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New media technologies in Europe: the politics of satellite, HDTV and DAB

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Introduction

It has been the tradition in Europe to develop media technologies at national level with close cooperation between the state and the private sector, and frequently with competition between different states and their industrial infrastructures. The creation of new technologies mostly occurred within the electric, and later the electronics industry and included studio equipment, transmitters and receivers; it also included those industries supplying equipment to areas such as telecommunications, optics and the aerospace industry. The state has always provided some of the central players, for example, Post Office administrations (Telecoms), research ministries, the military sector and in particular, the public service broadcasters (Flichy, 1994: 164ff, 228ff).

During the 1980's a Europeanization of research and development took place that was accompanied by quick and wide-ranging changes in the development of media technologies. This process occurred on several levels:

- The overall number of broadcasting stations was increased in Europe with the utilization of direct satellite transmission and/or via cable;
- New technologies facilitated European-wide reception of TV;
- For the first time, new technologies were no longer developed at national level (as it was the case with earlier innovations such as colour TV, stereo TV etc.) but through supranational cooperation between electronic companies, with European financing; this was especially the case for HDTV and digital radio transmission.

This paper focuses on three technologies that demonstrate the wide spectrum of the new developments; these are Direct Broadcasting Satellites (DBS), High Definition Television (HDTV) and Digital Audio Broadcasting (DAB). The development of DBS was largely steered by market forces whereas HDTV had been initiated by the EC/EU[1] and other European institutions such as EUREKA; DAB is being developed with European support in a limited number of EU countries (Kleinsteuber and Rossmann, 1994: 116ff).

1. EC refers to the European Community, EU describes the European Union, as the EC was renamed in 1993. The events that are being analyzed here, happened mainly at the time of the EC. If only the EU is concerned, this abbreviation is used.

Satellites

Satellite technology started as a result of the technological rivalry between the Soviet Union and the US with a strong emphasis on military applications. At the beginning, Europe was not a serious actor. In 1962, for the first time, the US satellite TELSTAR transmitted transatlantic TV images: in 1965 the US began regular satellite broadcasting. From 1964 until the 1970's, INTELSAT, which was US-controlled and which operated worldwide, transmitted to Europe. Europe itself remained passive and even Canada had launched communication satellites long before the Europeans. During the 1970's, however, Europe was haunted by the spectre of the 'American challenge'. This led a number of countries to boost their policies and spending on media technology in order to avoid dependency on the US. Initially satellite projects were still national (TV-SAT, TDF), followed later by European activities, partly at government (EUTELSAT), partly at commercial level (ASTRA) (Jahnson, 1993, Collins, 1992).

To get away from INTELSAT, European satellite projects, backed at first by the European Space Agency (ESA) began to move forward. Satellite TV started in Europe in 1978 with the orbital test satellite (OTS) of ESA, a low frequency Telecom satellite, designed to serve cable stations. In 1977, EUTELSAT had been set up by eighteen Telecom administrations as a European satellite operator, launching communication satellites of its own from 1983 (ECS-F-1 and F-2) (Ostergaard, 1986). As early as 1984, France had put its first national satellite into orbit; this was built by Matra and named TELECOM 1. Since then French satellites have been supplying the former French colonial territories with TV programmes.

At that time, it was thought that European technological self-sufficiency would be achieved by a completely new satellite specification which was aimed not only at catching up with the Americans but overtaking them. This was the direct transmission satellite (DBS) which bypasses cable systems and beams TV programmes directly into homes (Direct-to-Home, DTH). It featured a low number of transponders, a national 'footprint' (transmission radius) and high powered signals so that – leaving cable aside – a relatively small dish antenna would be needed for reception. The 1977 World Administrative Radio Conference (WARC) allotted the necessary frequencies. Prototypes of this line were the German TV-SAT and the French TDF with five channels each, followed by the British Marco Polo and the Swedish Tele-X.

Let us take the German example. In 1977, several large firms from the German electronics and aerospace industry were commissioned to develop the first DBS specification. The concept of DBS reflected the aim of the then social-liberal government coalition to minimize the number of new channels in order to safeguard public service broadcasting, but, at the same time, to demonstrate German 'high tech' competence. In 1981, the Federal Republic and France agreed on coordinated DBS development. The first satellite TV-SAT 1 was launched in 1988 but, owing to technical defects, was a total failure. TV-SAT 2, TDF-1 and TDF-2 went into orbit in 1990 with several channels of TDF not working. As part of government satellite policy, these satellites were tied to the D2-MAC policies of the EC (see below) and thus limited in their influence. At the end of 1994 TV-SAT ended transmission of TV programmes, demonstrating that this specification had been developed outside of market considerations and was no longer of much use.

Because satellite policy was under the direct control of EUTELSAT and the national Telecoms, competition could only come from outside Europe. A consortium of US origin entered the field with an American built, hybrid type satellite under the formal charge of the Grand Duchy of Luxemburg (Noam, 1991: 299 ff). Its special characteristics were a large number of channels, a pan-European 'footprint' and the potential for DTH reception. At that time, this advance met with bitter resistance from European Telecom administrations and was only finally accepted because the project was set up with capital from a European consortium. The Société Européenne des Satellites (SES), established in 1985, comprised financial institutions, banking houses and TV producers from the Federal Republic, Luxemburg, Sweden, Denmark, Belgium and Great Britain (Ahrens, 1992; Kleinsteuber, 1991).

The first SES satellite, manufactured like all others in the US, was ASTRA 1 A, launched at the end of 1988 with sixteen and later, eighteen channels. After a test period, it turned out to be an absolute winner. By November 1994, a total of four satellites had been placed in orbit with up to 68 channels. More ASTRA launches are planned for 1995-96: the first all-digital satellite will start transmission in 1995. Prices for ASTRA antennas have dropped in recent years and are now as low as ECU 200 or less. According to ASTRA figures, their satellites serve approximately fifteen million households throughout Europe with up to six million in Germany. (There is a high penetration in East Germany, because of the lack of cable TV). In Eastern Europe, too, ASTRA has a large, although hardly measurable 'shadow' clientele. ASTRA holds approximately ninety per cent of the DBS market and is thus almost in monopoly position.

Table 1

PENETRATION OF NEW MEDIA IN WESTERN EUROPE 1993
(SELECTED INDICATORS)

State	TV Household in millions	Cable connections in 1000s	Cable penetration in %	Satellite TV Receivers Number
Aus	2.99	967	32.30	max 500,000
Bel	3.80	3,725	98.00	10,000
DK	2.30	1,323	57.30	65,000
Fin	2.15	780	36.30	15,000
Fra	20.45	1,206	5.90	max 350,000
Ger	min 33.40	13,116	39.30	max 4,200,000
Gre	3.09	min	min	2,000
Irel	1.00	400	40.00	max 50,000
Ita	20.30	min	min	max 100,000
Lux	0.14	117	81.40	1,500
NL	6.20	5,700	92.00	max 250,000
Norw	1.05	642	36.60	max 160,000
Port	3.14	10	0.32	100,000
Spa	11.35	749	6.60	150,000
Swe	3.84	1,931	50.30	325,000
Swi	2.47	1,908	77.10	max 40,000
UK	22.08	504	2.28	2,662,000

Source: *Cable and Satellite, Europe*, 1994, 1: 56-65

The first ASTRA channels were leased by the Murdoch group for its Sky project that later changed into the present British Sky Broadcasting (BSkyB) system, mainly a package of DBS pay programmes. Meantime, nearly all German and British commercial programmes are being transmitted via this satellite system and also an increasing number of public TV offerings (ARD, ZDF, German Third Programmes, 3Sat and others) (Zimmer, 1993). In fact, ASTRA satellites serve not only the two most profitable European markets (Germany and Great Britain) including relevant markets on the periphery (Austria, parts of Switzerland, Ireland), but have achieved an immense lead over its main competitor EUTELSAT (Schmitt-Beck and Dietz, 1993). ASTRA is the pacemaker in European satellite development and very much ruined the strategies of the European Telecoms. The German Telecom accepted the new situation; while remaining part of EUTELSAT, it bought a large share (17 per cent) in ASTRA's SES company in 1994.

The essential characteristics of the emerging European satellite system are very much the opposite of what were the declared goals of EC media policy:

- ASTRA's satellites have been produced in the US and do not support Europe's space industry;
- the operator is a private consortium (SES) outside of any effective European regulation;
- the new DBS transmission norm decided upon by the EC is D2-MAC, but ASTRA continues to work in PAL (see below).

ASTRA's success marks a completely new situation in Europe. Until its emergence, new broadcasting technologies had been decreed 'from the top', based on an alliance of industry, Telecoms and public service broadcasters. With SES though, a different type of commercial operator arrived that may choose to refuse any politically desired technical

standards, if it does not suit its commercial interests. It does not seem possible to impose regulations on ASTRA, a fact which had been warned against at an early stage but was ignored (Taishoff, 1987). The establishment of SES in Luxemburg is only formal, some programmes for Britain (BSkyB) for example have never been licensed.

EUTELSAT is the only recognizable competitor of ASTRA. It transmits TV programmes (about forty) on seven satellites, but is, for the most part, a supplier for cable networks. EUTELSAT employs DBS satellites which operate, however, from a different orbital position and have no chance against those from ASTRA which has a market share of about ninety percent in Europe. In 1996 EUTELSAT plans to launch two digital DBS satellites of the HOT BIRD type (EUTELSAT, 1993).

Satellites and digital television

Current plans are for a new type of 'digital television' to be introduced within the next few years. This will not take the form of an all-digitalized line of transmission between studio and screen, but the digital transport of images fed into conventional (i.e. analogue) TV sets. The advantage lies in the fact that via the channels already available – cable or satellite – a considerable number of programmes (up to ten per channel) can be transmitted. An ASTRA satellite with eighteen transponders now would then be able to deliver up to 180 programmes.

It is evident that there is hardly any room for further expansion of advertising on commercial television in Europe. Further programme services are therefore planned through subscription TV, including pay-per-view; teleshopping channels are also in the pipe-line. For payment a simple feedback mode is planned which will work as a digital signal via the telephone network. In order to introduce the new technology in Germany, the firms of Bertelsmann and Kirch – which, together with Canal Plus, run PREMIERE, the only Pay-TV channel on the German market – established a joint venture with the German Telecom, named Media Service GmbH (MSG) at the beginning of 1994. The economic power thus brought together by the three largest media actors has been sharply criticized and the EU banned the project in November 1994.

Other European actors like Burda, Bauer, CLT have continuously attacked this scheme and started their own planning, based more on terrestrial networks and the American concept of interactive television. An international consortium, including Matra-Hachette, the Pearson group and Burda will introduce Europe Online, modelled on America Online (run by Meigher Communication, which is also participating) and offering interactive services, based on computer transmission.

For a long time, there were no substantial EC/EU policies which reflected these new developments. Until recently, the EC separated planning and organization for the media from telecommunication policies, as the different general directorates in charge show. Since the 1980's the EC has been very active in European telecommunication policies and has sought harmonization, liberalization and universal access (Steinfield, Bauer and Caby, 1994; Mansell, 1993). These guidelines had been inspired by pan-European business enterprises with the aim of improving European management communication. Over the years, the EC has been active in planning and financing different initiatives (KOM, 1994). Nevertheless, national Telecoms and their often conflicting interests in Europe remain the leading actors. In June 1994 the so-called Bangemann Group presented a paper calling for an integrated European broadband network, in order to connect all telephone, cable and satellite networks via common transmission standards.

In Europe, it now seems to have been realized also that digitalization is leading to a convergence of communications and media technologies, thus eliminating any differences between sound and image, text and data as they all travel via the same binary signal. The need in Europe for new and efficient networks – as the Maastricht treaty particularly underlines – is undisputed and certainly part of a strategy of bringing Europeans closer together. Yet, the logic of networks is always bound up with the

particular interests of different actors and so far the development of media networks has been mainly stimulated by large national actors with a tendency towards centralistic and hierarchical structures.

A comparison with the US is evidence for this. The improvement of media 'Superhighways' there has usually begun with terrestrial networks being 'scaled up' digitally and some interactive capabilities being introduced (MediaGruppe, 1994). Interactivity as a concept is taken from the logic of computer networks, which work on a server-client basis (like Internet). The advantage of the concept of interactivity is that viewers get various options for feedback signals, e.g. for e-mail, access to on-line databanks, individually selecting electronic newsmagazines or they may even participate as active senders (Neumann, 1991). Digital communication technologies are interpreted in the US above all as 'Technologies of Freedom' (Pool, 1983), adding to the media a completely new quality of strengthening the individual, enlarging his range of choices and offering the chance of becoming personally active and thus less dependent on the existing media agglomerates.

Comparing these concepts with the leading plans in Europe, a fundamental difference appears. Satellite channels of the ASTRA type are not suited for interactivity, they only allow uni-directional communication. This supports the strategy of the largest European media companies, like MSG, which prefer a technology that offers 'more of the same', as such providing more conventional TV channels. The situation is quite different in the US, where the telecom and computer (hardware and software) industries are on the move to build up the digital and interactive media structures of the future in order to take market share away from the conventional broadcasting industry (mainly the three large networks) (Kleinsteuber, 1994a). As was mentioned, European actors are choosing the 'American Way' also, as the Europe Online example shows.

New television transmission standards: HDTV

HDTV was developed in a 'high-tech triad' that included Europe, Japan and US. As a technology, HDTV represents the next generation of TV technology which entails at least a doubling of the number of lines that make up the TV picture (Kleinsteuber, 1994, Bischoff, 1993). TV's history may be seen as a succession of stages, each one characterized by an increase in the number of lines. During past decades, TV screens were made larger but the density of lines remained the same. Increasing the number of lines looked like a natural solution (HDTV in Japan 1125 lines, Europe 1250). The resulting HDTV image can be projected upon a much larger screen; the image is more detailed and is presented in wide screen format (16:9 ratio). The quality of reproduction, or so the promoters argue, parallels that of the cinema.

HDTV with its greater number of lines needs larger channels for signal transmission, at least as far as the analogue method is concerned (Prentiss, 1993, ZDF, 1991). That is why, earlier on, HDTV had not been designed for terrestrial broadcasting but only for digital satellite transmission (Japan) or for digital satellites with cable distribution (Europe). Only the US gave consideration to terrestrial transmission whereby the original channel remains and a second independent channel transports the additional HDTV signals.

HDTV, to be sure, conforms to common physical and scientific laws. Nevertheless, practical application in the three high-tech regions mentioned above disclosed certain peculiarities to be allowed for, as for instance the availability of frequencies in the electro-magnetic spectrum, geographical conditions, population density. Different traditions and experiences as to government policies concerning technology, industry and standards have to be taken into consideration as well. Last but not least, the parties and persons concerned with the development of technical innovations are very different indeed. Over the years, changing coalitions and competitions have appeared in the 'high-tech triad' in the tradition of 'capitalistic rivalries' as we know it from other fields of high technology (Hart, 1992).

HDTV experimental work was initiated in Japan where research in the field of new TV technologies had been going on since the 1960's. As a central actor there emerged the public-service broadcaster Nippon Hoso Kyoka (NHK) whose laboratories started around 1980, and which sought cooperation from interested Japanese private firms (NHK, 1992; Kenji, 1990). The result was the development of a Japanese HDTV specification, called Hi-Vision/Muse, based mainly on an extension of the conventional analogue technology. Since 1990, receivers for HDTV have been on the market, but they are extremely expensive and up to 1994 only about 20,000 have been sold. One HDTV programme via satellite has been offered on an experimental base for several years.

During the early 1980's, Europe watched the Japanese efforts with growing scepticism. The electronics industry had been confronted with the fact that a large share of the market for hi-fi equipment was being lost to producers from the Far East. In light of the Japanese success on the US market for TV sets, it was suspected that the same would happen to European manufacturers. The European market had been protected because patents for PAL and SECAM were only selectively passed on to Japanese competitors whose share of the European TV set market in 1986 was just fourteen per cent. But gradually these patents were going to expire. The EC started to react when, at the 1986 CCIR conference, the Japanese urged the introduction of global HDTV specifications, based on their HiVision. HDTV was declared a key technology for Europe that had to be developed independently from Japan. Preconditions for any European HDTV policies would be incompatibility with Japanese standards and the exclusion of the Japanese from research (Meyer-Stamer, 1994; Niblock, 1991).

In Europe, too, preliminary studies for new TV technologies had been made, starting with Great Britain in the late 1970's. The engineering division of the Independent Broadcasting Authority (IBA) developed the system Multiplexed Analogue Components (MAC) to be applied mainly in DBS satellites as a transmission technology to avoid colour distortion in TV images. In 1986 the European Broadcasting Union (EBU) stipulated that MAC was to be the new European standard for all future DBS projects. In the same year, the EC issued a directive according to which member states were committed to applying MAC exclusively in all DBS satellite transmissions. During the following years the European Council and the EC repeatedly announced the urgent need for the introduction of an all-European HDTV service.

A particularity of the European approach to HDTV was that the introduction was to be in two stages with compatibility between each. According to these plans, first D2-MAC (in Great Britain D-MAC) would be introduced with improvements in quality of image and sound, and in wide screen format (16:9), but with conventional density. During the second phase the number of lines would be doubled to 1,250 to provide for HD-MAC. Both specifications were planned to be partly digital, the actual transmission to continue to be analogue.

Beginning in 1986, HDTV received massive government sponsorship. Within the scope of the EUREKA programme, project EU 95 was set up with a capital input of ECU 625 million for research and development in support of HDTV. The consortium was headed by the two electronic companies Philips of the Netherlands and the French state controlled corporation Thomson; forty firms from ten countries participated.

A number of other EUREKA projects – Bischoff in his analysis counts eight – also related to HDTV (Bischoff 1993: 126). The JESSI programme (EU 125) was to bring European industry up to world standard in the development of computer chips. To safeguard HDTV policies, the RACE programme tested glass fibre cables in a 'fibre-to-home' structure to feed HDTV programmes. Parts of the MEDIA scheme for the advancement of audiovisual production and distribution in Europe were made ready for an early start to HDTV. Europe's filmmakers were encouraged to employ HDTV in film production. By the end of 1991, more than DM 800 million had been spent on the promotion of MAC via EU 95 (Bischoff, 1993: 153). There was also national HDTV promotion: i.e. in the Federal Republic, the two ministries responsible for research and telecommunications, had contributed approximately DM 100 million by 1992.

In the following years, HDTV was styled a prestige European project and the European Commission gave generous public relations support. 'The Commission is helping to ensure that the Community has an integrated HDTV strategy, involving all the different industries which must work together for the successful introduction of HDTV services in the 1990s.' (KOM, 1991). On the initiative of the EC, interested parties from the electronics industry and programme providers came together in 1990 to found 'Vision 1250' which was to promote the production of HDTV programme material. The Olympic Games of 1992 in Barcelona were the chosen occasion to demonstrate for the first time the whole range of HDTV technology and to offer HDTV programming to the public.

Nevertheless, the project was ill-fated once the adoption of MAC-generation had been declared an absolute European necessity in order to end the split between PAL and SECAM standards. In fact, national solutions were tolerated – Great Britain pushed through its incompatible variation named D-MAC. The two leading actors Philips and Thomson, sponsored mainly by their home governments, were both badly prepared and in economic difficulties; it was argued that EC capital helped to restore them both to health.

But the major handicap was that the transition to MAC had been virtually decreed by the EC 'from the top'. Those who were supposed to benefit most from HDTV, the television broadcasters, were hardly interested. Public service broadcasters feared to be deprived of their accustomed leading position in developing new media technologies, but they were obliged to face giant investments despite growing financial problems. Notwithstanding their legitimate problems and reservations, they were expected to obey and cooperate on these matters of political concern.

On the other hand, the 1980's in Europe had witnessed the growth of a new commercial TV industry which maintained an attitude of blunt rejection of HDTV. This industry had just introduced TV funded by advertising at high financial risk and did not want to bother with the uncertainties of new technologies. The president of the Association of Commercial Television (ACT), Werner Klatten, stated in 1992: "The procedure of the Commission concerning D2-MAC was typical of the idea of harmonization by regulation and is, thank God, a failure" (European Institute for the Media, 1992: 18). Moreover, we know from the US example that commercial TV suppliers prefer an attitude of strong technological conservatism. Accordingly, the leading commercial satellite company ASTRA and large programme suppliers like Murdoch's Sky Television stuck to conventional PAL which became the dominant DBS norm. Those holding on to D2-MAC such as the users of the German-French DBS satellites (of the TV-SAT type) or the British commercial DBS project BSB suffered heavy losses for lack of adequate decoders and significant consumer interest.

The outright rejection of D2-MAC by commercial broadcasters created a difficult situation for the promoters of HDTV. In a 'Memorandum of Understanding' of August 1990, the German TV suppliers, the electronics industry, Telecom and the Ministry for Post and Telecommunications were more or less forced to come to an agreement and support the introduction of MAC.

What looked like a perfectly organized action similar to previous successful strategies by the EC was contradicted by the reality that ASTRA and PAL continued to dominate the market. The appliance industry was quite right in assuming that there was no mass market in MAC and took time in offering reasonably priced sets. Some programmes were indeed additionally transmitted in D2-MAC via DBS satellites and Telecom cable, but this strategy – like the whole concerted action – seemed to be at a dead end. Similar results have been observed in other European countries, especially in Great Britain and France (Niblock, 1991: 59ff). In 1991, the first D2-MAC sets produced by Thomson came on the market at a price of approximately DM 10,000. In 1993 the price dropped to DM 3,000. During the first two years, according to information from the manufacturers, 'a few thousand wide screen sets' had been sold in Germany (*Wirtschaftswoche*, 20 August, 1993: 60).

The main opponents to the adoption of the MAC specification were, as the example above shows, the commercial programme-makers and satellite suppliers. Faced with their delaying tactics, the EC tried to use its authority to force a breakthrough of D2-MAC, a policy much associated with the commissioner responsible, Pandolfi. In several powerful actions the Commission prepared a directive according to which all new suppliers of satellite programmes would be obliged to transmit in D2-MAC and all large TV sets would be equipped with D2-MAC decoders. In a 'Memorandum of Understanding' the EC tried to get all parties concerned to accept this line. The EC planned a new five year scheme with a budget of ECU 850 million to subsidize programme production in wide screen 16:9 format and transmission in D2-MAC. This implied that satellite programmes were to be transmitted in D2-MAC at EC expense: a parallel service for the audience in PAL ('simulcasting') could remain (KOM, 1992a). Cable systems were to be provided with D2-MAC as well. From 1991 onwards, Philips, Thomson and the French Ministry for Research exerted pressure to ban PAL altogether after 1994.

These EC policies were formed at a time when it had already become clear that D2-MAC could be nothing more than a transitional standard, and the whole MAC system seemed to be more and more out of line with developments elsewhere. For the first time opposition arose in the European Parliament against HDTV policy, mainly from environment and consumer associations who objected to the amount of money spent on HDTV.

The MAC strategy of the EC as it had been drawn up in 1991/92 collapsed despite enormous concessions made to TV broadcasters. The major opponent of the plan had been Great Britain, an EC country with little domestic electronics industry, but a relatively large number of Japanese affiliates and also home for most commercial transnational TV broadcasters in Europe. Britain did however show interest in EC subsidies for its own industry, mainly for the development of genetic engineering. The meeting of the European Council in December 1992 put an end to the MAC-led policy. In January 1993 Philips announced a complete stop in the production of HD-MAC sets (Understanding and Outlook, 1993). At the end of 1994, transmission in D2-MAC via TV-SAT ended in Germany.

In mid 1993 the Telecom ministers of the EC managed to convince Britain to agree to the following arrangement: during the next four years, ECU 228 million were to be made available to support programme development for wide screen TV (16:9). The new EC commissioner Martin Bangemann, successor to Pandolfi, announced rather vaguely: 'Many exciting new television services – including high definition television – will be introduced on to the market over the next few years, but the wide screen 16:9 standard will be common to them all' (quoted in *Broadcast*, 25 June, 1993). The British consented because the European subsidiaries of Japanese firms will be allowed to participate, which is particularly relevant to Sony.

The EC policy concealed the fact that other less spectacular efforts were being made in Europe. The EC had offered its support to a group of mostly large companies and gave them publicity, whilst small firms and research institutions received hardly any attention. A very small consortium from Scandinavia, though, managed to develop a digital HDTV specification of its own named HD-Divine (Digital Video Narrow-band Emission) for just DM 6 million.

Another new foundation is the European Launching Group on Digital Video Broadcast in Europe (ELG/DVB), comprising the EBU (i.e. public-service broadcasters), European Telecoms and representatives of the electronics industry. This group is aiming to introduce a first version of digital television in 1995 (BMPT, 1993:5) with the main focus, it seems, on digital compression. Here, too, EC money has been made available for grants in the region of DM 500 million for a programme called Advanced Digital Television Techniques (ADTT).

Public service broadcasters in cooperation with the electronics industry are the driving force behind a further development of conventional technology which seems to conform better to the market: PALplus. It carries on the PAL standard in an evolutionary and compatible way. PALplus transmission will be analogue on 6 Mhz as part of conventional terrestrial service, but will also offer the 16:9 standard for images with better quality by a progressive build-up of the 625 lines together with improved sound. Developments are being carried on by, among others the German ARD and ZDF, the British BBC and the Dutch NOB. In 1994 films were first shown on German TV in PALplus on ARD, ZDF and the pay-TV channel PREMIERE. Transmission will be subsidized by approximately DM 450 million under the wide screen programme of the EU mentioned above.

Digital HDTV in the US and Japan

During the 1980's an understanding prevailed in the US that, because of a lack of domestic producers of TV technology, an independent HDTV policy was not possible. At times Japanese or European developments were supported and adaptions to the specific situation of the US planned (e.g. possibility of terrestrial transmission). Initiatives for separate American HDTV developments were started in the late 1980's, and, unlike Europe, were accompanied by a broad public discourse in the academic community and hearings before different committees of Congress (Prentiss, 1993; CasaBianca, 1992; Benson and Fink, 1991). American investment in HDTV was seen as an instrument of industrial policy, serving the recovery of key segments of the economy and securing America's future. There was strong demand for subsidies for HDTV by members of the Democratic party in Congress (amongst them the then Senator Al Gore), but any active HDTV policy was refused by the Reagan and Bush Administrations. In consequence, HDTV development remained on the agenda in the US, but received almost no government support.

In 1987, the FCC (Federal Communication Commission – eds.) began procedures to clarify the technical and legal aspects of HDTV and invited applications to present a HDTV standard by mid 1990. Independent institutes were to check the bids and select the best choice. Japan applied with a version of their HiVision/Muse and withdrew later, the Europeans Philips and Thomson joined American companies in a large consortium. Two days before the final deadline a small American high-tech firm announced its bid for an all-digitalized standard, i.e. a standard based on computer technology.

The resulting tests demonstrated that digital HDTV is going to be the solution of the future; it offers a simpler, more flexible and more reasonably priced alternative to the analogue specifications of Europe and Japan. In 1994 a 'grand alliance' was formed of large US firms together with Philips and Thomson to develop a final version of digital HDTV, scheduled to be demonstrated in 1995. American plans are to utilize the emerging digital 'information superhighway' for HDTV transmission.

In Japan HDTV of the HiVision type has shown very little growth. But any proposals to stop its spread have been attacked and put down so far. On 25 November,1994 a regular HiVision programme via satellite was introduced, jointly produced by NHK and commercial broadcasters. Wide screen TV of the PALplus type has been introduced in Japan with much more positive reaction from consumers.

Digital Audio Broadcasting: the technical and economic side

An innovative step in radio technology was developed in the 1980's to counteract a number of technical deficits in analogue FM transmission:

- FM transmission is subject to interference on mobile receivers (cars etc.). In addition, interference is increasing on account of the growing density in the range of FM frequencies and the heavy use of all kinds of electronic appliances.

- The FM signal is clearly more efficient than the earlier AM signal, but still cannot compete with the hi-fi quality of digital signals. In combination with digital audio storage already available (e.g. on CD-disc), digital radio would reach 'state-of-the-art' standard, and be able to compete with home CD recorder.

Digital Satellite Radio (DSR) was first presented to the public at the Berlin Broadcasting Fair (Internationale Funkausstellung, IFA) of 1989. It offers selected radio programmes of digital quality transmitted either via satellite or cable. DSR is now mainly used for programmes of classical music from public service broadcasters, and for a small number of commercial programmes. At present the Hamburg cable system has sixteen DSR channels. DSR tuner equipment is available at prices from DM 500 upwards. Up to now, though, DSR penetration is only minimal.

Preliminary consideration was given to terrestrial digital transmission in 1980 and initial testing started in 1985, mainly at the Institut für Rundfunktechnik (IRT) in Munich, a joint subsidiary of the public service broadcasters in Germany. In 1986, for the first time, the German Ministry of Research and Technology (BMFT) got involved in order to bring together industrial representatives of different states in a joint European research and development project. Since 1987, the development of DAB has been promoted on a large scale within the framework of the EUREKA project EU-147. During the four years 1987 to 1991, ECU 40 million was invested; for the second phase 1992 to 1994, ECU 35 million have been made available (according to information given by the EU-147 project office).

The Federal Republic has sought the position of initiator and chief promoter of DAB. A number of German electronic companies, public research institutions, Telecom and the IRT are taking part, together with partners from France, the Netherlands and Great Britain. The German Research Ministry (BMFT) contributed DM 30 million to the first development phase.

DAB standards were set up 'in cooperation with public radio/TV institutions of the Federal Republic of Germany' and are as follows:

- A high quality digital transmission mode, capable of lasting for the next fifty years and with options for multi-channel sound fidelity and data transmission (data radio).
- Unrestricted mobile, portable and stationary reception; perfect reception to be ensured for portable sets and in moving cars.
- A system with high transmission capacity for data channels to allow for broadcasting of additional information, i.e. traffic information, programme data, radiotext (DAB-Platform, 1994).

The initial intention in the Federal Republic was to broadcast DAB on Channel 12 (223-230 Mhz), formerly a channel for military use. Channel 12 could also be used for DAB in some neighbouring Western European countries. In Eastern Europe this channel is being used by high powered TV stations which cannot be easily allocated a different frequency. With a capacity of four frequency blocks with six programmes each, Channel 12 will not suffice to convert all current stations to digital transmission. Therefore, and with respect to the Eastern European situation, it is planned to include TV channels in sector 1 (channels 2-4) as well. The latest plans are to utilize the high frequency L band that may take eight to nine channels and about fifty programmes.

The development of media technology seems to be less an answer to consumer demand than a response to industrial politics. What counts are new industrial markets and behind the often publicly stated concern for job creation lies the profit motive. The German Post Ministry has revealed figures which support this assertion. Their predictions claim that, since new multi-norm radio sets will be needed, the DAB system offers European industry a mass market of approximately 600 million radio sets which require highly sophisticated chips (16 M and 64 M technology). To facilitate DAB and FM

radio during the starting phase, sets will be offered as multi-norm receivers. The annual output is estimated at about DM 500 million.

Actors in DAB

Dominant among the organized interests in DAB are the producers of equipment relevant for the production, transmission and receiving of digital radio programmes, all being part of the electronics industry. Another important actor is the German Telecom, responsible for a large part of all radio transmitters, yet concerned with little else but transmission 'hardware'. It is significant that DAB is being pushed by the Federal Republic's public service broadcasting system which has a long tradition in paving the way for new technical specifications in the media field, for instance stereo radio or Radio Data Systems (RDS). As far as technology goes, public service radio has traditionally been open to innovation and is attempting to continue this policy in the age of dual competition. This also is in line with their obligation (as stated by the Federal Constitutional Court) 'to safeguard a basic supply not only with respect to the contents but also to the distribution of programmes'.

In addition public service broadcasting partly transmits its own programming and consequently employs technical experts and supports the IRT, which is central to the development of DAB. It turns out though that the leadership of the highly decentralized public service broadcasting organization is split on DAB, some strongly supporting it (for example, Bavarian Broadcasting, Bavaria also being a centre of the electronics industry), others being more reluctant and not participating in the DAB-Platform (see below). Sceptics argue that DAB experiments exceed the public sector's financial means whereas commercial competitors might have the use of it later. Indeed, it may well be that public service broadcasters are going to take the technical and financial risks but be left empty handed when it comes to turning it into profit; partly on account of insufficient financial means needed for marketing and partly because politicians might hinder economic actions.

The competing lobby organization of the commercial broadcasting industry (VPRT) shows an attitude of watching and waiting. They clearly have reasoned thus: 'the development of DAB is of primary importance to industry. European equipment producers suffer sales losses and need ready markets.' Still in the process of establishing new commercial radio stations in the country, they show technological conservatism and have little enthusiasm for DAB.

So far, only the German music industry, i.e. the producers of CDs and the holders of music copyrights, have openly demonstrated scepticism towards DAB. They argue that music offered in digital quality via DAB to every household keeps the consumer from buying their 'stored music' on CDs and instead supports home recording on Digital Audio Tape (DAT). They also foresee many conflicts in the field of music copyright with DAB broadcasters. Their interests seem to go against the introduction of DAB.

On the political side, the Prime Ministers of the German Länder have the sole responsibility for broadcasting in Germany. They issued their first statement in March 1993, according to which legislation for DAB and its particularities should clearly incorporate the existing dual system and must account for different 'Länder-wide', regional and local radio stations. All existing stations of the FM band should be offered the possibility of DAB transmission, and room should be left for future radio stations. As reasonable as it sounds, this demand can hardly be met by DAB, as it is technically bound to blocks of six transmission channels and has only limited frequency space. The legal and regulatory side of DAB is still unclear, this being a central reason why the introduction of DAB has been postponed in Germany.

DAB Platform e.V.[2]

The German partners actively interested in DAB, formed an alliance in the form of the national DAB-Platform e.V. It was established by the Ministry for Research and Technology (BMFT). The membership of approximately fifty represented public and commercial radio stations, Telecom, industry and research institutes. The board chairman is Dr. Frank Müller-Römer, a key figure for DAB, who is based in the public service Bavarian Broadcasting company (Bayerischer Rundfunk). The Platform's declared aim is to continue pilot projects of DAB in 1995 and to introduce it publicly at the Berlin Broadcasting Fair of 1997.

The Platform is organized into four working groups with respective responsibilities for (1) testing and field work, (2) network planning, (3) reception and (4) strategies for introduction. It is striking that no measures have been instituted to include consumer interests or even market research.

Special interests of the car industry

The Radio Data System (RDS) currently allows for digitally coded information to be transmitted inaudibly and parallel to the radio programme, identifying the station. In essence, each digital service is a system for data transmission. Therefore it is possible to deliver a range of additional information, e.g. to transmit still pictures to accompany radio news or detailed meteorological maps on small LCD displays. Thus, data radio is bound to bring about new commercial applications and legal problems which need clarification. Important support for DAB has come from the car industry which is interested in this data aspect.

With support from the EU, several projects are on-going to replace the conventional type of traffic announcements on radio by a data intensive traffic information system which feeds an on-board computer. By supplying current data, it is intended to give motorists individual guidance as to by-passes, slowdowns, obstructions etc. either on a small screen or as spoken text. Experiments are under way to utilize a Traffic Message Channel (TMC) with a capacity for approximately sixty messages per minute which will supply motorists with individual multi-language information (called Pilot '93). These experiments actually pack digital information into conventional analogue radio transmission.

The TMC method will be adopted and further advanced by DAB and will also be available as a data service to interest groups such as the taxi and rent-a-car business (DAB-Platform, 1993: 22 ff). This actually means that radio technology might be somehow taken over by the car industry. The TMC developments are competing with other projects initiated by the same lobby, e.g. transmitters installed alongside main roads of highly urbanized regions or traffic guidance via infra-red signals. Obviously, the employment of these new technologies for traffic control will lead to, as an advertisement of the car radio producer Blaupunkt says, 'the intelligent car on intelligent roads' or, according to the same advertisement, 'if we cannot multiply our roads, we should at least make better use of them'.

European developments

In Great Britain, the BBC has had a stake in DAB developments from the very start. A DAB Forum was set up by the different interested bodies and the BBC participated in a steering group (DAB-Platform, 1994: Appendix 10). In addition the Radio Authority, newly established by the Broadcasting Act of 1990, has called for the introduction of DAB. In comparison to German DAB promoters, some detailed aspects are given different importance. For instance the question of a global standard is of much greater concern and so is the idea of holding on to parts of the FM and AM band 'for an unlimited period'. The attitude towards technology in general is more discriminating,

2. Eingetragener Verein (e.V.) is a registered association (eds.)

less deterministic and less built on the notion of automatic technological progress. Above all, the technical aspect should not be paramount, they have argued.

The European Broadcasting Union (EBU) regards DAB as the next generation of radio technology and is mainly concerned with getting necessary frequencies. To this purpose a World Administrative Radio Conference (WARC) was set up in 1992. The conference then allotted transmission frequencies for satellite sound broadcasting to different world regions (DAB-Platform, 1994, Appendix 10; the EBU has also been publishing a DAB newsletter since 1993).

Strategies to introduce DAB in Europe follow the traditional alliance of public actors (public service suppliers and Telecom) and the hardware producers in the electronics industry. Commercial radio suppliers are still reluctant if not opposed. The VPRT comments on this point:

> The past taught us that technical innovations succeed on markets only if consumers realize a distinct additional useful effect for themselves and accept the costs for it as reasonable. Special emphasise is to be put on the importance of compatibility which, in the case of DAB versus FM transmission does not exist. Misunderstood pressures of timing must be opposed in view of the proper relevance of development, introduction and market orientation. To start off with transmission norms for the sake of industry and competition cannot but end up in failure. The EC commission ought to be prevented from interfering by passing 'DAB regulations' (DAB-Platform, 1994: Appendix 17).

First pilot projects in DAB have already started in Bavaria (DAB-Platform 1994a). In 1995 more will commence, most of them testing mobile radio reception. Covering all of Germany with digital audio programming is estimated to cost about DM 500 million (DAB-Platform, 1994: 13)

Conclusion

This analysis did not cover all aspects of European media technologies, but the sample should have demonstrated that Europe follows basically two patterns in the introduction of new technologies. The first one, represented by cable and satellite is steered mainly by market forces and/or national media politics. In the case of cable this has resulted in an extremely uneven distribution of cable in different parts of the continent, reflecting a high degree of decentralization. If we take satellite, we find that the market is dominated by the one company, ASTRA, that established itself as a commercial enterprise beyond the reach of European regulation. The result is a centralized structure, supplying practically all of Europe via a number of DBS satellites.

The introduction of HDTV and DAB follow the old European tradition of 'top-to-bottom' policies. A consortium of influential participants got together in order to push through 'their' technology which is purposely incompatible with all formerly established specifications. It appears that technology is to be accepted as a benevolence rather than by conviction. Enforcement strategies are mingled with prohibitions and seemingly strict regulations. For example, starting from a fixed day in the new millennium, DAB is to be the new exclusive audio technology. Almost one hundred years of radio history will come to an end: all older receiver sets will be useless.

For HDTV as well as for DAB it seems that the technology is given high priority and is being worked on by a group of interested manufacturers and organizational users. Economically this may be defined as an innovation cartel; politically it is an elitist European group, seeking mutual agreement. Their scheme for the introduction of new technologies seems highly non-transparent. Neither in theory nor in reality do consumers as prospective final users come anywhere into the process of planning. They

are to be confronted with a 'ready to wear' technology which they are expected to be enthusiastic about, purely on account of the technical achievement. They have never been included in the genesis and design of the new technologies.

Public discourse about the need for new technologies is clearly avoided. An open and critical discussion – as took place in the US on HDTV – seems to be considered neither desirable nor acceptable. There has, of course, been some information available on HDTV and DAB, but only in well spaced portions via public relations material, in sophisticated brochures and at orchestrated public exhibitions. In practise it is almost impossible to get information about technical problems or about conflicts amongst those who foster or attempt to block the introduction of the new technology (and therefore it is difficult to draw conclusions as to the quality of the technology and the technical alternatives).

If we analyse available and familiar technologies we come to realize that there is not only 'one' unalterable technical solution for a current problem, but instead different paths of development can be followed up. (Television with its regional standards like PAL, SECAM, D2-MAC etc. is a vivid example). A comparison of the specifications for HDTV and DAB proposed in Europe and the US goes to show that the respective American version is much more open structured and adjustable than the decision-based European model. As a solution for digital audio transmission a US consortium is proposing an 'in-band' technology (or: FM-DAB) that allows for a gradual conversion to the digital age. The US already demonstrated in the case of HDTV that they can make better use of the flexibility of digital technologies than the Europeans. In the end it all depends on how the market reacts and it seems doubtful if a massive breakthrough in technology will be appreciated, as is common in Europe. PALplus has to be mentioned as an exception here.

The funding for HDTV and DAB research came from a variety of public sources: mostly taxpayer's money, distributed on the national as well as on the European level; in the case of DAB subscription fees for public broadcasting were also used. Is it acceptable to use public financial means for a limited purpose such as DAB? The question must also be raised if this type of HDTV or DAB policy really does serve the interests of European producers. In any case, the risks of private ownership are borne by the public, which clearly collides with the deregulatory and liberal rhetoric of present European politics.

It is not fitting for the outgoing twentieth century to indulge in technology policies which have been planned almost in conspiracy within an elite circle, 'from top to bottom'. In the past, too often this did not work well. A more objective and impartial approach to technology policies should be based on the following four principles: (1) The integration of critical expert knowledge in the planning process is highly desirable, to ask for expert opinion is the absolute minimum. The proposals outlines from the advocators which are usually much too optimistic should be compared to more realistic and, consequently more pessimistic reports from independent experts. (2) Technology policies must be made more transparent: current policies can only be examined if the financial sources are clear, if interested parties act publicly and technical alternatives are laid open. (3) Another prerequisite should be an examination of new technologies by an independent body. At present, inventors and investors are also responsible for final tests on the ultimate applicability of new technologies. Instead, a public and competitive testing of new technologies should be required, before technologies are launched and norms are declared binding. (4) Most technological innovations stem from small peripheral organizations – companies, research institutions etc. Large actors tend to think in large-scale terms and attempt to protect their dominant position in conventional technologies. Therefore they often develop less innovative technologies. Particularly in Europe small inventors are often cut off from public funding and support, partly because they lack bureaucratic experience to reach financial 'honey pots', partly because they are not taken seriously by large actors and bureaucracies.

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