USERS' PERCEPTIONS ON PARKING UTILIZATION PATTERN AT PARK-AND-RIDE FACILITY IN PUTRAJAYA SENTRAL

Sharifah Adibah Alyia Syed Adnan[1] and Abdul Azeez Kadar Hamsa[2]

ABSTRACT

The increasing number of private vehicles in Federal Territory of Kuala Lumpur and Putrajaya has created inadequate parking spaces and traffic congestion. The limited parking spaces for the public at Government complexes and its surroundings in Putrajaya had lead to the increasing number of illegal parking. As an initiative to encounter this problem, the concerned authority had provided the park-and-ride facilities at public transportation terminal in Putrajaya. The provision of park-and-ride scheme would obviously promote the use of rail transit, thus shifting the users from using motorcar to public transport. Putrajaya Sentral is the main public transportation hub of Putrajaya which provides multi-modal public transportation services such as Express Rail Link (ERL), intercity buses, intra-city buses namely as 'Nadi Putra', express buses and taxi services. However, the existing parking spaces at the park and ride facility in Putrajaya Sentral are not fully utilized. Thus, this paper highlights the user's perceptions on parking utilization pattern at Putrajaya Sentral park and ride facility in order to examine the current parking demand at the parking facility. Parking inventory survey to determine existing physical conditions of the parking facility and questionnaire survey to evaluate the perceptions of the users on the parking usage pattern were administered. The findings showed that most of the users (78%) parked their vehicles for longer duration (more than eight hours). The multi-storey parking facility was found to have higher demand than surface parking due to minimal parking fees and longer operation hours. The major factors that influenced the users in using the park-and-ride facility are "avoiding traffic congestion", "convenience of travel with public transport", "less stress by travelling with public transport" and "parking at destination are too expensive". Few recommendations to overcome the identified problems and conclusions are also drawn.

Key words: Park-and-ride, Parking Utilization, Parking Demand, Putrajaya

1. INTRODUCTION

Rapid growth in population and high vehicle ownership in Malaysia has lead to various transportation problems. The number of registered private cars soared from 6.5 million in 2005 to 8.5 million in 2009 and keep increasing (Road Transport Department, 2011). As a result, the use of public transport has been declining and occurrence of traffic congestion especially roads leading to the city has becoming more frequent. Increase in difficulty to find a parking space in the city is also noticed. Prabuwono and Idris, (2008) stated that an increase in car ownership, changes in traffic arrangements and densification of land contribute to the diminishing supply of parking facility.

One of the strategies that are widely applied in countering such problems is the implementation of the park-and-ride scheme. Currently, park-and-ride schemes have been successfully implemented in many developed countries and cities as a transportation demand

[1] BURP Student, Department of Urban and Regional Planning, Kulliyyah of Architecture and Environmental Design, International Islamic University Malaysia
[2] Associate Professor, Dr., Department of Urban and Regional Planning, Kulliyyah of Architecture and Environmental Design, International Islamic University Malaysia

management strategy and at the same time to increase the use of public transport. Parkhust (1994, 2000) as cited in Zakaria Ahmad et.al. (2004) stated that park-n-ride concept is to develop a balance policy in allowing private car users to switch their mode from car to public transport traveling to the congested city. However, O' Flaherty (1986) stated that park-and-ride schemes are excellent traffic planning measures. In practice, the degree of achievement of excellence depends on how they are used, and to what extent the commitments implicit in their usage are understood. Thus, a study to determine the parking utilization at the park-and-ride facility from the users' perceptions is initiated. This study is also intended to determine the existing parking demand at the park-and-ride facility in Putrajaya Sentral.

Putrajaya, a new federal administrative centre of Malaysia, is subjected to increase in the number of registered private cars and congestion. Nor *et al*. (2006) reported that the current mode of transport used in Putrajaya was predominantly private cars, a modal share of 70%, followed by 15% motorcycles, and 15% public transport. A shift from private car use to public transport is highly required. In achieving greater use of public transport, park-and-ride facilities were introduced in Putrajaya as an initiative to minimize the private cars entering into Putrajaya city and other areas in Klang Valley. One such facility is the Putrajaya Sentral park-and-ride facility located near public transportation hub at Precinct 7. Garber and Hole (2002) stated that the growing use of automobile as a personal feeder service to transit systems has also increased the demand for parking spaces at transit stations. Kuby et al (2004) had clearly highlighted the positive association of park-and-ride facility with the ridership of the light rail stations. It has established the fact that the park-and-ride facility does positively generate ridership for the LRT in low-density, car-oriented, polycentric US cities with smaller downtowns, for trips to the CBD. Apart from this, it is also a way in solving the problem of limited parking spaces at most of the government complex in Putrajaya. According to Arne Risa Hole (2004), one of the measures that can be taken by the employer in order to reduce the number of commuters taking their cars to the workplace is to introduce a park-and-ride service, i.e. a large off-site parking space with a shuttle-bus serving the workplace. This can be particularly effective in reducing car use if the workplace has poor public transport links or limited parking space on-site. Field observation at the Putrajaya Sentral parking facility shows that the park-and-ride facility is underutilized. Additionally, the previous study conducted by M.N Borhan (2011) at Putrajaya park-and-ride facility at Precinct 1 showed that only 2% of the parking lots were occupied and 98% of the parking lots were not used from the total of 320 parking spaces which were provided.

The purpose of this paper is to analyze the parking utilization pattern at the park-and-ride facility in Putrajaya Sentral based on the users' perceptions. The main objectives of this study are:

i. to determine the parking supply and other physical characteristics of the park-and-ride facility at Precinct 7, Putrajaya.
ii. To analyze the travel and parking characteristics of the users who parked at the park-and-ride facility.
iii. To identify the factors influencing the use of park-and-ride facility.
iv. To formulate recommendations in enhancing the utilization of the park-and-ride facility in Putrajaya Sentral.

This paper consists of five sections. In the next section, previous studies related to park-and-ride facilities were reviewed. The third section presents the research approach which explains about data collection, sampling and study area. The research findings are presented

in the fourth section. Finally, the fifth section provides the conclusions and recommendations of the study.

2. LITERATURE REVIEW

Several previous studies specifically on park-and-ride user characteristics, travel characteristics and satisfaction on the facilities are reviewed. Kwon (2001) analyzed the spatial characteristics and travel behavior of the users of 14 park-and-ride facilities in the Seoul Metropolitan Areas (SMA) to obtain basic data relating to the roles and functions of the park-and-ride facilities. In terms of socioeconomic parameters, the study focused on gender, age, and employment category. It was found that 78.1% of the facility users were men and 21.9% women while age wise, majority were in the group of 30 to 39 years old (41.3%). The age group of forties and twenties shared 28.4% and 19.4% respectively. Employment wise, 56.5% were in the high employment category while self employed and students were 21.0% and 6.20% respectively. Majority of its respondents were regular users of the facilities (65.0%).

One of the policies which encourage residents staying at suburban area to use public transport to travel to urban area is to promote park-and-ride concept. The park-and-ride concept involves commuters driving to the public transport terminals, parked their vehicles and continues their journeys to their destinations by public transport. Several criteria that can increase the utilization of the park-and-ride facilities being highlight by O'Flaherty (2001) are interchange must be serviced by a public transport system that offers reliable and frequent services to inward (to the central area) and outward directions. Generally, interchanges with reliable frequent services are more appealing to potential users as they maximize the travel time choice, particularly for the return journey. It is related with the study findings from Ying, H. and H. Xiang (2009), which highlighted that 98% of travelers are willing to accept a waiting time of 3 minutes or less. Moreover, the parking fee at the interchange plus the two-way public transport fare should be less than the perceived cost of travelling to the central area by car and parking at the destination. Other than that, ample parking space must be provided at the interchange to ensure that parking is easily obtained at all times and the car park must be well designed and supervised, with the walking distances should be as short as possible between the car park and the public transport waiting area. All these criteria are similar with the response from the users (Ying, H. and H. Xiang, 2009). Among the significant aspects that affected their willingness were waiting time, transfer time, walking distance, and fare employed by the transit line.

Furthermore, Highway Research Board Special Report No.125, (1971) explains some positive and negatives aspects that are considered by the users whenever using park-and-ride facilities. By parking away from the destination and completing the trip by rail or bus, the user stands to avoid congested driving conditions and high downtown parking costs. The users can read or relax while riding on a public transit and also can minimize the opportunities for his/her car to be involved in a traffic accident. In the case of rapid transit, travel time may be equal to or even less than driving time. Seik (1997) has found that cost saving is the major factor that car users switching to use park-and-ride. Seik (1997) also found that the higher charges for entering and parking at CBD area were the important factors which influence car users not to travel to the CBD area with their own cars. Hole (2004) pointed out that park-and-ride scheme will be well accepted if parking on-site introduce parking charges. Abdul Kadir *et al*. (2006) has highlighted in his study that the travel time and cost were the major influencing factors in making decision to choose between private vehicle and bus. Once the car has been purchased by user, little consideration is taken of its

cost or the number of bus journeys that could be made for the same amount of money. The car, therefore, usually appears to be an economical alternative compared with public transport (Ollson 2003). However, on the negative side, the user will have the inconvenience of interrupting his drive to downtown, parking, walking to the boarding area, and waiting for the bus or train. Where the transfer is made to buses operating on highways and streets with other traffic, the trip will almost always be slower than if he/she drives the entire distance (Highway Research Board Special Report No.125, 1971)

3. RESEARCH METHODOLOGY

3.1 Data Collection

Two survey methods were applied to collect data for this study. Firstly, a parking inventory survey on existing parking facilities was conducted to gather information on the aspects of physical conditions of the parking facilities. Aspects of parking facilities include type and number of parking spaces, time of parking operation, limits on duration of parking, parking fees and method of parking fee collection. The second survey method applied in this study was questionnaire survey. The questionnaire survey was administered to collect data on parking users' socioeconomic characteristics, travel, parking characteristics and also perceptions on parking utilization. The survey was administered on both weekdays and weekend. Three members were involved in collecting parking data and the survey was administered from 7.00 am to 12.00 pm and from 5.00 pm to 7.00 pm.

Method of data analysis applied were univariate techniques which involves measures of central tendency such as mean and standard deviation; bivariate analysis to determine correlation on the selected service attributes and Relative Important Index (R.I.I) method to determine the relative importance of each factor influencing the use of park-and-ride facility as perceived by the respondents were also applied. Statistical Package for Social Sciences (SPSS) software version 18 was used to code and analyze the data.

3.2 Sample Size and Sampling Method

The sample size derived for this study was 83 samples and rounded-off to 100 samples. It is calculated based on the formula:

$$n = N / (1+ Ne^2)$$

Where; n = sample size; N = population size (average of 500 users);
e= Precision level (assumed 10%)

Moreover, stratified random sampling method was applied in this study as the entire population of parking users was divided into the subpopulations according to two parking areas which are multi-storey and surface parking. The proportional allocations of samples were 80 for multi-storey parking and 20 for surface parking. A total of 100 questionnaires were returned from 145 questionnaires distributed, representing 69% response rate. A collection box was placed near the parking autopay machine for the respondents to drop their questionnaire upon completion. However, only 40% of the questionnaires distributed were collected by this method. The other method namely face-to-face interview has yielded almost 100% response rate. Borhan *et al*. (2011) had used face-to-face interview method in his survey for increased accuracy.

3.3 Study Area

Putrajaya is located in the south of Kuala Lumpur (figure 1) and serves as the federal administrative centre of Malaysia. The government administrative centre was shifted in 1999 from Kuala Lumpur to Putrajaya, due to the overcrowding and congestion in the Kuala Lumpur areas. The park-and-ride facility that was chosen as the study area is located in Precinct 7, Putrajaya (figure 2). The park-and-ride facility is located near to the Putrajaya Sentral transportation hub and started its operation in November 2008. The types of parking space that exists near to Putrajaya Sentral are multi-storey and surface parking that can accommodate around 2000 vehicles (figure 3).

Figure 1 Key Plan of Putrajaya

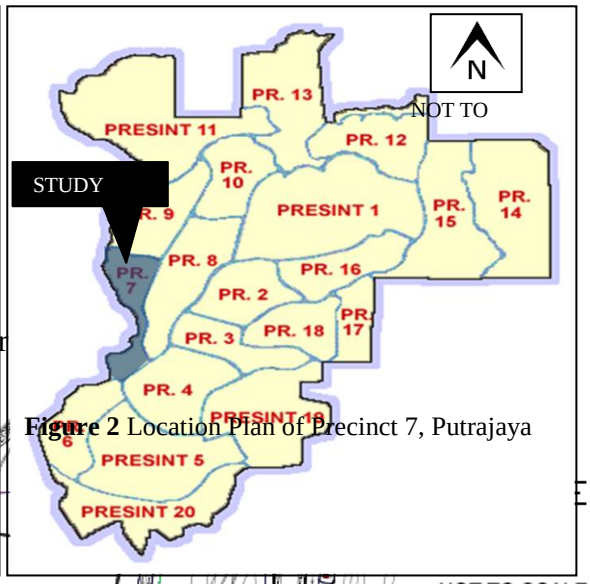

Figure 2 Location Plan of Precinct 7, Putrajaya

Figure 3: Location of Parking Facilities at Putrajaya Sentral, Precinct

4. RESEARCH FINDINGS

4.1 Parking Inventory

The parking inventory survey revealed that the total number of parking spaces at Putrajaya Sentral was 1834 spaces. It is divided into two types of parking facility; 1407 spaces at multi-storey parking and 427 spaces at surface parking (two locations). The parking fee at multi-

storey parking was RM2.00 per entry whereas the surface parking was charged with RM1.00 per hour. Auto pay machines located near the parking lots were used to pay parking charges. Various parking-related facilities which were provided include safety related facilities such as lighting, Closed Circuit TV (CCTV), and 24 hours security guard patrolling service. Andre (1980) mentioned that the most favorably perceived action to improve station security is to place a full-time attendant or security guard at the station or installation of CCTV (higher end safety facility). Other facilities such as pedestrian walkway, toilets, and elevator were also provided near the station to improve users' conveniences whenever need to use the station. The observation also recorded many illegal parking at the open space near the designated surface parking area. Responses obtained from the illegal parkers revealed that many refuses to pay the parking fees of RM1.00 per hour at the surface parking because they considered it as high if parked for longer duration. Niblett and Palmer (1993) had stressed that if park-and-ride were to be encouraged, then the car parking fee should be low. Moreover, O' Flaherty (1997) concurred with both Niblett and Palmer (1993) and pointed out that there is ample experience to suggest that parking at the interchange should be either very cheap or even preferably free to encourage park-and-ride usage.

4.2 Parking Utilization at Park-and-Ride Facility

4.2.1. Socioeconomic Characteristics

Table 1 shows socioeconomic characteristics of the park-and-ride users.

Table 1 Summary of Respondents' Background Profile

Variables	Frequency	Percentage (%)	Mean	Median	Standard Deviation
Gender					
Male	53	53.0	-	-	-
Female	47	47.0			
Age Group					
21 - 25 years	21	21.0	32 years	31 years	8 years
26 - 30 years	28	28.0			
31 - 35 years	16	16.0			
36 - 40 years	18	18.0			
41 - 45 years	14	14.0			
46 - 50 years	1	1.0			
50 years and above	2	2.0			
Marital Status					
Married	62	62.0	-	-	-
Single	37	37.0			
Widow/ Separated	1	1.0			
Monthly Income					
Less than RM1000	4	4.0	RM3675.52	RM3353.08	RM1739.02
RM1001 - RM2000	12	12.0			
RM2001 - RM3000	28	28.0			
RM3001 - RM4000	17	17.0			
RM4001 - RM5000	21	21.0			
RM5001 - RM6000	9	9.0			
More than RM6000	9	9.0			

Employment Sector					
Government	31	31.0	-	-	-
Private	54	54.0			
Semi Government	4	4.0			
Self employed	7	7.0			
Student	4	4.0			
Vehicle Ownership					
1	53	53.0	1.5	1.0	0.67
2	42	42.0			
3	4	4.0			
More than 3	1	1.0			

Source: Aliya, S.A.(2011) Studying the users' perceptions on parking utilization at park-n-ride facility in Putrajaya Sentral, Precinct 7, Putrajaya

Male respondents (53%) were higher than their female counterparts (47%). However, findings from the study by P. J. Foote (1998) showed that significantly more Chicago Transit Authority (CTA) park-and-ride users were women (62.0%). In term of age group, 28% were in the age group of 26 to 30 years old and 62% were married. A high number of respondents were in the RM2001-RM3000 income category which is considered as middle income group. Meanwhile, Hamid *et al*. (2008) concluded that the middle income group users (RM2000 – RM3,999) somehow indicated the extent of the affordability for the demand to use the facility as opposed to perhaps the lower income group. Besides, it is expected that the higher income group would use their private vehicles as compared to train. Majority of the users were from the private sector (54%) and most of the respondents owned at least one vehicle (53%). A study by Smith (1993) for CENTRO (West Midlands Passenger Transport Executive) in the West Midlands, UK, has found that 67.0% of the park-and-ride users came from households with more than one car, indicating that most of the users were prepared to leave one car at the train station all day while other member of the household had access to a second car for other purposes.

4.2.2. Travel Characteristics

Table 2 Summary of Respondents' Travel Profile

Variables	Frequency	Percentage (%)	Mean	Median	Standard Deviation
Travel Origin					
Within Putrajaya	39	39.0	-	-	-
Outside Putrajaya	61	61.0			
Travel Destination					
Within Putrajaya	24	24.0	-	-	-
Outside Putrajaya	76	76.0			
Travel Purpose					
Working	67	67.0	-	-	-
Official Business / Meeting	13	13.0			
Shopping	3	3.0			
Social and Recreational	9	9.0			
Educational	3	3.0			
Tourism/ Visits	3	3.0			
Others	2	2.0			
Travel Time					
Less than 15 minutes	21	21.0	33.8 minutes	25.9minutes	34.5minutes
16 minutes – 30 minutes	39	39.0			

31 minutes – 45 minutes	28	28.0			
46 minutes – 60 minutes	6	6.0			
More than 60 minutes	6	6.0			
Travel Cost					
Less than RM 100	3	3.0	RM330.50	RM382.03	RM134.91
RM 101 – RM 200	15	15.0			
RM 201 – RM 300	22	22.0			
RM 301 – RM 400	34	34.0			
RM 401 – RM 500	14	14.0			
RM 501 – RM 600	9	9.0			
More than RM 600	3	3.0			

Source: Aliya, S.A.(2011) Studying the users' perceptions on parking utilization at park-n-ride facility in Putrajaya Sentral, Precinct 7, Putrajaya

The O-D patterns show that trips originate mostly from the places outside Putrajaya such as Puchong, Banting, Seri Kembangan, Bangi and Dengkil (61.0%) and headed for destinations outside Putrajaya (76.0%). The major travel destinations were Klang Valley and Kuala Lumpur International Airport (KLIA) by Express Rail Link (ERL) public rail transport (63.0%). Similarly, a study by M. Shirgaokar and E. Deakin, (2005) revealed that the 82% park-and-ride users in the San Francisco bay area had used rail transit as their main mode of transport. Most of the park-and-ride users (67%) travel purpose was for "work". Regarding travel time and travel cost, majority of the users were found traveling 16 minutes – 30 minutes (39.0%) and spent RM301 to RM400 monthly (34.0%). The majority of rail rapid transit parking, as researched by the Federal Highway Administration, was found to be located 6 to 10 miles from central city CBD and having a peak-hour transit travel time to the CBD of less than 30 minutes. This is supported by previous findings by Bos *et al*. (2004) that stated the willingness of car drivers to use park-and-ride facilities increases if the travel time when using Park-and-ride is low. Meanwhile, Hamid *et al*. (2008) concluded, that there need to be cost savings as well as time savings in the use of the Park-and-ride scheme as compared to other alternative mode of transportation. The overall findings on travel characteristics are summarized in table 2.

4.2.3. Users' Perceptions on Park-and-Ride Facilities

The findings on parking utilization at park-and-ride facilities in Putrajaya Sentral had revealed that majority of the users were frequent users parking at the facility from Monday to Friday (57%) and have been using the facility for more than two months (72%). The average parking duration at park-and-ride facility was 11 hours and 6 minutes. This finding is similar to that of Hamid *et al*. (2008) where park-and-ride users of Rawang, Shah Alam and Seremban rail station of the Kuala Lumpur conurbation are mostly users who parked for longer duration (minimum of 8 hours). Multi-storey parking facility is the most preferred choice among users as compared to surface parking. Different characteristics of these two types of parking facilities are the main reasons for this trend. Majority of the multi-storey parking users revealed that they prefer to park their vehicles at this area because of safety (20.2%). Borhan *et al*. (2011) has stated that 54% of the respondents strongly agreed to use park-and-ride facility if they were guaranteed with car security at Park-and-ride station and 94% of respondents agreed that the security on board is the important thing to attract them to use park-and-ride facility. On the other hand, surface parking area is mostly preferred due to ease at which vehicles are parked (40%).

With the different utilization level at these two parking areas, the relationship between the duration of parking and type of parking preferred was determined (table 3). The findings revealed that 91.2% of the users who parked for duration of 11 hours to 15 hours were

preferred to park at the multi-storey parking facility. Whereas, 54.5% of the users who parked less than five hours were preferred to park at the surface parking facility. The average duration of parking at the multi-storey parking was 12.75 hours and at surface parking was 9.25 hours. Users who preferred to park at multi-storey parking for long duration were mainly due to safety aspects and cheaper parking fees as compared to surface parking. To encourage higher parking utilization at the surface parking, the parking fee should be reduced and kept minimal as accepted and afforded by the all groups of people.

Table 3 Relationship between Duration of Parking and Types of Parking

Duration of Parking	Type of Parking		Total
	Multi-Storey covered parking	Surface parking	
5 hours and less	5	6	11
% within Duration of Parking	45.5%	54.5%	100.0%
6 hours to 10 hours	17	6	23
% within Duration of Parking	73.9%	26.1%	100.0%
11 hours to 15 hours	52	5	57
% within Duration of Parking	91.2%	8.8%	100.0%
16 hours to 18 hours	1	0	1
% within Duration of Parking	100.0%	.0%	100.0%
19 hours and more	5	3	8
% within Duration of Parking	62.5%	37.5%	100.0%
Total	80	20	100
% within Duration of Parking	80.0%	20.0%	100.0%
Mean Duration of Parking	**12.75 hours**	**9.25 hours**	

Source: Aliya, S.A.(2011) Studying the users' perceptions on parking utilization at park-n-ride facility in Putrajaya Sentral, Precinct 7, Putrajaya

Moreover, most of the users of the park-and-ride facilities, normally, did not experience any difficulties in finding parking spaces at the respective parking areas. The average time spent in searching a parking space was 4.4 minutes. About 88% of the respondents agreed that they could always able to find a parking space upon arrival at the parking facility. Furthermore, 49% of the respondents mentioned that they are willing to drive to the next nearest parking facility if no parking spaces were found at the existing park-and-ride facility. Thus, it indicates the importance of the parking facilities at the Putrajaya Sentral public transportation terminal.

Table 4 Relative Importance Index (R.I.I) on Parking Characteristics

Statements Related to Parking Characteristics	(1)	(2)	(3)	(4)	(5)	R.I.I	Rank
	Frequency						
The parking spaces at the park-and-ride facility are adequate	0	0	3	35	62	0.92	1
I am satisfied with the location of the parking facility which is in walking distance to reach the public transport.	1	0	7	27	65	0.91	2
I can get the parking space within 5 minutes of time	0	1	9	28	62	0.90	3
I always use the park-and-ride	1	3	21	35	40	0.82	4

facility every time I travel to the destination							
The parking fee is affordable.	10	5	41	26	18	0.67	5
The mode of parking payment is convenient	4	11	39	28	18	0.69	6
I am willing to pay, even if an increase in parking fees since I need to use the facility	30	29	28	8	5	0.46	7

Source: Aliya, S.A.(2011) Studying the users' perceptions on parking utilization at park-n-ride facility in Putrajaya Sentral, Precinct 7, Putrajaya
(1)= Completely Disagree; (2)-= Disagree; (3) = Slightly agree ;(4) = Agree ;(5) = Completely agree

Additionally, several statements related to parking characteristics were asked to the respondents. Relative Importance Index (R.I.I) method was applied to rank the statements on parking characteristics (table 4). Accordingly, the RII value on the statement "parking spaces at the park and ride facility are adequate" was 0.92 as agreed by the majority of the users followed by "satisfaction on the location of park and ride facility with respect to the public transport terminal (RII = 0.91)" and "ease at which parking spaces are available (RII = 0.90)". These findings concur with observational data and previous studies. The current parking supply of 1834 spaces is considered adequate to cater the present and future parking demand at the public transport terminal. Moreover, most of the users are satisfied with the location of the parking facilities which is in walking distance to reach the public transport (less than 180 meters). Ying, H. and H. Xiang (2009) found 64.7% of the respondents had answered that the acceptable distance from parking area to transit station is less than 500 meters. The lowest RII ranking was for the statement "willingness to pay the increasing in parking fees (RII = 0.46)". A high percentage of respondents (59%) were found to disagree with this statement.

4.3 Factors Influencing the Use of Park-and-Ride Facilities

The Relative Importance Index (RII) method was applied to identify factors influencing the use of the selected park and ride facility. The factors are ranked according to RII value. The highest RII value is ranked 1, the second highest value ranked 2 and so on. Table 5 shows this trend.

Table 5 Relative Importance Index (R.I.I) on the factors influencing the use of park-and-ride facility

Factors Influencing the use of Park-and-Ride Facility	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**R.I.I**	**Rank**
	Frequency						
Avoiding traffic congestion	1	2	21	30	46	0.84	1
Conveience of travel with public transport (Reliability, Comfort,service)	0	3	17	35	45	0.84	2
Less stress travelling with public transportation	1	3	21	45	30	0.80	3
Parking at destination is expensive	9	8	16	23	44	0.77	4
Reduction in travel time by using the public transportation	2	5	33	33	27	0.76	5
Safe journey by using the public	1	7	33	34	25	0.75	6

transportation							
Lack of parking space in destination	11	12	14	21	42	0.74	7
Consideration in reduction of environmental damage	2	11	37	35	15	0.70	8
Parking fees charged at the park and ride facility is reasonable	6	10	58	15	11	0.63	9
Reduction in total travel cost by using park and ride	4	6	39	35	16	0.55	10
Unable to drive to destination due to the road unfamiliarity	49	24	12	4	11	0.41	11

Source: Aliya, S.A.(2011) Studying the users' perceptions on parking utilization at park-n-ride facility in Putrajaya Sentral, Precinct 7, Putrajaya

(1)= Not at all; (2) = Not Frequent; (3) = Slightly Frequent ;(4) = Frequent ;(5) = Most Frequent

The respondents were asked to respond on each of the identified eleven factors by using five-point Likert scale indicating "most frequent" and "not at all frequent". According to respondents "avoiding traffic congestion" and "convenience to travel by using public transport" were the most significant and influencing factors in using park and ride facility (RII = 0.84). In contrast to this finding, Ying, H. and H. Xiang (2009) had found that "convenience to travel by public transport" was only ranked six as perceived by the respondents. Kamba *et al.* (2007) pointed out that poor bus services such as "unreliability", "delay", "inconvenience" and "uncomfortable" were found to significantly lead to the excessive private vehicles ownership. Other factors such as "expensive parking fee at destination" and "reduction in travel time by using the public transportation" were also expressed as main factors that, normally, influence the use of park-and-ride facility. This is supported by previous findings which highlighted that the willingness of car drivers to use park-and-ride facility increases, if the travel time when using park-and-ride decreases (Bos *et al*. 2004).

5. RECOMMENDATIONS AND CONCLUSIONS

This paper has narrated the users' perceptions on parking utilization pattern at the park-and-ride facility at Putrajaya Sentral. Questionnaire survey was administered targeting users parking at two parking facilities in Putrajaya Sentral. The results illustrate the current parking demand at the park-and-ride facility. The existing parking supply is sufficient to cater for the demand as most of the users respond that they can easily get the parking spaces very frequently. Moreover, the park-and-ride facility is mostly utilized by the people travelling from outside Putrajaya to Klang Valley and Kuala Lumpur International Airport (KLIA) by using Express Rail Link (ERL) service. The major characteristics that differ between multi-storey parking and surface parking are safety aspects, parking fees and operation hours which eventually underscore the different parking demand at these two parking facilities. The multi-storey parking facility was found to have higher demand than surface parking due to minimal parking fees and longer operation hours. Most of the users (78%) parked their vehicles for longer duration (more than eight hours). The major factors that influenced the users in using the park-and-ride facility are "avoiding traffic congestion", "convenience of travel with public transport", "less stress by travelling with public transport" and "parking at destination are too expensive". To ensure the effectiveness of the park-and-ride facility in encouraging more people to travel by public transportation to the city centre, users' perceptions on parking facilities is essential. Few recommendations to increase the utilization of the park and ride

facility include; that the operators should restructure the parking fees especially for surface parking facility which should be affordable for the users, introduction of monthly parking ticket and smart card payment system and promotion of the parking facilities to a wider catchment population in the vicinity.

REFERENCES

Abdul Kadir, I.S., R.S. Radin, K. Haron, and M.S.A. Hariza, (2006). "Mode choice model for vulnerable motorcyclist in Malaysia.", *Traffic Injury Prevention*, 7: 1-5.

Arne Risa Hole (2004). "Forecasting the demand for an employee Park and Ride service using commuters' stated choices", Department of Economics, University of St Andrews St Andrews KY16 9AL, Scotland UK

Bos, I.D.M., R.E.C.M. Van der Heijden, E.J.E. Molin and H.J.P. Timmermans (2004). "The choice of park and ride facilities: an analysis using a context-dependent hierarchical choice experiment. *Environ. Planning A.*, 36: 1673-1686.

Hamid, N.A., J. Mohamad and M.R. Karim (2008). "Travel behavior of the Park and Ride users and the factors influencing the demand for the use of the Park and Ride facility", EASTS International Symposium on Sustainable Transportation incorporating Malaysian Universities Transport Research Forum Conference 2008 (MUTRFC08). Universiti Teknologi Malaysia.

Highway Research Board Special Report No.125 (1971). "Parking Principles", National Academy of Sciences. Washigton D.C

Hole, A.R.(2004). "Forecasting the demand for an employee Park and Ride service using commuters' stated choices" *Transport Policy* 11: 355-362

Kamba, A.N., R.A.O.K. Rahmat and A. Ismail (2007). "Why do people use their cars: A case study in Malaysia", *Journal of Sciences* 3(3): 117-122.

M.N Borhan, A. Ismail, R.A. O.K. Rahmat, K.Ambak. (2011). "Effect of Transport Policies to Shifting Private Car Users to Park-and-ride in Putrajaya, Malaysia"**.** *Australian Journal of Basic and Applied Sciences*, 5(3): 303-308.

Niblett, R. & Palmer, D. (1993). "Park and Ride in London and the South East", *Journal of Highways and Transportation*, 4 – 10

O' Flaherty, C. A. (ed.) (1986). *Traffic Planning and Engineering* (Vol.1). London: Arnold.

O' Flaherty, C. A. (ed.) (1997). *Transportation Planning and Traffic Engineering*. London: Arnold.

Ollson, A.L. (2003). "Factors that influence choice of travel mode in major urban areas: The attractiveness of park and ride", PhD Thesis, Royal Institute of Technology. Sweden.

Seik, F.T. (1997). "Experiences from Singapore's Park and Ride Scheme (1975 – 1996)", *Journal of Habitat ITNL*., 21(4): 427-443.

Sharifah Adibah Alyia Syed Adnan (2011) Studying the Users' Perceptions on Parking Utilization at Park-and-Ride Facility in Putrajaya Sentral, Precinct 7, Putrajaya, Unpublished BURP Project Paper Report, Department of Urban and Regional Planning, International Islamic University Malaysia.

Ying, H. and H. Xiang (2009). "Study on Influence Factors and Demand Willingness of Park and Ride", Second International Conference on Intelligent Computation Technology and Automation, pp: 664-667.

Zakaria Ahmad, Norida Mustapa, Zahidatul Farihah Zakaria (2004). An Empirical Study of Park-N-Ride in Rawang-Kuala Lumpur Corridor, Faculty of Architecture, Planning and Surveying, Univeristi Teknologi Mara.