

Table 1. Employment and socio-economic characteristics (n = 54)

Employment type	
Managerial	25.9%
Professional	31.5%
Associate professional	14.8%
Clerical	27.8%
Industry	
Financial intermediation and banking	42.6%
Real-estate and related business activities	37.0%
Telecommunication	5.6%
Education	
Postgraduate degree	12.7%
Undergraduate degree	49.0%
Diploma	21.3%
High school	17.0%
Marital status	
Married	65.3%
Single	34.7%
Age	
21-30	44.4%
31-40	22.2%
41-50	22.2%
51-60	3.7%
No. of children	
None	12.5%
1-2	34.4%
3-4	43.8%
5-6	9.3%
Caring for elderly parent(s) or relative(s)	
Yes	47.0%
No	53.0%

In order to shed some light on the compatibility of work activities performed on a weekly basis to teleworking, the respondents were asked to state the amount of time they currently spend on the following activities: ‘working by yourself’, ‘working face-to-face with others’, ‘working remotely using telecommunication devices, e-mail’, and ‘work related travel’. The respondents were also asked to specify how much control they had over scheduling of their time on the aforementioned activities.

The average time spent working by one’s self was found to be 20.2 hours per week, equivalent to 2.5 8-hour working days. With 38% of the respondents reporting having total control over scheduling their time on this activity (total control is defined as being permitted or entitled to schedule the time for the activity without the need for approval from other parties), and another 36.5% stating having ‘some control’ over scheduling their time on the activity (i.e. sometimes requiring approval) on a weekly basis. 21.3% stated having no control at all (i.e. always requiring approval). Only 4.2% stated that the activity was not performed by them on a weekly basis. This finding is indicative of the potential for being able to telework.

The average time spent face-to-face with others at the workplace was found to be significantly lower at 9.4 hours per week. With 14.6% of the respondents reporting having

total control over scheduling their time on this activity, and 62.5% stating having ‘some control’ over scheduling their time on the activity on a weekly basis. 18.8% stated having no control. 4.1% stated that the activity was not performed by them on a weekly basis.

The respondents stated spending an average of 10.4 hours per week working remotely, i.e. using information/telecommunication tools. With 36.2% of the respondents reporting having total control over scheduling their time on this activity, and another 36.2% stated having ‘some control’ over scheduling their time on the activity on a weekly basis. 21.3% stated having no control. 6.3% stated that the activity was not performed by them on a weekly basis.

Finally, the respondents spent an average of 8.6 hours per week on work-related travel. With 15.2% of the respondents reporting having total control over scheduling their time on this activity, and 32.6% stating having ‘some control’ over scheduling their time on the activity on a weekly basis. 28.2% stated having no control. Almost a quarter of all respondents (24%) stated that they did not perform that activity on a weekly basis.

These findings showed that there is a good opportunity for the potential telecommuters to get involve in teleworking based on the substantial amount of time spent on activities that could be easily performed away from the traditional work place, coupled with the fact that the majority of the respondents reported having at least ‘some control’ over scheduling their time spent on the respective activity.

5.2 Usage of Telecommunication and Office Equipment

The respondents were asked to state the frequency of using a number of telecommunication and office equipments. It should be noted that the more frequent usage of such tools is an indicator of the ability or suitability of one’s job scope to teleworking. More than 80% of the respondents stated that they surf the internet and send e-mails every day. More than 90% stated that they use a personal computer everyday of the week. Teleconferencing was found to be the least used and the least available technology. 22.9% stated that teleconferencing was not made available to them, while another 56.3% stated that they have never used it at work. Only 4.2% of the respondents stated that they use the technology every day.

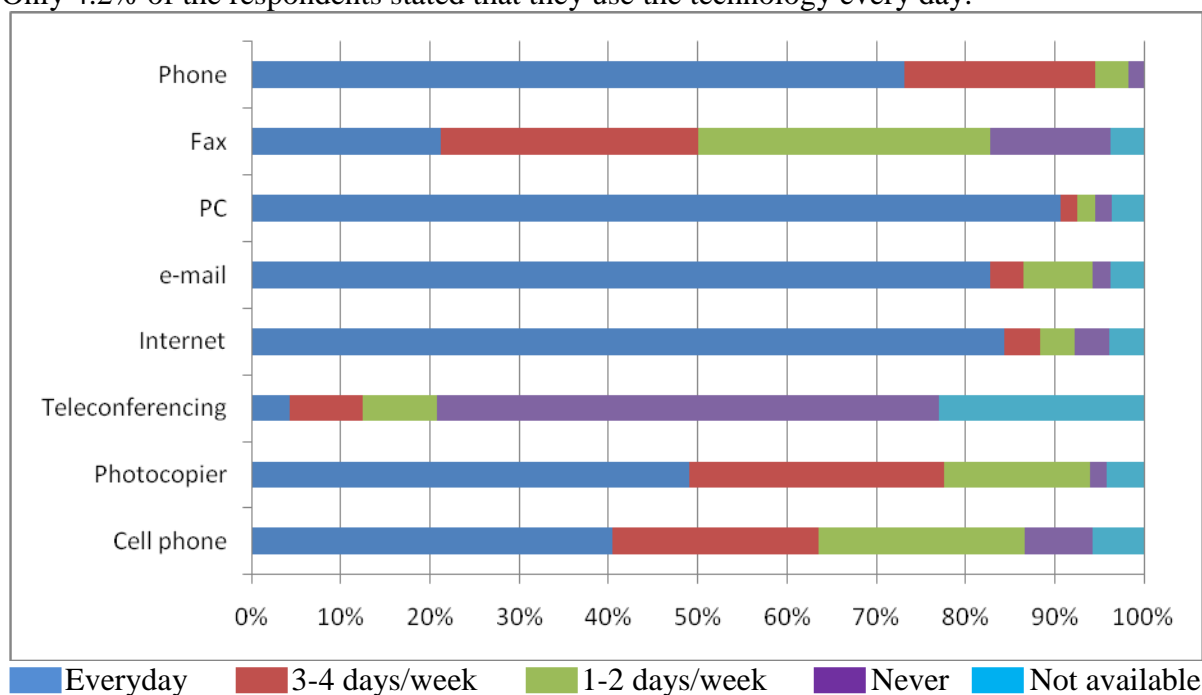


Figure 1. Usage of telecommunication and office equipment

5.3 Respondents' Travel Characteristics

The findings showed that only 25% (13) of the respondents used public transportation as the main mode of transport to commute. This is higher than the official figure for public transportation ridership of 16% in Kuala Lumpur for the year 2009. However, 11 of the respondents who relied on public transportation did so in combination with private automobiles. Only 2 respondents reported using the bus as the only mode for the daily commute. On the other hand, 75% (39) of the respondents relied entirely on private transportation. More than 40% of the respondents reported driving to work in a single occupancy vehicle. This figure is significantly lower than the 70% SOVs crossing some major roads in Kuala Lumpur during peak hours in the year 2008. 23.1% reported commuting by car (multiple occupancy) as drivers or passengers, 11.5% used motorbikes.

The average distance travelled daily by the respondents was found to be 61.4 km for all modes. All of the respondents – excluding the 11.5% motorbike users - reported experiencing delay as a result of recurrent rush hour traffic congestion. The average delay time experienced daily was found to be 33.2 minutes.

The average commute distance and delay experienced during the daily commute seem to play no part in influencing respondents to adopt teleworking. The average daily commute distance for the two groups of respondents (willing and not willing to telework) was an identical with 60.2 km. The delay time of 33.6 minutes experience by those who stated their willingness to telework was only slightly higher than that those who were not willing to telework (32.4 minutes).

Respondents stated a maximum of two journeys performed every working day i.e. the journeys to and from work in the Kuala Lumpur city centre. However, 81.5% of the respondents indicated performing a multiple number of activities in or on the way to their destination. The remaining 18.5% indicated performing work or returning home as the only purpose for the journeys performed. 68.5% indicated performing linked trips. 29.6% (16 respondents) indicated having to drop-off and pick-up children daily to school, another 29.6% of the respondents indicated visiting places for social and recreational activities in the evenings. 9.3% indicated linking trips in order to perform 'personal businesses' and 'every-day' or 'major' shopping. All trips recorded in the travel diaries have taken place during the morning and evening peak hours. Figure 2 and figure 3 show the findings on these trends.

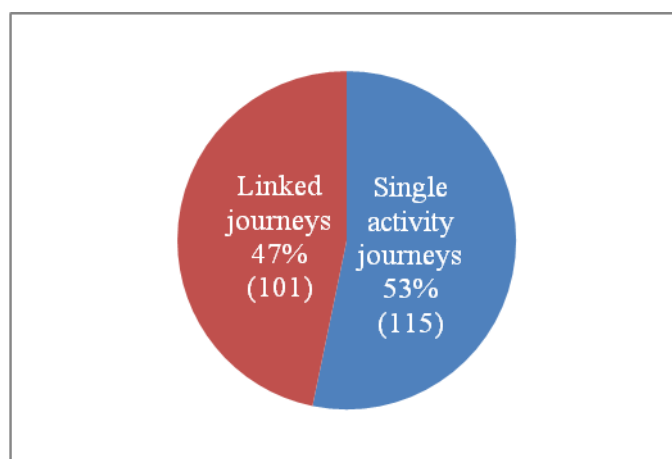


Figure 2. Journeys performed according to type

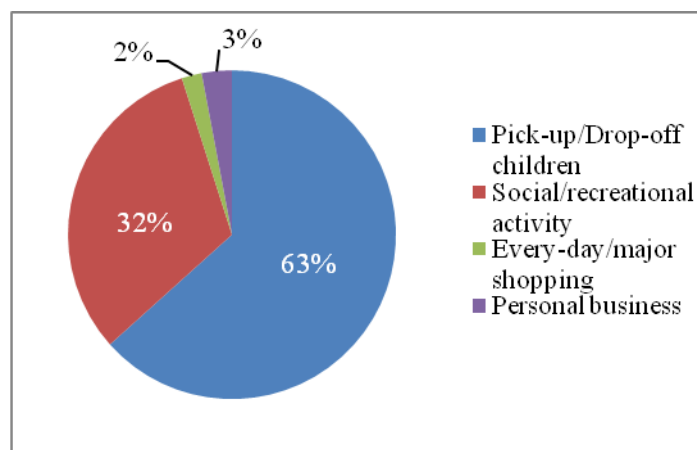


Figure 3. Additional activities performed in linked journeys

5.4 Perceptions of the Potential Telecommuters towards Telecommuting

The vast majority of the respondents (86%) reported having heard of teleworking. However, 58% stated that they have never performed any work at home. 27% stated that they experienced work from home on an irregular basis, i.e. in urgent situations in order to meet deadlines. 15% of all respondents stated that they experienced working from home on a regular monthly or weekly basis. Figure 4 shows this trend.

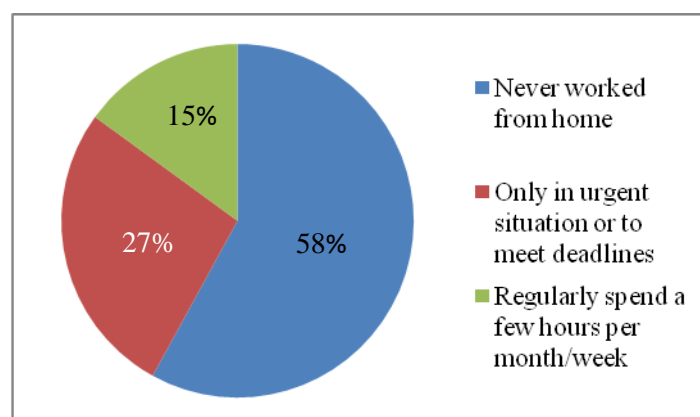


Figure 4. Work performed from home

It is important to mention that more than two thirds (68%) of those who stated having worked from home on a regular basis also stated that work performed from home was in addition to regular working hours. This indicates that even though there was some teleworking taking place, it did not result in any significant reduction in rush-hour trips since the work was performed at home outside the regular working hours. Only 10% of the respondents reported working from home as part of the regular working hours.

5.5 Practical Frequency of Teleworking

The respondents were asked to state how much would the nature of their current job allow for teleworking on a monthly or weekly basis. 41% of the respondents stated the nature of their job does not allow for teleworking, while the remaining 59% stated the ability to telework at a certain capacity. 40% of those able to telework stated that they could do so 1-3 days a month; and another 40% stated a frequency of 1-2 days a week; 17% stated a frequency of 3-4 days a

week; while one respondent stated being able to telework the entire week. Two respondents failed to provide the data.

50% of all managers reported being able to telework at least 1-3 days a month, while the remaining 50% stated that the nature of their job does not allow them to telework at all. 56% of all professionals reported being able to telework at least 1-3 days a month, while 67% of associate professionals and 60% of all clerical workers stated the same.

The average frequency of teleworking reported by respondents who were able to telework at any capacity was found to be 6.2 days a month. The average frequency stated by managers, professionals, associate professionals, and clerical workers were found to be 5.4, 6.8, 9.5, 4.2 days a month respectively. However, due to the small sample size (30 respondents stated their ability, and willingness to telework), these results should be used with caution.

About 55% of the respondents employed in the financial intermediation and banking industry reported being able to telework at least 1-3 days a month. A slightly higher figure of 59% was reported by those employed in the real-estate industry. However, there was a substantial differences in the average number of days of teleworking between the two industries. Respondents employed in the financial intermediation and banking sector reported the ability to telework an average of 4 days a month, while their counterparts employed in the real-estate industry reported an average of 7.2 days a month. This finding indicates that the real-estate industry may be more suited to the practice of teleworking; however, the finding remains preliminary and may not hold true until the entire data set of 400 respondents is collected.

Almost all respondents (97%) who were able to telecommute stated their willingness to adopt telecommuting if given the opportunity. The most preferred mode of teleworking was found to be working from home (83%), while the remaining 17% of the willing respondents preferred to work from a telecentre near their place of residence.

5.6 Motivators to Telework

Those who stated their ability and willingness to telework were asked to indicate the extent to which they agreed on the importance of a number of motivators. The list of motivators was compiled from the available literature. 12 out of the 13 motivators were highly regarded by the respondents. The highest rated motivators for adopting teleworking were 'saving on commute costs', 'eliminating the long daily commute', and 'remaining in a job after relocating place of residence'. Interestingly, the motivator that received the least rating among the respondents was the one concerned with increased productivity while working at home. Figure 4 illustrates this trend.

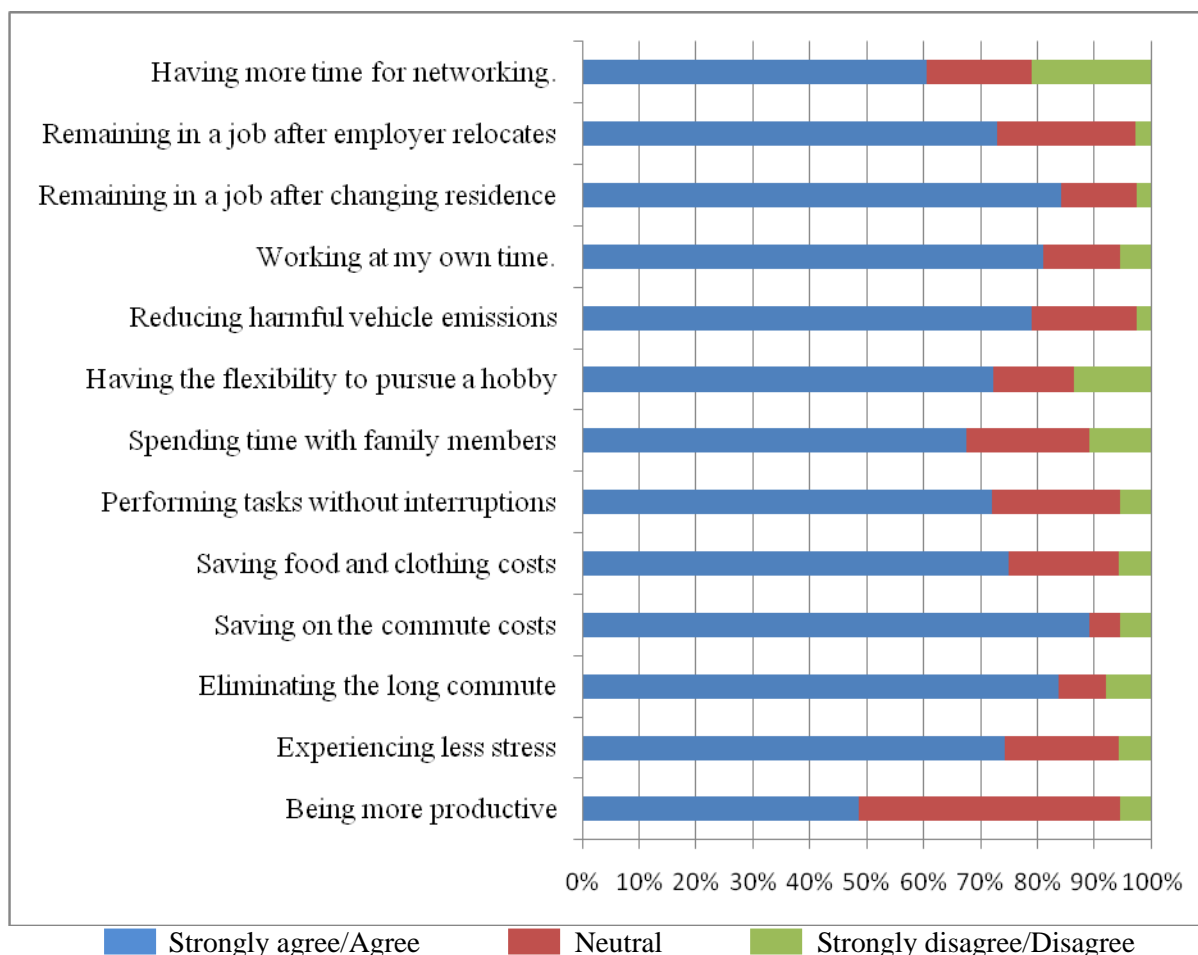


Figure 5. Respondents' agreement with main motivators for teleworking

5.6 Barriers to Telework

The same group of respondents were asked to rate a number of constraints or concerns related to the practice of teleworking according to their importance. Almost 40% of the respondents stated that 'having a conflict between home and work duties' was highly/extremely important constraint. Other highly rated concerns included: 'reduced interaction with colleagues and business contacts', 'being viewed negatively by colleagues for not being present at work', 'being induced to do more or extra work at home', and 'losing the chance for promotion due to the lack of visibility at the workplace'. The least concern for the respondents was found to be 'viewed negatively by neighbors for being present at home during working hours', 'losing office space' and feeling isolated at home'. Figure 6 shows this trend.

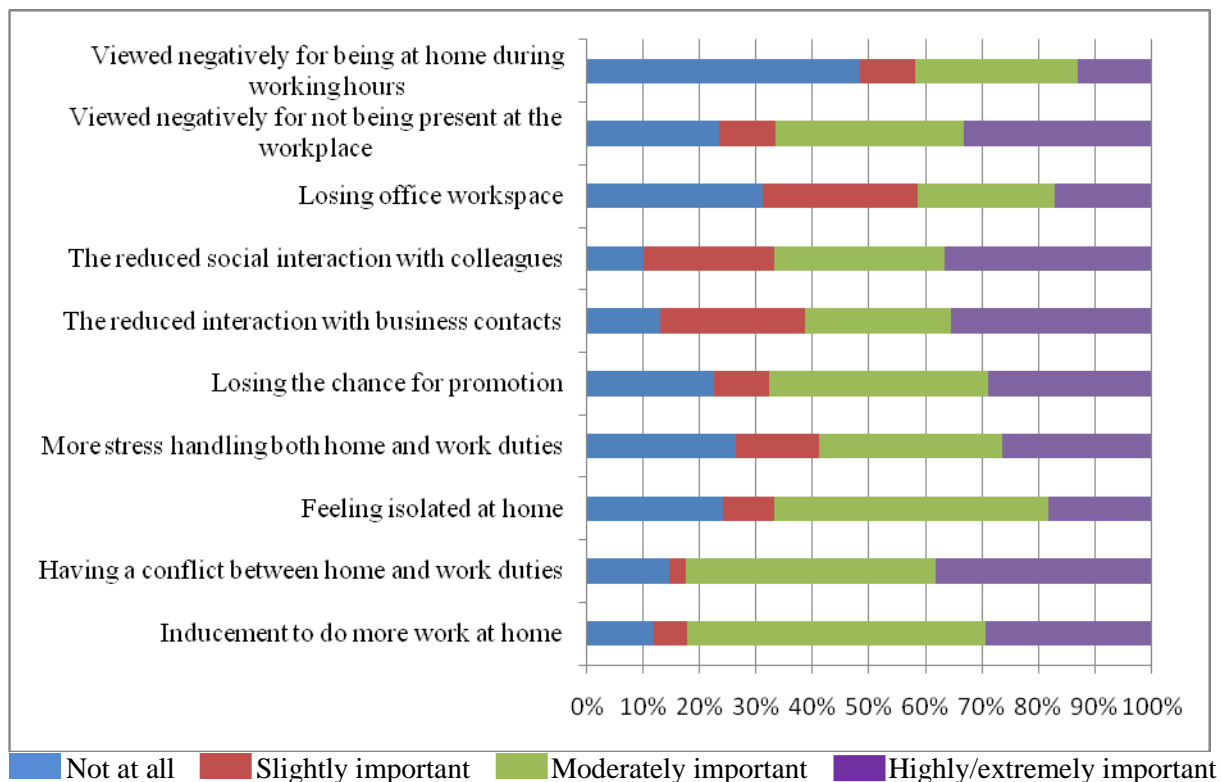


Figure 6. Respondents' rating of the major disadvantages of teleworking

Respondents willing to telework were asked to state whether they would require information and telecommunication tools if they were to perform their work from home. Almost all respondents (97.1%) stated that they would require a personal computer, 94.4% stated that they would require software as well. More than 88% stated the need for an internet connection (figure 7).

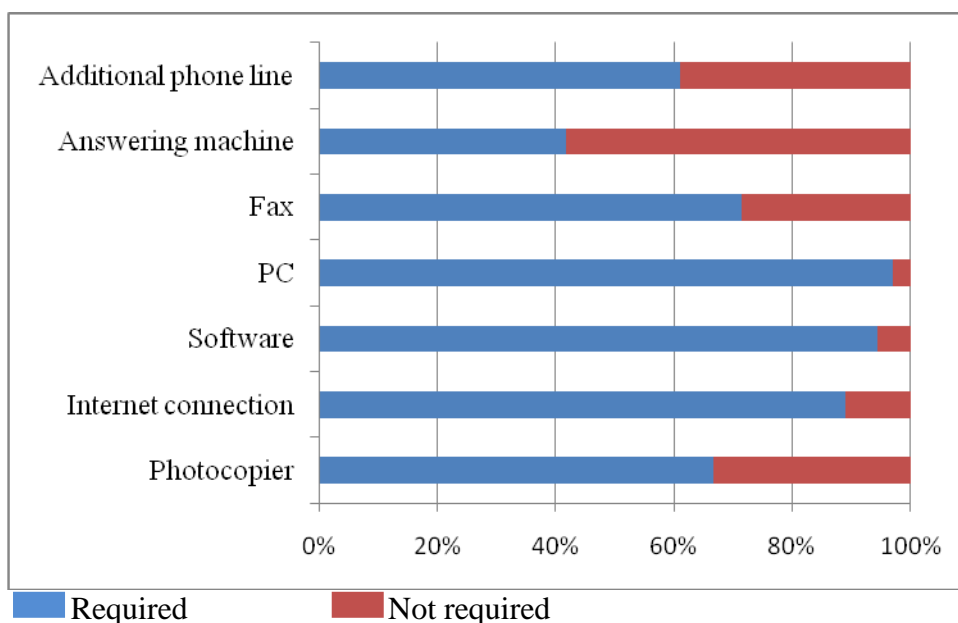


Figure 7. ICT requirements for setting up a home office

The same group was asked whether they were willing to pay the expenses involved in acquiring the ICT equipments to perform their office work at home. None of the respondents expressed their willingness to cover the expenses, 30.6% stated that they were willing to share the expenses with their employers, while the remaining 69.4% stated that they want the employers to cover all of the expenses (figure 8). The findings showed that investing in setting up a home office with the necessary equipments seems to be the main barrier towards practicing teleworking.

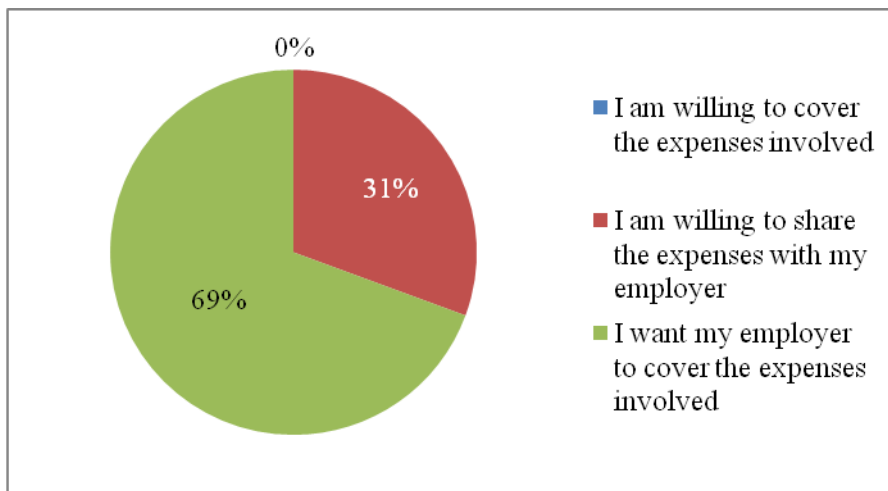


Figure 8. Willingness to invest in setting up a home office

Another possible constrain that can potentially hinder the propagation of a home-based teleworking culture is the availability of space for a home office. However, it did not prove to be a concern for the sampled respondents. 39% of the respondents reported having a space set aside for a home office. Another 53% did not have the necessary space, but stated their willingness to set up a home office. Only 8% did not have a home office, and were unwilling to set up one (figure 9).

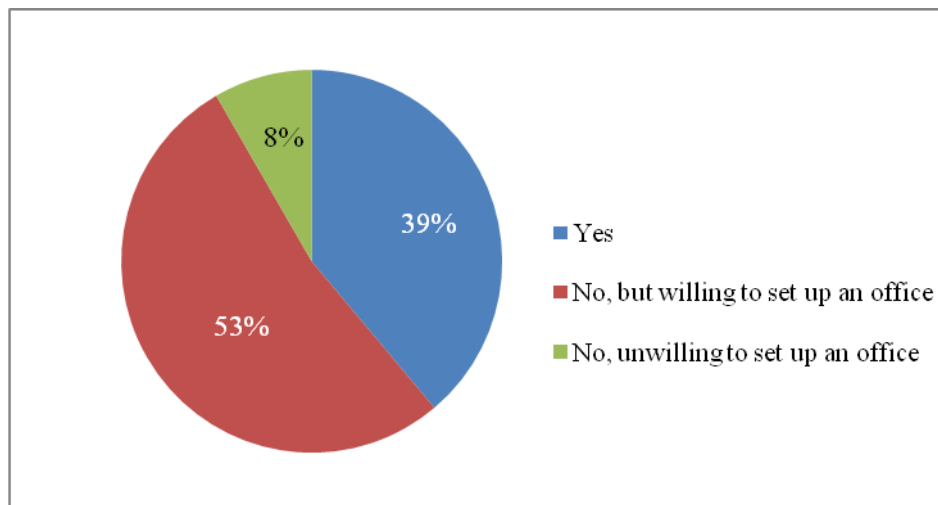


Figure 9. Willingness to invest in setting up a home office

6. TRAVEL IMPLICATIONS OF TELEWORKING BY FEMALE EMPLOYEES

Table 2 distributes the 33 respondents who stated both their ability and willingness to telework according to the mode of travel they rely on for the daily commute, the average distance of the one-way daily commute, and the frequency of teleworking events they can achieve given their job scope. The travel implications of teleworking were computed for the 24 respondents who stated ‘car as a driver’ and ‘car as a passenger’ as their main mode of travel (44.4% of all respondents). It is rather a hypothetical examination of the potential travel implications of teleworking if all those who stated their ability to telework did so according to the specified frequency.

Table 2. Respondents’ mode of travel, average commute distance, and preferred frequency of teleworking (n = 33)

Frequency of Teleworking	Mode of travel				Average commute distance (km)
	Car as a driver (single occupancy)	Car as a passenger	Train	Motorbike	
1-3 days/month	•				1-10
					11-20
	•••••	•	•	•	21-30
	•	••	•		31-40
					41-50
1-2 days/week					1-10
	•				11-20
	•••••	•	•	•	21-30
		•••	••		31-40
					41-50
3-4 days/week					1-10
					11-20
	•••			•	21-30
		•			31-40
					41-50
5 days/week					1-10
					11-20
					21-30
			•		31-40
					41-50
Total	16	8	6	3	33

6.1 Reduction in Commute Trips by Private Transportation

The potential number of trips forgone as a result of teleworking by the respondents on a monthly basis was calculated as the sum of multiplying the number of respondents by the preferred frequency of teleworking on a monthly basis (refer to table 2). This yielded the following:

$$\begin{aligned}
 &= \{10 \times (1+3)/2\} + \{10 \times [(1+2)/2]4\} + \{4 \times (3+4)/2\}4 \\
 &= (10 \times 2) + (10 \times 6) + (4 \times 14) \\
 &= 20 + 60 + 56
 \end{aligned}$$

= 136 one-way trips per month as a result of 24 (44.4%) teleworking respondents, equivalent to an average of 5.7 trips per teleworker per month.

The aforementioned figures can be used to estimate the potential reduction in trips for the entire target population, by multiplying the number of potential teleworkers by the average number of trips forgone per teleworker per month as follows:

$$[63900 \times (44.4/100)] \times 5.7 = 161,718 \text{ one-way trips per month.}$$

6.2 Savings in Vehicle-Kilometers Travelled by Private Transportation

The average vehicle-kilometers forgone as a result of teleworking on a monthly basis is the sum of multiplying the number of respondents by their preferred frequency of teleworking on a monthly basis and by the average commute distance they travel, as follows:

$$\begin{aligned} &= [(1 \times 2 \times 5.5) + (6 \times 2 \times 25.5) + (3 \times 2 \times 35.5)] + [(1 \times 6 \times 15.5) + (6 \times 6 \times 25.5) + \\ &\quad (3 \times 6 \times 35.5)] + [(3 \times 14 \times 25.5) + (1 \times 14 \times 35.5)] \\ &= (530 + 1650 + 1568) \\ &= 3748 \text{ vehicle-km forgone as a result of 136 one-way trips} \end{aligned}$$

Therefore, the total monthly vehicle-kilometers forgone

$$\begin{aligned} &= 3748 \times 2 \\ &= 7496 \text{ vehicle-kilometers, equivalent to 312 vehicle-km/month/teleworker} \end{aligned}$$

This finding needs to be further supported by obtaining a larger and more representative sample. However, for the purpose of this paper, the figures obtained can be used to estimate the potential reduction in vehicle-kilometers for the entire population as follows:

$$[63900 \times (44.4/100)] \times 312 = 8,851,939.2 \text{ vehicle-kilometers travelled per month.}$$

7. CONCLUSIONS

The preliminary findings discussed in this paper offer some positive insight on the potential of teleworking as a means for reducing rush hour traffic in Kuala Lumpur. The available data also shed some light on the actual compatibility of certain industries and employment types with the practice of teleworking.

All of the most commonly cited advantages of teleworking were highly rated by the female employees sampled. The main barrier preventing employees from being involved in teleworking was found to be the need for employees to be physically present at the work place with 55.6% of the respondents being unable to telework due to that constraint. A substantial portion of the sample reported the ability to telework at a certain capacity, but it is expected that they will be prevented from doing so because of the financial burden of setting up a home office with the necessary IT infrastructure. Therefore, a number of measures and policies need to be formulated in order to address that constrain, and consequently help realize the full potential of teleworking as a travel demand management tool.

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