

10. Teleworking

10.1 Introduction

Working practices have traditionally been viewed as something which the public sector does not get involved in, unless there is a need to protect employees (e.g. health and safety legislation), or in relation to financial issues (e.g. taxation and accounting). However, over the last ten years or more, government has increasingly aimed to work in partnership with private industry in relation to a range of corporate, social and environmental responsibility issues. Moreover, as a major employer, the public sector, of course, has a major opportunity to influence the work and business travel of its own employees. Company travel plans were discussed in Chapter 3, whilst Chapter 11 concentrates on the opportunities for teleconferencing to influence business mileage. This chapter focuses on teleworking – where employers encourage employees to adopt a range of remote working practices (i.e. more flexible practices than simply commuting to a fixed workplace every day), including working at home or in a closer location than their main workplace, for some or all of the time.

There are various reasons why teleworking is a relevant issue for government to consider. It is, of course, undoubtedly the case that many of those who undertake teleworking do so as a result of private business initiatives, which are rarely undertaken for transport motivations (alone) or as a result of public sector stimulation. However, local authorities have got involved in both adopting and promoting teleworking, via a range of initiatives. It is interesting that their motivation is also rarely transport alone, and more commonly related to a desire to increase economic competitiveness and/or social inclusion (both of economically deprived groups and geographically remote areas). Initiatives include:

- The provision of remote access to government services and information. For example, the LINNET terminals developed by Lincolnshire County Council placed in libraries across the county are one example (McInroy, 1999). Another is the Cambridge Online City project, established to increase access to public information through the use of the Internet, (www.colc.co.uk).
- Information and advice for companies wishing to develop electronically advanced facilities. For example, Cambridgeshire County Council developed a 'teleworking toolkit', in association with the East of England Development Agency, for companies that wanted to introduce teleworking (cf. Cambridgeshire workplace travel plans case study). In the East Midlands, EMNET exists as an independent, not for profit organisation (supported by the local authorities) to give advice to SMEs with limited resources about how to make best use of the Internet, (www.emnet.co.uk).
- Pilot projects to trial teleworking amongst local authority staff.
- The provision of 'telecentres' which provide a range of services for those who wish to work from home or satellite location close to their homes.

The extent and nature of available local authority experience to assess teleworking is discussed later in this chapter (in section 10.6). Meanwhile, the first part reviews the available literature about the topic.

There is an extensive literature on teleworking, including surveys of changes in travel behaviour comparing people who telework and those who do not, and also before-and-after surveys of new teleworkers. This material is supplemented with papers of comment, analysis and re-working of the experimental data to develop a theoretical framework for the behaviour changes that occur.

Research on the impact of teleworking on travel behaviour was comprehensively reviewed for DTLR by HOP Associates and the Transport Research Group at University of Southampton (DTLR 2002), and their report and database of reviewed research provided a valuable source for the summary presented here. Since that report was published, HOP Associates have continued to update their summary of published reports on the impacts of ICT (information and communication technologies) on travel behaviour. The online version (at www.virtual-mobility.com) includes summaries of more than 126 reports (website accessed 16 April 2004). Telework is also the subject of ongoing European research, via projects such as TARGET and SUSTEL¹.

In this literature review, we concentrate primarily on papers which present experimental results about the effects of teleworking, and do not attempt to summarise the many papers which re-work this data. In reviewing the literature, we were particularly interested in evidence to answer the following questions:

- Does teleworking cut car travel, and if so by how much? What evidence is there for second-order effects off-setting the car miles saved by teleworking?
- What proportion of the workforce teleworks now, and how many might do so in future?
- What are the travel characteristics of teleworkers?
- What estimates exist of the potential future impact of teleworking?

10.2 Literature evidence about whether teleworking cuts car travel

10.2.1 Overview of literature evidence about the traffic impacts of teleworking

Intuitively it seems likely that if someone works at home or at a nearby telecentre rather than driving to the office, their car mileage will fall. However, the debate about the potential contribution of teleworking to reducing travel demand is not quite as simple as this. If an employee starts teleworking all or (more likely) some of the time, the following second-round changes in household travel patterns may result:

- The employee may make other journeys by car during the day (for example to take the children to school or to visit the shops). These journeys might have been made as part of a linked trip if she or he had been driving to work.

¹ TARGET (Travel Awareness Regional Groups for Environmental Transport) 1 and 2 projects are being led by Metro (the West Yorkshire Passenger Transport Executive), www.eu-target.net
SUSTEL (Sustainable Teleworking) is being led by Prof Peter James, at the SustainIT unit of the UK Centre for Economic and Environmental Development in Peterborough, www.sustel.org

- Another family member may take advantage of the fact the car is available, for example to drive to work when he or she would previously have taken the bus.
- In the longer term, teleworking could encourage people to live further from their work. The benefit of reduced travel time on teleworking days would be offset (in part or even in whole) by increased travel on days when the employee travelled to work.

Much of the extensive US literature on teleworking has tended to suggest that these effects either balance or outweigh the first-round travel benefits of not driving to work. However, this seems to be largely based on speculation rather than empirical evidence, and the DTLR (2002) researchers concluded that:

“Literature that looks at the wider effects of teleworking and other online activities and their relationship to personal travel (mainly in the US) have tended to suggest that travel substitution effects are balanced or outweighed by new trip generation. The studies, however, do not persuasively show anything beyond the observation that both traffic and telecommunications use are growing.

An influential school of thought in the US (Ben Akiva, Mokhtarian, Niles) seem to have formed the view that while the direct effects of teleworking may be to reduce travel, the wider effect of telework and other ICT use is to generate a sufficient number of new trips to eliminate the benefit (which is seen as marginal in any case) or even to increase traffic levels...

The problem is, however, that the evidence for the traffic-generation effects of teleworking is partly anecdotal, partly speculative modelling, but mostly repeated assertion by experts. We have not found any compelling evidence (or much evidence at all) in empirical studies for the speculated generative effects. This is not to say that there are no such effects, as common sense would indicate that there are likely to be. But they have not as yet been measured.”

The results of some of the main experimental studies are summarised below. A few summaries are based on information provided in the HOP Associates database, and have not been independently reviewed. These are indicated in the reference list.

10.2.2 Empirical studies of the traffic impacts of teleworking

State of California Telecommuting Pilot Project

A detailed travel diary study of 40 participants in the State of California Telecommuting Pilot Project found that on average, telecommuters made 27% fewer trips in total on days when they worked at home, made up of a reduction in car trips to work and an increase in car trips for other purposes. They travelled 77% fewer miles by car (down from 44.8 miles to 10.2 miles) on teleworking days, compared to their behaviour before they began telecommuting (Koenig et al. 1996). Interestingly, although non-work trips increased, non-work mileage *fell*: that is, the teleworkers made shorter but slightly more frequent non-work car trips on teleworking days. The mileage reduction was the sum of fewer miles driven to work (a saving of 29.3 miles) and fewer miles driven for other trips (a saving of 5.3 miles).

The results of this study are similar to an earlier survey as part of the California Telecommuting Pilot Project, which studied 219 people and found average total mileage reductions on telecommuting days of 75% (Pendyala et al. 1991). Pendyala et al. also found evidence that teleworkers chose non-work destinations that were closer to home, exhibiting “contracted action spaces”.

California Residential Area-Based Offices Project

Other Californian studies have evaluated the impacts of telecentre-based commuting, where the worker travels to a neighbourhood telecentre (Balepur et al 1998; Mokhtarian et al. 1998). These studies found slightly lower but still significant reductions in car mileage on teleworking days, of between 53% (reported by Mokhtarian et al.) and 65% (reported by Balepur et al.). Workers generated additional car mileage by driving home in the middle of the day for lunch and back to the telecentre in the afternoon. However, the number of non-commuting trips on teleworking days either fell or remained constant. Balepur et al. calculated that when the reduction in car mileage was weighted by the frequency of teleworking, the overall reduction in car mileage was 17% of total weekday commuting travel. Mokhtarian et al. (1998), with a slightly larger evidence base, concluded that the reduction in car commuting mileage was 11.5% over the week (on average teleworkers used a telecentre about 1¼ days per five day working week).

Teleworking in the Washington Metropolitan Area

The Washington Metropolitan Telework Demonstration Project involved eight organisations in the Washington metropolitan area who were provided with help to expand or start formal telework schemes. Six were private sector organisations, one was a government body, and one was a non-profit organisation. Most of the teleworkers worked at home one or two days a week, although one site’s teleworkers worked at home full-time (Metropolitan Washington Council of Governments 1999).

The study gathered evidence on the effect of teleworking on vehicle use and vehicle miles travelled. It asked about non-commute trips that were eliminated (e.g. not going out for lunch) and non-commute trips that were made (e.g. going shopping after work). The interviewees were also asked if any other household member had used their vehicle on their most recent telework day. Amongst 100 employees surveyed, the average number of vehicle trips per day fell by 0.6, and average vehicle miles per day fell by 16, per teleworker.

The study also looked for evidence of people adapting to teleworking by moving further away from work. Amongst 22 people involved in the survey who had moved or were planning to move, it found the move was equally likely to be closer to work or further away.

Teleworking in the Netherlands

Hamer et al. (1991) analysed travel diaries of 30 employees of the Dutch Ministry of Transport who spent between 20 and 60% of their time teleworking. The study also surveyed the travel activity of members of the teleworkers’ households. For the teleworkers, they found that:

- The overall number of trips made fell by 17% (compared to the number of trips made before teleworking began)
- Peak-hour trips fell by 19%, and peak hour distance travelled fell by 26%

- Trips as a car driver fell by 19%, and distance travelled as a car driver also fell by 19%
- Peak hour car trips fell by 26% and peak hour car mileage by 34%.

For other household members, the study found:

- The overall number of trips fell by 9%; most of the decrease was for non-work related travel
- The estimated distance travelled by household members showed hardly any significant change.

The study found that the decrease in number of trips was more immediate for the teleworkers, whereas household members only gradually started to travel less. The reduction in trips made by household members was unexpected, and despite a further qualitative survey the researchers were unsure of the explanation for this.

Teleworking in Greater Munich

This study (Glogger et al. 2003) examined the travel behaviour of teleworkers in eight large organisations in Greater Munich, using travel diaries before and after teleworking was introduced. Before and after travel diaries were completed by 37 teleworkers and 29 members of their households. The study found that people who began teleworking reduced their total number of trips (for all purposes, not just for work) by 19%. The number of trips made by other household members also fell. Taking the household as a whole, the total number of trips for all purposes fell by 14%. The study suggested that in the absence of teleworking, traffic in the Greater Munich Area would be 2% greater.

Teleworking in Denmark

This study (Jensen et al. 2003) involved a questionnaire to a panel of 946 Internet users in Denmark who telework some of the time. People who always worked at home were excluded from the survey. It compared the travel behaviour of teleworkers on days when they worked at home with their travel behaviour on commuting days. The total amount of time spent travelling in the teleworkers' own cars was 48.6% lower on days when they worked at home. Travel time for all other modes apart from walking (that is, cycling, bus, train, and travel in someone else's car) also fell by between 21.0% and 74.8%. The survey did not ask about travel patterns amongst other household members.

The survey examined whether working at home had affected choice of where to live, or might do so in future. 4% of respondents said teleworking had influenced their choice of where to live, with equal numbers saying it had led them to move closer to, and further away from, work. 7% said that in future, the opportunity to work at home would have considerable influence on their choice of where to live; while 21% said it would have some influence. The number who said they would be likely to move further away was approximately the same as the number who said they would move closer to work.

Just over 3% of respondents had changed where they worked because they wanted the opportunity to telework. Equal numbers had moved to a workplace that was closer to, and further away from, their home. Six per cent said they were considering changing

their workplace in order to be able to telework, and again half said the distance between home and work would increase and half said it would decrease.

The study's authors concluded that the opportunity to telework will potentially affect long-term decisions about place of residence and place of work; that it is impossible to say whether the result will be a spatially more or less dispersed pattern; but that at present it seems that teleworking will have limited effect on these choices.

Teleworking in the UK

Hopkinson and James (2003) report the results of the European SUSTEL study on sustainable teleworking, including surveys of teleworking staff at BT and BAA. Information from the BT survey is reported in more detail, from section 10.7 onwards. Meanwhile, the following information is given about BAA. In the main administrative building for BAA at West Point, 64 out of 250 employees telework. The SUSTEL survey was completed by 20 staff, all of whom reported their commuting had decreased since becoming a teleworker, with mean reductions of 61 miles per week. This was partially offset by additional trips, mainly for shopping and child escort. Across the whole sample, this resulted in additional weekly travel of 16 miles per person, giving net weekly travel reductions of 45 miles per person. It was notable that the initiative has also led to reduced space requirements, estimated to be resulting in savings of £400,000 per annum.

The research by HOP Associates and the University of Southampton reports a study by Hopkinson et al. (2001) which looked at the changed travel patterns of 103 AA call-centre staff who moved to home-based working. Before the shift to working at home, 88% of commuting trips were by car, and journey length was on average 9 miles. By almost completely eliminating commuting trips, 3680 vehicle miles were saved per employee per year. This was offset by occasional employee visits to the office and home visits by managers, which came to about 30-40% of the miles saved. Of 29 employees who gave information about their non-work travel, most said that this had also reduced but nine said they now made longer or more frequent journeys.

An earlier study (Mitchell and Trodd 1994) examined the travel behaviour of a small sample of existing UK teleworkers. It found an average reduction in travel of 113 miles per week (after allowing for remaining travel to work and additional non-work trips). Half the sample reported no extra non-work trips. The journeys of this sample of teleworkers were significantly longer than the average journey to work – 21 miles compared to the national average at the time of 8.3 miles. On the assumption that long distance commuters might be more likely to find telework attractive, the study estimated a saving in car use nationally of 5 – 12%.

Travel plans literature (Hop Associates 2001) also gives reports from four private sector companies as follows:

- IBM introduced a 'Smart' project, which was a scheme mixing home-based working and shared office touchdown points. This resulted in a 13% reduction in travel time, a 36% increase in time spent with customers and a total space-saving of 30%.
- RM Consulting, an internal consultancy for the Post Office, began a 'location independent working' pilot project in 1995. Within two years, the 145 employees involved had reduced their mileage by around 500,000 km, with 10% of them

travelling half the distance that they had at the start of the project. In the following two years, the target was to double the number of employees involved.

- ADAS Consulting Limited adopted ICT based working practices about five years ago. Since then, it has reduced its number of office sites from 90 to 26, and more than 500 of the staff now work from home. Travel savings for each of these employees is estimated to be around 2000 miles a year.
- Yorkshire Water introduced a mobile working pilot project for its engineers. This resulted in annual mileage savings of up to 20%, mainly by eliminating daily visits to the team office.

There has been a more recent study by National Opinion Polls, as reported by Geraghty (2004) and Fogarty (2004). It involved interviews with 1,600 Internet users in December 2003. The sample was weighted to match Financial Research Survey² generated profiles of Internet users, and selected from 17,931 GB adults (who were screened for Internet usage in the previous 12 months using the FRS and NOP's two Omnibus Vehicles). Of the 1,600 Internet users who worked from home for some or all of the time, the average mileage of the round trip saved was 16.3 miles. 56% made non-work related car journeys whilst working from home of an average length of 4 miles. Consequently, the net effect, per teleworker, was 12.3 miles saved per day (an overall reduction in commuting mileage of approximately 75%).

10.2.3 Summary of findings about the impacts of teleworking on car use

The evidence from these various studies points to the following conclusions about the impact of teleworking on car use:

Teleworking does reduce the car mileage travelled by teleworkers, even allowing for some extra non-work car trips.

Estimates of the effects of teleworking are reported in a variety of ways, but all point in the same direction. Studies which compare distance travelled by teleworkers on teleworking days with that on non-telework days find reductions in mileage of between 48% and 77% (Balepur et al. 1998; Jensen et al. 2003; Koenig et al. 1996; Mokhtarian et al. 1998; Pendyala et al. 1991; Geraghty 2004 and Fogarty 2004). Reported overall reductions in mileage or trips (measured across both teleworking and non-teleworking days) range from 11% to 19% (Balepur et al. 1998; Glogger et al. 2003; Hamer et al. 1991; Mokhtarian et al. 1998). There is some evidence that teleworkers exhibit 'contracted action spaces': that is, that they begin to choose non-work destinations which are closer to home (Koenig et al. 1996; Pendyala et al. 1991).

There is rather little evidence about the impact of teleworking on other household members. However, the evidence that is available points towards their travel remaining the same or perhaps even falling slightly, rather than increasing.

Glogger et al. (2003) found that both teleworkers and other household members made fewer trips after teleworking began. Average trips per household fell by 14%. Hamer et al. (1991) found that the number of trips made by other household members fell by 9% after teleworking began, and that distance travelled showed little change. Hamer

² This is one of the most respected surveys of consumer behaviour in relation to the personal financial services sector, designed to give a representative picture of the UK.

et al. also noted that the behaviour change was more gradual for other members of teleworking households: whereas the decrease in trips for teleworkers was immediate, other household members only gradually started to travel less.

There is little evidence about the impact of teleworking on people's choice of where to live. What there is, points towards teleworking being of rather little importance in choice of home location, although there are links between teleworking and trip distance that may indicate long run effects, as yet not understood.

Two studies explicitly sought information about whether the opportunity to telework might lead people to move further away from their work, increasing commuting distances on non-telework days. The MWCOG (1999) study included 22 teleworkers who had recently moved or were planning to move. The direction of their move was equally likely to be closer to work or further away from work. Similarly, Jensen et al. (2003) found that amongst people who said teleworking influenced their choice of where to live (or would do so in future), the move was as likely to be closer to work as further away. There is also some evidence suggesting teleworkers may have longer commute journeys than the national average, reported in 10.4 below. This might be explained by teleworkers moving further away, or might indicate that employees who live further away have a greater incentive to telework, or even that both are associated with some other cause, such as income. The long run effects of this kind are, as yet, unknown.

Further comparisons of the various studies are given in section 10.10.

10.3 What proportion of the workforce teleworks, or might do so?

The proportion of the working population that is teleworking is growing fast. In 1993 it was estimated that about 0.5% of the workforce in Britain (130,000 people) sometimes teleworked (DTI 2002). By 2001, data from the Labour Force Survey showed that 2.2 million people in the UK (7.4% of the labour force) worked from home at least one day a week using a telephone and computer. Since 1997 the number of teleworkers in the UK has increased by on average 13% a year, giving an overall increase between 1997 and 2001 of 65%.

The same report (DTI 2002) also defined a subcategory of teleworker, as being people who could not perform their job *without* the use of both a computer and telephone. In 2001, there were reported to be 1.8 million of these (approximately 6% of the labour force). The 'essentialness' of telecommunications equipment is not of particular interest in transport terms. However, this subcategory is of interest, because there are later figures available from the Labour Force Survey. Specifically, as reported on content.equaltelework.org (a site run by the Telework Association), the 2003 Labour Force Survey showed that this subcategory had grown to 2.1 million in 2003, with a growth rate of 12% in the last year.

If growth rates of 12-13% p.a. continue for about 10 years, this would result in approximately 30% of the UK workforce teleworking for at least some of the time by the end of the period.

Clearly not everyone works in a job where teleworking is possible, which might mean that some kind of 'ceiling' could be reached, in terms of the proportion of the population who are able to telework. The same report (DTI 2002) provides some insights into this issue. In particular, it gives the number of teleworkers in two sets of occupational classification systems. These can be compared with the total numbers of employees that fall into these classifications, as shown in Tables 10.1 and 10.2.

Table 10.1 Breakdown of employment by occupation (figures for Spring 2001)

	% of employees in each employment category	% of teleworkers in each employment category	% of those in each employment category who are tele workers
Managers and senior officials	13.7	23	13
Professional occupations	11.9	25	16
Associate professional and technical	13.3	20	12
Administration and secretarial	13.4	9	5
Skilled trades	12.0	15	9
Personal services	7.2	3	3
Sales and customer services	7.8	2	2
Process, plant and machine operatives	8.6	2	2
Elementary occupations	12.2	1	1
Total	100	100	n/a

Sources: Figures for general employment taken from the ONS Labour Force survey reports on the ONS website, Spring 2001. Data are for all in employment. Telework data read from graphs in DTI 2001 (hence figures in second two columns only given to one or two significant figures). Both data sets coded according to the 2000 Standard Occupational Classification.

Table 10.2 Breakdown of employment by industry sector (figures for Spring 2001)

	SIC category	% of employees in each employment category	% of teleworkers in each employment category	% of those in each employment category who are tele workers
Agriculture, forestry and fishing	a,b	1.2	2	13
Energy and water	c,e	0.7	0	5
Manufacturing	d	15.0	12	6
Construction	f	4.7	14	24
Wholesale, retail and motor trade	g	17.6	9	4
Hotels and restaurants	h	6.6	1	2
Transport, storage and communications	i	6.3	5	6
Banking, finance and insurance	j	4.2	4	8
Real estate, renting and business activities	k	14.6	24	13
Public administration and defence	l	5.5	4	6
Education	m	8.4	10	10
Health and social work	n	10.2	6	5
Other community, social and personal	o-q	5.0	8	14
		100	100	--

Sources: Figures for general employment taken from National Statistics (2002) Annual Abstract of Statistics, TSO: London. Telework data read from graphs in DTI 2001 (hence figures in second two columns only given to one or two significant figures). Both data sets coded according to the 1992 Standard Industrial Classification (SIC).

Table 10.1 shows that the majority of teleworkers currently, and the highest incidence of teleworking, occur in managerial, professional, administrative (including secretarial) and skilled occupations, in each of which between 5% and 16% of the workforce currently telework. These groups make up 64% of the total workforce. The remaining one-third of the workforce currently has a quite small incidence of teleworking, at around 2%. However, all occupational groups have some degree of telecommuting already.

This is further illustrated by table 10.2, which uses the standard industry classification, where there are significant proportions of employees in every industry who are teleworkers - even including industries which rely heavily on personal contact, such as 10% in education, 13% in real estate and 5% in health and social work.

Hence, this initial analysis suggests that there is no clearly defined 'ceiling' in terms of the proportion of the population who might telework. Moreover, there are several trends which suggest that the growth of teleworking may continue to increase. The 'naturally' high teleworking occupations are also those which have, in recent years, been a growing proportion of the economy. There is a growth in the incidence of teleworking within those jobs most suitable for it. There has been the development of new techniques of work styles which apply telecommunications to those tasks previously thought unsuitable (such as medical diagnoses, further education teaching, estate agency, personal advice, and production control). Improving technologies have made it easier to work remotely. Moreover, occupations not presently seen as appropriate for teleworking may involve a proportion of tasks which could be carried out away from the main workplace relatively easily, and, as telework becomes more widespread, attitudes to working at home in these occupations may change. The growth of telesales, decline of traditional travel agencies, and changes in the music business all indicate that the pace of change can be rapid.

There have been a few other studies which have attempted to assess the potential scale of teleworking in the UK. These are as follows:

Institute of Employment Studies

DTI (2002) quotes research by the Institute of Employment Studies (Huws et al, 2001). This analysed the proportion of particular occupations in the total workforce. They are said to have included "for example managers, computer professionals, teaching professionals, writers and creative performing artists, and administrative associate professionals." Their study suggested that 22.6% of the UK workforce could potentially telework. (It is perhaps interesting that, in the same report, the DTI (2002) quoted a study from the United States in 2001, which suggested that 21% of the labour force were already teleworking.)

HOP Associates

A study for DTLR by HOP Associates (Lake et al. 1997) gives an insight into the potential for teleworking in occupations where it is currently low. Lake et al. looked at the "teleworkability" of tasks carried out by 2300 employees of Cambridgeshire County Council, and concluded that, of the tasks carried out by different types of employee:

- 5-20% of tasks carried out by support staff were location-independent
- 30-60% of tasks by service delivery staff, including field workers, were location-independent
- 30-50% of tasks by managers were location-independent.

Given that, as discussed below, some data suggest that teleworkers only tend to work from home for an average of about 30% of the time, this implies that some degree of teleworking may actually be feasible for the majority of staff. In particular, these figures show that occupations which are not presently seen to have much teleworking potential (such as support roles and service delivery) involve a significant proportion of tasks which could be carried out away from the workplace.

Motors or Modems

Dodgson et al (2000) quote US findings (reported by Fouracre and Hill, 1998) which suggest that 50% of the workforce are 'information workers' and 80% might telecommute, leading to a saturation level of 40% of the workforce. In their own scenario building, Dodgson et al estimate that 15% of the workforce might be teleworking by 2010 on any one day.

National Opinion Polls survey

As reported in section 10.2.2, a recent National Opinion Polls survey (reported by Geraghty 2004 and Fogarty 2004) involved interviews with 1,600 Internet users in December 2003. These were selected from 17,931 GB adults (aged 15+), who were screened for Internet usage in the preceding 12 months.

The NOP survey showed that, of internet-using employees, 25% were working from home some or all of the time. (It also showed that the proportion of broadband users sometimes working from home was higher – namely 31%). From the initial selection procedure, NOP concluded that 24.9 million GB adults were Internet users, and 66% of these were in employment – i.e. approximately 16.4 million people. Given that 25% of those in employment were working from home some or all of the time, this implies a total of 4.1 million (14.4% of the labour force³). This is considerably higher than the figure quoted from the earlier Labour Force Survey (c.f. DTI 2002). This may partly reflect higher growth rates for home working than previously, and/or may reflect different definitions of teleworking. Given the high proportion (25%) of Internet users who were working from home, the results also imply that, as Internet penetration increases, it is possible that teleworking will increase.

Meanwhile, for those Internet users who are in employment but don't currently work from home (estimated to be 12 million employees), the NOP survey suggested that 77% do not want to telework, 17% want to but would not be allowed to and only 7% want to and would be allowed to. Consequently, Fogarty (2004) and Geraghty (2004) argue that the potential for growth in teleworking amongst this group may be relatively small.

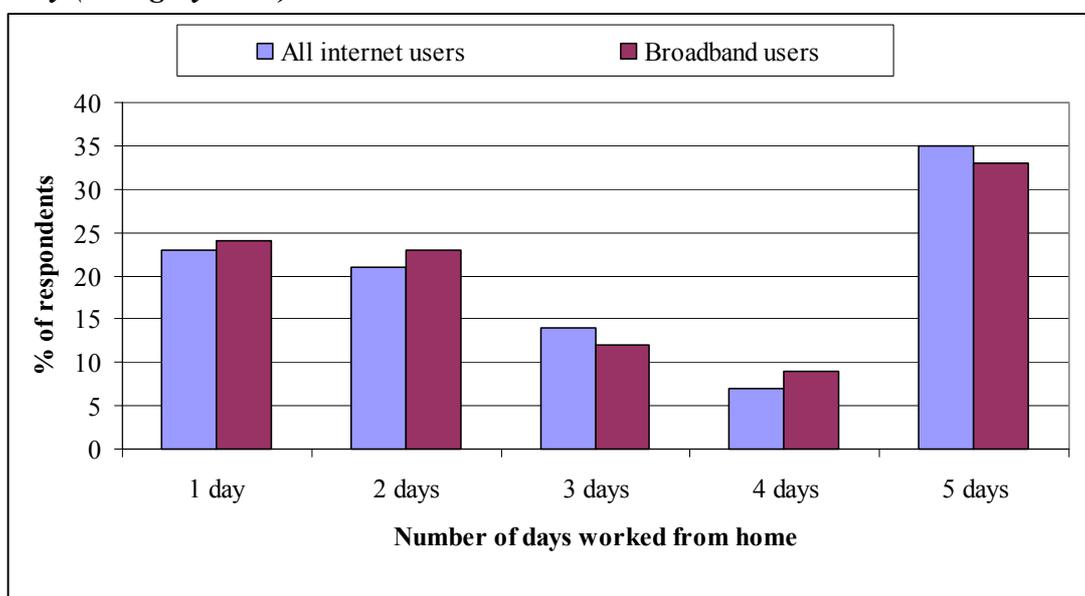
³ This assumes that there are currently 28.2 million people in employment, as given in the April 2004 Labour Force Survey Quarterly Supplement produced by National Statistics.

10.4 Characteristics of teleworking

Frequency of working from home amongst teleworkers

The DTLR (2002) review of published literature concludes that on average teleworkers work about 1½ days a week away from the main office. Dodgson et al (2000) quote research by Fouracre and Hill (1998) which estimates that tele-workers typically work from home for 25% of their time (ie. just under one and a half days). The Cambridgeshire County Council study by Lake et al. quoted above indicates that amongst the managers and service delivery staff they studied, there was the *potential* to work at home between 1½ and 3 days per week: in other words 1½ days telework per week would represent the lower limit of the amount of time that is actually spent on location-independent tasks. The National Opinion Polls survey suggested that, for those working at home in their survey, the average frequency was 3.1 days per week, (Geraghty, 2004). Their results are shown in Figure 10.1.

Figure 10.1: NOP results about the frequency of teleworking by those in their study (Geraghty 2004)



Journey to work distance of current teleworkers

There is some evidence suggesting teleworkers may have longer commute journeys than the national average. Mitchell et al. (1994) found teleworkers had average commute journeys of 21 miles compared to the national average at the time of 8.3 miles. DTLR (2002) concluded from their review of the published literature that 'generally teleworkers record longer (substituted) commute journeys than the average national commute journey.' As discussed in section 10.2, the cause and effect of this observation is ambiguous.

Information about the profile of people who currently telework (from DTI 2002) also suggests teleworkers might be more intensive car users than the national average. Two thirds of teleworkers in the UK are male; and they are concentrated in managerial and professional roles and hence likely to be on higher than average incomes.

10.5 Literature evidence about the future potential traffic impact of teleworking

Several studies have attempted to forecast the potential future impact of teleworking on car travel demand. A report by HOP Associates (2003), based on their review of the literature for DfT, argues that these forecasts follow a common pattern: working from data on current levels of teleworking, making projections of future uptake, calibrating through case study information, and making some reductions for expected compensatory trips. The earlier report by the same authors (DTLR 2002) concluded that this type of approach was generally unconvincing, and that more work was needed to gather the base data for this type of exercise.

Nevertheless, for comparative purposes, the forecasts of future demand which have been made by various studies are recorded below and summarised in table 10.3.

- Dodson et al (2000) estimated teleworking could lead to a reduction in car commuting traffic of 10% by 2005 and 15% by 2010. (This would be equivalent to a reduction in traffic for all trip purposes of about 2.5% in 2005 and 4% in 2010.) It is notable that they have revised their estimates slightly upwards from their original 1997 report, on the basis that teleworking is becoming easier due to technological development
- Lake et al. (1997) suggested from their study of Cambridgeshire County Council that if teleworking was adopted for suitable tasks, total traffic could be cut by 4-8%, with greater reductions in the morning and evening peaks.
- Illegems et al. (2002) looked at a range of scenarios for the growth of teleworking in Belgium. If teleworking increased at 5% a year, they predicted a car commuting reduction of 2.4% by 2011. If it increased at 20% a year, they predicted a reduction of 8.4% by 2011.
- Martens et al. (1999) used a model called Scenario-Explorer to assess the impact of second-order effects, including induced travel because of newly freed capacity. The model concluded that second-order effects would almost completely nullify the impacts of teleworking in substituting for travel. Recreational and business trips would increase because of the new highway capacity released by teleworkers. Allowing for these second-order effects, the authors concluded that teleworking would reduce the overall number of trips in the Netherlands by 1% at most, although the effect was higher for commuter trips at about 5%. A further second-order effect predicted by the model was reduced car ownership, as households had less need for a second car because of teleworking. Effects were greatest in urban areas (the Randstad) due to higher congestion levels, a higher education level and a high share of information-related employment, although a breakdown to show the difference in impact in urban and rural areas was not given.
- TfL (2003) highlight that London has the highest level of telework of all of the regions and estimate that, by 2016, 17-26% of London's workforce might telework for some of the time, resulting in a reduction of am peak commuter journeys of between 4.5% and 8.3%.

Table 10.3 Estimates of the future potential of telework

Source	Estimate
Dodson et al 2000	National commuting traffic reduction of 10% by 2005 and 15% by 2010. Total traffic reduction of 2.5% by 2005 and 4% by 2010
Lake et al 1997	4-8% reduction in total traffic
Illegems et al 2002	2.4-8.4% reduction in car commuting trips in Belgium by 2011
Martens et al 1999	5% of commuter trips in the Netherlands. Up to 1% of all trips
TfL 2003	4.5-8.3% of am peak commuter journeys.

10.6 Selection of telework case studies

For more detailed consideration in this study, we looked at a number of potential case studies from local authorities. These included:

- Hertfordshire's Trading Standards department (65+ staff) introduced 'flexible working', with part of the motivation being described as the Council's Travelwise scheme (HOP Associates, 2000-2003). This included the introduction of localised workstations called 'Oases', to reduce the number of journeys made to headquarters. In-work mileage (reimbursed) was reduced by 7% - a total saving of 9000 miles, representing a 5-8% reduction in travel costs. Personal miles were also reduced, although no figures were given.
- Sefton Metropolitan Borough Council undertook a pilot where 19 employees were offered telework as an alternative to conventional working over a twelve-month period, (SustainIT, 2002). Over the period, a total of 294 days was spent working from home and employees kept travelogues detailing their travel patterns and how they were affected by teleworking. Almost 22,000 km of car travel was saved. Since the successful pilot, the personnel department has appointed a senior manager to continue developing and promoting teleworking as an integral part of the Council's approach to flexible working.
- In 1997, Surrey County Council launched a five-year programme (called 'Surrey Workstyle') aimed at 3500 staff (SustainIT undated, Bibby 2000). The key motivation was to save office space, including a 33% reduction in floorspace and rationalisation from 74 buildings to 20. Initiatives include hot desking, teleworking, development of ICT infrastructure and intensive staff training in ICT skills. Costs were quoted at £6.7 million but savings were expected to include £11 million capital and £1 million revenue p.a. There is no information available about the effects of the strategy.
- As part of the EU 'Target' project, Wakefield Metropolitan district council began a pilot project in 1999 with 23 volunteers, who agreed to work from home once a week, from across a wide spectrum of the organisation, (Target 2001, Coles 2002). There are plans to extend the initiative to 9,500 staff within the authority. However, there is currently no information about the effects of the pilot initiative.
- York City Council is running a trial of teleworking with its own staff, (c.f. York travel awareness, marketing and campaigns case study).
- Nottinghamshire County Council and Buckinghamshire County Council have both developed remote tele-centres for both their own staff, and use by others in the local areas where the centres are established, (c.f. Chapter 11).

There were also a number of potential private sector schemes that we considered, including BAA and British Telecom, which have both been part of the SUSTEL project.

In the end, the British Telecom experience was chosen as the case study, because it has been far more extensively monitored than the majority of other cases, and is also operating on a larger scale than the majority of local authority schemes. Much of the information reported in the BT case study is drawn from the published research of the European SUSTEL programme, a two year research project financed by the European Commission which has been looking into the economic, environmental and social impacts of teleworking.

10.7 Details of chosen telework case study

BT began investigating teleworking in 1990. In 1997/98 promotion of teleworking was formalised through the Workstyle 2000 (then Options 2000) programme, which was renamed Workabout in 2002. The company itself rarely uses the term teleworking, seeing this as just one part of a broader commitment to flexible working. Part of the motivation for the company is to use office space more efficiently, and teleworking has gone hand in hand with re-organisation and re-location of office space, including development of several 'Workstyle' buildings which incorporate Internet cafes, meeting rooms and hotdesk space for workers. Flexible working is also seen as a way of enhancing staff morale, addressing work-life balance issues, and as a positive selling point when recruiting.

Employees who are part of the Workabout scheme are provided with the following help:

- phone and email support helpdesk (involving five dedicated staff)
- computer (sometimes the office computer re-deployed to the home office with new equipment such as a modem as appropriate)
- dedicated phone line (ADSL since 2002 with upgrade programme for others)
- furniture budget of up to £650
- option to work some of the time at a local telework office (if appropriate).

BT are also involved with teleworking as a commercial service for other businesses.

10.8 Staffing and budgets for telework

Our study was not able to collect full data on the cost of BT's teleworking programme, as the information was commercially confidential. However, we estimated that costs per employee might be about £750 (on the basis that staff who begin teleworking are offered a furniture budget of £650, and there may be some other costs, such as installing a modem). In addition, the team of five people assigned to support BT staff might cost an estimated £100,000 per year. (Although some of the time of this team is spent on commercial work for other organisations wishing to develop teleworking.)

Against these costs, BT explicitly recognise offsetting financial benefits in terms of lower office space requirements, improved staff retention and increased staff performance. These benefits are outlined further in section 10.11.

10.9 Case study evidence about the scale of teleworking

At the time of the interview (July 2003), over 7500 staff were registered with the Workabout scheme, out of a total workforce of 108,000 (7% of the workforce). Notably, this is approximately the same proportion of people who were working from home at least one day a week in 2001 nationally.

At BT, growth has exceeded targets, increasing from 5128 staff in March 2002. The number of staff registered with Workabout is growing at about 200 per month. These figures imply a growth rate of approximately 2% of the workforce each year, which may be gradually accelerating. (This is slightly higher than the national growth rate).

Staff registered with Workabout have a very wide range of work patterns. About a third work mainly at home with occasional days or half-days at BT offices, while a quarter have mixed work locations, split between home and multiple BT offices. Hence, the average frequency of teleworking is clearly higher than 1.5 days a week, although difficult to precisely calculate. A reasonable estimate might be an average of about 3 days per week. Table 10.4 gives the findings of research by Hopkinson et al. (2002), which indicates the complexity of different flexible working patterns, and that there is no one type of teleworker.

Table 10.4: Different types of teleworker at BT

Category of teleworker	Number	%
a Primarily work in a main BT office but regularly spend days/ half days working at home. Relatively small amount of in-work travel.	16	0.9%
b Mixed working locations split between home and main BT office (on average more than one day a week in each of the two different locations). Relatively small amount of in-work travel.	63	3.4%
c Mixed working locations split between home and main BT office (on average more than one day a week in each of the two different locations). Relatively large amount of in-work travel.	79	4.3%
d Mixed working locations split between home and multiple BT offices (i.e. no main BT office).	460	25.1%
e Mixed working locations split between home, BT offices and customers premises	350	19.1%
f Home working at start and finish of most working days, on the road during the day routinely visiting customers and clients. One day or less on average in BT offices	226	12.3%
g Primarily work at home with occasional days/half days in BT offices for team meetings, training etc	576	31.4%
h None of the above - I do not consider myself to be a teleworker.	4	0.2%
i None of the above for other reasons -	59	3.2%
TOTAL	1833	100.0%

Source: Hopkinson et al. (2002)

The onset of active encouragement for teleworking in the late 1990s coincided with a change in culture of the engineering workforce who work in the field. More than half

of these now base themselves at home, picking up their work schedules and reporting remotely.

Uptake of teleworking was particularly high for staff who had previously worked in London.

10.10 Effects of teleworking on car use

There have been a number of surveys of the effects of teleworking on the travel behaviour of BT staff.

Hopkinson and James (2001) analysed self-completion questionnaires from BT employees who were about to register with the BT Options 2000 teleworking programme. Some employees were already working at home an average of 1.9 days per week and, taken overall, respondents anticipated that in future they would work from home an average of 3.6 days per week. The average car mileage 'saved' by pre-existing teleworking was 95 miles per week per teleworker. If future increases in employees' frequency of teleworking were in line with their predictions, the authors estimated further savings of 76 miles per week car commuting per teleworker, suggesting a potential future saving of 171 miles per week altogether.

Hopkinson et al. (2002) refers to a second survey of BT staff, which found mileage savings of 186 miles per week for teleworkers who travelled by car.

As part of the SUSTEL programme, a third survey was emailed to all 5128 BT staff registered with Workabout in March 2002. This received responses from 1874 employees (a response rate of 37%). It reported an average reduction in commuting of 178 miles per week for car users (Hopkinson et al. 2002).

A further SUSTEL survey was sent to 814 BT staff registered with Workabout in October 2002 (Hopkinson and James 2003). This received 199 responses (a response rate of 24%). It found that about 90% of Workabout registrees had reduced their commuting travel, with nearly 80% describing the reduction as 'considerable'. The mean commute mileage reduction per respondent was 253 miles per week, although there is no data on whether these journeys involved passengers or car sharing. There were also offset effects:

- some people (20% of the sample) said they now used the car more for other trips. For these, the increase in car use was 77 miles per week.
- some people (47% of the sample) made replacement journeys for tasks that would previously have been part of a chained commute (for example to go shopping, or to escort children). For these, the increase in car use was 34 miles per week.
- business travel also increased for some staff, although this was balanced by other staff who said it had decreased.

There is no information on whether teleworking has resulted in participants living further from the workplace, nor whether it has affected the time of day that they make their replacement journeys.

Taking account of the offsetting effects, Hopkinson and James (2003) suggest the net effect was to reduce travel by 193 miles per week per teleworker.

Thus the four surveys of BT staff have found net reductions in car mileage of between 95 miles and 193 miles per week per teleworker. The lower figure is based on a survey of staff who were teleworking to a limited extent and were about to increase the amount of time spent working from home. The other three surveys suggest rather similar figures of 178 – 193 miles per week.

Meanwhile, separate data provided by BT suggests that, between 1998/99 and 2002/03, the total distance travelled by company cars, private vehicles and the BT fleet, for which expenses claims were made, fell from 852 million kilometres to 760 million kilometres, a reduction of 11%.

Table 10.5 compares the case study findings on car use at BT with findings from the literature review (section 10.2) and from the review of potential local authority case studies (section 10.6). Meanwhile, table 10.6 is an attempt to standardise some of the results given in table 10.5 as average weekly reductions in car mileage. In practice, standardising these different figures proved almost impossible, as they are from different countries and some are net car mileage savings (allowing for greater car use for other trips) while others only refer to the effect on commuting trips. In addition, some report on studies of people who work from home full time, whilst others report on studies for people who only work from home part-time. Some quote figures for 'tele-work days', whilst others quote for weekly travel, which will sometimes be an average of days when normal commuting took place (although this is clearly not the case where people are full time teleworkers). In a number of cases, it is not actually clear what is being quoted. However, despite this confusion, the findings do consistently back up the conclusion from the BT case study that teleworking delivers reduction in car mileage, even allowing for offsetting effects, and that these reductions can be substantial.

Table 10.5: Key results about impacts on car use

Study	Target group	Impacts on car use
BT	BT staff about to register with Options 2000 programme. Existing average if teleworking 1.9 days per week. Intended future teleworking of 3.6 days per week	Pre-existing teleworking reducing car mileage by 95 miles per week. Intended future teleworking predicted to reduce car commuting by 171 miles per week (given increased frequency).
BT	BT staff	Average car commuting mileage reduced by 186 miles per week. No further details.
BT	1874 staff registered with Workabout	Average car commuting mileage reduced by 178 miles per week. No information on offsetting mileage for other trips.
BT	199 staff registered with Workabout	Average car commuting mileage reduced by 253 miles per week.

		Net effect after allowing for more non-work car trips was 193 fewer car miles per week.
BT	Expenses claims	11% reduction in business mileage
State of California Telecommuting Pilot Project	40 tele-commuters	27% fewer trips and 77% less mileage on telework days. (Non work trips made more often, but less far)
	219 tele-commuters	75% less mileage on telework days. Shorter non-work trips
California Residential Area-Based Offices Project	People using neighbourhood telecentres (on av., 1.25 days per week).	53-65% less mileage on telecentre days. 11.5-17% less mileage per week. (No increase in numbers of non-work trips on telecentre days)
Washington Metropolitan Area study	100 employees from organisations offering telework. Most teleworking 1-2 days per week.	0.6 vehicle trips and 16 vehicle miles less per day (including use of vehicles by other household members). Those moving house equally likely to move closer or further.
Dutch Ministry of Transport	30 employees who spend 20-60% time teleworking.	19% reduction in car driver trips and mileage. Greater than overall trip reduction. Bigger reductions in peak hour travel. Other household members reduced trips by 9%, with no change in travel distance.
Greater Munich	37 teleworkers and 29 household members	14% reduction in trips overall
Denmark	946 Internet users who sometimes telework (excluding full time teleworkers)	48.6% less time in own car on telework days. Those moving house equally likely to move closer or further.
AA call centre	103 call centre staff who switched to working at home	3680 vehicle miles saved per employee per year with 30-40% offset – i.e. net saving of 2200-2600 miles. Inconclusive results about non-work travel
BAA	64 employees teleworking	Average weekly reductions of 45 miles per week, made up of an average reduction of 61 commuting miles and an average increase of 16 new trip miles.
Mitchell & Trodd	'small' sample of UK teleworkers	Average reduction of 113 miles per week per person
IBM	Staff home working for part of the time	13% reduction in travel time

RM Consulting	145 employees involved in a 'location independent working' pilot	Reduction of 500,000km
ADAS Consulting	500 staff work from home	2000 miles per year less per employee
Yorkshire Water	Daily visits to team office reduced	20% reduction in annual mileage
Hertfordshire's Trading Standards department	65 staff using tele-centres	Total business mileage reduced by 7%, or 9000 miles.
Sefton MBC	19 employees, working from home an average of 15 days per year each	22000 km of car travel saved in 12 months.

Table 10.6 Standardising the vehicle mileage savings

Study	Mileage savings per person
BT	178 - 193 miles per week
BAA	45 miles per week
Washington Metropolitan Area study	16 miles <i>per day</i> for part-time home-workers
AA call centre	48-57 miles per week (full time home-workers)
Mitchell & Trodd	113 miles per week
RM Consulting	47 miles per week
ADAS Consulting	43 miles per week (full time home workers)
Hertfordshire's Trading Standards department	3 miles per week for in-work mileage
Sefton MBC	15 miles per week per person 46 miles per telework day

Yearly totals converted to weekly totals assuming 46 weeks worked per year.

10.11 Other effects of teleworking

There are a number of other benefits that are typically identified for teleworking. These are outlined as follows, with illustrative data from BT.

- **Improved performance.**

81% of BT respondents reported improved performance from teleworking, including higher productivity, better quality of work, higher total output and more creative work. Employees reported this was due to less disruption while working, and more time spent working instead of travelling.

- **Lower levels of absenteeism.**

BT estimate that Workabout employees only take 25-30% the amount of sick leave of BT employees overall.

- **Higher staff retention rates, and higher rates of return to work after maternity leave.**

93-96% of BT employees return to work after maternity leave, which is considerably higher than the national average

- **Employees who would not be able to do office-based work are able to continue in employment.**

10% of BT Workabout employees said that they would be unable to undertake their current job if they could not telework. People affected include staff with responsibilities for child care, or who need to care for ill or disabled family members, or who are themselves disabled or recovering from an illness.

- **A positive effect on quality of life and a better balance between working life and personal life.**

90.3% of BT respondents reported that teleworking was having a positive effect on their quality of life, and high proportions reported beneficial effects for their partner and/or children. In addition, a small but significant minority were reporting increased involvement in the community (with 14% finding it easier to engage in community activities, and 6% spending more time on such activities).

- **Individual financial savings**

55.9% of respondents felt that they had experienced personal financial benefits from teleworking, with many individuals reporting savings of over £1000 p.a., (although it should be noted that 15.6% felt that they had been negatively affected).

- **Lower office costs.**

Teleworking was felt to have contributed to BT's space savings of £180 million per year, although it was not possible to disaggregate telework savings and savings arising from other re-organisation.

There were also a few negative effects reported. In particular, many BT respondents (75.7%) reported that they were working longer hours. 37.2% believed that they were slightly or considerably more isolated from work colleagues that previously and that this effect was negative, although only 10.9% of respondents felt this to be true for contact with non-work colleagues (with the majority feeling less isolated). In addition, 25.8% of BT respondents reported increases in domestic conflict, whilst 17.8% reported a reduction in such conflict.

10.12 Synergies between teleworking and other policies and issues

The promotion of teleworking is often associated with other business benefits, such as 'improved work life balance' and reducing office space requirements. Hence, it is synergistic with a range of other initiatives that may take place within organisations for non transport reasons. In some cases, it has also been promoted as an important element of workplace travel plans.

Where teleworking gives employees greater flexibility to organise their day, it could also be seen as synergistic with school travel plans, since it may make it easier for

full-time workers to not drive their children to school. Where teleworking reduces the need to own a car and/or encourages greater participation in the locality, it may also be synergetic with car club membership.

In addition to its teleworking programme, BT encourages the use of tele-conferencing by its staff, as discussed in Chapter 11. It seems plausible that the ready availability of tele-conferencing technology within the company makes it easier for staff to work from remote locations, and thus helps make teleworking viable. At the same time, staff who are relatively 'technology literate' from teleworking may be more willing and able to get involved in teleconferencing initiatives.

10.13 Relationship between telework spending and impact

In evaluating the relationship between cost and impact for BT's teleworking programme, we assumed that an average teleworking employee had reduced their car mileage by about 185 miles per week (a mid-range figure based on the two most recent SUSTEL surveys of staff registered with Workabout). We estimated the total car mileage saved over the period the scheme has been running, assuming that impact increased linearly from zero in the first year to current levels. Even if no more money were to be spent, we assumed there would be some impact in subsequent years, but that this would decline at the rate of 40% a year.

We assumed a cost in the current year of £750 per employee registered with Workabout, plus £100,000 for staff costs. Total costs of the programme were estimated on the assumption that each employee registered with Workabout had received a single payment of £750 when they began teleworking, with other staff costs growing linearly from zero in 1997, when the Options 2000 programme was launched, to £100,000. We were not able to take account of cost savings arising from the programme, so our estimate of cost per car kilometre saved is an upper figure. Given the cost savings due to office space released by teleworking, increased productivity, and better staff retention, it is possible – and even likely – that the Workabout programme has delivered net cost savings to BT.

The cost per kilometre saved is not a public cost, but a private one. However, it gives some indication of what might be the public cost of a programme to support teleworking, for example if a local authority offered grant funding to businesses to enable them to establish telework programmes.

Table 10.7 sets out the calculation.

Table 10.7 Calculation of relationship between cost and impact for teleworking

	BT
number of teleworkers in current year	7500
net distance saved in current year (km)	107,177,341
total car distance saved (from 1997 to 2003, plus future) (km)	482,298,037
cost of furniture and other resources (£)	5,625,000
cost of staff support team in current year (£)	100,000
total cost to date (estimated) (£)	5,925,000
cost per km saved (pence)	1.2

The cost is about 1 penny per kilometre saved, though again we emphasise that this is an upper estimate that does not allow for offsetting cost savings.

10.14 Future impact of teleworking

The future impact of teleworking depends upon:

- What proportion of the workforce is able to telework some of the time
- The average frequency of teleworking

Future levels of teleworking

Growth in teleworking over the next ten years will depend upon both the development of technology and a continuing shift in society's practices of work and work / life balance. Organisations such as BT have embraced the idea that their employees can work productively from home, and have developed effective management techniques to support this. For other organisations, a cultural shift may be necessary.

Some jobs do not lend themselves to teleworking: nurses, primary school teachers, shop workers and office reception staff, for example, are unlikely to be able to work from home. However, analysis of current patterns of teleworking suggest that considerable growth seems possible before 'natural limits' are reached, with 64% of the workforce in occupations where 5% or more already telework. There are also various trends which may cause growth to accelerate, as technologies become cheaper and more widespread, the employment structure alters etc..

At BT, the case study interviewee reported accelerating growth in the proportion of staff teleworking, and suggested that up to 65% of the BT workforce might ultimately take part in some form of telework. Research by Lake et al. (1997) suggests that the majority of staff in a local authority might be able to work from home at least one day a week. Evidence from the US suggests that, by 2001, 21% of the workforce was already teleworking (DTI 2002), and that 40% of the workforce were 'information' workers who should be able to telework relatively easily (Fouracre & Hill, 2000). An Institute of Employment Studies report (Huws et al 2001) suggested that 22.6% of the UK workforce might telework. A recent National Opinion Polls survey suggests that 25% of Internet users are already working from home at least some of the time (although their figures suggest that the potential for further growth amongst this group may be small).

If current growth rates continue, around 30% of the workforce would be teleworking in ten years time. Although there are some estimates which are lower than this, the majority of evidence seems to suggest that such growth may occur, and may even be exceeded.

Average frequency of teleworking

The BT case study revealed a wide range of types of teleworking (table 10.2 in section 10.9). Taken overall, it seems that a reasonable estimate is that an average teleworker at BT works from home about three days a week. The Lake et al. (1997) study suggested an upper limit of 3 days per week (or 60% of the time of a full-time worker) for local authority workers. The NOP results (Geraghty, 2004) suggested an

average frequency of 3.1 days per week for the teleworkers in their study. As reported in the literature review, other estimates suggest that the average teleworker currently spends about 1½ days a week away from the main office, or 30% of the time of a full-time worker. Thus we have a range of estimates of how often, on average, teleworkers work from home in current circumstances, from about 1½ days per week to about 3 days per week.

10.15 Key issues for scaling up telework

The case study suggests that teleworking is likely to continue to grow steadily within BT. In other organisations, it was suggested that teleworking would be likely to grow more rapidly in areas where congestion charging or a workplace parking levy were brought in. It was also suggested that legislation to encourage flexible working would increase levels of teleworking, and that a higher public profile for teleworking could also encourage take-up. Some commentators have further highlighted that companies perceive teleworking to mean 'working from home five days a week' and that a greater awareness of the potential for part-time teleworking might help to increase participation.

When considering the impact of teleworking on the number of work trips, it is also important to remember that a small number of employees who telework all or most of the time, will have a larger effect than a greater number who only telework occasionally, and therefore scaling up the effects will be more sensitive to the size of the former group.

10.16 Policy implications relating to telework

- Teleworking has the potential to deliver substantial reductions in car travel at peak hours.
- Demand management policies for car use, such as road pricing, fuel duties, workplace parking levy and congestion charging, are all likely to encourage more sustainable commuter travel.
- Requiring employers to take more responsibility about how their employees get to work could help to facilitate more sustainable commuter travel (including, probably, helping to stimulate telework).
- Information and advice about teleworking could be included as part of any initiative aiming to influence commuter travel, including the literature relating to travel plans.
- More education and guidance about what constitutes telework could be of benefit. Currently, it is often taken to mean people working at home five days a week. However, many organisations with successful telework strategies offer employees a more flexible range of options, for example, the chance to work at home one-day a week or to use satellite offices on occasion.
- The social benefits of teleworking (greater participation of those with disabilities; better work life balance) could be more widely disseminated.
- Local authorities could be encouraged to lead by example – perhaps by enabling their employees to sometimes use satellite offices. Occasional use of district council facilities by county council employees was given as one successful form of teleworking.

- Local authorities could potentially be encouraged to set up local office facilities that can be used, on occasion, by employees from a range of companies (including small and medium enterprises) to reduce their commuting distances.
- Either government or local authorities could potentially encourage teleworking through grants to businesses, to help meet the initial costs of establishing a teleworking programme, perhaps as part of workplace travel plan programmes. There may also be a role for tax breaks – for example enhanced capital allowances to establish telecentres.

10.17 Acknowledgements

We are very grateful for the help of the following people with the main case study:

<i>Individual</i>	<i>Organisation</i>
Ian Wood	BT Social Policy Unit
Peter James	University of Bradford

In addition to the main case study interviewees, we would like to thank:

<i>Individual</i>	<i>Organisation</i>
Alan Denbigh	Telework Association
Andy Lake	HOP Associates
Barry Fogarty	BT Wholesale

10.18 References

Balepur, P.N., Varma, K.V., Mokhtarian, P.L. (1998) The transportation impacts of center-based telecommuting: interim findings from the neighbourhood telecenters project *Transportation* 25(3) 287-306

Bibby A (2000) *Surrey County Council pioneers new ways of working*. Article published in 'Flexible Working 2000'.

Coles M (14/9/02) Battle to survive on the home front. *The Guardian*

Department of Trade and Industry (2002) *Teleworking in the UK, Labour Market Trends* June 2002

Dodgson J, Pacey J & Begg M (2000) *Motors and modems revisited: the role of technology in reducing travel demands and traffic congestion*. Report by NERA for the RAC Foundation and the Motorists Forum.

DTLR (2002) *The impact of information and communications technologies on travel and freight distribution patterns: review and assessment of literature*. Report by HOP Associates and Transport Research Group, University of Southampton

Fogarty B (2004) *A role for teleworking: the BT experience*. BT Seltrans presentation.

Fouracre & Hill (1998) *Report for the Highways Agency research programme on understanding travel behaviour*, produced by TRL, as quoted in Dodgson et al (2000).

Geraghty C (2004) How the Internet can help ease traffic congestion. Presentation at 'Alternative Approaches to Congestion' conference convened by BT, 26/1/02.

Glogger, A.F., Zängler, T.W. and Karg, G. (2003) *The impact of telecommuting on households' travel behaviour, expenditures and emissions*. Proceedings of the TRIP research conference, Hillerod, Denmark, February 2003

Hamer, R., Kroes, E., Van Ooststroom, H. (1991) Teleworking in the Netherlands: an evaluation of changes in travel behaviour *Transportation* 18 365-382

Hills, S., Hopkinson, P., James, P (2002?) *SUSTEL Case Study UK-2, BT Workabout*.

HOP Associates (2001) *Travel plans: new business opportunities for suppliers of information and communication technology*. Report produced by the Energy Efficiency Best Practice Programme. General report 80.

HOP Associates (2003) *Virtual mobility research monitoring 2002-3 report* (unpublished report for DfT)

HOP Associates (2000-2003) *Case study on flexible work: Miles better – Hertfordshire County Council Trading Standards*. Report downloaded from www.flexibility.co.uk

Hopkinson, P., James, P. (2001) *The BT Options 2000 – a pilot study of its environmental and social impacts*.

Hopkinson, P., James, P., Mayurama, T., Selwyn, J. (2001) *The impacts of teleworking – a study of AA employees*. As summarised on the HOP Associates database at www.virtual-mobility.com.

Hopkinson, P., James, P., Maruyama, T. (2002) *Teleworking at BT – the economic, environmental and social impacts of its Workabout scheme*. Report on survey results 14/10/2002. Report as part of SUSTEL programme.

Hopkinson, P., James, P. (2003) *UK report on national SUSTEL fieldwork*.

Huws H, Jagger N & Bates P (2001) *Where the butterfly alights, the global location of e-work*. Institute of Employment Studies, Report 378, as quoted in DTI (2002).

Illegems, V., Verbeke, A. and S'Jegers, R. (2002) Telecommuting / teleworking: a virtual commuting possibility – the cases of Belgium and Brussels. In: Stern, E., Salomon, I. and Bovy, P.H.L. (editors): *Travel behaviour: spatial patterns, congestion and modelling* (2002). As summarised on the HOP Associates database at www.virtual-mobility.com.

Jensen, L.M., Jensen-Butler, C., Madsen, B., Millard, J. and Schmidt, L. (2003) *A web-based study of the propensity to telework, based on socio-economic, work organisation and spatial factors*. Proceedings of the TRIP research conference, Hillerod, Denmark, February 2003

Koenig, B.E., Henderson, D.K., Mokhtarian, P.L. (1996) The travel and emissions impacts of telecommuting for the State of California telecommuting pilot project. *Transpn. Res.-C* 4, 13-32

Lake, A.S., van Vuren, T. (1997) Assessing the impact of advanced telecommunications on work-related travel. Summarised at www.hop.co.uk/ict2002

McInroy R (1999) *Linnet Locals in Lincolnshire – electronic provision in a rural setting*. Article by the Operations Manager for Library Support Services, Lincolnshire County Council, produced by South Bank University

Martens, M.J., Wilmlink, I.R., Korver, W., Heijma, A.O.J., van Katwijk, R.T., Harrell, L. (1999) The mobility impact of the electronic highway. A technology forecast and assessment using a scenario approach. TNO Inro report: Inro-transport/2003-05, The Netherlands.

Metropolitan Washington Council of Governments (1999) Commuter Connections: Washington Metropolitan Telework Demonstration Project August 1997 – April 1999

Mitchell, H. and Trodd, E. (1994) An introductory study of telework based transport – telecommunications substitution. Research project for the Department of Transport. As summarised on the HOP Associates database at www.virtual-mobility.com.

Mokhtarian, P.I., Varma, K.V (1998) The trade-off between trips and distance travelled in analyzing the emissions impacts of center-based telecommuting *Transpn. Res.-D* 3(6) 419-428

Pendyala, R.M., Goulias, K.G., Kitamura, R. (1991) Impact of telecommuting on spatial and temporal patterns of household travel *Transportation* 18, 383-409

SustainIT (undated) '*Surrey Workstyle: Surrey County Council*'. Case study report downloaded from www.sustainit.org

SustainIT (2002) '*eWell-Being Awards – 2002 winners. Commended: Sefton Metropolitan Borough Council*'. Report downloaded from www.sustainit.org

TARGET (2001) Flexible working: teleworking pilot. News release dated 2/5/01, downloaded from www.eu-target.net on 28/5/03.

Transport for London (2003) *Soft options: review of studies*. Report produced by and for Transport for London