire survey was conducted in Lahore city with the help of university students and a total of 338 usable samples were obtained. Structural equation modeling technique was used to analyze the data. The analysis results revealed that people's transit-oriented attitudes, status and auto consciousness are underlying factors for the reduction of car use in Lahore city. These significant variables need to be considered in policy making regarding improvement of public transport and implementation of car use reduction policies in Lahore.

KEYWORDS: Travel behavior, Attitudes, Lifestyles, Public transport, Private car, Lahore.

INTRODUCTION

The trend of automobile ownership and usage has changed the shape of many metropolitan areas and way of travel (Susilo and Kitamura, 2008). The increase in vehicular traffic results in traffic congestions on road networks. The traffic jams tend to increase social cost in terms of increase in travel time and cost, increase in energy consumption and environmental pollution. Most of the efforts are made to enhance the capacity of road networks in order to meet the increased travel demand. However, in the long run, the increased capacity does not prove to be enough to make transportation infrastructures efficient, because demand also increases

as capacity increases. In other words, increase in road network capacity encourages more vehicle ownership and usage. Now-a-days, transportation experts in both academic and practical sectors are looking for alternative transportation policies to manage the travel demand. These policies are referred to as travel demand management (TDM) strategies. It is believed that TDM policies are effective in reducing travel time, travel cost, energy consumption and environmental pollution (Garling et al., 2002; Litman, 2004). TDM policies tend to reduce vehicular travel demand by influencing the individual's travel behavior and distributing the demand in space and time (Ferguson, 2000). TDM strategies are mainly classified into two categories; namely: push or disincentive measures aiming to reduce the advantages of car use (e.g. increase in fuel and road taxes) and pull or incentive measures where alternative travel choices

are provided (e.g. improved public transport, van pooling, HOVs' lanes) (Steg and Vlek, 1997). Another classification of policies includes hard measures such as road pricing, parking charges and new public transport services, as well as soft measures such as workplace travel plans, personalized travel planning, public transport marketing and travel awareness campaigns (Garling and Fujii, 2006).

It is very important for developing economies to look for alternative solutions (i.e., travel demand management (TDM) measures) to traffic congestions along with traditional methods; i.e., addition of supply. The consideration of TDM policies at the planning stage is very important in the developing countries where financial and technical resources are in deficit. Most of the cities in the developing world are facing complex situations in determining an appropriate mix or set of TDM policies for implementation purpose. Differences exist between countries as well as between cities from the aspects of transportation problems, economic growth, social and cultural constraints, individual's attitudes and psychological constraints. It is required to explore the potential of suitable demand management strategies in the local socio-economic context of the concerned city. It is also essential to consider the attitudinal aspects of travel behavior in transportation policy development. In addition to the above stated issues, collection of reliable data for the development of transportation policies is a big issue for the authorities in the developing world due to low literacy rate and response of the public.

Researchers believe that it is very important to evaluate the attitudes of the public towards TDM measures (Schade and Schlag, 2003; Thorpe et al., 2000). In different studies, push measures perceived low acceptance from the public compared to pull measures (Javid, 2015; Schlag et al., 2000; Bhattacharjee et al., 1997; Thorpe et al., 2000). Steg and Vlek (1997) stated that commuters normally perceive pull measures to be more suitable, even though push measures are often estimated to influence car use decrease largely. In evaluation, it is vital to explore the factors influencing

the acceptability and success of specific TDM measures. In developing countries, a few studies provide the evidence of the impact of socio-economic factors such as income, education and gender on acceptance and effectiveness of TDM measures (Javid et al., 2014; Bhattacharjee et al., 1997; Pradono et al., 2009; Pkusumantoro et al., 2009). On the other hand, some researchers believe that travel-related strategies are likely to be affected by individual's lifestyle, norms, individual's freedom in mode choice and different attitudes (Schade and Schlag, 2003; Steg, 2003; Eriksson et al., 2006; Jakobsson et al., 2000; Bin and Dowlatabadi, 2005; Hildebrand, 2003; Tranter and Whitelegg, 1994). Other important features to be considered in policy making concerning transport are: the current and changing nature of society, lifestyle patterns and travel attitudes that generate diversified travel demands (Beirao and Cabral, 2007) and instrumental factors that seem to play an important role such as feelings of power, freedom, status and superiority (Steg, 2005). In some studies, different attitudes have been found to influence the individual's behavior significantly (Dobson et al., 1978; Prillwitz and Barr, 2011; Anable, 2005). Similarly, personality characteristics have also been found to have some impact on travel behavior (Prevedouros, 1992). Cao and Mokhtarian (2005 a, b) stated that travel-related strategies are likely to be affected by attitudes, personality and lifestyle. Therefore, this study included some lifestyles and attitudinal aspects of the individual's travel behavior such as value of money, status consciousness, freedom and flexibility in travelling and public transport-oriented attitudes, in order to evaluate their influence on selected car use reduction policies.

The objective of this paper is to evaluate the influence of the individual's lifestyle and attitudinal aspects on the acceptability of some selected car use reduction policies. The car use reduction policies were selected in this study considering the background of TDM philosophy and local socio-economic and transportation problems. A questionnaire survey was conducted in Lahore city to obtain the required data.

Structural equation modeling (SEM) technique was deployed for analyzing and modeling of the collected data. This paper is organized in the following manner. The next section describes the characteristics of Lahore city, followed by a section which elaborates data collection methods and another section in which analysis and modeling results are presented. Last section summarizes the key findings and implications.

STUDY AREA CHARACTERISTICS

Lahore is the 2nd biggest city of Pakistan with a population of almost 8.65 million (JICA, 2012). The central part of the city is densely populated and population density decreases as we move towards the outer part of the city. The population density in the city varies from 1000 to 50,000 people/km^2 (JICA, 2012). In the past decade, the urban population growth rate has reached almost 3.0% (JICA, 2012). Lahore city is concentrated with educational and medical facilities. There is a huge trend of migration from other small cities to Lahore for better employment and education opportunities. The vehicle ownership growth rate has reached almost 17% *per annum* and there is a high trend for motorcycle ownership (JICA, 2012). The share of motorcycle traffic on the road network is almost 50% of the total motorized vehicles. The trend of car ownership and usage is very high among middle-and high-income people (JICA, 2012). The modal share of Lahore city constitutes 8.5% car, 22.4% motorcycle, 12.5% public transport modes (bus and wagon), 7.6% rickshaw/taxi, 5% bicycle and 40% walking (JICA, 2012). Considering modal share, it can be argued that Lahore city has a high potential for non-motorized trips; however, the appropriate facilities are not available for bicycle and walking modes. The rapid increase in private vehicle ownership and usage has resulted in traffic congestion-related problems. The main reasons for increase in vehicle ownership and usage are banking leasing policy, changing lifestyles and social values. Traffic congestions cause an increase in travel time and cost, as well as an increase in both energy consumption and environmental pollution. The traffic safety is also a matter of concern in the era of motorized transport. The high usage of private vehicles puts economic burdens on the country in the form of more fuel consumption, because most of the fuels are imported from other countries. Despite the construction of 28 km BRT route, the public transport system is underdeveloped and inefficient. There is a big gap between demand and supply of public transport facilities (JICA, 2012). The current situation of Lahore city demands the consideration of appropriate transportation policies at the planning stage which should control the usage of private vehicles and should develop and promote the alternative travel options in the city. The cultural and lifestyle differences among different groups of the society affect their choices for travel modes, which is true for Lahore city (Javid et al., 2013). Considering the mentioned facts and issues, time is needed to identify the major contributing factors for the development of effective transportation policies in order to promote sustainable travel options in the city.

DATA COLLECTION METHODS

Questionnaire Design

A questionnaire survey was designed seeking the objectives of this study. In the first part, respondents' personal and travel information was asked. In the second part, some statements were designed on attitudes, lifestyle, status and auto consciousness, as well as perceived freedom and flexibility in travelling by travelers. These statements were designed considering the target groups of this survey and details are given in Table 1. In the last part of the questionnaire, four car use reduction polices or responses were designed. Respondents needed to show their intention toward each defined car use reduction policy on a six-point ordinal scale considering whether the travel cost of private car use is doubled. These policies include: (1) reduced use of private vehicles in response to double travel cost of car use, (2) use of improved public transport system in response to double travel cost of car use (3) shift to car

sharing in response to double travel cost of car use and (4) shift to office or campus transport services if available in response to double travel cost of car use. The travel cost of private car use was supposed to be doubled by increasing fuel taxes, vehicle registration taxes and increasing/ imposing parking charges and tolls on private car usage. In this study, office or campus transport means the transport services provided by the company or university to the employees, workers or students. The selected TDM policies were designed in the form of a package of pull and push measures (i.e., integrated approach is adopted for its successful implementation). Therefore, travelers were offered with alternatives in response to increase in travel cost of car use. These four responses were conceptualized based on the available literature in this context, local transportation problems as well as local socio-economic conditions of Lahore city. Due to increase in cost, we expect a decrease in the use of cars; that's why the first response was included. The response of improved public transport has both objective nature and subjective nature. The public transport system

has improved somewhat in the past 3-4 years, including the development of 27 km BRT line and the operation of conventional bus service on some routes. Mass transit development is part of the local government policy in the future. The 3rd alternative is subjective in nature, which is explained in the questionnaire considering its potential in response to increase in car usage cost. The last response or alternative was designed considering the target group of respondents; i.e., students and employees. Currently, some institutions/organizations provide transport services to their students/ employees and any substantial increase in car travel cost may result in a change in modal shift from private vehicles to the provided services. A six-point ordinal scale (1: strongly disagree, 2: disagree, 3: somewhat disagree, 4: somewhat agree, 5: agree, 6: strongly agree) was used to evaluate the respondents' responses on the stated questions in the last two parts of the questionnaire. This scale was selected keeping in view easiness, data reliability and structural equation modeling technique for analysis and modeling purposes.

Table 1. Questionnaire items

Sr. #	Description of statements on attitudes and lifestyles
1.	I like to travel by public transport, because I can do some other acts (e.g. reading books)
2.	I like to travel by public transport, because I can talk with other people
3.	I like to travel by public transport, because I feel more safe from accidents
4.	I like to travel by public transport, because it is a cheaper mode of transport
5.	Having a car is a status to me in the society
6.	Social influence is a guiding principle of my life
7.	Wealth is a guiding principle of my life
8.	I prefer a mode of transport which offers flexibility in travelling
9.	I like a travel that allows me to do other acts on the way (e.g. shopping)
10.	I think, car gives a lot of independence in travelling
11.	Travel schedule of other family members does not give me enough freedom in travelling
12.	Obeying religious rules is important in travelling
13.	Obeying social values is important in travelling
Behavioral intentions in response to double travel cost of car use	
1.	I would reduce use of private vehicle
2.	I would prefer to use improved public transport
3.	I would shift to car sharing
4.	I would prefer to use available office or campus transport services

Survey and Sampling

The main target groups of this questionnaire survey

were engineering students and employees at the university. The employees of some other organizations

were also included in the sample. The other objective of this survey was to target current car users and potential car users. It was assumed that the engineering graduates have more potential of owning private cars in the future compared with graduates of other disciplines. Only those employees were targeted in this survey who belong to middle- and high-income rank, because such groups use private cars or have a potential of using cars.

This survey was conducted in Lahore city with the help of university undergraduate students. The selected students for the survey had a background of transportation engineering and they were well aware of the contents of questionnaire and survey methodology. However, they were trained for the survey objectives and contents. They were instructed for each part and statements of the questionnaire to ensure the reliability of the collected data. The objectives of the questionnaire and filling guidelines were mentioned at the start of each part. To make the questionnaire understandable for the general reader, the terminologies used in this survey were well explained at the start of each part of the questionnaire. Self completion by respondents and interview approaches were used in this survey considering the feasibility to conduct for each respondent. Random sampling was conducted for the selected groups of target population in this study. The respondents were instructed with the help of survey team members about the contents of the questionnaire and other statements used in it. Sufficient time (i.e., 2 weeks) was given to the respondents for the completion of the questionnaire. Completed forms were collected with the help of the survey team. A total of 338 usable samples were obtained. Some samples were discarded because of incomplete and/or incorrect information.

The most of the respondents were males, because the share of the working females is less in Lahore city. Also, due to religious and social constraints, it is difficult to get proper responses from females. Table 2 shows that most of the respondents belong to middle-to high-income category, which is consistent with our survey and sampling objectives. The details of other respondents' socio-economic characteristics are given in Table 2.

Table 2. Descriptive statistics of respondents' socio-economic characteristics

Characteristics	Distribution (%)
Gender	Male (71%), Female (29%)
Occupation	Students (25.7%), private employees (28.6%), civil employees (41.4%), entrepreneurs (4.3%)
Personal income per month (PKR)	<10,000 (18.5%), 11,000-20,000 (14.8%), 21,000-30,000 (15.7%), 31,000-40,000 (18.2%), 41,000-60,000 (16.8%), 61,000-80,000 (9.8%), >80,000 (6.2%)
Vehicle ownership	None (10.5), Motorcycle (58.3), Car (55.0)
Modal share (most frequent travel mode)	Walking / Bicycle (8.1%), car (32.5%), motorcycle (25.8%), auto-rickshaw/taxi (10.5%), campus/office transport (8.3%), public transport (bus/ minibus/ Qingqi) (14.8%)

RESULTS AND ANALYSIS

The data was analyzed using structural equation modeling (SEM) technique with the help of SPSS AMOS software. Now-a-days, researchers in the transportation field have widely been using SEM technique for analysis of travel behavior considering attitudes and other psychological factors (Javid et al., 2016; Vilakazi and Govender, 2014; Javid et al., 2013; Javid et al., 2012; Eriksson et al., 2006; Choocharukul et al., 2006; Golob, 2003; Dobson et al., 1978). This technique provides a way to include maximum number of observed and unobserved variables in a model depending upon the number of samples. It helps in interpreting the results without considering the constraints of multi-collinearity. Initially, a factor

analysis was conducted for attitudes and lifestyles and three factors were extracted. These factors include; transit-oriented attitudes, freedom and flexibility in travelling and social status consciousness. These factors were named considering the nature of their associated indicators or observed variables. The factor analysis results are presented in Table 3. Cronbach's alpha values were calculated for each factor and presented in Table 3. The alpha value of extracted factors shows that internal consistency is relatively good among respondents in evaluation. Similarly, higher factor loadings of a particular observed variable for any extracted factor indicate high consistency among respondents in evaluation. Moreover, observed variables with higher factor loadings have more significance in explaining the influence of extracted factors on car use reduction policy. Mean response of respondents for attitudes is also given in Table 3. Respondents' evaluation is high for indicators of flexibility and freedom in travelling among all statements. Table 4 shows the respondents' responses on selected behavioral intentions. The intentions are high to use office -or campus- based transport services in response to doubled travel cost compared with other alternatives. The influence of extracted factors was evaluated on the acceptance of four selected car use reduction policies as presented in previous subsections.

At structural equation modeling stage, some observed variables of the respondents' socio-economic characteristics were introduced in the model. Only two variables of the respondents' travel characteristics were found significant in explaining the respondents' behavioral intentions. These two significant variables were coded as dummy variables; i.e.,car users (1 if using car or 0), public transport users (1 if using car or 0).A typical diagram of structural model is given in Fig. 1. The structural models were run separately for each car use reduction policy. The results of structural equation modeling are given in Table 5 and the interpretation of these results is presented in sub-sections.

Different researchers in the field of statistics have recommended permissible values for parameters of goodness of fit. As the ratio of chi-square to the degree of freedom ($\chi 2/DF$) less than 5 indicates a reasonable fit of SEM model (Marsh and Hocevar, 1985), GFI, AGFI and CFI greater than 0.90 indicate good fit of model (Bentler and Bonett, 1980; Bentler, 1982) and RMSEA less than 0.08 shows a good fit (MacCallum et al., 1996). Considering these recommendations from researchers, it can be said that the values of goodness of fit parameters for all models are falling within permissible values as mentioned above, which indicates that the developed models have good fit in estimating the respondents' behavioral responses.

Table 3. Average response and results of factor analysis

Latent variable	Description of observed variables	Mean	Factor loading	α
Transit oriented attitudes	I like to travel by public transport, because I can do some other acts (e.g. reading books)	3.85	0.790	0.69
	I like to travel by public transport, because I can talk with other people	3.65	0.721	
	I like to travel by public transport, because I feel more safe from accidents	3.37	0.450	
	I like to travel by public transport, because it is a cheaper mode of transport	3.25	0.372	
Social status consciousness	Having a car is a status to me in the society	3.78	0.853	0.63
	Social influence is a guiding principle of my life	3.87	0.610	
	Wealth is a guiding principle of my life	3.57	0.472	
Flexibility and freedom in travelling	I prefer a mode of transport which offers flexibility in travelling	4.77	0.589	0.57
	I like a travel that allows me to do other acts on the way (e.g. shopping)	4.66	0.474	
	I think, car gives a lot of independence in travelling	4.78	0.353	

Note: Mean: average response on 6-point ordinal scale, α: Cronbach's Alpha.

Table 4. Respondents' responses on behavioral intentions to car use reduction policies

| Behavioral response	Level of Agreement on Six-Point Ordinal Scale						Mean
	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree	
I would reduce use of car	9.1%	14.8%	20.4%	21.4%	24.4%	9.9%	3.77
I would prefer to use improved public transport	7.1%	13.6%	21.7%	19.1%	24.8%	13.7%	3.85
I would shift to car sharing	8.8%	12.4%	14.8%	21.9%	26.6%	15.5%	3.90
I would prefer available office or campus transport services	5.8%	7.0%	7.8%	17.8%	29.5%	32.1%	4.44
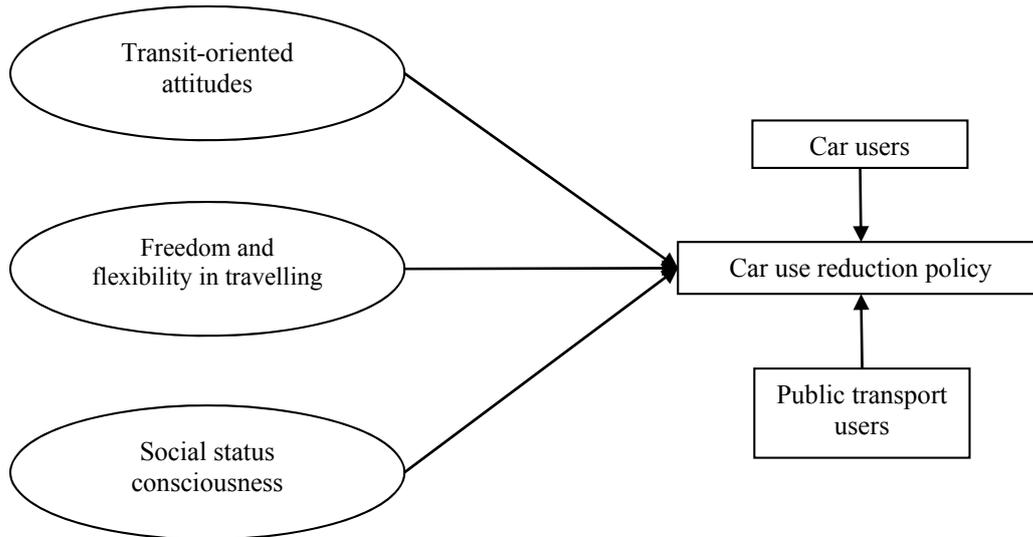
Figure (1): A typical diagram of a structural model

Reduced Use of Private Vehicles in Response to Double Travel Cost of Car Use

The modeling results in Table 5 show that the extracted latent variable '*transit-oriented attitudes'* has positive influence on car use reduction with double travel cost of car use. This means that people who possess positive attitudes on public transport have more potential for reduction of car use in case that its travel cost is doubled. The latent variables '*freedom and flexibility in travelling'* and '*social status consciousness*' have negative association with this policy. This implies that people who place high value on the indicators of these latent variables have less potential to reduce the usage of private cars even with doubled

travel cost. Similarly, the current car users have less possibility to reduce the use of cars. However, the association of current public transport users is positive with this policy. This means that the increase in travel cost of car use would help in restricting current transit users to public transport and from owning private cars.

Use of Improved Public Transport in Response to Double Travel Cost of Car Use

Results of Table 5 depict that the '*transit-oriented attitudes'* have positive influence on people's intentions to use improved public transport, whereas '*perceived freedom and flexibility in travelling*' have negative influence on those intentions. The respondents' social

status and auto consciousness result in low usage of improved public transport. The association of current car users is negative, whereas that of public transport users is positive with improved public transport scenario with doubled travel cost of car use.

Shift to Car Sharing in Response to Double Travel Cost of Car Use

The latent variables '*transit-oriented attitudes*' and '*freedom and flexibility in travelling*' as shown in Table 5 have positive associations with the policy of shift to car sharing in response to double travel cost of car use. However, status and auto conscious people have less potential to shift to car sharing mode, as the relationship is negative. Similarly, current car users have less potential to avail this travel mode in response to increased travel cost. The relationship of public

transport users with this policy is insignificant.

Intentions to Use Office/Campus-Based Transport Service in Response to Double Travel Cost of Car Use

The results in Table 5 reveal that the behavior of respondents towards office/campus- based transport service is the same as for policy of shift to car sharing. This means that people who are conscious about their status in the society have less potential to consider this service for use even with double travel cost of car use. However, the current public transport users have positive consideration for this service. The results depict that the users perceive some freedom and flexibility in using this mode, as the structural relationship is positive between '*freedom and flexibility in travelling*' and this policy.

Table 5. Results of structural equation modeling for four policies

Latent/observed variables	Car use reduction policies			
	Reduced use of private vehicles	Use of public transport	Shift to car sharing	Shift to office or campus transport
Transit-oriented attitudes	0.16***	0.26***	0.26***	0.11**
Freedom and flexibility in travelling	-0.21*	-0.18*	0.20***	0.15*
Social status consciousness	-0.23***	-0.25***	-0.14*	-0.25***
Car users (1 if using car, otherwise 0)	-0.10**	-0.16***	-0.16***	-0.12**
Public transport users (1 if using public transport, otherwise 0)	0.18***	0.23***	0.05	0.11**
Indices of goodness-of-fit parameters				
Chi-sq/ DF (degree of freedom)	2.330	2.697	2.416	2.394
Goodness of fit index (GFI)	0.956	0.951	0.954	0.955
Adjusted goodness of fit index (AGFI)	0.926	0.917	0.923	0.924
Comparative fit index (CFI)	0.864	0.845	0.857	0.855
Root mean square error of approximation (RMSEA)	0.061	0.069	0.063	0.063

Note: *** significant at 1%, ** significant at 5%, * Significant at 10%.

CONCLUSIONS AND IMPLICATIONS

This study was conducted to evaluate the influence of people's lifestyles and attitudes on stated car use reduction policies. The results of survey and structural modeling showed some interesting findings and their

implications for Lahore city. It is found that increase in travel cost of car use has some impact on reduction of car use and usage of alternative travel modes. It is found from modeling results that people who possess transit-oriented attitudes have more potential to use alternative travel modes to cars such as car sharing, improved public

transport and other mentioned modes. This finding implies that it is required to promote and develop transit-oriented attitudes among people for reduction of car use and proper modal shift. This can be achieved by using some soft TDM policies that can be very effective in changing attitudes and creating awareness among people for the benefits of using sustainable travel options. These soft policies include marketing of alternative travel options to cars and education and awareness campaigns which should highlight the benefits to the public of using sustainable travel alternatives.

The other main finding is that people who place high value on status symbol in the society and have high belief in freedom and flexibility of private transport have less potential to consider alternative travel options. However, car sharing and office/ campus-based transport policies have more consideration to use among the offered travel modes in response to increased travel cost of car use. The modeling results imply that the policy of increase in travel cost of car use can help in restricting the current public transport users to the public transport and reducing the use of private cars to some extent when other better travel options are available in the market.

This study implicates that it is required to develop and promote alternative travel options to private cars which should be able to attract car users. Before increasing the travel cost of private cars, it is suggested to improve the public transport system in Lahore city to attract auto users. As mentioned earlier, soft policies need to be considered concurrently with these polices for efficient promotion from private vehicles to the stated travel modes.

It can be said that the findings of this study would provide a theoretical background based on public perceptions for the consideration of appropriate demand management policies in order to solve congestion-oriented problems in developing counties. The study findings would also provide a strong background to researchers and planners in the developing world regarding attitudinal aspects of travelers, because these attitudinal aspects can affect the effectiveness of the transportation behavioral policies. The findings of this study would be helpful for local planners and decision makers in deciding the proper mix of TDM policies in making efficient use of transportation infrastructure of Lahore city.

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