FACTORS THAT INFLUENCE TRAVELERS' WILLINGNESS TO USE OR NOT PARK-AND-RIDE SERVICE IN PUTRAJAYA AND KARACHI CBD

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ABSTRACT

Urban transportation planning has a key role in the daily routine of inhabitants. Transportation planning has been observed as the most debatable subject, but least attention has been paid on it. Traffic congestion is expanding up to the outskirts of city centres during peak hours. Currently, congestion in Karachi's south district specifically Saddar Town is known as Central Business District (CBD) and Putrajaya are the result of people driving their cars to work. People cannot be convinced to shift towards public transportation without understanding their travel behaviour. Thus, there is a need to reduce the imbalance between public and private transport. Therefore, being a part of travel demand management park-and-ride (P&R) service has extensively used in many countries and proved to be successful in decreasing congestion and difficulty of finding parking space in the urban centres. Hence, this research determines the factors that influence travellers' decision to use or not to use P&R, and study the possible ways of attracting car drivers to P&R service. To collect the travel behaviour information, a survey was conducted through a self-administrative quantitative questionnaire. Data was analysed through descriptive analysis such as a contingency table (cross-tabulation) technique in chi-square test of independence/association model were applied through SPSS (Statistical Package for the Social Sciences). The findings of the research were more towards the implementation of parking charges at workplaces to discourage people from parking their cars at the workplace. Through this approach, car traveller can be shifted towards P&R services. Research outcomes will support policy making and provide a base for future study on mode choice model for P&R service.

INTRODUCTION

A developed country is not a place where the poor have cars; it's where the rich use public transport, these are the famous words of Gustavo Petro, Mayor of Bogota, Colombia. Since last few decades, the intensity of travel has increased substantively in all over the Europe (MOTIF, 1998). This increase grows private car usage and in reflection congestion and pollution increases. Additional imperative features to be measured in decision making regarding transportation existing and changing society and lifestyle which create a variety of travel needs. Most of the travellers are now extremely reliant on the car (Anable, 2005; Nguyen, Han, & Sahito, 2019). Therefore, the importance of car is not limited up to a mode of transportation, it's more than that (Steg, 2005). Such as additional reasons than only its influential purposes have a significant role, for instance, feelings of impression, freedom, status, superiority and power (Han, Sahito, Thi Nguyen, Hwang, & Asif, 2019; Steg, 2005).

Furthermore, the positive use of car depends on the user's lifestyle and their social-spatial engagements (Hiscock, Macintyre, Kearns, & Ellaway, 2002). Some suggestion has recommended that certain car users may not always travel out of need, but besides their choice (Handy, Weston, & Mokhtarian, 2005). Therefore, it is essential to encourage strategies that can decrease the use of private car dependency by providing sustainable replacements. Such strategies may involve advancement in the public transportation system and attract them to sustainable modes for instance cycling or walking. Moreover, it is essential to encourage the measures that discourage the usage of car (Gärling & Schuitema, 2007; MEMON, 2018).

In the early 1990s, several upper-middle income cities of Asia for instance, Bangkok, Seoul and Kuala Lumpur had touched the income levels which potentially capable of bearing high amounts of car and motorbike possession (Barter, 1999). Specifically, Kuala Lumpur urban area, although couldn't up till now be considered expressively car dependent, but in the stage of 'moderately traffic congested (Barter, 2004). The percentage of the modal split of travels is less than one third by public transport as compared to private transport in Surabaya, Bangkok and Kuala Lumpur cities (Marcotullio & Lee, 2003; Memon, Napiah, Hussain, & Hakro, 2016; Memon, Napiah, Talpur, & Hakro, 2016).

On the other hand, the dense structure of Karachi, Pakistan encourages the use of public transportation and non-motorized transportation (NMT), these are sustainable and reasonable means of transportation for lower and poor income people (Ahmed, Lu, & Ye, 2008). This can also meet the demand of about 22% of the population of Pakistan which is below the poverty line (S. Ali, 2006). In comparison to densely populated structure and mixed land-use features in Asian cities following the urban sprawl development of western countries and developing their highways, expressways and rapid transit system (Ahmed et al., 2008). Traffic congestion predicting cost, which is currently US $2.5 billion annually, will reach to $7.85 billion in coming 10 years in Karachi. It was observed in a research conducted by T-RTC (Toyota Research on Traffic

Congestion), as a part of their assurance to participate for the sustainability of the society (Recorder, 2013).

Additionally, Whitfield and Cooper (Whitfield & COOPER, 1998-9) focused on their findings that to increase attraction, P&R services would be as effective as travelling in a private car (with switching times), therefore it is essential to ponder service regularity and bus precedence methods. Similarly, a research in the United Kingdom explores that 81% of prospective bus travellers believed that a 'turn up and go' level of regularity (at minimum once every 10 min) was required to encourage them to commute in the service (TAS, 2001). Personal lifestyle and attitude have an important impact on travel behaviour (De Vos, Derudder, Van Acker, & Witlox, 2012; Sahito, Han, et al., 2020). Therefore, possible clarifications to deal with low public transport ridership do not simply include improving the quality but also to recognise users' travel behaviours and necessities.

The purpose of this research is to investigate the factors that influence travellers' mode choice and willingness to shift towards P&R service. In this research, a binary logistic model will be selected and the use of the model will explain using a case study. It is, therefore, essential to investigate their travel patterns and also the willingness to shift the mode if given certain encouragements. The results will be very helpful which provides some awareness into policy makings.

Problem background

Karachi

The fastest-growing megacities over the past decade have been primarily in the developing world. Karachi, Pakistan, has led the growth charge, with a remarkable 80% expansion in its population from 2000 to 2010 (Kotkin & Cox, 2013; Sahito, Kalwar, Memon, Mangi, & Hussain, 2020). The population of Karachi is around 20.88 million, it is known as World's number one fastest growing megacity (Kotkin & Cox, 2013). The city has seen a 35-times increase in its population and an almost 16-fold increase in its spatial expansion since the emergence of Pakistan with an annual growth rate of over 5% (Qureshi & Lu, 2007), as shown in Table I.

Table I. Karachi Metropolitan Population And Area Growth Rates (Kotkin & Cox, 2013)

Year	Population (million)	Area (km^2)
1947	0.4	233
1981	5.3	1994
1998	9.8	3527
2004	14.0	3566
2010	20.8	More than 3728

Karachi is the largest urban and economic centre of Pakistan, passing through an uncontrolled phase of rapid urbanisation and motorization (Qureshi & Lu,

2007). Karachi's south district specifically Saddar Town is administrative hub of Karachi and is known as the economic backbone of the country (Paracha, 2014). The increased urbanisation and economic growth in the city have put a tremendous pressure on travel demands (Qureshi & Lu, 2007). The increased demand has quickly filled the roadway infrastructure as about 33% of all motorised vehicles in the country multitude on its roads and expressways (Qureshi & Lu, 2007). Figure I shows that the vehicle fleet is dominated by cars and motorcycles, which account for 87% of the vehicles as compared to 7% for Paratransit; taxis and rickshaws and 1% for public transport (W. Ali, 2012). This rapid rise in personal vehicle ownership and the lack of economic instruments, such as charged parking and road pricing, has led to enormous congestion especially in the central part of the city which increases the average commute travel time in Karachi by over 45 minutes (Qureshi & Lu, 2007).
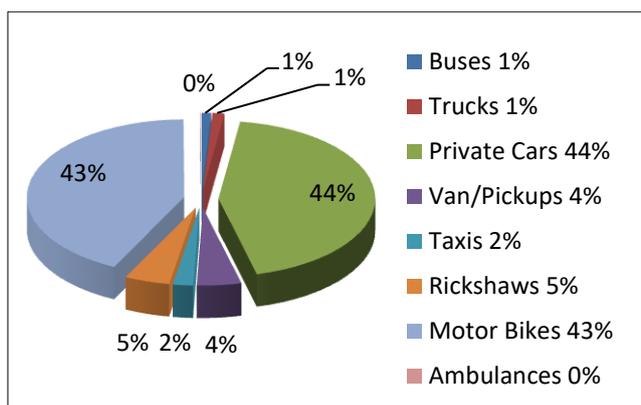
Fig.I. The share of passenger vehicles fleets in Karachi-2011.

The urban transport needs of a city are cyclic in nature and largely depend on the travel behaviour of the citizens (Ahmed et al., 2008). Table II lists the mode shares of two surveys carried out in 1987 and 2004 by the Traffic Engineering Bureau of Karachi. Although the trips made by private vehicles are increasing and recently in 2013 a research conducted by T-RTC (Toyota Research on Traffic Congestion) and discovered that almost 60% of the travellers are travelling in their private vehicles such as cars and motorbikes (Recorder, 2013). The noticeable feature is that the buses/minibuses still continued to provide over 50% of the travel demand. Therefore, the buses/minibuses are the most important mode of public transport in Karachi and better transport management strategies, service, accessibility, and affordability can help reduce the use of private vehicles.

Table II. Trend Of Mode Split At Karachi (Qureshi & Lu, 2007; Recorder, 2013)

Mode share (%)			
Year	Public Transport	Private Transport	Walking/Cycling
1987	57	31	12
2004	52	48	--
2013	40	60	--

Non-motorized transport is one of the most sustainable means of transport but unpopular in Karachi and only used by the low-income group who cannot even afford the public transport. The statistics in Table II show that percentage of trips made by walking/cycling was 12% in 1987 with no data in 2004. The alarming security and safety problems, the absence of policy and planning for pedestrians/cyclists, and the encroached/ill maintained footpaths are some of the main reasons that lower middle and middle-income groups do not use non-motorized transport. Pedestrians, besides being exposed to air and noise pollution, are also the largest group of victims of road accidents as almost 600 people die in road accidents every year in Karachi with over 50% being pedestrians (Qureshi & Lu, 2007).

It is counted that around 50,000 vehicles averagely per day are travelling in both directions, which is beyond the existing capacity of the roads. This reflects that it is essential to taking measures for increasing the capacity in order to meet future requirements of growing demand (Recorder, 2013). The traffic congestion is increasing day by day and government is focusing on the construction of flyovers, overhead bridges and new expressways (Ahmed et al., 2008). These approaches are increasing the traffic day by day and enhancing the use of private transport (Qureshi & Lu, 2007). The government is adopting conventional approaches which are encouraging the car users rather than a sustainable approach such as P&R service (Qureshi & Lu, 2007). Therefore, there is a huge imbalance in the modal split between public transport and car users (Ahmed et al., 2008; Gakenheimer, 1999; Qureshi & Lu, 2007).

Putrajaya

On the other hand, Malaysia's new federal administrative capital Putrajaya is a unique Malaysian city from a transport policy perspective. Putrajaya's explicit policy goal is to achieve a 70 percent share of all travels by public transport to its core precincts (Nor Ghani Md. Nor & Nor, 2006). Putrajaya, Malaysia has its own significant status in the world which is known as world's first intelligent Garden City (Putrajaya, 2013). It is an inspiring example of sustainable human development design to meet the needs of the growing nation for at least 300years (Putrajaya, 2013). The Rapid traffic growth and excessive use of private cars are a most important issue of this city (Borhan, Rahmat, Ismail, & Ismail, 2011). To reduce the traffic intensity, P&R service (P&RS) was developed in the beginning which is one of the best methods to reduce the intensity of traffic. However, very few car travellers were attracted towards P&RS (Borhan et al., 2011).

Therefore, the policy goal of Putrajaya becomes difficult to achieve and it seems to confront to the city authority. However, it appears impossible because this goal needs a reversal of the current modal split of 15:85 between private and public transport (Nor Ghani Md. Nor & Nor, 2006). The current modal split is 70 percent for cars; 15 percent, motorcycles; 15 percent of public transport (Nor Ghani Md. Nor & Nor, 2006). On another hand, in Karachi, there is no such kind of park ride facility is provided and also no concept of integrated transportation system (Ahmed et al., 2008). People are

habitual towards cars which cause of traffic congestion in the city centre. Although this research tries to find that if such kind of P&R service started in Karachi then could private car users influenced to use that service.

Therefore, this research will focus on how to attract the car drivers to reduce the imbalance between private and public transport usage in developing countries. To study the possible ways to find out measures that could fit in the travel behaviour and fit their habits to motivate the car users towards P&R service.

Furthermore, the theme of the study is towards investigating the factors that influence travel behaviour and mode choice such as; environment, trip, individual, transport, quality and uncertainty specific factors, which are affecting the mode choice of private and public transport users. The researcher followed the procedure in specifying the method of research to attain the required findings for the research. In the light of the above conversations, the following research questions materialise to help better understanding and to find measures which can attract car users to P&R service for future promotion and planning for P&R facilities.

What are the factors that influence traveller's willingness to choose service?

How to demonstrate the determined factors that influence travellers' willingness to choose P&R service

TARGETED SOCIAL ISSUES AND PROJECT OBJECTIVES

This study has extracted traffic management solution of traffic congestion problem by using P&R facility in urban cities (CPRE, 1998; Institute for Transport Studies; Institute, 2010; Qin, Guan, & Wu, 2013; Seik, 1997). There is an opportunity to develop P&R service to encourage users for modal shift from car to public transport. In developing world less work has been carried on how to attract the car travellers to choose the mode of P&R (Arup & Accent, 2012).

Several studies were conducted in Karachi, such as urban transport equity, sustainable transport strategies and pedestrian, but less attention has given on P&R service (Qin et al., 2013; Seik, 1997). Similarly, in Putrajaya the current modal split turns opposite and is 15:85 between private and public transport. Therefore, there is a need to investigate the factors that influence the traveller's mode choice(Memon, 2010; Memon, Kalwar, Sahito, Qureshi, & Memon, 2020; Memon, Madzlan, Talpur, Hakro, & Chandio, June 2014).

Currently, congestion in Karachi and Putrajaya is the result of people driving their cars to work (Ahmed et al., 2008; Borhan et al., 2011; Gakenheimer, 1999; Hamid, Mohamad, & Karim, 2008; Qureshi & Lu, 2007). People cannot be convinced to shift towards public transportation without understanding their travel behaviour (Anable, 2005; Elias, Albert, & Shiftan, 2013; Gurcharan, 1996; Hamid et al., 2008; Z. He, Ma, & Tang, 2009; Ho, Sadullah, & Vien, 2008; Lindstrom Olsson, 2003; Phil Goodwin & Gordon Stokes, 2004) The

imbalance between public and private transport has increased nowadays, thus there is a need to understand that how to fit the travel behaviour of private car users in public transport, such as P&R service (P&RS) (Qin et al., 2013). P&R service has extensively used in many countries and proved to be successful in decreasing congestion and difficulty of finding parking space in the urban centres being a part of travel demand management (Han, Nguyen, & Sahito, 2019; B. He, He, & He, 2012). Therefore, this research intended to understand car travellers' willingness to use P&R service and the factors that influence car travellers' mode choice and decision.

Thus, this research is to determine how environment, transport, trip, quality and individual-specific factors influence the choice of mode. This study will focus on the users (only Putrajaya) and non-users of P&R service in Karachi and Putrajaya. This study also determines the factors that influence travellers' decision to choose P&R service (P&RS), and study the possible ways of attracting car drivers to P&RS. Hence, the main objective of the study is as follow:

-To determine the factors that influence traveller's willingness to use or not to use P&R service.

-To model the determine factors that influence traveller's willingness to use or not to use P&R service.

PROJECT IMPLEMENTATION AND METHODS

This study mainly covers two clusters; users of P&R and private transport travellers. This research mainly focuses on the employees or working people. Especially those whose workplaces exist at the central business district or the city centre of the study areas. In Karachi, majorly the car owner respondents will be focused. Instead of that in Putrajaya both the car owners and users of P&R service (P&RS) are targeted. It is preferred to make the study meaningful the researcher only focuses on the employees of the study area. There is no such kind of age limit for the respondents; because they all are working people, they must be above 18 years and independent. There is also a benefit of choosing working people; they generate their trips on specific timings while going and coming back from their workplaces. Therefore, mostly traffic increases in that particular peak hour, which creates traffic congestion in the cities. Stratified random sampling technique was adopted in this study and this technique is very common for these types of studies (Borhan et al., 2014).The respondent's timings were asked to participate in a research upon their wish on a volunteer basis. If they were agreed, a self-administrative questionnaire provided them at their workplaces to the non-users of P&R service. Regarding the users of P&R service, they recruited at P&R lots upon their willingness of participation similarly like non-users.

The survey from the users and non-users of P&R service conducted and determined the importance of specific variables and willingness to choose P&R service. Similarly, the survey also collects the information of the real trip choices made by the travellers which are known as revealed preference and

information related to hypothetical situations is called stated preference. The stated preferences data evaluated to determine the travellers' willingness to use or not to use P&R service.

According to Krejcie and Morgan's well-known sample size calculating method, this study has 382 samples (Krejcie & Morgan, 1970). Ortuzar and Willumsen in 1996 mentioned that the sample size for mode choice study should not be less than 250 samples. Furthermore, 400 samples, which is divided into 300 for non-users and 100 for users of P&R service were chosen for Putrajaya, and 1000 samples were selected for Karachi city. According to a recent research in University of Leeds, England, it was suggested that the sample should be large enough so that when it is divided into groups each group will have a minimum sample size of 100 (Pathan & Faisal, 2010).

A self-administered questionnaire was distributed in the ministry offices, governmental departments and private offices in the Putrajaya and Karachi city centres (CBD). The respondents of the survey were working in the above-mentioned offices. Data collected through questionnaires and analysed by IBM Statistical Package for Social Sciences (SPSS) version 22(Gill, Kalwar, & Memon, 2021; Kalwar, Memon, & Qureshi, 2021; Memon et al., 2020; Shaikh, Memon, Memon, Laghari, & Memon, 2020). SPSS is a software package used for statistical analysis. Descriptive statistics approach in which contingency table (cross-tabulation) technique was applied for data analyzation. In the cross-tabulation technique, Chi-square model of association which is also known as chi-square model of independence is applied to know the significant association between dependent and independent variables as described in equation 1. Furthermore, this test is applied to explore the association of different factors with a willingness to use or not P&R service.

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Where;
O= the observed frequency
E= the expected frequency

More specifically, it tests for the association/independence between two nominal/dichotomous variables. The value of χ^2 is calculated by taking the squared differences between the observed frequencies and expected frequencies divided by the expected value. This is performed for all categories of the factors, which are then summarized, see equation 1.

RESULTS AND EFFECTS

The Chi-square test of association is the primary statistical method applied to test the significant association between dependent and independent variables by the cross-tabulation. Chi-square test of association or independence to check whether two variables are independent or associated. If variables are independent (no relationship) it means null hypothesis is accepted and a statistical test is non-significant. If the variables are associated with each other or related, then the result of the statistical test shows that it is statistically

significant and the null hypothesis is rejected. Which can be stated that there is some relationship between the variables

Therefore, Table III enlist the variables which are highly and moderate associated with the private transport users' choice to switch or not towards P&R service in Putrajaya. In conclusion, these below factors' null hypothesis is rejected and the alternative hypothesis is accepted which shows that there is a significant relationship between these factors and willingness to switch or not towards P&R service factor.

TABLE III associated factors with willingness to use or not P&R service

S.No.	Factors	Association	
01.	Socio-demographic factors	**High**	**Medium**
		Gender	
			Income
			Level of education
			Household Size
			Type of transport
02	Environment factors	Harsh weather	
03	Trip Specific factors	Travel time	
		Drop kids/family	
		Going for shopping	
			Travel directly
		Workplace distance	
		Travel time per trip	
		Trips per day	
04	Transport specific factors		Mode of travelling
		Improper location of P&R service	
05	Quality specific factors		Comfort preference
		Expensive parking	
		Personal status	
		Privacy	
		Car is convenient	
06	Uncertainty Specific factor	Threat of robbery	
		Threat of terrorism	
			Safety and Security at P&R service

In contrast, Table IV shows the variables of Karachi's employees which are highly and moderate associated with the dependent variable willingness to switch. In conclusion, these below factors' null hypothesis is rejected, it means alternative hypothesis is accepted which shows that there is a relationship between these variables and willingness to adopt or not P&R service factor.

Table Iv Associated Factors with Willingness to Use or Not P&R Service

S.No.	Factors	Association	
1.	Socio-demographic factors	**High**	**Medium**
			Gender
			Income
			Level of education
			Household Size
02	Environment Specific factors	Protect Environment	
		Harsh weather	
03	Trip Specific factors	Travel time	
		Drop kids/family	
		Going for shopping	
			Workplace distance
04	Transport specific factors	Mode of travelling	
		Parking problem	
		Traffic congestion	
		Fare rate cheaper than car	
05	Quality specific factors	Avoid mental stress	
		Personal status	
		Privacy	
		Car is convenient	
06	Uncertainty Specific factor		Threat of robbery
		Threat of terrorism	

CONCLUSION

In conclusion, it is revealed that socio-demographic factors such as; gender, income, the level of education and household size are common influencing factors in both cities except gender has a high association in Putrajaya. Secondly, in environment-specific factors, only harsh weather are a common concern for both, which reflects that harsh weather encourages private transport users to remain with their current mode of transport. Similarly, in trip specific factors; travel time, drop kids/family, going for shopping and workplace distance are also same factors with discouraging private transport users from using of P&R service.

Consequently, transport specific factor has the only mode of travelling variable which influencing both cities individuals, otherwise, there are many other variables have influenced, but not in both cities, such as traffic congestion variable has influence in only Karachi. Quality and uncertainty specific variables have almost equal influence in both cities.

Therefore, it revealed that except few almost all variables have influence in these both cities travellers, which represents those private transport users can be encouraged towards P&R service. Hence, this research can support policy makers for future planning and development of P&R service and can be the base for future study on mode choice behaviour model for P&R service.

REFERENCES

Ahmed, Q. I., Lu, H., & Ye, S. (2008). Urban transportation and equity: A case study of Beijing and Karachi. Transportation Research part A: Policy and Practice, 42(1), 125-139. doi: http://dx.doi.org/10.1016/j.tra.2007.06.004

Ali, S. (2006). Managing urban poverty: Council for Social Development,Uppal Pub. House.

Ali, W. (2012). Total number of vehicles registered/ on road in Karachi – 2011 compiled by URC. Karachi: Urban Resource Centre Retrieved from http://www.urckarachi.org/Registered%20vehicle%202002%20-%202011.pdf.

Anable, J. (2005). 'Complacent car addicts' or 'aspiring environmentalists'? Identifying travel behaviour segments using attitude theory. Transport Policy, 12(1), 65-78. doi: http://dx.doi.org/10.1016/j.tranpol.2004.11.004

Arup, & Accent. (2012). The effects of park and ride supply and pricing on public transport demand (pp. 110): Trnsport Scotland.

Barter, P. A. (1999). An international comparative perspective on urban transport and urban form in Pacific Asia: The challenge of rapid motorisation in dense cities: Murdoch University. Division of Social Sciences, Humanities Education.

Barter, P. A. (2004). Transport, urban structure and 'lock-in' in the Kuala Lumpur metropolitan area. International Development Planning Review, 26(1).

Borhan, M. N., Rahmat, R. A. A., Ismail, R., & Ismail, A. (2011). Prediction of travel behavior in Putrajaya, Malaysia. Research Journal of Applied Sciences, Engineering and Technology, Vol.3(05), 434-439.

Borhan, M. N., Syamsunur, D., Mohd Akhir, N., Mat Yazid, M. R., Ismail, A., & Rahmat, R. A. (2014). Predicting the Use of Public Transportation: A Case Study from Putrajaya, Malaysia. The Scientific World Journal, 2014, 9. doi: 10.1155/2014/784145

CPRE. (1998). Park and Ride: Its role in local transport policy. London: Council for the Protection of Rural England.

De Vos, J., Derudder, B., Van Acker, V., & Witlox, F. (2012). Reducing car use: changing attitudes or relocating? The influence of residential dissonance on travel behavior. Journal of Transport Geography, 22(0), 1-9. doi: http://dx.doi.org/10.1016/j.jtrangeo.2011.11.005

Elias, W., Albert, G., & Shiftan, Y. (2013). Travel behavior in the face of surface transportation terror threats. Transport Policy, 28(0), 114-122. doi: http://dx.doi.org/10.1016/j.tranpol.2012.08.005

Gakenheimer, R. (1999). Urban mobility in the developing world. Transportation Research part A: Policy and Practice, 33(7–8), 671-689. doi: http://dx.doi.org/10.1016/S0965-8564(99)00005-1

Gärling, T., & Schuitema, G. (2007). Travel demand management targeting reduced private car use: Effectiveness, public acceptability and political feasibility. Journal of Social Issues, 63(1), 139-153. doi: 10.1111/j.1540-4560.2007.00500.x

Gill, R., Kalwar, S., & Memon, I. A. (2021). Yeh's Satisfaction Index Modelling of Tenants in Rental Appartments (A Case Study of Latifabad Hyderabad). Sukkur IBA Journal of Computing and Mathematical Sciences(2), 1-10%V 14. doi: 10.30537/sjcms.v4i2.654

Gurcharan, S., A/L , Sangkar, Singh. (1996). Factors influencing mode choice for journey to network among government employees case study: Johor Bahru. (Master of Science Transportation Planning), Universiti Teknologi Malaysia.

Hamid, N. A., Mohamad, J., & Karim, M. K. (2008). Travel behaviour of the park and ride users and the factors influencing the demand for the use of the park and ride facility. Paper presented at the EASTS International Symposium on Sustainable Transportation incorporating Malaysian Universities Transport Research Forum conference 2008 (MUTRFC08). . .

Han, H., Nguyen, T. V. T., & Sahito, N. (2019). Sidewalk Zoom-In: A Spatial–Temporal Negotiation and Self-Organization within a Sociable Space. Sustainability, 11(22), 6241.

Han, H., Sahito, N., Thi Nguyen, T. V., Hwang, J., & Asif, M. (2019). Exploring the features of sustainable urban form and the factors that provoke shoppers towards shopping malls. Sustainability, 11(17), 4798.

Handy, S., Weston, L., & Mokhtarian, P. L. (2005). Driving by choice or necessity? Transportation Research part A: Policy and Practice, 39(2–3), 183-203. doi: http://dx.doi.org/10.1016/j.tra.2004.09.002

He, B., He, W., & He, M. (2012). The attitude and preference of traveler to the park and ride facilities: A case study in Nanjing, China. Procedia - Social and Behavioral Sciences, 43(0), 294-301. doi: http://dx.doi.org/10.1016/j.sbspro.2012.04.102

He, Z., Ma, S., & Tang, X. (2009). Empirical study on the influence of learning ability to individual travel behavior. Journal of Transportation Systems Engineering and Information Technology, 9(2), 75-80. doi: http://dx.doi.org/10.1016/S1570-6672(08)60057-4

Hiscock, R., Macintyre, S., Kearns, A., & Ellaway, A. (2002). Means of transport and ontological security: Do cars provide psycho-social benefits to their users? Transportation Research part D: Transport and Environment, 7(2), 119-135. doi: http://dx.doi.org/10.1016/S1361-9209(01)00015-3

Ho, J. S., Sadullah, A. F., & Vien, S. L. L. (2008). Understanding travel behaviour: An important approach to switch private car users to public transport. Paper presented at the EASTS International Symposium on Sustainable Transportation incorporating Malaysian Universities Transport Research Forum Conference 2008 (MUTRFC08).

Institute for Transport Studies, U. o. L. Park and ride. KonSULT, knowledge base on sustainable urban landuse and transport. Retrieved 26/10, 2013, from

http://www.konsult.leeds.ac.uk/private/level2/instruments/instrument035/l2_035a.htm

Institute, V. T. P. (2010). Park &Ride – Convenient Parking For Transit Users TDM Encyclopedia.

Kalwar, S., Memon, I. A., & Qureshi, S. (2021). Significance of National Spatial Planning for Economic Development of Secondary Cities in India: Critical Analysis of JNNURM Programme. Sukkur IBA Journal of Computing and Mathematical Sciences(2), 49-60%V 44. doi: 10.30537/sjcms.v4i2.658

Kotkin, J., & Cox, W. (2013, 4/08/2013). The World's fastets-growing megacities. 04/08/2013. Retrieved 26/09, 2013, from http://www.forbes.com/sites/joelkotkin/2013/04/08/the-worlds-fastest-growing-megacities/

Krejcie, V. R., & Morgan, W. D. (1970). Determining sample size for research activities. Education and Psychological Measurement, 30, 607-610.

Lindstrom Olsson, A.-L. (2003). Factors that influence choice of travel mode in major urban areas. (Ph.D), Royal Institute of Technology, Stockholm. Retrieved from https://www.diva-portal.org/smash/get/diva2:7556/FULLTEXT01.pdf (ISRN KTH/INFRA--03/048--SE)

Marcotullio, P. J., & Lee, Y. S. F. (2003). Urban environmental transitions and urban transportation systems: A comparison of the North American and Asian experiences. International Development Planning Review, 25(4), 325-354.

Memon, I. A. (2010). Factors influencing travel behaviour and mode choice among Universiti Teknologi Malaysia employees. Universiti Teknologi Malaysia, Faculty of Built Environment.

MEMON, I. A. (2018). Mode Choice Modelling to Shift Car Travelers Towards Park and Ride Service in the CBD of Putrajaya and Karachi. (PhD), Universiti Teknologi PETRONAS. Retrieved from http://utpedia.utp.edu.my/id/eprint/18372

Memon, I. A., Kalwar, S., Sahito, N., Qureshi, S., & Memon, N. (2020). Average Index Modelling of Campus Safety and Walkability: The Case Study of University of Sindh. Sukkur IBA Journal of Computing and Mathematical Sciences(1), 37-44%V 34. doi: 10.30537/sjcms.v4i1.582

Memon, I. A., Madzlan, N., Talpur, M. A. H., Hakro, M. R., & Chandio, I. A. (June 2014). A review on the factors influencing the Park-and-Ride traffic management method. Paper presented at the Applied Mechanics and Materials, Kuala Lumpur.

Memon, I. A., Napiah, M., Hussain, M. A., & Hakro, M. R. (2016). Influence of factors to shift private transport users to Park-and-Ride service in Putrajaya. In N. A. W. A. Zawawi (Ed.), In Engineering Challenges for Sustainable Future: Proceedings of the 3rd International Conference on Civil, Offshore and Environmental Engineering (ICCOEE 2016, Malaysia, 15-17 Aug 2016) (1st Edition ed., pp. 566). London: CRC Press.

Memon, I. A., Napiah, M., Talpur, M. A. H., & Hakro, M. R. (2016). Mode choice modelling method to shift car travelers towards Park and Ride

service. ARPN Journal of Engineering and Applied Sciences, 11(6), 3677-3683.

MOTIF. (1998). Market orientated transport in focus Transport research fourth framework programme: Office for Official Publications of the European Communities.

Nguyen, T. V. T., Han, H., & Sahito, N. (2019). Role of urban public space and the surrounding environment in promoting sustainable development from the lens of social media. Sustainability, 11(21), 5967.

Nor Ghani Md. Nor, & Nor, A. R. M. (2006). Predicting the impact of demand and supply side measures on bus ridership in Putrajaya, Malaysia. Journal of Public Transportation, Vol. 9(No. 5).

Paracha, N. (2014). Visual Karachi: From Paris of Asia, to City of Lights, to Hell on Earth. Retrieved 19 October, from http://www.dawn.com/news/1134284

Pathan, H., & Faisal, A. (2010). Modelling travellers' choice of information sources and of mode. University of Leeds.

Phil Goodwin, S. C., Joyce Dargay, Mark Hanly, Graham Parkhurst,, & Gordon Stokes, a. P. V. (2004). Changing travel behaviour.

Putrajaya, P. (2013). World's first intelligent garden city. Retrieved 22/10/2013, 2013, from URL: http://www.putrajaya.gov.my/m_tourist/green_city/

Qin, H., Guan, H., & Wu, Y.-J. (2013). Analysis of park-and-ride decision behavior based on Decision Field Theory. Transportation Research Part F: Traffic Psychology and Behaviour, 18(0), 199-212. doi: http://dx.doi.org/10.1016/j.trf.2013.02.001

Qureshi, I. A., & Lu, H. (2007). Urban transport and sustainable transport strategies: A case study of Karachi, Pakistan. Tsinghua Science & Technology, 12(3), 309-317. doi: http://dx.doi.org/10.1016/S1007-0214(07)70046-9

Recorder, B. (2013). Research report reveals: traffic congestion cost to swell to $7.85 billion in next 10 years. Retrieved 18 June, 2014, from http://www.brecorder.com/general-news/172/1148125/

Sahito, N., Han, H., Nguyen, T. V. T., Kim, I., Hwang, J., & Jameel, A. (2020). Examining the Quasi-Public Spaces in Commercial Complexes. Sustainability, 12(5), 1830.

Sahito, N., Kalwar, S., Memon, I. A., Mangi, M. Y., & Hussain, A. (2020). EXAMINING RAPID LAND-USE VARIATION USING MULTI-CRITERIA DECISION ANALYSIS (MCDA) METHOD. International Journal, 76(7/1).

Seik, F. T. (1997). Experiences from Singapore's park-and-ride scheme (1975–1996). Habitat International, 21(4), 427-443. doi: http://dx.doi.org/10.1016/S0197-3975(97)00016-7

Shaikh, K., Memon, A., Memon, I. A., Laghari, Z. A., & Memon, A. M. (2020). Awareness regarding Coronavirus pandemic among the population of Sindh, Pakistan: A cross-sectional study. Sukkur IBA Journal of Computing and Mathematical Sciences(1), 28-36%V 24. doi: 10.30537/sjcms.v4i1.573

Steg, L. (2005). Car use: lust and must. Instrumental, symbolic and affective motives for car use. Transportation Research part A: Policy and

Practice, 39(2–3), 147-162. doi: http://dx.doi.org/10.1016/j.tra.2004.07.001

TAS, P. L. (2001). Quality bus partnerships: Good practice guide. Version 03.05.01: TAS Publications & Events Limited.

Whitfield, S., & COOPER, B. (1998-9, 14-18 SEPTEMBER 1998.). The travel effects of park and ride. Paper presented at the Public Transport Planning and Operations, European Transport , Loughborough university, England.