

**PLANNING MALAYSIA***Journal of the Malaysian Institute of Planners*

Volume X (2012), Page 41 - 66

## **ANALYSIS OF FACTORS INFLUENCING THE STATED PREFERENCE OF ACADEMIC EMPLOYEES TOWARDS TELECOMMUTING IN IIUM CAMPUS, GOMBAK**

**Farah Diyanah Ismail<sup>1</sup>, Abdul Azeez Kadar Hamsa<sup>2</sup>, Mansor Ibrahim<sup>3</sup>**

<sup>1, 2&3</sup> *Kulliyyah of Architecture and Environmental Design*  
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

### **Abstract**

Telecommuting acts as one of the Transportation Demand Management (TDM) measures that aimed to reduce peak hour traffic congestion by allowing commuters to work from home or a nearby telecommuting centre on certain days of the week. The increasing private vehicle usage by IIUM community (staffs and students) is posing a strain on the ability of the existing road and the related infrastructure on-campus. The purpose of this paper is to investigate factors influencing the stated preference of the academic staffs of IIUM towards various aspects of telecommuting. About 100 respondents had participated in this study through a self-administered questionnaire survey. Four research hypotheses highlighting the relationship between the preference to telecommute and commute distance, commute time, marital status having children as well as amount of time spent on research were formulated. Among the hypotheses, only the hypothesis highlighting the preference to telecommute and married female staff with children was tested statistically significant at 95% confidence interval. On the preference to telecommute, about 68% of the respondents expressed willingness to telecommute, even though, the University does not have an official policy on telecommuting arrangement. Some of the recommendations to increase the penetration of telecommuting in IIUM are: establishing telecommuting arrangement; promoting awareness of telecommuting; implementing telecommuting pilot project and conducting further study on various other aspects of telecommuting.

**Keywords:** telecommuting, teleworking, academic employees, travel demand, peak-hour traffic.

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<sup>1</sup> Postgraduate Student (Master of Science Built Environment). Email: farahd.ismail@gmail.com

<sup>2</sup> Associate Professor, Department of Urban and Regional Planning. Email: azeez@iium.edu.my

<sup>3</sup> Professor, Department of Urban and Regional Planning. Email: profmansor@iium.edu.my.

## **INTRODUCTION**

Malaysia is a rapidly growing country with high private vehicle ownership. The number of cars in the Klang Valley is expected to reach seven million by 2020, unless there is a marked shift to public transport (BERNAMA, 2011). This number of vehicle ownership has been growing at an exceedingly fast rate with an average of 30,000 cars per month. Recently in the Klang Valley, 83% or six million trips were made using private transport, mostly single occupancy vehicles (SOVs). This explains the huge traffic jams and constant gridlock conditions even though the Klang Valley has one of the highest concentrations of roadways and tolled highways in the world (Sabariah, 2011). The growth of private vehicle trips has been exerting tremendous pressure on the capacity of the existing road network that cannot be subdued by only physical extension of the network, which often proved to be costly. The rapid increase in the use of private transport has resulted in increased traffic congestion, accidents, inadequate parking space and air pollution among other negative effects (Abdalla Nurdeen et al., 2007). In view of the above problems, telecommuting could be seen as one of the measures in reducing the number of private vehicles on the road especially during peak hour and thus reducing the associated negative impact.

The increase in private vehicle use also affects road, parking and related infrastructure in higher learning institutions in Malaysia. International Islamic University Malaysia (IIUM), being located in Gombak, Kuala Lumpur, is one of the public Universities in Malaysia. The University has been subjected to an increasing number of staff and student population every year. The University statistics showed that the number of employees in IIUM has increased at an average rate of 6.6% per year between 2001 and 2010 (IIUM Management Services Division, 2011). The increasing number of employees has contributed to the high number of registered vehicles in IIUM. According to IIUM Security Management Unit Office (2011), the number of registered vehicles among the staffs has reached almost 3000 registered cars in 2010. The statistics also showed that the number of registered private motorized vehicles has exceeded the total number of employees by 10.4%. As a result of the increasing number of private vehicles, IIUM has been facing insufficient parking spaces to accommodate both staffs and students' vehicles. The statistics of IIUM Security Management Unit Office (2011) showed that the number of registered vehicles, among the staffs, to the number of available parking spaces on-campus has exceeded by 9.2%. It clearly showed that the available parking supply is far less

than the parking demand. The increasing private vehicle usage by staffs as well as students has been imposing an enormous pressure on the ability of the existing infrastructure to cope with the increasing traffic volume and parking demand on-campus. As a result, the major circular road has seen congested with long queues of vehicles, which cause slow moving of traffic especially during morning and evening peak hours. The purpose of this paper is to investigate factors influencing the stated preference of the academic staffs of International Islamic University Malaysia (IIUM) towards telecommuting and also analyze their perceptions on various aspects of telecommuting. As such, there is no policy on the telecommuting phenomenon being introduced in the University. However, some of the academic staffs were found to be practicing telecommuting as informal work arrangement. Hence, the views of the academic staff, especially due to their involvement on telecommuting compatible work arrangement such as research and consultancy, on the facets of telecommuting is very crucial and pertinent. Self-administered questionnaires were administered on the selected respondents to ascertain academic staffs' views on the practice of telecommuting as an alternate work arrangement in IIUM. The findings of the questionnaire survey are discussed in the following sections. Recommendations to increase the penetration of telecommuting phenomenon as an alternate work arrangement in IIUM are also drawn.

## **LITERATURE REVIEW**

Various authors have pointed out the diverse meanings assigned to the term "telecommuting". Additionally, several other researchers had tried to establish their own definition. To exemplify, Joice (1999) defines telecommuting as a "work arrangement in which employees work at alternate worksites to conduct some of their officially assigned work during paid hours". According to Fairweather (1999), telecommuting uses information and communication technologies to bring work to the worker. Telecommuting is sometimes equated with the use of telecommunications-related technology to conduct work. Ellison (1999) defined telecommuting as a "periodic work out of the principal office, one or more days per week either at home, at a client's site, or in a telework centre". Due to such an inconsistency in shaping the definition of the term, one could argue that the definitions applied to telecommuting can be grouped in three main blocks; some emphasize on where the work has taken place, some agreed that telecommuting is usually connected with the use of telecommunication tools and others defined in terms of how often it has taken place.

The literature on telecommuting has grown significantly, especially in western countries, over the last two decades. Research on telecommuting in developing countries is still considered unsurprisingly new (Mohamed and Abdallah, 2009). On empirical part of telecommuting research, some researchers had presented results from the investigation and analyze of the preference towards performing telecommuting among the employees. Wan Rozaini and Haitham (2005), for example, had used a sample of 70 lecturers from “Fakulti Teknologi Maklumat (faculty of information technology)” to investigate the possibilities of implementing telecommuting as a first mode of working at all faculties at Universiti Utara Malaysia (one of the public Universities) by ascertaining their views on willingness to telecommute. Similarly, Abdul Azeez and Wan Nurul Mardiah (2009) had conducted a study to unravel travel, work and socioeconomic characteristics of the stated preferred telecommuters and factors associated with preference to telecommute in the private and public sectors in Johor Bahru and Kuala Lumpur city by targeting 391 employees.

Based on earlier studies, Yen and Mahmassani (1994), Sullivan (1993) and Peters et al. (2004) had agreed that the decision to telecommute is governed by socioeconomic variables. In terms of gender, Popuri and Bhat (2003), Yap and Tng (1990) and Wells et al. (2001) had suggested that telecommuting would be of particular interest to women employees. Earlier studies had identified that age is also one of the factors that contribute to preference to adopt telecommuting (Mokhtarian and Meenakshisundaram, 2002 and Walls et al., 2007). Thériault et al., (2005) had suggested that older workers are more likely to telecommute than younger ones. Several studies have suggested that telecommuting would be of particular interest to employees who have children (Popuri and Bhat, 2003; Yap and Tng, 1990 and Wells et al., 2001). Furthermore, Peters et al. (2004) had assumed that the likelihood on the preference to telecommute is positively influenced by the number of children especially children in the youngest age group. The employees with a child under the age of four more often prefer to telecommute than employees with a child over 12 years of age. On other aspects, Walls *et al.* (2007) claimed that both the choice and frequency decisions of telecommuting were found to be substantial influences of workplace-related factors. According to Brown (2010), job position plays an important role in the selection process or in some non-telecommuters’ decision to opt out of telecommuting. Moreover, the length of service also found to be one of the important influential factors for the decision to telecommute (Bagley and Mokhtarian, 1997). Safirova and Walls (2004)

confirmed that having more professional experiences, in general, and a longer tenure with one's current company and one's current supervisor will boost the probability of telecommuting. Popuri and Bhat (2003) also suggested that employees with a long period of service with the current employer tend to be more inclined to telecommute.

According to Mokhtarian and Salomon (1996c), commute stress is expected to be positively related with the choice to telecommute, assuming that stressful commuting conditions can be avoided by telecommuting. Employees who have to spend long unproductive time on the road for work trip thereby subjected to stress and fatigue. Employees commuting to work who are facing traffic congestion and commute stress may encourage them to telecommute more frequently (Mokhtarian and Salomon, 1996b, 1997). In a study of emotional impact of telecommuting, Mann (2000) found that respondents of two service industries in the UK had perceived telecommuting advantages as follows: less travel (57%); more freedom/flexibility (57%); better working environment (50%); fewer distractions (43%); cheaper (29%); freedom to choose comfortable clothes (14%); freedom from office politics (7%); and easier to complete domestic chores (7%). On the other hand, Tremblay (2003) found the perceived disadvantages of telecommuting that are most often mentioned include: lack of co-workers and isolation (15.4% and 10% of respondents respectively), risk of working more (9%), difficulty of motivating themselves (6%) and work-family conflict (5%).

## **OBJECTIVES, HYPOTHESIS AND RESEARCH APPROACH**

The objectives, research hypothesis and research approach are highlighted in this section.

### **Study objectives**

The formulated objectives of this study are:

- (1) To analyse number of academic and administrative employees and their patterns of registered vehicles on-campus
- (2) To describe the existing traffic and road characteristics on-campus
- (3) To identify factors contributing towards the practice of telecommuting among the academic staffs
- (4) To formulate recommendations to increase the penetration level of telecommuting among staff members on-campus

## **Research hypothesis**

Jiang (2008) and Mokhtarian and Salomon (1996a) explained that workers who have longer commute distances might be more likely to telecommute. In many studies commuting time is indeed found to have a large positive effect on telecommuting adoption (Mokhtarian and Salomon, 1997). Peters et al. (2004) mentioned the likelihood of preferring to telecommute is for individuals who have long commuting times. For some motivation and constraint variables, the presence or absence of children might have an important impact towards the choice of decision on telecommuting. Mannering and Mokhtarian (1995); Popuri and Bhat (2003) explored some of the most important variables in explaining the choice of telecommuting were the presence of small children in the household and gender of respondents. In response to that, Wells et al. (2001) found that telecommuters are more likely to be women, married, and have children. Thus, the following hypotheses were formulated based on the above literature study:

- H1 Further the commute distance from home to workplace, greater the inclination toward preference to adopt telecommuting by academic employees.
- H2 Longer the commute time experienced on the road, higher the inclination of the academic employees to telecommute.
- H3 Married female academic employees with children at home are more likely to state preference towards telecommuting.
- H4 Longer the time being spent on research, more likely the academic employees would prefer to telecommute

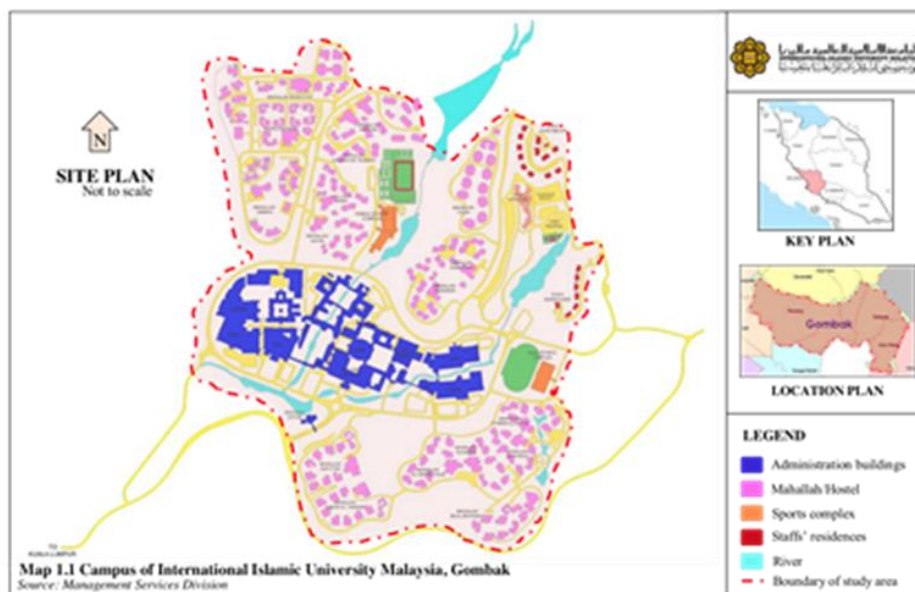
## **Research approach**

The selection of appropriate research approach is imperative to achieve the stated objectives of the study. Both primary and secondary data were collected based on the stated objectives and research hypotheses. Field observational and questionnaire survey were applied in this study to collect data for this study.

## **Background of study area**

The main campus of International Islamic University Malaysia (IIUM) is nestled in a valley in the district of Gombak, a suburb of the capital city of Kuala Lumpur. It is situated around 10 kilometers at the northeast direction

from Kuala Lumpur at the foot of the Gombak hillside. The campus occupies an area of 700 acres and it can be accessed by using the Middle Ring Road 2 (MRR2), Karak Highway or the Gombak road. The University was established in 23 May 1983 being founded based on Islamic principles with the aim to become a premier Islamic University in the world (The Star, 2007b). IIUM Gombak Campus comprises of 8 faculties, also known as Kulliyahs, specialized in Architecture and Environmental Design, Economics and Management Sciences, Engineering, Islamic Revealed Knowledge and Human Sciences, Education, Laws, Information and Communication Technology and Language Centre. Presently, the University accommodates about 2708 employees including both academic and administrative staffs and a total number of 20,000 students (IIUM Management Services Division, 2011).



**Figure 1: Campus of International Islamic University Malaysia, Gombak**

### Field observational survey

This survey was used to collect data related to traffic and road characteristics, parking demand and traffic circulation especially along major road on-campus. This is mainly to determine the rationale for the study. Field measurement on the road dimensions along the major road was administered. The road dimension at four different stretches along major roads in IIUM was measured because of different dimensions at these stretches. The measurement of road dimensions includes: carriageway width, width of pedestrian walkways, and width of landscape and drainage. Similarly, data on parking demand and traffic flow with the campus were also collected.

### Questionnaire survey

The perceptions of academic staff on the various facets of telecommuting were determined by using a questionnaire survey approach. The questions were carefully drafted not only for the purpose of avoiding irrelevant and inappropriate questions but also reducing the length of the questionnaire. Academic employees of IIUM were selected as the target population for this study because of their involvement in telecommuting-compatible jobs such as research, and consultancy besides teaching and flexibility in working hours. Samples were selected because of high number of academic staff in IIUM, as it is extremely difficult to include the entire academic staff population. The total sample size for this research was estimated by using Yamane (1967) formula. Refer to Equation (1).

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

Where:  $n$  = sample size,  $N$  = population size,  $e$  = the level of precision (assumed 10%). The total number of academic staff population in IIUM Gombak campus was 1335 as given by Management Services Division, the main administrative wing of the University. The total sample size was calculated to be 93 and rounded off to 100. The total population of the academic staff was stratified according to Kulliyah (faculties) and proportional samples were selected from each Kulliyah (stratum). The proportional allocation of samples is determined by the following expression (Anderson, 1989). Refer to Equation (2).

$$n_i = N_i \times \frac{n}{N} \quad (2)$$



Where:  $n_i$  = sample units of  $i$ th stratum,  $N_i$  = population members of  $i$ th stratum,  $n$  = sample size,  $N$  = population size.

**Table 1: Proportional allocation of sample according to Kulliyah/Department**

Kulliyah/Department	Number of academic employees	Proportional Allocation	
		Sample units	Percentage
KAED	116	9	9%
KENMS	143	11	11%
KOE	225	17	17%
KIRHS	258	19	19%
INSTED	31	2	2%
AIKOL	135	10	10%
KICT	54	4	4%
CELPAD	373	28	28%
Total	1335	100	100%

*Source: Management Services Division of IIUM, 2011 & Primary Calculation, 2011*

Self-administered questionnaire survey forms were distributed to the academic employees by applying convenience sampling method. It is mainly to decrease the expected high response rate. Sufficient time was given to the respondents to respond the questionnaire. One hundred and sixty nine (169) questionnaire survey forms were distributed but only 100 participants had actually responded, a response rate of 57% (Table 2). The questionnaire form was divided into three main parts consisting of travel characteristics, perceptions of telecommuting and background profile of the respondents.

**Table 2: Distribution of Questionnaires**

Kulliyah/Department	Questionnaires distributed	Questionnaires received	Response rate
KAED	11	9	81.8%
KENMS	21	11	52.4%
KOE	29	17	58.6%
KIRKHS	34	19	55.9%
INSTED	5	2	40.0%
AIKOL	20	10	50.0%
KICT	8	4	50.0%
CELPAD	41	28	68.3%
Total	169	100	Average 57.1%

*Source: Primary Survey, 2011*

### Method of analysis

Relative Importance Index (RII) method was applied on the ordinal ranking data to determine the ranking of the identified factors/determinants on the various aspects of telecommuting according to respondents' preferences. RII formula is shown in Equation (3).

$$RII = \frac{\sum a_i x_i}{A \times N} \quad (3)$$

Where:

$a_i$  = constant expressing the weight of the  $i$ th response

$x_i$  = frequency of the  $i$ th response of the total responses for each cause

$i$  = response category index (where  $i = 1, 2, 3, 4$  and  $5$  respectively)

$A$  = highest weight (5) if 5 (if 7, then  $A = 7$ )

$N$  = total number of respondents

Each of the ordinal variables was categorized by using Likert scale. Cross-tabulation technique was used to determine the relationship between variables (preference of academic employees towards telecommuting and background profiles as well as travel characteristics of the respondents). Chi-square method was also used to test the statistical significance of each identified hypothesis.

## ANALYSIS AND FINDINGS

The findings showed that the total number of employees in IIUM has been increasing at the rate of 6.6% per year from 2001 to 2010. The number of registered cars on-campus has been increasing at 1.8% per year from 2007 to 2010. Analysis on traffic volume in IIUM showed highest traffic volume in the evening peak hours (5.00 pm-6.00 pm). The demand for parking has also exceeded the parking supply in almost all the Kulliyahs/faculties in IIUM. The total number of parking spaces for both cars and motorcycle are 2567 and 1273 respectively. The study reveals that the parking spaces provided at the Kulliyah/faculties is highly utilized with the average of 83.55%. This indicates that the demand for parking is high. The traffic conditions in IIUM have been exerting tremendous pressure on the limited road and supporting infrastructure. Thus, this study is considered important in highlighting the perceptions of employees on telecommuting as an alternative form of work arrangement which would help to reduce impact on road infrastructure. The following sections discuss on the background profile of the respondents and their perceptions on telecommuting as an alternative work arrangement.

### Background profile

The gender composition of respondents showed 57% female and 43% male. The majority (25%) of the respondents fall under the age structure of 41-45 years old with an average age of 42 years. Refer to (Table 3). A high number of “teachers” (27%) attached to the Centre for Language studies has participated in the questionnaire survey. Among the respondents, 7% hold the position as Professor, 18% as Associate Professor, 21% as Assistant Professor, 24% as lecturer 3% as academic fellow. A large proportion of the academic staffs (30%) have been working in IIUM for 6-10 years with an average tenure being 11 years. Generally, the academic staffs were involved in administration tasks, attending meetings, paper markings, lecture preparation, research and publications besides teaching.

**Table 3: Summary of background profile of the respondents (n=100)**

Background Profile	Frequency	Percentage	Mean	Median	Std. Deviation
<b>Gender</b>					
Male	43	43.0%	-	-	-
Female	57	57.0%			
<b>Age Group</b>					
26-30 years	9	9.0%	42.13 years	41.5 years	8.643 years
31-35 years	13	13.0%			
36-40 years	23	23.0%			
41-45 years	25	25.0%			
46-50 years	13	13.0%			
51-55 years	9	9.0%			
56-60 years	4	4.0%			
> 60 years	4	4.0%			
<b>Marital Status</b>					
Single	15	15.0%	-	-	-
Married	83	83.0%			
Divorced/Widowed	2	2.0%			
<b>Children Status*</b>					
0-5 years old	37	21.8%	11.15 years	10.6 years	6.587 years
6-10 years old	47	27.6%			
11-15 years old	44	25.9%			
16-20 years old	25	14.7%			
21-25 years old	14	8.2%			
> 25 years old	3	1.8%			
<b>Job Position</b>					
Professor	7	7.0%	-	-	-
Assoc. Prof	18	18.0%			
Assist. Prof	21	21.0%			
Lecturer	24	24.0%			
Teacher	27	27.0%			
Academic Fellow	3	3.0%			
<b>Duration of Service</b>					
0-5 years	28	28.0%	10.5 years	9.2 years	7.136 years
6-10 years	30	30.0%			

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11-15 years	19	19.0%			
16-20 years	9	9.0%			
21-25 years	12	12.0%			
26-30 years	2	2.0%			
Time spend on job scopes					
a) Teaching					
1-8 hours/week	12	12.0%	18.42 hour per week	17.44 hour per week	9.071 hours per week
9-16 hours/week	34	34.0%			
17-24 hours/week	34	34.0%			
25-32 hours/week	13	13.0%			
> 32 hours/week	7	7.0%			
b) Consultancy					
None	7	7.0%	9.49 hours per week	6.70 hours per	7.774 hours per week
1-8 hours/week	60	60.0%			
9-16 hours/week	15	15.0%			
17-24 hours/week	12	12.0%			
25-32 hours/week	5	5.0%			
> 32 hours/week	1	1.0%			
c) Research					
None	4	4.0%	15 hours per week	11.55 hours per week	10.913 hours per week
1-8 hours/week	36	36.0%			
9-16 hours/week	21	21.0%			
17-24 hours/week	23	23.0%			
25-32 hours/week	9	9.0%			
> 32 hours/week	7	7.0%			
d) Others					
None	76	76.0%	19.5 hours per week	19.16 hours per week	11.618 hours per week
1-8 hours/week	6	6.0%			
9-16 hours/week	5	5.0%			
17-24 hours/week	3	3.0%			
25-32 hours/week	6	6.0%			
> 32 hours/week	4	4.0%			
Registered Vehicles*					
a) Car					
1	52	47.3%	1.55 cars	1 car	0.745 cars
2	34	30.9%			
3	9	8.1%			
4	2	1.8%			
b) Motorcycle					
1	12	10.9%	1.08 cars	1 car	0.227 motor- cycle
2	1	0.9%			

Source: Primary Survey, 2011

\*Respondents may response to more than one answer choices

### **Travel characteristics**

The average number of registered cars and motorcycles by an academic staff were found to be 1.55 and 1.08 respectively. "Driving alone" (single occupancy) to the campus (64%) was found to be very common among

academic staffs. Surprisingly, none of the academic staff were using public transport to the campus. Refer to (Table 4). The average commute distance of the respondents was 16.75 km. Most of the respondents (53%) spent commuting time of 15 to 30 minutes to the campus with 51% have experienced less than 15 minutes delay time.

**Table 4: Summary of travel characteristics of the respondents (n=100)**

Travel Characteristics	Frequency	Percentage	Mean	Median	Std. Deviation
<b>Mode of Transportation</b>					
Car – (single occupancy)	64	64.0%	-	-	-
Car – (more than single occupancy)	22	22.0%			
Car – as passenger	10	10.0%			
Motorcycle	4	4.0%			
<b>Commute Distance (one-way trip)</b>					
5 km or less	19	19.0%	16.75 km	11.5 km	17.54 km
6 -10 km	29	29.0%			
11-15 km	10	10.0%			
16-20 km	17	17.0%			
21-25 km	8	8.0%			
26-30 km	5	5.0%			
31 km or more	12	12.0%			
<b>Average Commute Time</b>					
<b>a) To workplace</b>					
15 minutes or less	18	18.0%	29.5 minutes	24.16 minutes	20.074 minutes
15-30 minutes	53	53.0%			
30-45 minutes	10	10.0%			
45-60 minutes	10	10.0%			
1 hour-1h 15mins	4	4.0%			
1 h 15mins-1h 30mins	3	3.0%			
More than 1h 30mins	2	2.0%			
<b>b) From workplace</b>					
15 minutes or less	14	14.0%	32.7 minutes	27.59 minutes	19.454 minutes
15-30 minutes	44	44.0%			
30-45 minutes	16	16.0%			
45-60 minutes	17	17.0%			
1 hour-1h 15mins	5	5.0%			
1 h 15mins-1h 30mins	3	3.0%			
More than 1h 30mins	1	1.0%			
<b>Average Delay Time</b>					
<b>a) To workplace</b>					
Not experienced any delay	17	17.0%	14.67 minutes	6.68 minutes	9.177 minutes
15 minutes or less	51	51.0%			
15-30 minutes	26	26.0%			
30-45 minutes	6	6.0%			
<b>b) From workplace</b>					
Not experienced any delay	24	24.0%	17.80 minutes	15.50 minutes	11.307 minutes
15 minutes or less	36	36.0%			
15-30 minutes	32	32.0%			

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30-45 minutes	5	5.0%			
45-60 minutes	3	3.0%			
Experience of stress					
Yes	35	35.0%	-	-	-
No	65	65.0%			

Source: Primary Survey, 2011

### ***Perceptions of respondents on telecommuting as an alternative work arrangement***

The concept of telecommuting was widely accepted by the respondents. The findings showed that 68% of the respondents were preferred to adopt telecommuting while only 32% were against. The preferred frequency of telecommuting (about 34%) was 2 days per week followed by 3 days per week (28%) and 1 day per week (21%). This study also shows that some of the respondents preferred to telecommute for 3 days per week (27.9%) followed by 20.6% preferred only 1 day per week. Nearly 78% of the academic staffs were aware about telecommuting and 48% of the respondents were performed telecommuting informally. The views of respondents on telecommuting were asked based on their likely preference to practice telecommuting during and after office hours. Peters et al. (2004) mentioned that informal telecommuting is more widespread than formal telecommuting.

### **Hypotheses testing**

Each hypothesis was tested for statistical significance by using Chi-square method. The following shows results of the hypothesis testing.

*H1 Further the commute distance from home to workplace, greater the employees show preference to practice telecommuting*

Jiang (2008) and Mokhtarian and Salomon (1996a) explained workers who have longer commute distances may be more likely to telecommute. The findings showed that this hypothesis was tested to be statistically insignificant at 95% confidence level. This finding is similar to that of Abdul Azeez and Wan Nurul Mardiah (2009) and Drucker and Khattak (2000) which indicated that distance to work is negatively correlated with telecommuting—that is, the farther the individual lives from his/her job, the less likely he/she to telecommute. (Table 5) shows the cross-tabulation between those two variables.

**Table 5: Preference towards telecommuting according to commute distance**

Likely to practice telecommuting		Commute distance					Total
		10 km or less	11-20 km	21-30 km	31-40 km	41 km or more	
Yes	<i>Count</i> <i>Percentage of respondents who likely to practice telecommuting in terms of commute distance</i>	32 47.0%	19 27.9%	8 11.8%	4 5.9%	5 7.4%	68 100.0%
No	<i>Count</i> <i>Percentage of respondents who are not likely to practice telecommuting in terms of commute distance</i>	16 50.0%	8 25.0%	5 15.6%	2 6.3%	1 3.1%	32 100.0%

*Source: Primary Survey, 2011*

*H2 Longer the commute time between home and workplace, the higher the inclination of academic employees to telecommute.*

In many studies commuting time is indeed found to have a large positive effect on telecommuting adoption (Mokhtarian and Salomon, 1997). Peters et al. (2004) mentioned that the likelihood towards preference to telecommute is related with long commuting time. Results of chi-square test had revealed that there exists no significant association between the propensity towards telecommuting and commute time (for both to workplace and from workplace). The chi-square results showed insignificant relationship between inclination to practice telecommuting and commute time. (Table 6) shows the relationship between commute time and preference to telecommute.

**Table 6: Preference towards telecommuting according to travel time**

Likely to practice telecommuting		Average commute time to workplace				Total
		< 30 minutes	30 minutes - 1 hour	1 hour - 1 hour 30 minutes	> 1 hour 30 minutes	
Yes	<i>Count</i> <i>Percentage of respondents who likely to practice telecommuting in terms of average commute time to workplace</i>	47 69.1%	13 19.1%	6 8.8%	2 2.9%	68 100.0%
No	<i>Count</i> <i>Percentage of respondents who are not likely to practice telecommuting in terms of average commute time to workplace</i>	24 75.0%	7 21.9%	1 3.1%	0 .0%	32 100.0%

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Likely to practice telecommuting		Average commute time from workplace				Total
		< 30 minutes	30 minutes - 1 hour	1 hour - 1 hour 30 minutes	> 1 hour 30 minutes	
Yes	<i>Count</i> <i>Percentage of respondents who likely to practice telecommuting in terms of average commute time from workplace</i>	38 55.9%	22 32.4%	7 10.3%	1 1.5%	68 100.0%
No	<i>Count</i> <i>Percentage of respondents who are not likely to practice telecommuting in terms of average commute time from workplace</i>	20 62.5%	11 34.4%	1 3.1%	0 .0%	32 100.0%

Source: Primary Survey, 2011

### *H3 Married female academic employees with children at home are more likely to state preference towards telecommuting*

The presence of children at home may have an important impact towards the choice on the decision to telecommute. Mannering and Mokhtarian (1995); Popuri and Bhat (2003) explored that the most important variables in explaining the choice of telecommuting were the presence of small children in the household and gender of respondents. In response to that, Wells et al. (2001) found that telecommuters are more likely to be women, married, and have children. Among the respondents who expressed interest to practice telecommuting, 57.6% were married female with children. The third hypothesis, which states that married female academic employees with children at home are more likely to state preference towards telecommuting was tested for statistical significance. Mokhtarian and Salomon (1996b), on the other hand, showed different findings on this relationship. Their findings revealed that the presence of children were not significantly different between preferrers and non-preferrers. This research however has come out with a contrary result. The findings of this hypothesis showed that the association between preference towards telecommuting and married female with children status was statistically significant at 95% confidence level. (Table 7) shows the cross-tabulation between those two variables.



**Table 7: Preference towards telecommuting according to married female with children status**

Likely to practice telecommuting		Married female with children status		
		Married female with children	Married female without children	Total
Yes	<i>Count</i>	19	14	33
	<i>Percentage of respondents who likely to practice telecommuting in terms of married female with children status</i>	57.6%	42.4%	100.0%
No	<i>Count</i>	2	11	13
	<i>Percentage of respondents who are not likely to practice telecommuting in terms of married female with children status</i>	15.4%	23.9%	100.0%

*Source: Primary Survey, 2011*

*H4 Greater the time spent on research, more likely the academic employees to show their willingness to telecommute*

The main work tasks of academic staffs are teaching, consultancy and research activities. Based on Yen and Mahmassani (1997) stated-preference approach survey, in which respondents are asked about their preferences towards telecommuting adoption, the authors find that the more face-to-face communication with the coworkers that the employee says he needs, the lower the probability of telecommuting. Since research activities mainly involve spending time independently and require less face-to-face interaction, it is presume that those who spend more time on research and publication would more preferably express willingness to telecommute. Chi-square test, however, has revealed that the association between propensity towards telecommuting and more time spent on research was statistically insignificant. It is because among those who preferred to telecommute were mostly spent their time on research for 1 to 8 hours per week (least frequent) whereas only few of the respondents who were willing to telecommute spent time on research for more than 32 hours per week (most frequent). (Table 8) describes the relationship between the time spent on research and the employees' preference towards telecommuting. A summary of hypotheses is shown on (Table 9).

**Table 8: Preference towards telecommuting according to the time spent on research**

Likely to practice telecommuting		Allocation of time spent on research					Total
		Least frequent*	Less frequent*	Frequent*	More frequent*	Most frequent*	
Yes	<i>Count</i>	23	19	11	6	6	65
	<i>Percentage of respondents who are likely to practice telecommuting in terms of time spent on research</i>	35.3%	29.2%	16.9%	9.3%	9.3%	100.0%

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No	Count Percentage of respondents who are not likely to practice telecommuting in terms of time spent on research	13 41.9%	2 6.5%	12 38.7%	3 9.7%	1 3.2%	31 100.0 %
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Source: Primary Survey, 2011

\* Least frequent = (1-8 hours per week), Less frequent = (9-16 hours per week), Frequent = (17-24 hours per week), More frequent = (25-32 hours per week), Most frequent = (More than 32 hours per week)

**Table 9: Summary of Research Hypotheses**

	Research Hypothesis Statement	Variables	Chi-square Value	df	Asymp. Sig. (2-sided)	Interpretation
H1	Further the commute distance from home to workplace, greater the academic employees show preference to practice telecommute	1. Commute distance from home to workplace 2. Willingness to tele-commute	.109	2	.947	Insignificant relationship
H2	Longer the commute time experienced to workplace, higher the inclination of the academic employees to telecommute	1. Commute time between home and workplace 2. Preference towards tele-commuting	Average travel time to workplace			Insignificant relationship
			.210	2	.647	
H2			Average travel time from workplace			
			.391	2	.532	
H3	Married female academic employees with children at home are more likely to state preference towards telecommuting	1. Gender 2. Marital status 3. Children status 4. Preference to perform tele-commuting	6.691	1	.010	Statistically significant
H4	Greater the time spent on research, more likely the academic employees to show their willingness to telecommute	1. Frequency of time spent on research 2. Willingness towards tele-commuting	4.151	2	.126	Insignificant relationship

Source: Primary Survey, 2011

The results of the hypothesis showed whether or not there exist relationship between preference to telecommute and the chosen variables. The results showed that as many as three hypotheses were tested statistically insignificant at 95% confidence interval. However, these results should be applied with caution because of the limitation in the selection of total sample size.

***Perceived advantages on the preference towards telecommuting***

This study also analyzed on the motivational factors that influenced the preferences towards telecommuting by using Relative Importance Index (RII) method. The results showed that “increase flexibility to work at own pace” was the most important factor (RII=0.84). Previous studies also mentioned that the importance of individual’s freedom is one of the key telecommuting facilitators as perceived by employees (Feldman and Gainey, 1997; Pulido and Lopez, 2005). “Proper management of time” was the second most important factor (RII=0.81) followed by “having more time with family” (RII=0.80), “ability to reduce travel time” (RII=0.78) and “ability to contribute in reducing traffic congestion” (RII=0.78). Furthermore, “increase comfort of workspace (i.e. at home)” (RII=0.76) and “ability to contribute in reducing pollution” (RII=0.75) were the other important factors, according to ranking index, as perceived by the academic staffs on the factors towards telecommuting. Findings from earlier studies showed that increasing productivity is considered as a key factor for employees to adopt telecommuting (Kurland and Bailey, 1999; Lim et al., 2003; Mills et al., 2001; Tung and Turban, 1996). However, this study has found that “increase productivity” (RII=0.74) and “increase job performance” (RII=0.74) were scored low ranking values by the respondents. The other factors which scored low ranking values are: “ability to reduce stress of traveling to work” (RII=0.74), “ability to reduce travel cost” (RII=0.73), “need to travel less” (RII=0.72), “control over physical environment (i.e. at home)” (RII=0.71) and “ability to avoid long commute distance” (RII=0.70). Refer to (Table 10). The ranking of these factors indicates what actually perceived as the important contributing factors towards willingness to practice telecommuting by the academic staffs.

**Table 10: Factors influencing the motivation towards telecommuting**

Factors influencing the preference to telecommute	Frequency of respondents					R.I.I.*	Rank
	(1)*	(2)*	(3)*	(4)*	(5)*		
Increase flexibility to work at own pace	0	3	13	20	32	0.84	1
Proper management of time	1	6	9	26	26	0.81	2
Having more time with the family	3	7	10	15	33	0.80	3
Ability to reduce travel time	4	7	11	15	31	0.78	4
Ability to contribute in reducing traffic congestion	2	7	15	17	27	0.78	5
Increase comfort of workspace (i.e. at home)	3	5	18	19	23	0.76	6
Ability to contribute in reducing pollution	3	6	19	16	24	0.75	7
Increase job performance	3	9	11	27	18	0.74	8
Increase productivity	2	10	13	24	19	0.74	8

Ability to reduce stress of travelling to work	4	11	14	13	26	0.74	9
Ability to reduce travel cost	6	9	15	12	26	0.73	10
The need to travel less	5	6	23	10	24	0.72	11
Control over physical environment (i.e. at home)	2	9	26	12	19	0.71	12
Ability to avoid long commute distance	7	10	15	13	23	0.70	13

Source: Primary Survey, 2011

\* (1)= Least Important, (2)= Less Important, (3)= Important, (4)= More Important, (5)= Most Important \*\*  
 R.I.I= Relative Importance Index

### ***Perceived disadvantages on the preference towards telecommuting***

This study also investigated perceived disadvantages on the preference towards telecommuting by the academic staff. The findings showed that “lack of resources to accomplish the tasks” as the most important inhibiting factor (RII=0.71) to adopt telecommuting. This finding is in concurrence with Mokhtarian and Salomon (1996b) which also states the similar trend. The results also showed that “low career advancement”, “decrease job productivity”, “inadequate work environment at home” and “increase level of overwork (due to lack of separation between work and family domain)” were scoring a RII value of 0.68. “Decrease job performance” (RII=0.67), “lack of social interaction with colleagues” (RII=0.66), “increase family-work role conflicts” (RII=0.61) and lastly “emotional stress (feeling of seclusion)” (RII=0.60) was the other inhibiting factors, as perceived by the respondents, to adopt telecommuting. Refer to (Table 11). Recent research indicates that isolation is perceived as one of the key factors that may hinder the implementation of telecommuting (Kurland and Cooper, 2002; Rognes, 2002).

**Table 11: Factors influencing the demotivation towards telecommuting**

Factors influencing the demotivation towards telecommuting	Frequency of respondents					R.I.I.*	Rank
	(1)*	(2)*	(3)*	(4)*	(5)*		
Lack of resources to accomplish the task remotely	1	7	7	8	9	0.71	1
Lower career advancement	2	4	12	8	6	0.68	2
Decrease job productivity	3	3	11	9	6	0.68	2
Inadequate work environment at home	3	5	9	7	8	0.68	2
Increase level of overwork	2	5	11	7	7	0.68	2
Decrease job performance	3	4	10	9	6	0.67	3
Lack of social interaction with colleagues	1	9	7	9	6	0.66	4
Increase family-work role conflicts	4	8	8	7	5	0.61	5

Emotional stress – feeling of loneliness	3	11	5	9	4	0.60	6
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*Source: Primary Survey, 2011*

\* (1)= Least Important, (2)= Less Important, (3)= Important, (4)= More Important, (5)= Most Important \*\*  
R.I.I= Relative Importance Index

## DISCUSSION AND RECOMMENDATIONS

The implementation of telecommuting in higher learning institution will provide benefits in many aspects such as job flexibility to the academic staffs, travel and related benefits and reduction in the road and related infrastructure requirements on-campus. Nevertheless, the idea of introducing telecommuting in the University poses few challenges, which require careful close consideration before implementation. The level of achievement of job productivity, continuous inspiration to work away from main office especially at home, need to separate work and family time at home, desired frequency of working at home, possible long term benefits to road infrastructure and finally actual level of acceptance by academic staffs to work at home are few among them. The findings of this study showed that 68% of the respondents preferred to adopt telecommuting as an alternate work arrangement with an average frequency 2.51 days a week. Among the respondents who preferred to adopt telecommuting, female academic staffs (66.2%) were having greater inclination to practice telecommuting than male counterparts. Moreover, those who are expressed willingness to adopt telecommuting, 57.6% were married female academic staffs with children. However, the University does not have an official policy to allow its employees to perform telecommuting.

Few recommendations to increase the penetration level of telecommuting among academic staffs are:

- (1) Formulation of telecommuting policy and clearly established procedures on matters such as frequency of telecommuting, eligible staff members, work schedule, equipments and supplies, security and liability, worksite criteria, injury compensation and performance evaluation is highly required.
- (2) Wan Rozaini and Haitham (2005) stated that telecommuting work arrangement is relatively new among the Universities in Malaysia. Therefore, initiation of awareness to promote telecommuting at the Universities is highly recommended. An earlier study has stated that the intensity of promotion could lead to reduction in car commute trips by 3% to 12% in ten years (Cairns et al, 2004). Moreover, a pilot project on telecommuting should be initiated to ascertain the feedback on the practice

of telecommuting from both supervisors and employees of the organization.

- (3) Further studies covering other compatible workforce among administrative staff members of the University should be undertaken. Additionally, the views of top management of the University in introducing telecommuting should also need to be considered. This will provide much better insights on the compelling issues facing adoption of telecommuting by the University population.

## **CONCLUSIONS**

Telecommuting is considered as one of the travel demand management measures in reducing the amount of travel and road infrastructure requirements. The amount of travel by private cars has been increasing in IIUM over the years because of increase in population and car ownership level. The increase in travel in and out of the campus has induced enormous pressure on the limited road, parking and related infrastructure on-campus. Formation of long queue of vehicles entering and leaving the campus in the morning and evening hours has become a normal phenomenon over the recent years, thereby increasing delay time. Thus, it has given an indication and immediate attention to address the increasing traffic problems on-campus. The suitability of adopting telecommuting in a University setting looks promising because of the greater flexibility involved, especially among academic staffs, in conducting research and consultancy projects. The findings showed that a high number of academic staffs (68%) were willing to adopt telecommuting for at least few days in a week. It is more prevalent especially among married female academic staffs with children. A formal telecommuting policy is required to further increase the number of preferred telecommuters. The formulation of policy on matters such as frequency of telecommuting, eligible staff members, work schedule, equipments and supplies, security and liability, worksite criteria, injury compensation and performance evaluation is required to provide a clear overview of the various aspects involved in practicing telecommuting as an alternate work arrangement. However, even with all the policy and procedures in place, the actual number of telecommuters and the associated benefits it may bring over an extended period of time is what actually need to be seen.

## ACKNOWLEDGEMENTS

The authors are grateful to International Islamic University Malaysia (IIUM) for providing facilities and support for this research.

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