11. Teleconferencing

11.1 Introduction

Teleconferencing can be defined as the use of telecommunications to facilitate contacts that might otherwise have involved business travel – such as meetings, training sessions, interviews or information provision. It typically involves two or more people in a multi-way phone conversation or video link or web link[1]. There are a range of ways in which teleconferencing can be provided, including private facilities, public facilities, special rooms fitted with equipment, facilities available via individual PCs etc.

In common with teleworking, teleconferencing has not often been seen as an appropriate focus for public sector attention. However, local authorities have been involved in developing a range of related initiatives. Their motivation has rarely been transport alone, and more commonly related to a desire to increase participation and social inclusion (both of economically deprived groups and geographically remote areas), and to improve local business competitiveness. Initiatives include:

- the provision of remote access to government services and information. 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 'tele working toolkit', in association with the East of England Development Agency, for companies that wanted to introduce teleworking, (c.f. 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 or teleconferencing amongst local authority staff.
- The provision of 'tele centres' which provide a range of services for those who wish to work from home or satellite location close to their homes.

However, information about, and monitoring of, these initiatives is rare - particularly, any information about their transport impacts. Moreover, there are a number of other ways that the public sector could get involved in promoting teleconferencing, as discussed in section 11.12.

In terms of literature on teleconferencing, papers on the subject date back to the mid 1970s (although Bennison, 1988, comments that HG Wells speculated on the

[1] Although it is not theoretically appropriate to exclude one-to-one telephone conversations from a definition of teleconferencing, we do so on the belief that these are already exploited to the full, and that it is other forms of teleconferencing that have the potential to impact on business travel in the future.

importance of teleconferencing as early as 1902). However, the amount of empirical work remains remarkably sparse, particularly in contrast to the large literature on teleworking. Moreover, different studies have taken place at different times - when the technology available for teleconferencing will have been significantly different.

As a common characteristic, the majority of papers (covering a period of nearly 30 years) highlight the technical and cost issues associated with teleconferencing, and that both technical problems and financial costs are likely to reduce in 'the future', providing a stimulus to increased use.

Many of the papers also share a number of undesirable characteristics. In particular, there is a tendency to use the terms teleconferencing and videoconferencing interchangeably, even when it is clear that the authors recognise that there are different forms of teleconferencing.

Another issue with the literature is a range of complexity. Specifically, some papers estimate the amount of business travel that could convert to teleconferencing, and assume that this is the likely potential effect. Others highlight that the issue is more complicated - specifically, teleconferencing may generate meetings that might otherwise not have taken place; in some cases it may foster contacts which lead to more face to face meetings; and in some cases it may generate alternative trips to videoconferencing facilities. There is also a tendency for papers to begin with empirical evidence and then make theoretical estimations about the implications of that evidence for total business travel, or, in some cases particular types of business travel (with particular interest in the implications for air traffic), without being clear about the transition from evidence to estimates. In this chapter, we try to present the results as unambiguously as possible.

The following section summarises the available literature. Subsequent sections describe our main case study for teleconferencing – British Telecom – and compare BTs experience with the findings reported in the literature.

11.2 Literature evidence on teleconferencing

11.2.1 Early studies

Salomon (1985) describes some of the earliest work on the subject undertaken by Pye (1976), Goddard & Morris (1976) and Goddard & Pye (1977). This was focused on exploring the potential to decentralise office activities from London. Based on detailed communications diaries, they concluded that 34% of the meetings recorded could have been performed by audioconferencing and that an additional 10% would have been possible by videoconferencing - in other words that 44% of the meetings could have been replaced by teleconferencing.

Twelve years later, Bennison (1988) reports on an evaluation of a British Telecom 'videoconferencing' trial, which partly drew on this earlier work. The trial took place between 1983 and 1986. 14 companies were involved, and were provided with videoconferencing facilities in two or more locations. There were some technical problems, and some organisations were not connected until the last four months of the trial. The majority (11) actually made very little use of the facilities they had been

given, after an initial period of experimentation. When asked why, the reason given by most respondents was that the facilities were "not strongly promoted". The three companies where videoconferencing was used regularly came from 3 different industrial sectors - banking, toiletries, and oil and chemicals. However, Bennison comments that they shared some characteristics, namely a large number of intra-organisational contacts between people based on different sites (each of which was supplied with a videoconferencing facility) and had a culture of calling meetings at relatively short notice to undertake routine activities.

In terms of the characteristics of videoconferencing (sample of 47 meetings):

- 71% were booked with less than seven days notice
- 76% involved 4-6 people
- 92% lasted two hours or less
- the main purposes of the videoconferences were to discuss ideas, exchange information and make decisions. However, some of them also included report presentation, negotiation, and conflict, and the only activity which was seen as being confined to face-to-face meetings was "forming impressions of others".

In terms of interaction with face-to-face meetings (sample of 54 face-to-face meetings and 47 videoconferences), respondents felt that:

- 25% of the face-to-face meetings could have taken place by videoconferences
- 38% of the videoconferences could have taken place as face-to-face meetings
- 9% of videoconferences represented contact that would not have taken place otherwise

In addition:

- 75% felt that videoconferencing was a satisfactory alternative to travel (50 respondents), and
- 87% felt that videoconferencing had reduced the number of trips they made (31 respondents)

In general, videoconferencing was associated with shorter, more formal meetings. There was perceived to be a decline in spontaneity, which was generally regarded as detrimental. However task orientation and, to a lesser extent, cooperation among participants were seen to have increased, which was perceived to be beneficial and to have led to enhanced meeting effectiveness and time savings. The opportunity to call meetings in shorter notice and faster dissemination of information were also reported as benefits.

As a counter example of travel impacts, Mokhtarian (1988) describes the impact of a teleconference held in 1986 for the regular monthly meeting of the Southern California Association of Governments (SCAG) Transportation and Communications Committee, a planning organisation covering 38,000 square miles. This was held by setting up videoconferencing facilities in two locations. Analysis of travel changes showed that vehicle miles travelled actually increased, compared to an average meeting held at the usual single location of the SCAG offices. This was primarily because attendance increased, from its typical level of 14 people to a total of 23 people. Analysis suggested that the average distance per person to the nearest teleconference site was 24% lower than the distance to the SCAG offices (48 miles compared with 61 miles). However, because of the attendance increase, the total

vehicle miles travelled was 29% higher than for a typical meeting. Mokhtarian notes the one of the main reasons for introducing the videoconference was precisely to increase attendance, and some of the survey evidence specifically showed that the higher attendance levels were due to the meeting mode. She also highlights that the travel to the teleconference sites typically took place in less congested conditions, avoiding the congested central location of the SCAG offices, and that participants were able to leave later, avoiding more of the morning peak.

11.2.2 Dodgson et al (1997) – 'Motors or Modems' study for the RAC

Moving forward another ten years, Dodgson et al (1997) report on the survey carried out by Critical Research for the 'Motors or Modems' project commissioned by the RAC. As part of this work, interviews were carried out with 303 employees (including representatives of company car drivers, people in managerial occupations, people who work from home, and people who travelled on behalf of work). Of these, 26% thought that videoconferencing could be appropriate in their job. This 26% were then asked about the proportion of business travel that could be replaced by different forms of teleconferencing, depending on the price of the equipment. Some of the results are shown in the following table:

Table 11.1: Proportion of business travel that could be replaced by different forms of teleconferencing

	Replacement by audioconferencing	Replacement by videoconferencing with perfect display and life-size image
At current prices	6.6% now 14.6% in 10 years	7.2% now 13.4% in 10 years
At low prices	11.5% now 17.8% in 10 years	15.2% now 19.7% in 10 years

Data: 79 respondents who thought videoconferencing could be appropriate in their job
Source: Dodgson et al 1997

Dodgson et al argue that these figures provided the basis for a conservative scenario about the potential impact of videoconferencing, whereby 20% of business travel for 26% of people could be replaced in about 10 years - a total of approximately 5% of business travel. They argue that a more optimistic scenario would not limit the impact to the 26% of people who believed that videoconferencing could be helpful to them, and suggest that total impact on business travel under an optimistic scenario could be 20% after 10 years. In the revised version of their report published in 2000, they reduce these estimates to suggest that teleconferencing might reduce car business travel by 3% by 2005 and 5% by 2010, although without much explanation other than the statement that "videoconferencing has not yet achieved the potential foreseen for it" and some reported technical problems to be addressed with 'transmission and switching technologies'.

11.2.3 Roy and Filiatrault (1998) – teleconferencing and air travel

Next, Roy & Filiatrault (1998) review a number of studies from the early 1990s, looking particularly at the potential for teleconferencing to substitute for business *air* travel. They quote the following results:

- teleconferencing could substitute for business air travel by between 2% in a conservative scenario and 11% in a more optimistic scenario by 2005 (Apogee Research Inc., 1994)
- teleconferencing could substitute for business air travel by 12% by 2005, 25% by 2010 and 35% in 2020 (Arvai, 1991)
- all air travel could reduce by 15% due to videoconferencing by 2030, with potential reductions as high as 40% for business trips made by air (Burger, 1995). It should be noted that as a result of this work, air traffic growth forecasts were revised downwards and plans to build a second airport in the Boston area were cancelled.
- Annual surveys from the Canadian Tourism Research Institute suggested that in 1992, 25% of respondents were making less business trips due to communications technologies and 28% were doing so in 1994, (Redekop 1994).

Roy & Filiatrault (1998) also report on their own work which involved interviews with 1139 business travellers, carried out at 7 Canadian airports, namely Halifax, Quebec City, Montreal,Val d'Or, Toronto, Calgary and Vancouver. To qualify as a respondent, the interviewee had to have completed six business trips during the last year and be a Canadian resident. Interviews took place in October 1996. Of the interviewees, 29.6% worked for organisations that use videoconferencing and 19.6% had participated in at least one videoconference during the last year. Users typically belonged to top management, and worked primarily for government, financial institutions and the communications sector.

Specific estimates of different forms of communications technologies usage, and predicted future levels of usage are given in table 11.2. Roy & Filistrault highlight the findings that 18% of respondents worked for companies with privately owned videoconferencing equipment and another 14% worked for organisations which planned to introduce these facilities in the next three years. They contrast them with a survey of Canadian firms carried out in 1990, which showed that only 2% were equipped with videoconferencing and only 5% of the non-users were planning to acquire this technology in the next three years. This is compatible with the recency of use shown in their survey (where most of the technologies had, on average, been being used for five years or less). They also state that the results showed that the proportion of respondents whose organisation had access to videoconference equipment (either through private or public facilities) could double within the next three years, compared with the current 29.6% of the sample.

Table 11.2: Current and planned usage of communications technologies

		Use now	Will use within three years	Number of years of use for existing users
Teleconferencing		49.1%	10.4%	4.5
Videoconferencing from	Private facilities	17.7%	14.2%	2.4
	Public rooms	8.1%	8.1%	2.2
	Hotel or other business facility	4.0%	8.6%	2.1
	Desktop facility	2.6%	13.9%	5

Roy & Filistrault's survey also provides some information about the impacts of teleconferencing on business travel. The findings were as follows:

- for the full sample, 24.2% claimed to be travelling less often as a result of company policy to increase utilisation of teleconferencing and 13.4% believed that their organisation would implement this policy over the next three years
- for the 19.6% of the sample (223 respondents) that had participated in at least one videoconference in the last year, on average, users stated that videoconferencing were a substitute for an air trip in 44.8% of cases. The authors argue that this represents 9.4% of all air trips by this group, and 1.8% (9.4% x 19.6%) of air trips by all respondents in the survey.
- The 29.6% of respondents whose organisation uses videoconferencing were asked about the perceived substitutability of their business air trips. On average, this was estimated to be 14.5% of these trips. Therefore the authors argue that this could represent about 4.3% of the overall business air travel market (14.5% x 29.6%).

On the basis of these figures, the authors suggest that videoconferencing could reduce air travel by 1.8% to 4.3% in the short-term and by 3.6% to 8.6% within the next three years.

In addition to these quantitative estimates, survey respondents were asked about their agreement or disagreement with a series of statements relating to videoconferencing. On average, there was agreement from the full survey for the statements that "videoconferencing saves time", "videoconferencing saves travelling costs", "telecommunications technologies will increasingly replace business trips in the future", and "videoconferencing can accelerate decision-making by rapidly linking key players". In all cases, on average, existing users of videoconferencing agreed with the statements more strongly.

11.2.4 Arnfalk (2002) – review and new analysis of Swedish companies' teleconferencing

As part of doctoral research, Arnfalk (2002) reports on the nature of business travel, based on surveys in Sweden and the USA. His work suggests that the majority of business travel is to attend meetings, and that, in large organisations with extensive geographical distributions, the majority of business trips are related to collaborations within the company. Specifically, he quotes the following:

- a national survey of business travellers in the US, where 47% reported that their last trip was to attend a meeting, trade show or convention.

- a survey of the Swedish company Skanska, where more than 80% of domestic business travel was due to collaborations within the organisation
- a survey at the Swedish company Telia Nära, where 66% of respondents travelled to meetings about company projects, 45% travelled for training or conferences, 39% travelled for network meetings and 12% travelled for customer contacts or marketing reasons.

Arnfalk also quotes a number of estimates about the proportion of business travel that might be substituted by tele-conferencing as follows:

- 30% of total Irish business travel – estimate from 1978, (Rapp & Skåmedal 1996)
- 20% of total US business travel – estimate from 1983, (Rapp & Skåmedal 1996)
- 20% of total Canadian business travel – estimate from 1983, (Rapp & Skåmedal 1996)
- 35% of German business travel – estimate from 1985, (Rapp & Skåmedal 1996)
- 35% of UK business travel – estimate from 1985, (Rapp & Skåmedal 1996)
- 25% of US business travel by air – estimate from 2010 (Cook & Haver 1994)

As part of his own research, Arnfalk carried out surveys with personnel from 4 Swedish organisations. These were the company Telia, the Scandinavian Videoconferencing User Group (SVUG), the farmers association Skånska Lantmännen and the company Tetra Pak. The results are shown in table 11.3.

Table 11.3: Respondents impressions of the effects that using videoconferencing has had on their own and others business travel.

	Telia	SVUG	Skånska Lantmännen	Tetra Pak*
Replaced my own travel	47%	45%	58%	61%
Replaced other people's travel	15%	22%	25%	19%
Some reduction but only minor effect on my travel	20%	14%	17%	39%
Participated in meetings that I would not have travelled to otherwise	16%	15%	n.a.	19%
Increased my travel	1%	4%	0%	3%
Number of respondents	158	73	12	31

* In the survey at Tetra Pak, respondents had the opportunity to tick more than one option.

Arnfalk comments that the number of respondents to this question for the latter two organisations is relatively small, yet nonetheless it was interesting that there was considerable similarity between responses for all four. He notes that "replaced other people's travel" tended to refer to the situation where managers would normally have invited staff to meetings at the head office, but instigated a teleconference instead, or where people were giving courses to employees working at different locations and chose to give these courses via teleconferencing. He concludes that the dominant effect of teleconferencing seems to be travel reduction, given that about half of the respondents said that videoconferencing had replaced their own travel and approximately another fifth said that it had reduced other people's travel.

Arnfalk also quotes traffic impact estimates made by the companies themselves.

- Tetra Pak believes that videoconferencing has reduced business travel by about 10%.
- Between 1997-2000, Telia reduced business travel by air, cutting the volume by more than a third, whilst, over the same period, their use of virtual meetings (mainly audioconferencing) increased dramatically.
- As a more specific example from Telia, three of the four quarterly meetings for top managers (60-70 people from across Sweden) were changed to become teleconferences. The company estimates that it has saved 3 million SEK in reduced costs of travel, accommodation and staff time in two years.

11.2.5 Face-2-Face – UK teleconferencing venture launched in 2003

As a final insight into teleconferencing, in 2003, a new initiative called 'face2face' was launched in the UK, (face2face, 2004). It aims to provide "*a nationwide network of low-cost, pay-as-you-go, high-quality, videoconferencing facilities*." It was founded by Noel Edmonds, and has the backing of organisations such as the RAC Foundation, Friends of the Earth and Transport 2000. It offers a central booking system for locations nationwide, and is being run in collaboration with Cisco Systems.

By November, there were more than 60 Venue Partners in the UK offering meeting facilities, with 1800 affiliated sites globally. The organisation was aiming to offer facilities in over 200 locations in the UK by 2005 and to have more than 2000 branded sites in operation worldwide by 2006. In early publicity, the intention was stated as being to "bring videoconferencing rooms to every major town and city in the UK by Christmas [2003]".

Costs for using facilities are £50 per hour for 'local members' using their local venue for the first three hours, rising to £60 per hour after that. For local members using other venues, and 'roaming members', the costs are £65 per hour. For 'pay-as-you-go' members, costs are £100 per hour. Local and roaming members receive preferential telecoms charges, whilst pay-as-you-go members pay standard telecoms charges. The costs are described as follows *"meeting start from just £50 - the equivalent of a tank of petrol, a day in a car park at Heathrow or a round trip of approximately 50 miles on the train."*

In June 2003, face2face carried out a survey of more than 80 regular travellers passing through London's Paddington Station in the morning. Approximately 60% were travelling purely for business purposes. The survey found that:

- the average business trip costs in excess of £2000 per person in terms of staff costs, and on average, three employees travel to a single meeting. Hence the typical costs of a meeting are claimed to be £6000 plus the costs of travel, food and entertainment.
- most business trips last more than six hours, whilst the average time spent in meetings was typically less than two hours, representing 30% of the total time spent out of the office.
- up to two hours of average meeting time is time which would usually have been spent at home.
- the business travellers surveyed typically attended meetings at least twice a week.

- almost 50% of those surveyed would consider video meetings as a preferable alternative to making their trip.

The benefits of videoconferencing are described as follows:

- *more control and better work-life balance*: the option to videoconference arguably makes planning easier and frees up time. The literature states "*satisfied users are now managing to have meetings in Edinburgh, Birmingham, Manchester and Bristol, all before lunch*". The literature also stresses that the time savings can enable a better work-life balance
- *increased effectiveness*: the loss of 'stressful or tiring' travel should arguably increase effectiveness
- *peace of mind*: the literature argues "*forget worries about being late, missing a connection, losing your way or parking your car at airports*". It also highlights freedom from *"the dangers we face travelling today - road traffic accidents, SARs, earthquakes, war or terrorism*"
- *costs savings:* the literature contrasts the estimated staff costs for attending a normal meeting (£2000, of which only about a third is spent in the meeting itself) with the cost of hiring the videoconferencing facility (starting from £50 per hour).

The face2face website is linked to the website of VMC (the Video Meeting Company, www.videomeetingcompany.com). They were founded in 1999, and describe themselves as "the UK's leading independent, fully dedicated and impartial provider of total videoconferencing solutions". They employ over 50 staff, based in four locations in the UK. They have over 300 clients, including Carphone Warehouse, Grant Thornton, Mason Williams, Origin, Richards Butler, Taylor Woodrow, and Visage Group. Each of the named clients has a short write up, which includes their perceptions of the benefits of teleconferencing. Many of their reported benefits are similar to those claimed by face2face. It is also mentioned that teleconferencing tends to make meetings more efficient, as people are already prepared when they begin a meeting (rather than starting with small talk about travel).

In particular, the website quotes information from Mason Williams, a PR agency with 45 staff and a turnover exceeding £2 million. After installing video-meeting equipment, the travel costs within the agency dropped by a third. Even using videoconferencing for London meetings with London based staff is estimated to save two hours a day (given that it can typically take an hour to travel across London to a meeting). Mason Williams estimate that the monthly cost of the video equipment is normally recouped within the first week of each month. They also believe that it enables them to offer higher levels of customer service, and increased productivity. It has also increased coordination between the London and Manchester based offices of the organisation.

11.3 Selection of teleconferencing case studies

Prior to undertaking the teleconferencing case study, we obtained a small amount of information about following;

- in 1996, as a pilot project, Nottingham County Council set up a telecentre in Walsop town hall, (SustainIT 2003). This included the latest computer systems and videoconferencing facilities. It provided a base for six staff who give clerical

and administrative support to departments within the County Council. It was considered a success and enabled six staff members to avoid a 46 mile round commute trip to County Hall. The telecentre became a trading organisation in 1999 as it began to generate its own income, and is now self financing. There are plans to expand and extend the telecentre in terms of staff numbers and breadth of services.

- Buckinghamshire County Council has set up 2 telecentres - one in Amersham and one in Winslow - each with ten desk spaces for County Council staff. The county would like to make the telecentres available to staff from other employers in the area. It is not clear whether the centres have teleconferencing facilities or not, (c.f. Buckinghamshire workplace travel plans case study).
- In 1997, Surrey County Council launched a new corporate development programme which included a "Surrey Workstyle ' programme (SustainIT undated, Bibby 2000). As part of this programme, they set up a telecentre in Epsom with desk space for eight people. It was set up on an initial budget of about £90,000, and was designed for use on an informal basis by all Surrey employees (and in theory, though rarely in practice, by councillors as well). Part of the thinking was to help reduce the time which staff spent driving to and from Kingston in rush-hour congestion. In practice, trading standards and social service staff have tended to be the main users, although some teachers have also made use of the centre as a convenient access point for accessing the internet. In 2000, it was replaced by an equivalent facility in Epsom town hall for staff and a separate community telecentre operated by the District Council. The inclusion (or exclusion) of teleconferencing facilities is not clear. In total, the Epsom telecentre was reported to say 30,000 vehicle miles a year.

In terms of private sector initiatives, there was information about the following:

- the Royal Bank of Scotland, which estimates that it saves more than £70,000 a month by eliminating corporate travel through the use of video and audioconferencing, (HOP Associates 2001)
- BT report that Reed Personnel have developed videoconference facilities for use between employment consultants and clients
- BT itself has extensive audio and videoconferencing facilities.

Finally, British Telecom was chosen as the case study for this initiative because there was a substantially greater volume of information available about both the nature and scale of its teleconferencing activities, and the impacts that are resulting, in comparison to any other possible candidates.

11.4 Details of chosen teleconferencing case study

In the 1990s, BT underwent fundamental re-structuring to increase the efficiency of use of their workspace. This was due to assessments showing that their desk occupancy rate was 25%, and the realisation that technological developments enabled them to re-evaluate how their employees operate. Teleconferencing is now at the heart of communications within the organisation, and is used routinely for meetings.

There are three main types of teleconferencing:

- Audio-conferencing involves multiple-person telephone meetings. There are two kinds – centrally booked conferences, where calls are booked with a central service, and "Meet me", where calls are set up through a website and users can dial in without requiring central facilitiation.
- Video-conferencing involves real-time two-way visual and audio links, generally via a dedicated videoconferencing suite.
- Web conferencing involves interaction via computing technology, including facilities such as file sharing and 'live' whiteboards.

Currently, the majority of tele-conferencing that takes place within BT is audio-conferencing.

In addition to the use of tele-conferencing for internal purposes, teleconferencing is a strong growth area of BT's business. BT is currently the number five provider internationally and number one provider in Europe for teleconferencing services provided on a commercial basis.

11.5 Staffing and budgets for teleconferencing

The costs of teleconferencing are complex since they relate to both the costs of installing facilities and the ongoing costs of using them, and are different for different types of teleconferencing. We were not able to obtain staffing and budget information for the provision of teleconferencing at BT. Those using corporate services within BT use the same system that BT provides as a commercial service, and the costs of using facilities are charged internally to account holder budgets.

The commercial rates charged by BT are as follows:

Audioconferencing -	22p per user per minute, or £35 per month and 12p per user per minute
Videoconferencing -	typically £35-45 per hour for a user in the UK, £1.40 per minute for a slow connection within Europe and, £12.60 for a fast connection to Australasia and the Far East
Web conferencing -	35p per user per minute plus ISP charges

Providing the videoconferencing infrastructure ranges from between £5000 and £40,000 for companies, depending on the type of facilities provided.

This highlights that audioconferencing is considerably the cheapest (about £13 per hour), followed by Web conferencing (about £21 per hour plus ISP charges) followed by videoconferencing (£35-45 per hour, plus the costs of installing facilities).

As a cost comparison, face2face are offering use of video-conferencing facilities from between £50 and £100 per hour, depending on the type of membership. Local and roaming members receive preferential telecoms charges, whilst pay-as-you-go members pay standard telecoms charges.

One issue is how to put these costs in context. Face2face argue that "meetings start from just £50 - the equivalent of a tank of petrol, a day in a car park at Heathrow or a round trip of approximately 50 miles on the train." They also highlight that the average business trip costs in excess of £2000 per person in terms of staff costs, and lasts more than six hours, whilst the average time spent in meetings is typically less than two hours. Hence, teleconferencing should result in considerable cost savings.

Specific estimates of business cost savings are given in section 11.8

11.6 Scale of teleconferencing

BT employs about 108,000 people. In the last year, about 350,000 audio-conferencing calls were made with additional video and web conferencing taking place. Unfortunately, there are no data on the number of conventional face-to-face meetings to provide a context for these data. BT also report that there has been a 20% growth per annum in the use of teleconferencing up to 2002, whilst data for 2000 and 2003 suggest that recent growth may have been in the order of 30% per annum.

Hopkinson et al (2003) report on the results of a survey undertaken in October 2002 about teleconferencing at BT. Of 5457 staff contacted, 771 responded who were considered to be fairly representative of BT as a whole, in terms of business unit and age. They were asked to outline their use of teleconferencing in the previous four weeks. Tables 11.4, 11.5 and 11.6 summarise the results.

Table 11.4: Use of teleconferencing by a sample of 771 BT staff

	% using service in previous 4 weeks	Frequency of use by users				
		Once	Twice	Three times	Four times	5 and more
Meet-me audio	86.0%	14.7%	12.6%	9.1%	13.3%	50.2%
Booked audio	49.4%	21.5%	12.3%	12.1%	6.6%	47.5%
Web	13.4%	61.2%	17.5%	5.8%	2.9%	12.6%
Video	2.2%	No data				

Source: Hopkinson et al (2003)

Table 11.5: The number of participants in the respondents' last calls

Don't know	3	4	5	6	7	8	9+
3%	9%	12%	16%	16%	9%	11%	24%

Source: Hopkinson et al (2003)

Table 11.6: The number of locations in the respondents' last calls

Don't know	3	4	5	6	7	8	10
8.9%	20.0%	17.5%	17.1%	13.9%	6.8%	4.9%	11.0%

Source: Hopkinson et al (2003)

Hopkinson et al (2003) highlight that audioconferencing is very popular, being used by 92% of all staff, and, of those who use it, about 50% use it 5 times or more per month. Web conferencing is only used by about 13% of staff, but is reported to be becoming more popular, whilst videoconferencing remains a minority activity, used by only 2% of staff.

On average, conference calls involve 6-7 people, although the average number of locations was only 5, implying that many conferences involve more than one person in the same location. The majority of conferences last for under an hour.

There are currently 40 videoconference suites for BT employees spread across the country.

This information can be compared with findings from the literature as shown in table 11.7.

Table 11.7 Scale of teleconferencing

Source	Finding
BT (c.2001) and Hopkinson et al (2003)	• 92% of BT staff use audioconferencing and 13% use web conferencing • Meetings usually last up to an hour, and typically involve 6-7 participants
Roy & Filistrault (1998)	In a survey of 1139 business travellers: • 49% worked for organisations that use teleconferencing • 30% worked for organisations that use videoconferencing • 20% had participated in at least one videoconference in the last year • 18% worked for companies with private videoconferencing equipment
Bennison (1988)	In a pilot between 1983-86: • Videoconferencing was particularly useful to companies with a large number of intra-organisational contacts between people on different sites • Most videoconferences involved 4-6 people • Most videoconferences were less than 2 hours • Videoconferences fulfilled the majority of meeting functions

The available data on which to draw conclusions are sparse. Clearly, audioconferencing is the most popular and widespread form of teleconferencing. However, the work undertaken by Roy and Filistrault (1998) suggest that videoconferencing may be more widespread among senior business people than the BT data suggest. It seems typical that meetings undertaken by teleconferencing are relatively short, with a relatively large number of participants (4-7). It is also interesting that Bennison (1998) identified companies with a large number of intra-organisational contacts between people on different sites as the most fertile territory for teleconferencing, and, of course, BT are a perfect example of this. It is interesting that Arnfalk (2002) highlighted that intra-organisational contacts often constitute the majority of business travel for large, dispersed organisations.

For some types of teleconferencing (notably videoconferencing), the scale of activity may directly relate to the availability of facilities. However, facilities appear to be available to most BT staff, without widespread take-up. In contrast, Roy and Filistrault (1998) highlighted that more organisations were using videoconferencing than had their own facilities available. Face2face currently aim to provide facilities in most big towns and cities in the UK. Therefore, it is unclear how far availability of

facilities will be a limiting factor in the use of such technology. Anecdotal evidence received by personal communication with an employee from one company suggested that there may be 'image problems' with videoconferencing. Specifically, in his company, facilities are placed next to the Managing Director's office and there is the perception that your meeting needs to be "very important' to justify use of such facilities. Consequently, the facilities remain relatively underutilised[2]. Bennison (1988) also highlighted that, of 14 companies provided with free videoconferencing facilities, suites remained underutilised in 11 of them, and the main reason given was that facilities were 'not strongly promoted'.

11.7 Effects of teleconferencing on car use

Unravelling the BT data relating teleconferencing to car use reduction is not straightforward due to (amongst other things):

- non-existent data on pre-teleconference meeting schedules
- limited detailed data on teleconference use and the risk of double counting
- teleconferencing changing the way that people meet (frequency, length of meeting, number of people in the meeting)

In March 2000, an sample (of unspecified size) of BT staff were contacted who had booked an audioconference call on March 30th or 31st, and asked about its impacts. This is reported in BT (c. 2001). The following results are reported:

- 75% of respondents stated that their call had replaced a face to face meeting.This comprised all local calls, 75% of national calls but only 38% of international calls
- If the sample was representative of BT, audioconferencing was estimated to be saving 135,000 face to face meetings a year, of which 120,000 involved a car journey
- Overall travel savings were estimated to be around 150 million miles, of which 59 million miles was car travel

In the survey by Hopkinson et al (2003), 71% respondents stated that their last conference call had definitely or probably replaced a meeting (with 52% being 'definite'), whilst 5% stated that it had generated a meeting. 443 of the 771 respondents provided details about the travel avoided by their last call, as given in table 11.8.

Table 11.8: Characteristics of travel replaced by teleconferencing

Mode	Number of replaced trips by respondent's last call	Mean distance of avoided travel (miles)	Total avoided miles
Petrol car	203	91.4	18558.5
Diesel car	45	102.5	4611.0
Van/LGV	15	92	1380.0
Train	143	95.3	13624.0
Plane	20	146.3	2925.0

[2] The employee wished both he, and his company, to remain anonymous.

Taxi	17	34.9	592.5
Tube/bus/tram	68	19.2	1306.5
Other	17	51.8	880
Total	443		41690

Source: Hopkinson et al (2003)

In addition to the information given above, the survey showed that 46% of the avoided trips would have taken place during peak congestion periods.

Hopkinson et al (2003) scale up these results as follows: "In a typical year, BT employees initiate around 350,000 conference calls. If 52% of these calls definitely replaced a meeting (the figure which we obtained from the survey) this gives a figure of 182,000 avoided meetings. If each of these avoided meetings resulted in five avoided journeys (bearing in mind that the mean number of locations participating in a conference call was 5.3) this gives a total of 910,000 avoided journeys" (p31)

A similar scaling up suggests that of the 910,000 avoided journeys, 541,735 would have been by car or van, relating to 50.56 million road miles per year. This compares well with the previous study which showed that audio-conferencing was saving 59 million miles of road travel per year. These savings are estimated to represent a 9.8 - 11.1% reduction in business mileage overall. However, BT comment: "if conference calls were not an option, work might have been differently organised to avoid any need for face-to-face meetings", and hence the mileage reductions should be seen as maximum estimates.

These conclusions can be compared with evidence from the literature, as shown in table 11.9.

Table 11.9 Impacts of teleconferencing on car use

Source	Finding
BT (BT c.2001 and Hopkinson et al 2003)	• 71% of respondents said their last conference call had replaced a meeting (with 52% being 'definite'), whilst 5% stated that it had generated a meeting. • 0.5 million car/van trips and 51-59 million miles of travel saved for 108,000 people (approx 5 trips and 450-550 miles per person per year) • 46% avoided trips would have taken place during peak periods • 10-11% reduction in business mileage
Epson telecentre (SustainIT undated, Bibby 2000)	Telecentre with 8 desks estimated to save 30,000 vehicle miles p.a. (3750 miles per desk).
Mason Williams (2004)	Video meeting equipment meant that travel costs have dropped by a third.
Tetrapak (Arnfalk 2002)	Business travel reduced by 10% due to videoconferencing
Telia (Arnfalk 2002)	Between 1997-2000, business travel by air reduced by over a third, partly due to more virtual meetings (particularly audioconferencing)

Surveys with 4 Swedish companies (Arnfalk 2002)	• 45-61% respondents said videoconferencing had reduced their own travel • 15-25% said it had reduced other people's travel • 17-20% said it had only had a minor effect • 1-3% said it had increased their travel
Canadian business travellers (Roy & Filistrault 1998)	• 24.2% said they were travelling less often as a result of company policy to increase utilisation of teleconferencing • Of those participating in at least one videoconference in the previous year, users stated that videoconferencing had been a substitute for an air trip in 45% of cases. • 1.8% of all business travel may currently be substituted by teleconferencing
Canadian employees (Redekop 1994)	25% respondents made less business trips due to communications technologies in 1992, and 28% in 1994
SCAG meeting (Mokhtarian 1988)	• Total vehicle miles increased by 29% by replacing a regional meeting for a teleconference, as shorter distances to teleconference facilities were outweighed by increased attendance. • Travel in peak-hour, congested conditions was replaced by travel in off peak, less-congested conditions
BT trial 1983-86 (Bennison 1988)	87% of respondents felt that teleconferencing reduced the amount of travel they were making

The results suggest the following:

- When teleconferencing takes place, somewhere between 45% and 90% of those involved feel that it reduces their travel. A small minority (less than 5%) feel that it has generated extra travel.
- In terms of impacts on overall company travel, reductions of between 10% and 30% are typically reported for organisations that promote teleconferencing. It is plausible that some of the differences in reported impacts may relate to the composition of the workforce (and its suitability for teleconferencing), although there is not really enough available data to assess this.
- Often, travel at peak times, in congested conditions can be avoided.

Meanwhile, the study by Mokhtarian highlights that the availability of teleconferencing facilities may alter participation in business interactions, such that measuring the effects of teleconferencing is complex.

11.8 Other effects of teleconferencing

Many of the quoted benefits for teleconferencing are similar to those quoted for telework. The main benefits are as follows:

- **Enabling people with disabilities or family commitments or from distant locations, to contribute more easily to meetings.**

In the BT study by Hopkinson et al (2003), 44% of respondents said that teleconferencing had enabled them to work when they were prevented from reaching

another work location. Of those giving reasons as to why they were prevented, 59% identified domestic issues and 43% said health or disability had been a cause. Mokhtarian (1988) reported that replacing a real meeting with a virtual meeting increased attendance at a regional event by over 60%. Reed personnel have developed videoconference facilities for use between employment consultants and clients, which will presumably facilitate job applications from people who are not resident in particular areas.

- **Reduced hassle, time savings and better work-life balance**

The option to teleconference arguably makes planning easier and frees up time for the individual, including reducing the stress and hassle of travel. The face2face literature states "satisfied users are now managing to have meetings in Edinburgh, Birmingham, Manchester and Bristol, all before lunch" and that teleconferencing enables you to "forget worries about being late, missing a connection, losing your way or parking your car at airports". It also highlights freedom from "the dangers we face travelling today - road traffic accidents, SARs, earthquakes, war or terrorism". Work on teleconferencing also stresses that the time savings can enable a better work-life balance - for example time spent travelling at unsociable hours may instead be spent with the family. In the BT study, 76% of respondents stated that teleconferencing had had either mild or strongly positive impacts on their quality of life. In Roy and Filistrault's work (1998), there was general agreement that videoconferencing saves time.

- **Cost savings**

In the study by Hopkinson et al, 54% of respondents stated that the journey they avoided would have cost over £50. BT (c.2001) estimate that audioconferencing saves £6 million a year in terms of reduced petrol claims. Mason Williams, a PR agency, estimates that the monthly cost of their video conferencing equipment is normally recouped within the first week of each month. Telia estimate that by replacing three of its four quarterly meetings for top managers by teleconferences, it has saved 3 million SEK in two years in terms of reduced costs of travel, accommodation and staff time. The Royal Bank of Scotland estimates that it saves more than £70,000 a month by eliminating corporate travel through the use of video and audioconferencing.

- **Improved organisational efficiency, cohesion and resilience**

BT argue that the introduction of teleconferencing has resulted in improved staff recruitment and retention and reduced absenteeism. Benefits quoted by staff include ease of the staying in touch with remote colleagues, ease of accessing expertise, easier decision making reduced time between an issue emerging and a solution being found, and more efficient use of worktime generally. Hopkinson et al (2003) found that 82% felt that conferencing had increased their work performance (including 44% who felt the increase was 'considerable'). At a business strategy conference, a BT representative also noted that "we can be very creative about what we used by way of computer-based training [and] we can do more and more training". However, in the study by Hopkinson et al (2003), a few respondents - less than 10% - commented that there was a tendency for teleconferencing to be overused, resulting in unnecessary meetings, and a very small minority missed face to face contact. Early work by Bennison (1988) highlighted the benefits of videoconferencing as being the opportunity to call meetings at short notice, faster dissemination of information, a greatest degree of task orientation in meetings, and greater co-operation among

participants. However, there was also perceived to be a decline in spontaneity in meetings, which was generally regarded as a minor, offsetting detrimental effect. In Roy and Filistrault's work (1998), there was general agreement from their survey of business travellers that "videoconferencing can accelerate decision-making by rapidly linking key players".

11.9 Synergies between teleconferencing and other policies and issues

At British Telecom, teleconferencing had partly been promoted as part of a strategy to ensure that 'all business travel is operationally necessary and carried out in the most cost-effective manner'. This type of strategy could typically form part of a comprehensive workplace travel plan and/or fleet management initiative. The interviewee also highlighted that by providing teleconferencing, individuals are encouraged to reassess their own travel choices, which may have wider impacts than simply affecting the particular journey they are planning at the time. Conversely, policies aimed at reducing car use more generally should also help to encourage the use of teleconferencing.

In addition to its teleconferencing programme, BT encourages teleworking amongst its staff, as discussed in Chapter 10. As discussed there, it seems plausible that the two are synergetic. Ready availability of teleconferencing 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. Specifically, in the survey by Hopkinson et al (2003), 44% of respondents said that teleconferencing had made them more likely to think about working from home.

Where teleconferencing reduces the need for employees to start travelling early, it could be synergistic with school travel plans, since it may make it easier for such workers to not drive their children to school. Where teleconferencing reduces the need to own a car, this could contribute to more general changes to a less car dependent lifestyle.

Given that teleconferencing is associated with other business benefits, such as 'improved work life balance', it is also synergistic with a range of other initiatives that may take place within organisations for non transport reasons.

11.10 Relationship between teleconferencing spending and impact

As highlighted in section 11.5, information about overall costs of installing and using teleconferencing facilities are limited. However, the trade-offs identified by face2face suggest that teleconferencing should result in considerable financial savings to an organisation. As highlighted in section 11.8, numerous companies are quoting substantial savings from reduced travel costs and improved efficiency of staff time

use. However, this does not mean that companies will automatically invest in teleconferencing facilities, or encourage staff to use them. Public sector marketing or pump priming may be necessary to encourage greater teleconferencing practice, as discussed further in section 11.12.

11.11 Future impact of teleconferencing

Within BT, teleconferencing was reported to be growing at a rate of 20% p.a., with some data suggesting recent growth rates of 30% p.a.. The interviewee felt that it was not possible to suggest how much the number of calls would increase in the future, as this would partly be a function of changes in attitudes of society to work and communications, the emergence of other ways of communicating, and, potentially, future changes in the overall working practices of the company. He felt that there was no reason to suggest that the current growth rates would not continue for the foreseeable future, but that at some point, saturation would take place.

Meanwhile, there were also some insights from BT's commercial provision of teleconferencing facilities. In 2000/01, the value of its conferencing products and services was estimated at £68 million. This grew to £83 million in 2001/02 (i.e 22% in one year). It is expected to reach £260 million in 2004/05, representing a growth rate of 260% over five years. BT also quoted a Key Note market report from 2000. This estimated that the videoconferencing market had grown by 28% between 1999 and 2000, and that it would grow from £122m to £332 million between 2000 and 2005, an increase of similar proportions (272%). Both projections assume accelerating growth. A more recent Key Note report on the subject (2003) highlights that between 2001 and 2002, market growth was actually only 14% - partly because teleconferencing products have become cheaper.

A mid range interpretation of these estimates would be that growth rates of 20% a year may be expected in terms of actual use of services.

Meanwhile, as highlighted earlier, there are numerous estimates in the literature about the potential magnitude and impacts of teleconferencing on business travel. These are summarised in table 11.10.

Table 11.10 Future scale and impacts of teleconferencing

Source	Finding
Pye 1976, Goddard & Morris 1976 and Goddard & Pye 1977	44% of meetings could be teleconferenced, including 34% by audioconferencing, and 10% by videoconferencing
Bennison 1988	25% of face to face meetings could have been replaced by videoconferencing
Dodgson et al 1997 and 2000	1997 report argues that, in about 10 years, teleconferencing could replace somewhere between • 20% of business travel for 26% of people, and • 20% of all business travel. Their 2000 report only quotes the more conservative estimate.

Apogee Research Inc 1994	Teleconferencing could substitute for 2-11% of business air travel.
Arvai 1991	Teleconferencing could substitute for 12% business air travel by 2005, 25% by 2010 and 35% by 2020
Burger 1995	Videoconferencing could reduce business air travel by up to 40%
Roy and Filistrault 1998	• Proportion of organisations with access to videoconference equipment could be about 60% by approx 2001 • Videoconferencing could replace 15% of business air trips • Videoconferencing was reducing air travel by 2-4% in the short term and could reduce it by 4-9% in about three years
Rapp & Skåmedal 1996	Estimates of the proportion of business travel that teleconferencing could replace are: • 30% of Irish business travel (1978 estimate) • 20% of US business travel (1983 estimate) • 20% of Canadian busines travel (1983 estimate) • 35% of German business travel (1985 estimate) • 35% of UK business travel (1985 estimate)
Cook and Haver 1994	Teleconferencing could replace 25% of US business travel by air by 2010.
Face2face	50% of business travellers think that videomeetings could be a preferable alternative

There is clearly quite a wide range amongst these estimates – from assertions that teleconferencing could replace up to 50% of all business travel, to much more modest assumptions that only 15% of trips could be replaced, and that the actual impacts will be lower since many companies will not have available teleconferencing facilities.

It is notable that most estimates do not distinguish between the proportion of companies that increase their volume of teleconferencing, and the impacts on travel per company. Another problem with many of the estimates described above is that they are undated and probably relate to perceived transferability of meetings to technology, rather than the probability of this actually happening.

The only two estimates of the proportion of companies expected to have teleconferencing facilities in the future are the study by Dodgson (where teleconferencing is seen as viable for 26% of people) and Roy and Filistrault (where 60% of companies were expected to have access to videoconference equipment by 2001). This can be compared with the (relatively sparse) data from section 11.6 about the current scale of teleconferencing, which ranged from BT's experience (where 92% of staff audioconference, but only 2% videoconference), to Roy & Filistrault's survey of 1139 business travellers, where 20% had taken part in a videoconference in the past year and 30% worked for organisations that used videoconferencing.

The figures given above can also be compared with those discussed in sections 11.7 about the effects of teleconferencing. These appeared to show that teleconferencing typically reduces business travel by 10 to 30% in companies which adopt it as a mainstream business practice. This appears to be in line with many of the estimates about the overall potential of teleconferencing, and therefore 30% should perhaps be

taken as an upper bound of potential impacts. However, this is unlikely to be realised given that take up of teleconferencing is unlikely to be universal.

For teleconferencing to have an impact on all business travel of this order of magnitude would clearly require a major scaling up of business activity in this area. However, this does not seem entirely implausible given the high growth rates (perhaps 20% p.a.) implied in reports by BT and Key Note. Key issues for scaling up are discussed below.

11.12 Key issues for scaling up teleconferencing

In terms of public sector involvement, the key ways to promote teleconferencing are:

- to market the benefits of teleconferencing to try and encourage organisations to undertake more teleconferencing.
- to provide both technical and managerial advice to businesses about how to undertake teleconferencing
- to offer to run training courses for staff about teleconferencing
- to provide grants for organisations to introduce teleconferencing
- to provide facilities for use by the general public and
- to encourage teleconferencing amongst their own employees.

We are currently unable to comment on the extent to which this happens, however there is clearly scope for increasing these activities. Our intuition is that, even in organisations with facilities, in many cases, there is considerable ignorance about teleconferencing, and that many staff would not know how to book an audio conference call, or how it would be charged, let alone how to get involved in videoconferencing. In some cases, as discussed in section 11.6, there may also be misperceptions about eligibility to use facilities, which result in expensive facilities being relatively underutilised, and concerns about the internal cultural acceptability of not travelling to meetings. If this is the case, there could be considerable scope for the public sector to get involved in promoting greater use of teleconferencing. Initiatives on workplace travel plans and fleet management initiatives offer a good starting point for engaging with organisations about this. There may well need to be a national lead in this area, since many local authorities may lack the internal expertise to promote and advice on teleconferencing in an expert capacity.

Meanwhile, more general policies that discourage car use for work travel will all help to encourage organisations to assess whether the business travel they undertake is a good use of resources. More explicit policy implications are given in the next section.

11.13 Policy implications relating to teleconferencing

- Information and advice about teleconferencing could be included as part of any initiative aiming to influence business travel, for example, 'fleet management programs'.
- Legislation which increases the employer's (health and safety) responsibilities for employees when they are undertaking travel in the course of work is likely to encourage a greater rationalisation of business travel.

- Demand management policies for car use, such as road pricing, fuel duties, road space reallocation etc., are all likely to encourage greater rationalisation of business travel.
- Both national and local guidance and advice about teleconferencing could be helpful, covering the range of different teleconferencing options available (audioconferencing, webcams, videoconferencing etc.), the technical issues involved in running such options, the costs of such options and the associated managerial and cultural changes needed to make such options work.
- The social benefits of teleconferencing (greater participation of those with disabilities; better work life balance) could be more widely disseminated.
- There may be a role for facilities provided by local authorities where companies can go to use some of more expensive teleconferencing facilities, such as videoconferencing. Such facilities might be particularly appropriate for small and medium enterprises, and for rural areas where business interactions are perhaps more likely to be over longer distances.
- Local authorities could be encouraged to lead by example in considering whether their own business travel is always appropriate, and whether they could make more use of electronic communication methods.
- Of all the soft factors, this is the one where there is the least literature and information, and greater empirical research could be of clear benefit.

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