

Multimedia: Forecasts of Employment Growth in the Media and Communications Sector Often Exaggerated

Many recent commentaries by politicians and business representatives have given voice to expectations that an accelerated development by western industrialised countries towards the "information society" will generate positive effects for economic growth and employment.¹ The new digital storage and transfer technologies permitting the interactive utilisation of text, graphic, sound and video data play a central role in this vision. The multimedia services that can be made available to private households and their application in the public and private sector will, it is argued, lead to new markets and a major increase in the demand for media and communications (M&C) products. The greatest potential for higher employment in Germany is seen in the rapid diffusion of the new programmes and services and their effects on Germany's international competitiveness. Model calculations, however, suggest that in the M&C sector itself employment will only expand marginally even if domestic demand were to treble to the year 2010, as is expected.²

Methodological basis of the analysis and model calculations

In the German national accounts statistics the branches whose firms are primarily concerned with producing and distributing M&C products are not brought

together under a single economic sector. Rather they are distributed among a number of branches of manufacturing industry (office machinery/EDP, electrical engineering etc.) and several service branches (wholesale and retail trade, data communications etc.).

In order to be in a position to quantify the impact of changes in the domestic demand for M&C products on the domestic production and distribution of such goods and services, it was therefore first necessary to group firms from the following subsectors into a single "media and communications sector":

- firms whose central field of activity is the production or distributions of mass media (print and electronic media) constitute the subsector "media",
- firms producing or distributing electronic consumer goods, office machinery and data processing equipment, information-technology appliances and photo-technical and photo-chemical products form the subsector media and communications technology,
- firms whose activities centre on producing DP software and services, telecommunications and postal services constitute the subsector communications services.

This relatively broad definition of the M&C sector was selected in order to take account of the fact that the new M&C technologies will both weld together previously specialised branches (consumer electronics, telecommunications technology, DP technology, photo-technology) and will also dissolved the boundaries between mass and individual communications services. Moreover, this approach means that the analysis encompasses not only those branches in which the new multimedia markets offer a growth potential, but also those branches that are likely to be most severely affected by substitution effects (e.g. photochemical and postal services).

The calculations are based on a demand prognosis conducted by the Basle-based Prognos AG in the form of a trend scenario of the development of the domestic German media and communications goods markets to the years 2000 and 2010. Into this scenario were entered the probable – from a current perspective – dates of market entry for new multimedia programmes and services, whereby the existing technological constraints and the time required to reduce regulatory barriers were taken into account; it was assumed that recent demand trends for private households, the private and the public sector will be maintained.³

¹ One prominent example is the European Commission. Cf. Commission of the European Communities, Growth, Competitiveness and Employment, *White Paper*, Luxembourg 1993 (Bulletin of the European Communities, Supplement 1993).

² The impact of the new M&C technologies on output and employment trends in the German M&C sector were analysed within the framework of a study conducted last year in collaboration with Prognos AG, Basle. The study is published in German: Klaus Schrape, Wolfgang Seufert, Hansjörg Haas et al., *Künftige Entwicklung des Medien- und Kommunikationssektors in Deutschland* (DIW series *Beiträge zur Strukturforchung*, issue no. 162).

³ Of course any forecast of the market trends for new products and services is subject to greater uncertainty than that for established products. In the light of this, two qualitative scenarios were developed in addition to the trend scenario, enabling the upper and lower limits to a range of developmental possibilities to be established.

Table 1

The Macroeconomic Weight of the Media and Communications Sector, 1980 to 1992

Share of total output and employment

	West Germany						Germany
	1980	1982	1984	1986	1988	1990	1992
Gross output ¹⁾							
Media	1.5	1.5	1.5	1.7	1.8	1.8	1.8
M&C technology	1.8	1.7	1.8	2.0	2.2	2.3	2.3
Communications services	1.2	1.2	1.3	1.4	1.5	1.6	1.6
M&C sector, total	4.4	4.5	4.6	5.1	5.5	5.7	5.6
Gross value added ¹⁾							
Media	1.6	1.6	1.7	1.7	1.7	1.7	1.6
M&C technology	1.7	1.6	1.6	1.7	1.7	1.6	1.5
Communications services	2.7	2.9	2.9	2.9	3.0	3.0	3.0
M&C sector total	6.1	6.1	6.2	6.2	6.4	6.4	6.1
Employment							
Media	1.4	1.4	1.4	1.4	1.5	1.6	1.4
M&C technology	1.7	1.6	1.6	1.6	1.7	1.8	1.5
Communications services	1.9	2.0	2.1	2.3	2.4	2.3	2.4
M&C sector total	5.1	5.1	5.1	5.3	5.6	5.6	5.3

1) At current prices.

Sources: Federal Statistical Office; DIW calculations.

On this basis the likely impacts on output and employment in the domestic M&C sector were calculated by the DIW. A growth of domestic demand for M&C goods does not necessarily lead to a corresponding increase in domestic output. Of decisive importance in this context is whether Germany's balance of trade with respect to M&C goods will improve or deteriorate over the longer term. Finally, the extent to which a rise in domestic output leads to a rise in employment in the M&C sector depends on the extent to which parts of value added are transferred to other sectors and on the rate of labour productivity growth. In most cases the model calculations were based on an extrapolation of the trends observed since 1980. However, account was also taken of a number of structural discontinuities, to the extent that can be foreseen at present, an example being the productivity "leap" that will be associated with the deregulation of Germany's postal and telecommunications markets.⁴

⁴ The Telekom AG and the postal service plan to shed at least 90 000 of the current workforce of more than 600 000 employees.

Media and communications sector trends since 1980

In 1992 – the last year for which full official data are available – the output of the M&C sector amounted to around DM 420 billion, its net value added was around DM 175 billion; the M&C sector thus accounted for somewhat in excess of 6% of GDP.⁵ At 1.9 million employees the sector accounted for 5.3% of total employment. Between 1980 and 1990 the sector's share of GDP and of overall employment (in West Germany) increased steadily. Following the accession of the former GDR, however, there was a slight decline in the macroeconomic importance of the M&C sectors as measured by these two coefficients.

In 1992 48% of the gross value added generated by the M&C sectors was accounted for by communications

⁵ In the current discussion unadjusted turnover data – instead of value-added figures – have repeatedly been compared with GDP. This serves to seriously overstate the macroeconomic importance of the output of media and communications goods.

Table 2

The Media and Communications Sector, 1980 to 1992

	West Germany						Germany
	1980	1982	1984	1986	1988	1990	1992
in DM billion at current prices							
Gross value added							
Media	22.2	23.9	27.9	29.7	34.0	39.0	46.8
M&C technology	23.7	23.3	26.1	29.9	32.2	36.8	43.4
Communications services	37.3	42.4	47.2	51.3	59.2	67.2	84.2
M&C sector total	83.2	89.6	101.1	110.9	125.4	143.0	174.5
in 000's							
Employment							
Media	385	379	362	384	415	445	509
M&C technology	466	434	415	441	470	499	554
Communications services	519	534	551	609	642	663	845
M&C sector total	1 370	1 347	1 328	1 434	1 527	1 607	1 908
in %							
Value added as a share of gross output							
Media	38.5	37.7	39.0	36.8	37.0	35.5	35.4
M&C technology	34.5	32.9	31.2	30.6	28.9	26.6	25.5
Communications services	84.1	81.3	81.1	77.8	75.7	71.6	70.4
M&C sector total	48.8	48.1	47.4	45.4	44.5	41.8	41.4
Overall economy	35.4	35.2	35.1	37.0	37.7	37.4	37.7
in 000's DM							
Gross value added per employee							
Media	57.6	63.1	77.1	77.4	81.9	87.7	91.9
M&C technology	50.8	53.7	62.8	67.8	68.5	73.8	78.5
Communications services	71.9	79.4	85.6	84.2	92.2	101.3	99.7
M&C sector total	60.7	66.5	76.1	77.4	82.1	89.0	91.4
Overall economy	50.5	55.3	61.6	66.7	71.4	78.9	79.2

Sources: Federal Statistical Office; DIW calculations.

services, 27% by the subsector "media" and 25% by M&C technology. As a result of differences in the rate of growth between the various subsectors, the following structural shifts occurred between 1980 and 1992:

- There was scarcely any change between 1980 and 1992 in the contribution to gross value added by the M&C sector made by companies producing and distributing media products. The relative share of M&C technology, on the other hand, has fallen markedly over this period, whereas that of communication services has increased to a corresponding extent.
- Within the traditional media sector there has been a shift away from print media in favour of electronic media. Even so, in 1992 the print media still

accounted for three quarters of the gross value added of the media subsector.

- Within the subsector M&C technology there was a pronounced shift away from producer companies in favour of distribution firms. In 1992 more than one third of gross value added was accounted for by distributive firms specialising in M&C technology.
- Within the subsector communication services there was a marked increase in the contribution made to value added by DP service companies. Even so, in 1992 the postal and telecom services still accounted for more than three quarters.

One striking trend is the decline in value added as a proportion of the value of gross output in all subsectors

Table 3

Foreign Trade in Media and Communications Goods, 1980 to 1992

in DM billion at current prices

	West Germany						Germany
	1980	1982	1984	1986	1988	1990	1992
Exports							
Media	1 798	2 031	2 572	3 355	3 805	4 696	5 228
Print media	1 445	1 605	1 853	2 235	2 547	2 861	3 132
Electronic media	353	426	719	1 119	1 258	1 835	2 095
M&C technology	14 937	18 136	22 726	28 011	29 070	33 817	30 613
Consumer electronics	4 547	5 098	5 829	7 793	9 328	10 660	9 194
Telecommunications equipment	2 526	3 282	3 656	3 979	3 987	4 825	5 229
Office machinery, EDP	5 231	6 863	10 057	12 791	11 802	14 050	12 060
Photo-technology/photo-chemistry	2 633	2 893	3 184	3 448	3 953	4 282	4 130
Communications services ¹⁾	1 317	1 679	1 823	2 096	2 362	2 540	3 560
M&C goods total	18 052	21 846	27 121	33 462	35 237	41 053	39 401
Share of total exports (in %)	4.9	4.9	5.4	6.1	6.0	5.8	5.8
Total exports	368 730	447 830	502 530	545 550	582 930	712 700	680 160
Imports							
Media	1 330	1 388	1 782	1 983	2 746	4 173	5 765
Print media	623	654	750	780	964	1 182	1 410
Electronic media	707	734	1 032	1 203	1 781	2 991	4 355
M&C technology	13 566	16 525	23 050	26 579	32 512	42 916	48 296
Consumer electronics	4 570	5 501	6 941	7 888	10 356	15 063	14 351
Telecommunications equipment	1 066	1 417	1 603	1 778	2 668	3 436	4 651
Office machinery, EDP	5 581	7 143	11 758	13 989	15 845	20 420	24 900
Photo-technology/photo-chemistry	2 349	2 464	2 749	2 924	3 643	3 998	4 394
Communications services ¹⁾	1 036	1 759	2 029	2 329	2 524	3 420	3 780
M&C goods total	15 932	19 672	26 861	30 891	37 782	50 509	57 841
Share of total imports (in %)	4.5	5.0	6.0	7.2	8.3	8.8	8.8
Total imports	356 320	393 550	445 730	430 240	454 840	574 340	656 000
Exports minus Imports							
Media	468	642	790	1 372	1 059	523	-537
Print media	822	950	1 103	1 456	1 582	1 679	1 723
Electronic media	-354	-308	-313	-84	-523	-1 156	-2 260
M&C technology	1 371	1 611	-325	1 432	-3 442	-9 100	-17 683
Consumer electronics	-23	-403	-1 112	-95	-1 028	-4 403	-5 157
Telecommunications equipment	1 460	1 866	2 054	2 201	1 319	1 388	578
Office machinery, EDP	-350	-280	-1 701	-1 198	-4 043	-6 370	-12 840
Photo-technology/photo-chemistry	284	429	435	524	310	284	-265
Communications services ¹⁾	281	-80	-206	-233	-162	-880	-220
M&C goods total	2 120	2 174	260	2 571	-2 545	-9 456	-18 440

1) International payments transactions related to postal and telecommunications services.

Sources: German Bundabank; Federal Statistical Office, DIW calculations.

since 1980. The difference in the rates of growth of gross output and value added is due primarily to an intensification of the division of labour between firms and the resulting decline in the extent of vertical integration of production processes within firms. The process of shifting value added shares downstream was particularly

pronounced among producers of M&C technology and suppliers of communications services.

In 1992 value added per employee in the M&C sector as a whole amounted to around DM 92 000, 15% higher than for the German economy as a whole. In the media sector, and particularly among the electronic media, this

indicator of productivity has increased more rapidly than in the economy as a whole. Productivity growth in M&C technology, on the other hand, is slightly below average. Productivity growth in the subsector communications services was markedly lower than the overall trend.

Both the exports and imports of M&C goods increased sharply between 1980 and 1992. However, while there was scarcely any change in the "export share" (exports as a share of gross output), at 13% in 1992, the "import share" (imports as a proportion of "domestic supply"⁶ increased from 12% in 1980 to 18% in 1992. The import share is highest among M&C technology goods; the 1992 figure was 49%. There was a particularly sharp rise in Germany's foreign trade deficit in M&C goods following the accession of the former GDR. In 1992 the total deficit amounted to DM 18.5 billion. This reflected a deficit of DM 2.2 billion on electronic media, of DM 17.5 billion on M&C technology and a positive balance on print media and telecommunications equipment.

Conditions for the development of multimedia markets

The new range of multimedia goods and services on offer will, over the coming years, lead to profound changes in the ways private households and firms use the media and in their demand for information. Overall domestic demand for M&C goods will increase, partly by a process of substitution for the demand for "old" M&C goods. An important distinction needs to be drawn between so-called off-line and on-line multimedia goods and services:

- In the case of off-line systems, the services and programmes (e.g. reference works, learning programmes) can be used interactively and are stored on a medium. By means of digital compression and rising storage density, the quality of supply will increase enormously compared with the current systems and will increasingly be able to incorporate video sequences.
- On-line multimedia involves the interactive use of programmes and services that are offered by external computers (so-called servers) and which can be called up via the telephone line or wireless forms of telecommunication. A distinction needs to be made between systems which merely permit the selection from a very large number of TV-channels and genu-

ine interactive services offering individual access to stored data (e.g. video-on-demand) or services linked to communications services (e.g. electronic sales catalogues with the option of placing an order directly by computer).

Numerous barriers on both the supply and demand side must be overcome before such services can be used on a broad scale, however. Technical problems remain, particularly with regard to on-line multimedia for instance, the problem of developing sufficiently powerful servers. Moreover, in addition to the technical enhancement required for the terminal appliances (television sets, PCs, etc.) in private households, firms and educational and training establishments, substantial investment will be required to run interactive programmes and services including video sequences on the existing telephone and cable television networks. In Germany the pace of expansion will depend primarily on the behaviour of the Telekom AG which, unlike in most other western industrialised countries, owns not only the public telephone and data networks, but also a significant proportion of the cable TV networks. Experiences in other countries suggest that by selling these networks competitive pressure could be increased and with it the pace of innovation. Another barrier to the rapid market introduction of digital programmes is the lack of a standard for the invoicing system in the digital decoders (the so-called set-top boxes), in which two groups of suppliers are currently at an impasse.⁷

Uncertainty surrounding the legal situation is also serving to delay development. The problems of data protection and data security need to be regulated in the case of on-line services, in particular financial transactions. The current debate on blocking specific services in the Internet has also drawn attention to the problems of varying national legislation to protect young people and differences in criminal codes in the face of transnational on-line services. Similar problems apply to national differences in copyright laws. A further problem requiring urgent solution is the form currently taken by radio and television regulation in Germany. At present any new on-line service subsumed under the rubric "radio and television" must pass through a laborious licensing procedure. This problem is particularly thorny as it is the federal states that are responsible for that: thus for services offered at national level 15 independent state bodies have to reach agreement. This time-consuming licensing procedure, not least in comparison to the print media – which in legal terms also

⁶ Domestic supply equals domestic output plus imports minus exports.

⁷ The set-top box is an additional appliance necessary to convert digital signals into the PAL norm or other formats, and contains the software necessary to select and pay for individual programmes and services.

incorporates the multimedia off-line service –, can only be justified with respect to the aim of ensuring a diversity of opinions. Consequently, in future the procedure should be restricted to programmes that, in terms of their content and the number of users, are relevant to public opinion. A single, central regulatory body for Germany as a whole would also be much more efficient.

Last but not least, the development of multimedia markets will depend on the acceptability of services to and the financial resources of customers. There is a dilemma involved here. The demand for multimedia services and for the corresponding technical equipment depends on the cost and the quality of these new services. However, the price reductions derived from mass production and large-scale investment by suppliers in network infrastructure and programme production are not to be expected until a sufficiently large market potential has been identified. Thus strong market expansion is only likely to occur after a start-up period lasting several years, once a certain threshold value has been reached. For the reasons already mentioned the off-line multimedia market is likely to reach this point before the market for on-line multimedia.

Domestic demand for M&C goods to the year 2010

Over recent decades there has been a steady increase in expenditure related to media and communications as a proportion of private consumption. In the private sector, too, the costs involved in optimising internal and external communications processes, obtaining external information and external presentation via advertising, public relations etc., has grown. The use of modern media and communications technology in the public sector, by contrast, is still at a relatively low level.⁸

According to calculations by the Prognos AG, in 1992 the domestic demand by private households for M&C goods amounted to around DM 103 billion. This figure includes total spending on M&C technology, media products (including electronic games) and post and telecommunications charges. In the same year the private and public sectors together spent around DM 211 billion for M&C goods. This figure includes expenditure on advertising, sponsoring, trade fairs, exhibitions etc.

The trend scenario for the demand for multimedia is based on the following assumptions on supply trends and the pace of diffusion:

- the fundamental technical problems and standardisation issues for off-line multimedia and for an extended range of tv channels in digital technology will be solved in 1996, and those for interactive on-line programmes and services in 1998;
- the regulatory framework will be adjusted to the new requirements by 1997;
- the degree of acceptance and the financial conditions are most favourable in the private sector, whereby the pace of diffusion will be faster among large concerns than among small- and medium-sized enterprises;
- while the potential for applications in the public sector is also large, financial constraints will retard diffusion;
- there are no fundamental financial problems with respect to private demand, although the change in media utilisation and communication behaviour will proceed only gradually.

Allowing for possible substitution effects exerted by the new multimedia products and services, overall domestic demand for M&C goods will, on the above assumptions, be 70% above its 1992 figure (in current prices) in the year 2000 and 210% higher in 2010. Demand by the private and public sectors (+215%) will expand slightly more strongly than that of private households (+200%). Thus the increase of demand in the public and private sector will exceed the expected growth of the economy as a whole (+200%), while the growth of private demand for M&C goods will exceed the expected increase in private consumption (+180%).

Impact on domestic output and employment

Not all of the increase in demand will be reflected in rising demand for goods and services produced by the domestic M&C sector. In particular, a significant proportion of the distribution services will be rendered by firms that do not specialise in M&C goods. In addition, a considerable proportion of spending on advertising and sales promotion is not destined for the media, but for other sectors of the economy.

Besides these considerations, the model calculations with the help of which the impact – in terms of its order of magnitude – of the forecast demand trends on output and employment in the M&C sector are to be determined were based on the following assumptions:

- no major changes occur in the distribution structure, i.e. the relevance of wholesalers and retailers for the various M&C goods;

⁸ M&C spending probably accounted for less than 2% of public capital spending and of government consumption in 1992.

Table 4

Gross Value Added by the Media and Communications Sector, 1992, 2000 and 2010

	1992	2000	2010	1992	2000	2010	2000	2010
	DM billion			Shares in %			1992 = 100	
Media	47	75	139	27.0	27.3	28.7	159.6	295.7
Production	41	66	124	23.6	24.0	25.6	161.0	302.4
Distribution	6	9	15	3.4	3.3	3.1	150.0	250.0
Print media	35	52	89	20.1	18.9	18.4	148.6	254.3
Electronic media	12	23	50	6.9	8.4	10.3	191.7	416.7
M&C technology	43	64	99	24.7	23.3	20.4	148.8	230.2
Production	28	42	64	16.1	15.3	13.2	150.0	228.6
Distribution	15	22	35	8.6	8.0	7.2	146.7	233.3
Communications services	84	136	247	48.3	49.5	50.9	161.9	294.0
M&C sector total	174	275	485	100.0	100.0	100.0	158.0	278.7
Production	153	244	435	87.9	88.7	89.7	159.5	284.3
Distribution	21	31	50	12.1	11.3	10.3	147.6	238.1

Source: DIW model-estimations.

- the export shares remain relatively stable as they have done since 1980;
- the import quotas do not continue to rise but remain at their 1992 level;
- value added as a share of gross output in the M&C sector continues to decline, particularly in the case of postal and telecommunications services (where value added still accounts for more than 70% of gross output);
- in most branches value added per employee will expand in accordance with general macroeconomic trends, but substantial productivity reserves remain in the case of the producers of M&C technology products and firms rendering communications services.

Under such conditions the gross output of the M&C sector in current prices would rise by 190% to around DM 1 225 billion by the year 2010. This would be accompanied by an increase in the balance of trade deficit in M&C goods of DM 18 billion in 1992 to DM 51 billion in 2010. Due to the shifting of productive activities downstream, the value added by the M&C sector fails to increase to the same extent as gross output. By 2010 it will have increased by 180% to around DM 485 billion, i.e. not to a greater extent than GDP as a whole.

Under such conditions employment is expected to increase by around 10% to around 2.1 million. The

sharpest relative increase is recorded for the electronic media, although the increase in employment there is almost fully offset by a decline in the number of jobs in the print media. Indeed, because of this effect the number of employees in the traditional media sector will actually decline as a proportion of total M&C sector employment. The proportion of M&C employees working in communication service companies and in the retail trade will increase slightly; the relative number of employees involved in the production of M&C technology will remain virtually constant.

These figures take no account of the employees in downstream sectors whose jobs indirectly depend on the demand for M&C goods. Moreover, additional employment effects will result from the application of M&C technology in other areas of the economy. In a study conducted on behalf of the European Commission, these effects are thought likely to be very positive. On this view the potential for rationalisation inherent in modern M&C technologies helps improve the competitiveness of the European economy to such an extent that the long-term rate of economic growth in the EU rises by 0.2 percentage points to 2.6%. At EU level this would represent around 6 million jobs which, it is claimed, could not be maintained if this technology is not utilised.⁹ According to estimates by the German government, 1.5 million of these jobs could be created in Germany. This, though,

Table 5

Employment in the Media and Communications Sector 1992, 2000 and 2010

	1992	2000	2010	1992	2000	2010	2000	2010
	000's			Shares in %			1992 = 100	
Media	509	520	517	26.7	26.3	24.7	102.2	101.6
Production	424	440	438	22.2	22.3	21.0	103.8	103.3
Distribution	85	80	79	4.5	4.1	3.8	94.1	92.9
Print media	416	393	366	21.8	19.9	17.5	94.5	88.0
Electronic media	93	127	151	4.9	6.4	7.2	136.6	162.4
M&C technology	554	585	623	29.0	29.6	29.8	105.6	112.5
Production	309	315	332	16.2	15.9	15.9	101.9	107.4
Distribution	245	270	291	12.8	13.7	13.9	110.2	118.8
Communications services	845	870	950	44.3	44.1	45.5	103.0	112.4
M&C sector total	1 908	1 975	2 090	100.0	100.0	100.0	103.5	109.5
Production	1 578	1 625	1 720	82.7	82.3	82.3	103.0	109.0
Distribution	330	350	370	17.3	17.7	17.7	106.1	112.1

Source: DIW model-estimations.

requires the rapid diffusion of multimedia, as it is only a lead over a country's most important competitors that can generate the effects described.¹⁰

Summary

In the light of the probable market development of new multimedia products and services, domestic demand for media and communications goods in the year 2010 will be around three times its level at the start of the 1990s. The increase in private sector demand will be somewhat higher than general economic expansion, the rise in private household demand will be slightly higher than the growth of private consumption. This is, however, contingent on solutions being found by 1998 for the technical and regulatory questions that are as yet still unresolved. What is decisive for the pace at which the telecommunications infrastructure will develop is the degree of competitive and innovative pressure. German policy makers can contribute to this by ensuring

that the (still publicly owned) Telekom AG sells off its cable TV networks. It would also seem important to restrict the time-consuming licensing procedure for broadcasting companies to programmes with a bearing on public opinion and to render the regulatory procedure more efficient by setting up a national body to perform this task.

The number of employees in firms producing and distributing M&C technology will expand to a far lesser extent than domestic demand to the year 2010, largely due to productivity growth. Model calculations point to an increase of the order of 10% to around 2.1 million jobs. This means that the significant positive employment effects frequently forecast for the new M&C technologies can only come about if the potential for rationalisation inherent in these technologies is utilised throughout the economy in a rigorous fashion to raise efficiency and international competitiveness. Such competitive advantages can only be generated, however, if a broad-based application of the new multimedia is realised earlier than in Germany's leading competitors.

Wolfgang Seufert

⁹ Cf. METIER, The Impact of Advanced Communications on European Growth and Trade, Final report for CEC, London 1995 (available as a manuscript).

¹⁰ To this end, on the occasion of the G7 conference on the information society held in Brussels in 1995 the seven leading western industrialised countries decided to promote pilot projects in selected application areas (transport telematics, telemedicine, etc.).