The Spread of Telework in 2005

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Abstract. The rise of telework as a widespread way of working has profound implications for society in general and for the labour force, policy makers and IT service providers in particular. By 1999 the number of teleworkers in the European Union had reached 9 million. How will this development continue? In this paper, two models for a projection to the year 2005 are presented, based on data derived from a number of surveys covering both the general population and establishments in 10 European countries that have been conducted in 1999 as part of the ECaTT project. Results of the analysis are presented for 10 European countries.

1. Introduction

In 1999, the European ECaTT consortium (**E**lectronic **C**ommerce and **T**elework **T**rends) set out to measure the current size of the teleworking population in 10 EU member states and find out about attitudes, interest and barriers concerning the further spread of work liberated from space and time constraints [1]. According to the results of the representative population survey, 9 million residents of the EU did some telework in 1999, 6 million of which spent at least one full working day per week at home or in the field being linked with their employer/ client via data communications [2]. For the 5 biggest EU member states, these findings can be compared to the results of a set of 1994 surveys (also conducted by empirica) that used the same survey design and question phrasings [3].

Spread of telework in Europe 1999: General Population Survey findings (source: ECaTT)

	home-based teleworkers		**All teleworkers**	
	absolute	**% of labour force**	**absolute**	**% of labour force**
Denmark	121,000	4.5	280,000	10.5
Finland	142,000	6.7	355,000	16.8
France	272,000	1.2	635,000	2.9
Germany	538,000	1.5	2,132,	6.0
Ireland	14,000	1.0	61,000	4.4
Italy	315,000	1.6	720,000	3.6
Netherlands	285,000	4.0	1,044,	14.5
Spain	162,000	1.3	357,000	2.8
Sweden	207,000	5.3	594,000	15.2
United Kingdom	630,000	2.4	2,027,	7.6
EU10	***2,687,***	***2.0***	***8,205,***	***6.1***
Total EU15	***2,946,***	***2.0***	***9,009,***	***6.0***

Note: home-based: comprising permanent and alternating teleworkers working from home for at least one full working day per week; all: comprising also: self-employed teleworkers in SOHOs; mobile teleworkers using online connections when travelling; supplementary teleworkers teleworking from home, but less than one full working day per week. Total EU15 figures include figures for 5 EU member states not included in the survey. These were estimated on the basis of other countries whose economic and social structure are believed to be comparable.

Another ECaTT-survey was targeted at decision makers in establishments that were able to give information on IT-related human resource matters. One of the main findings was that the share of establishments that practise telework has reached considerable levels in all countries surveyed. In Scandinavia and the United Kingdom establishments accounting for more than 50% of the labour force employ teleworkers of one kind or another.

Spread of telework in Europe 1999: Decision Maker Survey findings (source: ECaTT)

	Establishments practising home-based telework	**Establishments practising any kind of telework**
	in % of all establishments	
Denmark	26.9	57.9
Finland	22.4	59.3
France	8.3	35.0
Germany	13.3	29.9
Ireland	13.5	39.1
Italy	4.7	17.2
Netherlands	18.7	46.0
Spain	7.8	20.0
Sweden	22.4	61.7
United Kingdom	24.5	55.0
EU10	***13.9***	***35.8***

Note that the establishment survey made use of a stratified random sample that reflected the employee distribution between establishments size bands. For this reason, reference in reported results such as ”50% of all establishments in country A” are properly interpreted to mean ”establishments accounting for 50% of all employees in country A”.

In this paper, these and additional results from ECaTT are used as a base for forecasting the spread of telework in the near future (2005).

2. Telework as technological substitution

In a very simple model, telework can be interpreted as a technological innovation which substitutes telecommunicative transmission of work-related information for travelling and face-to-face-interaction [4]. Based on this assumption it is possible to extrapolate trends in telework diffusion, as it is supposed to follow the usual pattern of adoption of a new technology, i.e. an “S-curve” with very small growth rates in the beginning of the diffusion process up to some kind of “take-off point”, followed by a period of exponential growth and finally an outlevelling of the growth curve when it approaches what is called the saturation level [4]. The shape of the curve follows the equation:

$$\ln\left(\frac{f}{F-f}\right) = c_1 + c_2 * t$$

with:

f = current penetration of telework (% of labour force)
F = maximum penetration = saturation level (% of labour force)
t = current year, where in year the diffusion started is t = 0
c_1, c_2 = constants

To use the equation for extrapolation, diffusion rates at at least 2 points in time must be given. For our purpose, we can use 1999 findings from ECaTT [2] and 1994 findings from TELDET [3] for France, Germany, Italy, Spain and the United Kingdom.

For maximum penetration level, Handy and Mokhtarian [4] used a figure that derived from an estimate by Nilles, roughly based on the share of “information workers” in the

labour force. ECaTT supplies data which goes beyond such an estimate: Respondents were asked if they spent more than 6 hours per week on (a) office work (b) work which could be done at a desk (paperwork, writing, reading, making calls etc.) (c) work on a computer or using a computer-controlled machine. These are tasks that lend themselves to teleworking and which - under the assumption that the tasks can be collapsed on (at least) one working day - make it possible to spend one full working day per week teleworking. According to the results of this part of the survey, in roughly two out of three cases in Europe telework is "technically" feasible.

We believe, however, that saturation levels used for the forecast should also reflect employee attitudes towards teleworking, e.g. from home. Now and in future, many employees will not have the personal or spatial means to efficiently work at home, or they just prefer working in physical proximity to other persons with similar fields of activity. Although attitudes and conditions might change in the long term, we do not believe they will in a significant way until 2005.

For these reasons, saturation levels for telework penetration are estimated as follows:

Estimated saturation levels regarding telework penetration in Europe (source: ECaTT)

	teleworkability	**employee interest**		**saturation level**	
	in % of labour force				
	any kind = home-based	home-based	any kind	home-based	any kind
France	62.8	58.9	64.8	37.0	40.7
Germany	69.1	56.6	64.7	39.1	44.7
Italy	74.2	62.4	69.5	46.3	51.6
Spain	64.8	50.7	60.6	32.9	39.3
United Kingdom	67.9	58.7	64.8	39.9	44.0

Note: saturation level calculated as the product of teleworkability and employee interest (based on the conservative assumption that both are independent from each other)

The results of the calculation are shown in the figure and table below. According to the extrapolation model, Germany and Italy will show strong growth in the coming years and will almost have reached their respective saturation levels in 2020, while the share of teleworkers will grow much slower in the other countries. By 2005, diffusion rates will be 22.8% in Germany, 14.6% in Italy, 11.2% in the U.K., 5.0% in France and 4.9% in Spain. Italy's and Germany's optimistic forecasts are grounded in the high growth rates these countries have shown between the two points in time for which empirical data is available, 1994 and 1999.

First extrapolation model: results for 5 major European countries

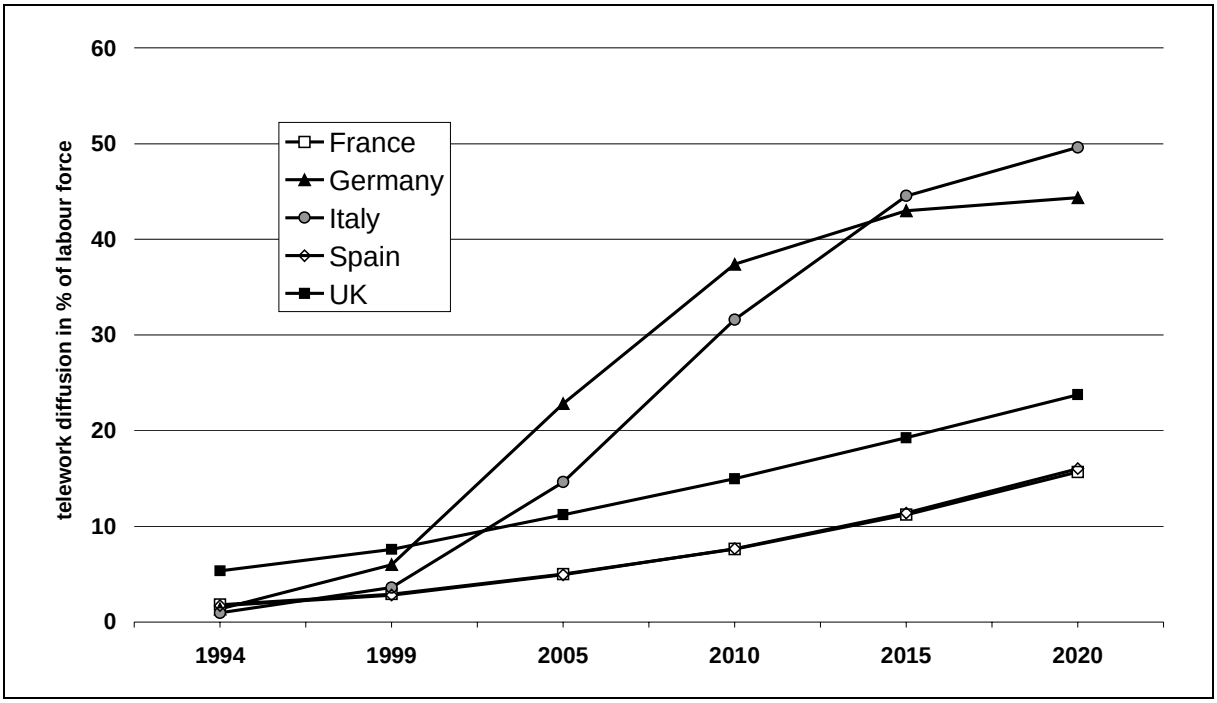
	home-based teleworkers in % of labour force			**All teleworkers in % of labour force**		
	1994	**1999**	**2005**	**1994**	**1999**	**2005**
France	0.8	1.2	1.9	1.8	2.9	5.0
Germany	0.4	1.5	7.1	1.4	6.0	22.8
Italy	0.5	1.6	6.3	1.0	3.6	14.6
Spain	0.8	1.3	2.1	1.7	2.8	4.9
United Kingdom	1.7	2.4	3.4	5.4	7.6	11.2

Although the model takes into account employee interest as well as teleworkability of current jobs, it seems to be utterly simplistic in its underlying claim that the current potential will be reached eventually. It does not consider that the introduction of telework may make economic sense for some companies and workplaces, but not for all. It is not at

all clear that every potential teleworker will be offered a teleworkplace even in the distant future.

Moreover, it is not likely that the diffusion process will follow a path comparable to substitutional technologies since telework is not primarily a technological but a techno-social innovation whose development is influenced by the behaviour of many stakeholders from all parts of society. In Germany, for example, the high growth rates in the second part of the 1990s seem to constitute a catching-up to forerunners like the United Kingdom which has by far outperformed Germany in the 1994 survey. German establishments have started to exploit the favourable infrastructural conditions existent in the country while resistance by trade unions (a strong influence in the 1980s) has all but disappeared. There is, however, scarce evidence that Germany (and Italy, for that case) will move ahead of the United Kingdom as fast and strong as indicated by the result of the extrapolation calculation, because barriers still exert a strong influence on telework uptake.

First extrapolation model: results for 5 major European countries (all teleworkers)



Amongst these barriers [5], the most important seem to be those affecting the willingness of employers to offer telework to their employees. After all, someone has to provide all the teleworkplaces that are needed to make growth projections real. Many employers still remain inactive even in the face of a multitude of empirical evidence that proves that telework can be highly profitable. Since it takes up time - in most companies more than a year - from the decision to set up a telework pilot till the first teleworkplaces are up and running (and much more until a significant share of the workforce works from out of the office), today's corporate decisions concerning telework will to a large degree determine how many teleworkers will exist in 2005.

3. Establishments interested in introducing or extending telework and existing plans

ECaTT has collected establishment-side data on interest and plans regarding the introduction (or extension) of telework. In the table below establishments currently using and not using telework are differentiated according to these variables. These findings are

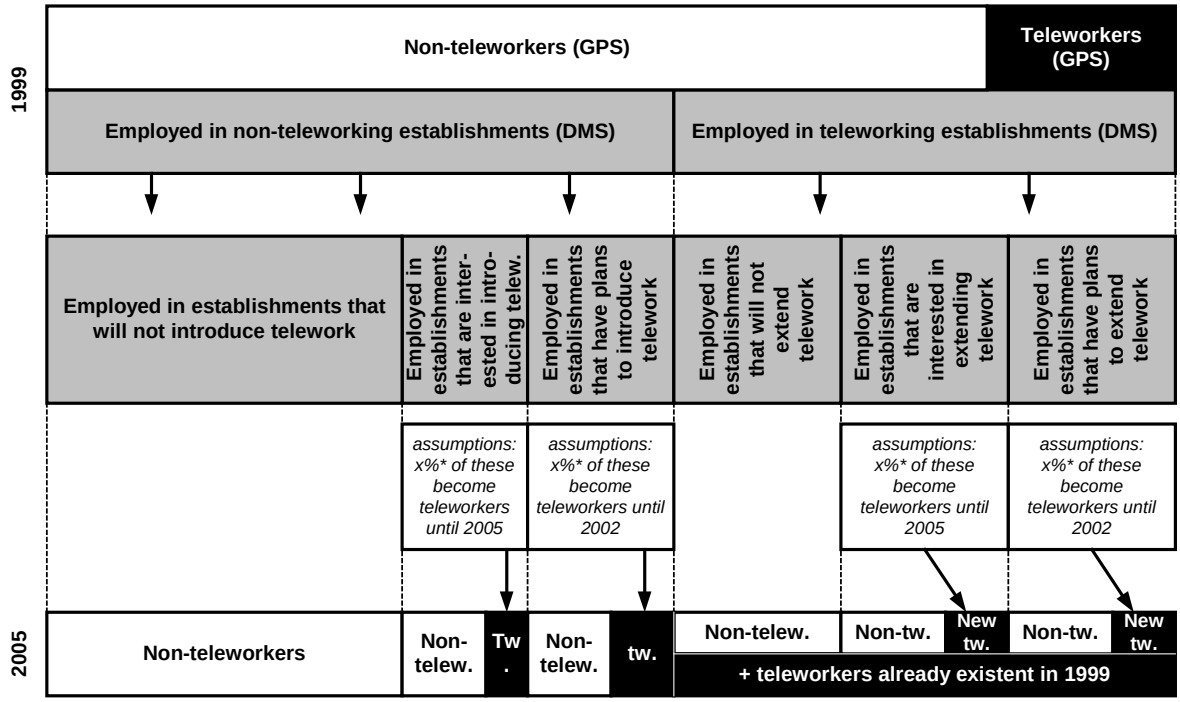
now integrated in a model of the future development of telework that takes into account the following data derived from the ECaTT representative surveys: current spread of telework, current share of establishments employing teleworkers, share of establishments with concrete plans for or only interest in introducing/ extending telework.

Practice, plans and interest in any kind of telework in % of all establishments 1999 (source: ECaTT)

	establishments that do <u>not</u> practise telework already (in % of all est.)				**establishments that practise telework already (in % of all est.)**				
	concrete plans for introducing	interest in introducing	no interest in introducing	n.a. on interest	concrete plans for extension	interest in extension	no interest in extension	n.a. on interest	total
Denmark	5.3	6.0	28.8	2.0	25.4	12.6	9.7	10.2	100
Finland	1.5	9.2	28.7	1.3	15.6	18.2	12.4	13.1	100
France	4.4	7.0	49.8	3.8	4.5	6.5	10.8	13.3	100
Germany	5.6	11.6	50.6	2.3	5.2	10.8	5.0	8.9	100
Ireland	3.6	8.7	43.6	5.0	7.3	9.7	7.1	14.9	100
Italy	2.3	8.0	62.2	10.2	1.9	4.3	2.9	8.1	100
Netherlands	5.0	7.7	37.0	4.3	5.0	16.3	11.7	13.0	100
Spain	4.5	6.1	60.8	8.6	1.9	6.4	4.0	7.7	100
Sweden	2.2	4.5	29.3	2.4	17.0	13.3	18.1	13.3	100
U.K.	2.1	3.7	37.4	1.8	10.8	12.8	11.2	20.2	100
EU10	***3.9***	***7.6***	***48.3***	***4.4***	***6.3***	***9.6***	***7.7***	***12.1***	***100***

As the results from ECaTT do not tell us how many teleworkplaces establishments are planning to set up in the next few years, an assumption about how large the number of newly set up teleworkplaces as a share of total workforce is necessary. We assume that this share will be as high as the current aggregate share of teleworkers amongst those establishments that employ teleworkers (in Germany: 6% of the labour force are teleworkers and 30% are employed in establishments that practise telework, i.e. in the latter

Model for second extrapolation



* x = [teleworkers 1999] / [employed in teleworking establishments 1999]

in average 20% of the workforce are actually teleworking). Anecdotal evidence tells us that this assumption is conservative, as many companies that already make use of telework have set up teleworkplaces on an ad-hoc basis and serving only those who for private reasons desperately need to work at home, while many new telework projects seem to be conceptually better prepared and aim at providing telework as a more regular solution to employee as well as company requirements.

We further assume that establishments that in 1999 planned to introduce/ extend telework will have done so to the said degree in 5 to 6 years time, while those which already have concrete plans will only need about 2 to 3 years. These are very rough estimates that stem from evidence from the insurance industry [6].

Using this model for all countries surveyed in ECaTT, 2005 diffusion rates can be estimated. They range between 5% in Spain (up from 3% in 1999) to 29% in Finland (17%). Comparing the results from both extrapolation models for the five biggest EU member states, it is striking that estimates for France, Spain and the U.K. are very close in both models, while the figures for Italy and Germany are much smaller when using the extrapolation that is based on employers' 1999 interest/ plans. This seems to suggest that the high growth rates that Italy and Germany have shown in the period 1994-99 most likely indicated rather a process of catching up to European forerunners like the United Kingdom, but did not mean the beginning of a period of continuous above-average growth in the near future.

Second extrapolation model: results for 10 European countries (in % of total labour force)

	home-based teleworkers		**all teleworkers**	
	1999 (ECaTT)	**2005 (estimate)**	**1999 (ECaTT)**	**2005 (estimate)**
Denmark	4.5	10.2	10.5	19.4
Finland	6.7	16.7	16.8	29.4
France	1.2	2.4	2.9	4.8
Germany	1.5	4.0	6.0	12.6
Ireland	1.0	2.1	4.4	7.7
Italy	1.6	4.2	3.6	7.1
Netherlands	4.0	9.7	14.5	25.2
Spain	1.3	2.7	2.8	5.4
Sweden	5.3	11.2	15.2	24.3
U.K.	2.4	4.3	7.6	11.7
EU10	***2.0***	***4.2***	***6.1***	***10.8***

4. Discussion

The validity of any model used for forecasts is hampered in general by the need to make certain assumptions about underlying factors. Not only do we lack many of the data that would set us in a position to validate the assumptions used in the models. Factors influencing the extrapolation model also change in time due to their inherent dynamic. For example, employee interest in teleworking can change due to a shift in attitudes toward work/life-distinctions, but also as a result of fiscal (dis)incentives (e.g. partial abolishment of the tax-deductibility of commuting expenses).

More important in the context of an extrapolation until 2005 is the shift in the understanding of telework that can be observed everywhere. While telework in its early years was a very rigid method to "flexibilize" work organisation, in recent years the development for example of mobile computing technology has made such huge leaps that an office liberated from most time/space constraints has become a real option. For

researchers who are asked to come up with numbers of how many teleworkers there are, this situation imposes huge problems. We can already observe what Millard and Mitchell [7] call the “mainstreaming of telework” by which they mean that the constituent features of telework lose their distinctiveness and meld into the every-day handling of work organisation. Little by little, as workplaces lose their fixation in space, we also lose our ability to simply count teleworkers. More sophisticated indicators to measure the phenomenon of dislocated work will have to be developed.

At the same time, however, if potential employers and teleworkers are asked about their plans concerning telework, there answers are still based on traditional concepts of telework that might be hopelessly dated in a few years time. Especially, we think that the results of our extrapolation concerning the growth of mobile telework (as a part of “all teleworkers”) must be interpreted with care because of the rapid progress in mobile data communications. Nobody can say for sure now how mobile telework will look like in 2005. For this reason, projections for home-based telework (see tables) should be more accurate than those for telework overall.

5. Conclusion

Telework is set for another round of strong growth, according to the results of the two projection models described in this paper. If employment levels stay roughly the same, a share of 10.8% of the EU labour force indicates a total number of 16 million teleworkers in 2005, amongst which 6.3 million (4.2%) will be regularly teleworking from home. For those countries for which empirical data from 1994 as well as 1999 are available, both models arrive at roughly the same results with the notable exception of Italy and Germany. Here, very high growth rates between 1994 and 1999 stand against modest expectations of employers concerning their plans for and general interest in introducing/ extending telework. This finding might imply that Italy and Germany have entered a new stage in diffusion consisting of a more cautious expansion of teleworking practice. Such a development would mean a diversion from the S-curve diffusion model underlying the first extrapolation model. Quite obviously, there is a need for further research, especially an addition of more points in time for which (comparable) empirical data is available.

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