

Liberalization and integration

Pathways to a trans-European network in telecommunications

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In a discussion of the telecommunications industry, the authors focus on the European Community's objective of liberalization and integration – goals which they consider 'only partly compatible' – and the frameworks within which they operate: standardization and harmonization. In examining the developments of policies in these two areas, the authors identify different interests and different Community strategies in each case.

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Increasingly, the European Commission demands that the construction of a European infrastructure should be looked upon with urgency. Without trans-European networks the realization of a common market seems hardly possible or at least will not show the results so urgently desired. The concern for European infrastructures has also found its imprint in the Maastricht treaty which demands in article 3n and articles 1296-d that the Commission should concern itself with the construction and further development of trans-European networks.

The most important types of infrastructure to be considered by the Commission are without any doubt telecommunications networks. They not only transport all kinds of information from one point to another, but they also serve as an informational infrastructure for other transport networks. The Commission has repeatedly reported that one of the main aims of the Community's telecommunications policy is to create a telecommunications infrastructure based on a harmonized and integrated network covering the whole of Europe. In the past, the

Commission started initiatives in such fields as broadband communication and mobile telephones as well as initiatives concerned with the regulatory framework and technical specifications for a common infrastructure. The approach adopted by the Commission is not without problems, however, and far from being consistent. Indeed, two broad strategies of the Commission can be distinguished. One aims at promoting common EC standards that guarantee interoperability and a harmonized European network, at least at a minimum level. The other strategy aims at the development of an integrated network with a specified set of services and organizational rules. While the first strategy allows for some competition between technological approaches and organizational designs, the second strategy is reducing the available options to a common set of prescriptive statements. The first strategy controls variances through standardization; the second strategy aims directly at harmonization and uniformity. Both strategies have their pros and cons, but they also might be considered as complementary.

In our paper we analyse examples that highlight the different strategies. In one example we examine EC efforts to coordinate and accelerate the introduction of ISDN, reflecting an active policy approach. The other example focuses on the establishment of the European Telecommunications Standards Institute (ETSI) as the central institutional element of a strategy which aims at developing common European standards without prescribing a material infrastructure. The two strategies have important linkages. Euro-ISDN needs standards for its realization to be developed by ETSI. ETSI needs the support of the traditional actors in telecommunications, especially the network operators, to fulfil its purpose. This linkage, however, also has its problems. Euro-ISDN is oriented towards the old network operators and their vested interests; ETSI and the standardiza-

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tion initiatives are oriented more towards a liberalization and thus a disempowerment of the old actors. By analysing the two examples, the possibilities as well as the limitations of both strategies on the way to a trans-European telecommunications network will be discussed.

European standardization and integration

Early standardization initiatives

From the beginning of the European integration process, harmonization of the member states' quality, safety and environmental regulations as well as product standardization at an industry level has been seen as a crucial means to remove internal barriers to trade in the common market.¹ But harmonization and standardization is even more necessary and almost a prerequisite when a trans-European technical infrastructure is developed. Such an infrastructure, providing road, railway, air transportation, electricity, gas and telecommunications systems, has been explicitly characterized by the Commission as the backbone of an integrated market.

In telecommunications it is evident that at least some degree of interoperability of the national networks is required to facilitate transborder communication of voice, text, data and pictures. In Europe as in most other parts of the world, however, national telecommunications systems developed in isolation from each other. Though functionally equivalent, the components of each network differed in their technical specifications. As a result, international services were typically provided on the basis of bilateral agreements between the network operators, most of whom were public administrations or regulated monopolies.² The administrative parts of the agreements detailed the procedures for collecting and apportioning tariffs, whereas their technical parts defined the operating procedures and technical arrangements to achieve compatibility of the networks at the network interconnection points. As internetwork traffic was minor in comparison to intranetwork traffic, compatibility requirements were secondary and virtually did not extend into national networks.

Traditionally, the necessary provisions for international telecommunications in Europe were arranged by the CEPT, the European Conference of Postal and Telecommunications Administrations. Created as an interadministrative body by a diplomatic conference in 1959, the CEPT was an exclusive domain of the traditional postal, telephony and telegraphy (PTT) administrations. On a consensual basis it developed technical standards necessary

for network interconnection, formulated common tariff principles and dealt with other relevant issues to be settled among the PTTs (long-range planning, common position in international fora, etc). The CEPT was not restricted to the members of the European Community (EC) but included EFTA and other European countries. The PTTs were satisfied with this institutional arrangement since – as some kind of 'gentlemen's club' – it gave them great freedom. Delegates used to work in subcommittees which met every six months, while a plenipotentiary session which defined the working plan of each subcommittee was held every two years. Any difficult decision on which a consensus could not be found would be delayed to the next subcommittee meeting six months later.

With the Commission of the European Community (CEC) gradually entering the telecommunications arena in the early 1980s, the old constellation came under pressure. Building on technological, regulatory and industrial political arguments, the Commission demanded increased efforts to standardize telecommunications technology. These efforts were initiated at a meeting of Ministers for Industry in November 1983. A Senior Officials Group Telecommunications (SOG-T) was established to propose actions which should help 'to overcome the major handicaps which inhibit the development of telecommunications and hinder the Community to take full advantage of the opportunities offered by this development'.³ Though not confined to them, these actions included steps towards more efficient and more comprehensive standardization in telecommunications.

In July 1984 a Memorandum of Understanding (MOU) concerning standards and type approval was signed between the CEPT and the CEC. Its main focus lay on telecommunications terminal equipment because here the CEC saw an opportunity to establish a Community-wide market in the short term. The CEPT would produce common standards and specifications for type approval in 'priority sectors' such as teletex, telefax group IV, videotex and mobile telephony. Telephone handsets were excluded because they were defined by the PTTs as integral parts of the public telephone network like cables or switching devices and therefore from the PTTs' point of view not subject to competition policy.

Although the Commission did not share the PTTs' opinion, insisting that member states' telecommunications authorities were commercial undertakings supplying goods and services for payment, it concentrated its influence on initiating measures to

accelerate and improve type approval in the priority sectors. The activities resulted in a Council directive from July 1986 on the initial stage of the mutual recognition of type approval in this area.⁴ On the basis of common conformity specifications drawn up by the CEPT in the form of a European telecommunications standard (NET), every terminal that had passed a certification procedure according to the NET in one state would be recognized in the other member states. General principles for standardization laid down by a Council decision at the end of 1986 demanded European standards and technical specifications to be compatible with those issued by international standardization bodies.⁵

The Commission's efforts to initiate standardization and harmonization mainly within the existing institutional framework were not very successful. The powerful PTTs, often in accord with the national governments, managed to defend their national domains, and the CEPT turned out to be not very easy for the Commission to control. In the period from 1983 to 1986, however, the Commission at least achieved its goal of creating awareness and strengthening its position in this new sectoral policy domain.⁶ EC actions in telecommunications were perceived as legitimate, and they were supported by a growing number of organizations and firms in the member states and at the European level. They saw an opportunity to provide or use a wide range of new or better-quality services in a technology field which was characterized by a growing overlap of telecommunications and information technology.

Institution building

In parallel, and as a significant feedback to the early activities of the Commission and the Council in telecommunications, the 1992 (Internal Market) process began to unfold. The ratification of the Single European Act in 1987, a cornerstone of this development, added new EC competences to the Treaty of Rome. One of the new goals proclaimed the creation of a European Technology Community and a research and development (R&D) framework which to a large part addressed telecommunications activities.

In order to establish guidelines for European telecommunications policy in this context and to forge alliances for deregulation and liberalization, the Commission issued the *Green Paper on the Development of the Common Market for Telecommunications Services and Equipment* in Summer 1987.⁷ Unlike the earlier actions in telecommunications, the Green Paper received wide recognition and support from most of the parties involved. This

is the direct consequence of the awareness-building policy of the EC and a change in the environment: the USA had divested AT&T in 1983, the UK had privatized British Telecom in 1984 and had licensed a competitor, Mercury, who entered business in 1986. Japan had also privatized NTT and opened competition in 1985. The Netherlands, France and Germany were preparing reforms.

The key provisions of the Green Paper aimed at deregulation and increased competition, although the continued provision of the network infrastructures and basic services by the existing national telecom administrations under a monopoly regime remained unchallenged. In the domains of enhanced services and terminal equipment, however, the Green Paper fostered radical liberalization. It also called for a separation of regulatory from operational activities of the PTTs.⁸

In this context the necessity of common standards and technical specifications was stressed several times. To be competitive, standards should be neither national nor proprietary. Telematics standards should be in line with the Open Systems Interconnection (OSI) architecture, which was developed by the International Standards Organization (ISO) and supported by the International Telegraph and Telephone Consultative Committee (CCITT). Standards drafted by the CEPT or the other two relevant European standardization organizations, the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (Cenelec), could achieve the status of a European (telecommunications) standard (EN or NET) when they met some minimum requirements. In telecommunications these general 'essential requirements', to be detailed by the Commission, were:

- user safety;
- safety of employees of public telecommunications network operators;
- protection of public telecommunications networks from harm;
- interworking of terminal equipment.⁹

From the perspective of the Green Paper the question not only of how, but also of what, to standardize was crucial. Efforts would not be restricted to terminal equipment but would extend into the area of technical – including software – components of telecommunications networks and services. Close cooperation was needed between the CEPT and CEN-Cenelec in order to maintain coherence of standards relating to either telecommunications or information technology. Industrial organizations, users and, of

course, the Commission should be able to influence the agenda and the process of standardization. An Information Technology Steering Committee (ITSC) made up of representatives from the standardization organizations and the CEC as an observer was one element while industrial standardization groups such as SPAG (Standards Promotion and Application Group) and ECMA (European Computer Manufacturers' Association) with direct connections to CEN-Cenelec were others which were able to exert influence directly. In addition, on the basis of an agreement with CEN-Cenelec from 1985, the CEC could commission these organizations to carry out the necessary technical work for the preparation of an EN standard. The placing of orders for such work involved financial support.

The idea of establishing a new standardization institution seemed to play only a minor role in the Green Paper. It was very cautiously proposed when the Commission considered the growing need for financial resources in an accelerated and more comprehensive process of standardization:

It is now time to consider together with CEPT and CEN-Cenelec the best way to establish industrial working methods based on permanent teams, including an increased contribution by industrial and user experts. . . . The only efficient solution for creating a permanent basis will be the establishment of a stable physical centre. Such a *European Telecommunications Standards Institute* could provide the core functions on which the acceleration of standards work can be based. In this way it would create the institutional conditions for a strengthening of the current framework of cooperation of the telecommunications administrations and industry within CEPT and CEN-Cenelec.

Surprisingly, there was a broadly favourable reaction to ETSI. The majority of those national and European interest groups, business associations and other organizations which commented on European standardization and ETSI supported the idea, but at the same time stipulated 'openness' of such an institute to a broader range of interests. ETSI should not be controlled by the PTTs or the CEPT and should allow participation of the industry and the users. In a rather definitive move, CEN-Cenelec rejected the establishment of a new standardization institute, however, because it would reinforce the position of the PTTs claiming separate standards for terminals in public networks, and would generally contribute to continuing the split between a public and a private telecommunications domain with different standards for equivalent or identical functions. In CEN-Cenelec, since it was the most appropriate organization for European standardization, all in-

terested parties could participate and cooperate on a consensual basis. Therefore, instead of establishing ETSI, all activities aiming at European standards should be concentrated in CEN-Cenelec.¹⁰ But through this move the organization had manoeuvred itself out of the game.

This left much room for the CEPT which had already in September 1987 taken a basic decision to establish ETSI by April 1988. In fact, it began operation in May 1988. Whereas the CEPT's initial plans concerning the new institute entailed a notion of tight control, it was anticipated that this would not be acceptable to the CEC. A so-called Group of Reflection within the CEPT came to the conclusion to open ETSI to all interested parties including the CEC, but to retain the institute's formal independence from the Commission.¹¹ On the basis of individual membership, all European organizations having an interest in the creation of European telecommunications standards can participate in the process. From about 270 members in the first half of 1991 almost two thirds were manufacturers (62%), 15% were public network operators, 10% were administrations and national standards organizations, 9% represented users, and 4% were research organizations and others. Non-European organizations can be invited as guests. The CEC and the EFTA secretariat have the status of counsellors.

The technical work is done in technical committees and their subcommittees, working groups and *ad hoc* groups. Technical committees may set up project teams to work full-time on a draft standard so that solutions are found within months rather than years. Besides the General Assembly, ETSI's main governing body, the Technical Assembly, is the highest authority. The Technical Assembly approves standards, prepares the work programme and organizes the work, which includes the installation of technical committees or project teams. Decisions upon standards and most other matters are based on a system of weighted majority voting instead of consensus. In the Technical Assembly as well as in the General Assembly members are grouped in national delegations with France, Germany, Italy and the UK having ten votes each, Spain eight votes, Belgium, Greece, Netherlands and Portugal five votes each, Denmark and Ireland three votes each, and Luxembourg two votes. From the EFTA countries, Sweden and Switzerland have five and Austria, Finland and Norway three votes each. Usually a majority of 71% of the votes is required to adopt a proposal. Although voting is done on a national basis, ETSI rules do not specify how a country's vote is to be determined. They only state

that the views of the different members shall be taken into account in order to arrive at a national position.

The technical committees have a high degree of autonomy in their area of responsibility. They decide when a draft standard is ready. From the beginning, the emphasis here has been on the individual member, with no role whatsoever for national groupings. Where industrial and commercial obstacles are preventing an initial agreement in these committees a resolution is sought, on the merits of the technical case. Therefore it is hardly surprising that the technical committees and their subgroups still rely on consensus; at least, they are supposed to endeavour to reach consensus on all issues, including the approval of draft standards. If no consensus can be reached indicative voting may take place.¹²

ETSI's common operating costs are financed by the member states' telecommunications administrations. All members contribute to cover the expenses of the agreed work programme and the project teams involved. Special projects and activities carried out on a contract basis are also financed by the members or by the counsellors, especially the CEC. The already mentioned Council decision from December 1986 entitles the Commission to determine 'the priority standardization requirements with a view to the preparation of work programmes and the commissioning of such European standards and functional specifications as may be deemed necessary to ensure the exchange of information and data and systems interoperability' (Art. 2). ETSI is open for standardization mandates from the Commission. Therefore the CEC does not have to wait and see which standards emerge, but can and does entrust ETSI with the development of required standards.¹³

The CEPT transferred almost all standardization and technical specification work to ETSI, but remains a relevant actor as far as the coordination of commercial PTT interests in the area of public networks and services is concerned. Compared with the situation 'before ETSI', however, the influence of the PTTs on standardization has been considerably reduced. CEN-Cenelec's activities have remained widely unchanged. They are coordinated with ETSI through the ITSTC. But not all jurisdictional conflicts between ETSI and CEN-Cenelec, especially in the field of private networks, can be regarded as resolved. ETSI has already gained a recognized position in the global setting of international standardization organizations in telecommunications. This is exemplified in the results of the Fredericksburg conference in 1990, which coordinates the work of the CCITT and the regional

standardization organizations TI (USA, North America), TTC (Japan, East Asia) and ETSI as the relevant European partner.¹⁴

With the establishment of ETSI the CEC has laid the institutional foundation for the production of standards which can help to secure interoperability of existing, and more so of future, telecommunications networks, network components, terminals and services. Standardization is not exclusively controlled any longer by the powerful PTTs and public network operators. Other interested parties, mainly manufacturers of telecommunications equipment, but also users, can participate. Also, the CEC itself has direct access to standardization, either in the role of a counsellor or as an initiator of standardization mandates.

An indicator of the relative success of ETSI can be seen in the current general debate on a reform of the production of standards in Europe. In October 1990 the CEC presented a Green Paper on the development of European standardization.¹⁵ In this paper the Commission – partly implicitly and partly explicitly – treats ETSI as an institutional model for efficient European standardization. ETSI's open membership structure, its decision rules (qualified majority and not consensus) and its industry-specific orientation are repeatedly referred to. But also what Temple¹⁶ calls 'managed standards making' is stressed by the Commission; ie programme-oriented standardization with the assistance of full-time project teams under strategic review.¹⁷

Compatibility standards as policy tools

The Green Paper on standardization repeats the Commission's well-known position that diverging national standards, even when compliance is voluntary, are barriers to trade because they create incompatibilities. Fragmented markets in the EC hamper competition and reduce economies of scale. European companies may therefore become less competitive in world markets. From this point of view the problems are doubled in the area of telecommunications. Telecommunications networks and their components are not only devices that can be produced and sold in internal and external markets; they also serve as an infrastructure for services of information transmission and exchange. They therefore have an encompassing significance for European integration.

To function as a European infrastructure, national or proprietary networks must interoperate. In the Commission's perspective, a precondition for interoperability is the existence of European compatibility standards. With ETSI an institute is available to produce these standards. The most liberal variant of

integration through standardization would be to create the institutional essentials for European standardization (like ETSI) and then wait for the appropriate standards to emerge. Especially in network technologies, where developments tend to be path-dependent,¹⁸ once a technological base has been installed operators hesitate to switch to new standards.¹⁹ Therefore, within a short period of time, network integration through adoption and implementation of new standards would be highly unlikely.

As a consequence, the Commission started to initiate the development of certain standards through contracts with ETSI and also Cenelec. The resulting European standards still remain rather weak, although it is mandatory for the EC member states, or more precisely their standards organizations, to adopt the European as national standards. As long as there is no legal determination, manufacturers, operators and other addressed organizations are not obliged to comply with the European standards. As with regular national standards, compliance is voluntary, and installed base restrictions as well as strategic considerations of competing organizations may retard implementation. Therefore, compatibility standardization without supporting measures would stay a rather inefficient policy tool.

Two strategic options are, at least in theory, available to achieve compliance with standards. The first is to create standards very early in the process of technological development. As a result, their implementation may not cause additional (switching) costs and, if respected by all interested organizations, may even significantly enhance the opportunity to build up a large infrastructural system in a cooperative way. The other option – not necessarily substitutive but complementary – entails measures which require economic or legal resources. Procurement power, for example, can compel manufacturers to comply with standards which are imposed by the client. PTTs and comparable public enterprises could use this instrument as long as they dominated isolated national markets. Therefore, on the basis of a Commission's proposal, the Council issued a directive in September 1990 which also aims at influencing public procurement procedures towards compliance with European standards. In Article 13 the 'contracting entities' are obliged to include in contracts technical specifications, which shall be defined by reference to European specifications including standards.²⁰ This directive, which is legally addressing public procurement, sets economic incentives for manufacturers to conform with European standards.

Standards, however, can also be directly imposed on those who produce and install or operate telecommunications networks and their components. The most prominent case of this direct approach is embedded in a Council directive from June 1990.²¹ The so-called Open Network Provision (ONP) directive 'on the establishment of the internal market for telecommunications services through the implementation of open network provision' uses European and international standards as a tool to open the member states' public networks for the establishment or improvement of transborder services and to facilitate the (competitive) provision of services, especially by private firms within the public network(s). ONP stipulates that the member states should nationally bring into force the laws, regulations and administrative provisions necessary to comply with the directive (Art. 11). In our context the technical part of this directive is most significant because it should help to yield access to the networks at the termination points.²² This will be achieved through a harmonization of technical interfaces and other specifications on the basis of standards. Only 'a telecommunications organization which complies with the [respective] standards fulfils the requirement of open and efficient access' (Art. 5(2)). The Commission is entitled to request ETSI to draw up European standards as a basis for setting up harmonized technical interfaces and service features. The requirement to implement standards in public networks is frequently a necessary precondition to facilitate interworking and also to technically unbundle or decompose a network into elements which can be produced or provided by independent firms.²³ A European telecommunications infrastructure, when constructed on the basis of harmonized technical specifications, may resemble a patchwork of private and public interconnected islands of services and clusters of transmission and switching devices, but it allows interworking without imposing the restrictions of full integration.

The rather indirect approach towards an integrated telecommunications network through harmonization and standardization transforms the character of coordinative standards (eg compatibility standards). Usually initiated and negotiated in international organizations on a voluntary basis and issued as non-binding recommendations, in the context of the EC some of them are converted into policy tools of the Commission.²⁴ Harmonization through standardization induces a hitherto unknown degree of politicization of international standardization. The Commission can mandate the development of standards through CEN-Cenelec or ETSI, the latter being

the more appropriate standardization body from the Commission's perspective. Included in directives that control or regulate production, installation and operation of networks, the implementation of the mandated standards becomes obligatory. Eventually a multifaceted European network with a satisfying degree of interoperability may result. This type of network clearly differs from the alternative to be discussed in the following section: the ISDN, which has been planned as a highly integrated and in many respects totally uniform European infrastructure.

ISDN and integration

ISDN policy initiation

A FAST research team, the technology assessment brain trust of the EC, stated that in the mid 1980s there existed only one genuine international telecommunications network: the old telephone system.²⁵ This network had become international only in the 1960s and 1970s. For a very limited user group the telex network existed and since 1986 the EC member states were beginning to interconnect their packet-switched data traffic. But there was no true common network for private as well as business users that would connect all EC Europeans with one another. ISDN should become the major network initiative to deal with this problem. The head of the Commission's General Directorate (DG) XIII, Schuringa, believed that in the process of European 'revitalization', ISDN would play a key role for two main reasons. First, as Pandolfi (then Science, Research and Development Vice President) remarked when the first ISDN report was published in 1989: 'ISDN has the potential to develop into an essential component of the new nervous system which the 1992 market so urgently needs' – a telecommunications infrastructure based on a harmonized and integrated network covering the whole of the EC. Second, operating ISDN networks using equipment delivered by European producers would be a good recommendation for sales of European products around the world.²⁶

These arguments clearly demonstrate that the main thrust behind ISDN was the idea to actively generate a new network and to support the European industry. Information technologies were looked upon by the CEC as the most volatile sector of what became known as the 'new technologies'. The image of Europe's backwardness at present compared with its preeminence in the past seemed to be most striking in this case. With respect to telecommunications networks, a modernization of the existing inventory had been under way in virtually all

member states since the late 1970s. Digitization was the key innovation coupled with major technological breakthroughs in the area of data storage and data processing. The EC wanted to seize the opportunity to steer the modernization process in a common direction and, at the same time, fulfil the aims of the 'new' Community of the 1990s: achieving high-tech corporations. Telecommunications seemed to be especially well suited for EC interventions, since it constituted a sector traditionally dominated by public decisions and not by market forces. For strategic reasons the CEC not only overinterpreted the 'crisis' of the European telecommunications industry, but also overemphasized the importance of a new and common telecommunications infrastructure for the European economy. Impressive calculations were meant to show that the (public) telecommunications infrastructure might be the decisive lever for a revival of the European economy.

In its 'Communication on Telecommunications' to the Council in June 1983 the Commission stated that telecommunications was a stronghold of European industry.²⁷ Its strong position, however, was challenged by technological developments, mainly in the field of information technology, closed national markets, high R&D investments and an onslaught by American and Japanese competitors. The Commission predicted that Europe's telecommunications industry would only be capable of dealing with this situation if a European policy was developed which set regulatory guidelines, provided policy aims for a European network of the future, facilitated R&D cooperation, established a truly European market and created new political institutions at the European level. National memoranda sent to the Commission a short time later seemed to confirm the main targets. Six action guidelines were developed, in the context of which ISDN was mentioned for the first time. Here urgent coordination was required because ISDN was supposed to be instrumental for the competitiveness of European industry. The Commission claimed that investments in telecommunications networks were the most important public investment decisions for the decade to come and that, within network planning, ISDN seemed to be the logical next step.

The central role of ISDN was reinforced in a Council recommendation from November 1984 concerning harmonization in the area of telecommunications.²⁸ In this recommendation ISDN was called an especially convenient opportunity for European harmonization. Network operators were called upon to increase their cooperation efforts and to guarantee that all new services introduced after

1985 would be based on a common, harmonized concept and that after 1986 all orders for digital switching and transmission systems should encompass the technical capabilities for integration and should also take into consideration all existing European standards.

The specific ISDN report was finally delivered in 1985, and in April 1986 the Commission proposed a recommendation on the coordinated introduction of ISDN, which was finally adopted by the Council in December.²⁹

The EC Commission recommended to the EC Council:

- that the PTTs apply the jointly developed detailed recommendations on the coordinated introduction of ISDN;
- that the application of the recommendations be concentrated on standards and introduction of the S/T interface, a schedule for the ISDN introduction, and objectives regarding market penetration;
- that the CEPT continue to harmonize activities on the basis of a schedule of ISDN specifications still to be completed;
- that the PTTs take all the measures necessary to facilitate the coordinated introduction of ISDN;
- that the financing instruments of the Community take into account this recommendation;
- that the member-state governments urge the PTTs to apply this recommendation;
- that the member-state governments inform the Commission annually on the measures taken as well as the problems which have arisen in the application of the recommendation.

Of special interest is the operationalization of the aim 'market penetration': it was agreed that by 1993 each member state should ensure that an equivalent of 5% of the total number of telephone subscribers of 1983 were connected to ISDN.³⁰

The proposed measures indeed constituted a broadly based policy programme. They contained policy aims, identified the addressees of the measures, and named mechanisms for achieving the aims of the programme as well as procedures for controlling progress. The aims of the programme appeared realistic, since they were not only agreed upon in a consensual manner but, more importantly, were also based on proposals coming from the national PTTs, which themselves had close contacts with the equipment manufacturers. Thus a conflict between Commission strategies and national strategies was not a very likely prospect. National strategies and Euro-

political strategies seemed to converge easily.

The EC obviously committed itself to a technology-push strategy in spite of the fact that the real need for ISDN, especially broadband, was far from being clear. Even a FAST research team made very cautious comments about the potential demand for new public network technologies. In the same year the American telecommunications specialist Noam noted the paradox that while there seemed to be a general understanding about the importance of ISDN, he could not find a single study dealing with such problems as the economic feasibility of ISDN plans or the eventual acceptance of the new network by the users.³¹

The Commission was an early convert to the importance of ISDN. This was 'early' because at this time no working ISDN projects existed. There were only plans from the network operators, and attempts were under way to standardize important ISDN characteristics at CCITT. The chances for the development of a true European network, therefore, were promising.

The recommendation mirrored the shared conceptions and expressed the interests of the people who had participated in the process so far – people primarily affiliated with the national network operators. The network operators again cooperated closely with their respective national producers. Thus a strategy was developed that seemed to fit the interests of these two main actors and was also in line with EC plans. At the same time ISDN was supposed to work as a barrier against what was seen as one of the main threats to their status: American and Japanese competitors and an American government pressing for European telecommunications markets to be opened up. In particular, IBM and AT&T were considered by some policy planners to be forceful competitors that would endanger the status of European producers.³²

The PTTs were thinking in terms of a new universal network for both private and business users, which would require huge investments, but which also promised substantial revenues in the future. The hardware manufacturers could be more than pleased by these plans: ISDN promised them hardware orders for a long period of time and considerable rewards for their huge investments in R&D. It had become obvious that very few European producers would be able to invest R&D billions in the development of new digital switching and transmission technology. Looking more closely at the negotiation process, it was also tacitly understood that some of the European manufacturers would simply have to go out of business or merge with other

corporations. It was also clear that financial incentives would have to be offered to the less affluent member-state PTTs to introduce ISDN. This found its imprint in the STAR programme.³³ In this sense the negotiation process encompassed some distributive issues, but they were small compared with the overall consensus regarding the direction that developments should take and the belief that everybody participating would benefit from the outcome.

ISDN in the aftermath of the Green Paper

Parallel to the development of the ISDN plans, the consultation process leading to the *Green Paper on the Development of the Common Market for Telecommunications Services and Equipment* substantiated the consensus that the current and future integrity of the basic network infrastructure must be maintained or created. This implied, in particular, a continuing strong role for telecommunications infrastructure and – as already shown in the preceding section – a strong emphasis on Europe-wide standards in this area. It also implied safeguarding the financial viability of the PTTs in order to ensure the build-up of new generations of telecommunications and the necessary levels of investment. Since the EC would not invest much financially in ISDN development, the PTTs were expected to invest billions of dollars in network modernization to guarantee the success of ISDN. Private network operators would hardly be willing to put up the enormous investments necessary.

The first interim report on the introduction of ISDN in the EC, published in October 1988, was not very encouraging.³⁴ The PTTs were well behind schedule, because of ‘technical and industrial reasons’, as the Commission reported. The 1988 SCICON report confirmed that considerable progress had been made towards the introduction of ISDN in Europe, in particular in the availability of switched 64 kbit/s transmission paths.³⁵ The report also clearly identified a number of deficiencies in the various administrations’ plans. Not only was the introduction of ISDN at the national level very much behind schedule when compared with the recommendation of 1986, but its introduction at the international level was also progressing more slowly than planned. In addition, there was considerable variation in the standards being adopted in the various member states. Further initiatives from the Commission and near-market activities by the telecommunications administrations would be needed to ensure the timely and widespread availability of ISDN throughout the Community.

The recommendation that stronger actions should

be taken found its imprint in a new Commission proposal issued at the end of 1988.³⁶ It was approved in July 1989. Several measures aiming to bring the ISDN activities back on schedule were listed. They included speeding up standardization work, to be largely achieved by the newly created ETSI and the signing of a ‘Memorandum of Understanding’ (MoU) between the PTTs.³⁷ In spite of the fact that most of these measures were put into practice relatively quickly (generally by the end of 1990), the Commission and its plans simply came too late. National ISDN networks and trials had been developed using different specifications and non-compatible standards; the equipment industry had remained passive; the technological and institutional environment was changing quickly; and – most important – the whole network market had undergone dramatic developments that were not reflected in the Commission’s proposals. Discussions had moved away from the idea of universal (telephone) networks and now centred on improved data communication via local area networks, metropolitan area networks, private networks and on new developments not related directly to ISDN such as intelligent networks and mobile phones.

The Commission therefore tried to exert more leadership and provide more instruments for a realization of the ISDN programme. Initially, the ISDN implementation was not conceived as a process harbouring serious difficulties, but as something proceeding on its own, based on agreement among the telecommunications administrations. Over the years, problems increased and even newly devised timetables were simply out of touch with the real world. There is no doubt that the Commission tried to cope with the main deficiencies, but its efforts were only partly successful.

ISDN standardization in ETSI should help to overcome national differences in the member states and partly substitute for CCITT standards which offered so many technical options that the application of common standards could not be guaranteed. For this purpose a specific sub-organization, the ISDN Standards Management Group (ISM) was set up. ISM was created at the Third ETSI Technical Assembly (TA) with the purpose of coordinating the preparation of all ETS (European Telecommunications Standards) to ensure that the objective of the MoU could be met. ISM members are the chairmen of all technical committees and technical subcommittees of ETSI responsible for the elaboration of standards. ETSI TA also established a Technical and an Administrative Core Team to support the activities of ISM. In April 1990 a Strategic Review

Committee was set up which was to concern itself with ISDN terminal equipment standardization. This committee also had a political role since its main objective was to gain an understanding of how ETSI could best contribute to the success of ISDN by ensuring appropriate and timely production of standards for terminal equipment.

The initial lifetime of ISM was supposed to be only one year, but it had to be prolonged several times owing to ISM's inability to meet the deadlines. Soon it became clear, however, that despite the new organization and institutional innovations, standardization work would take longer. One specific problem was the intention of ISM to develop common service descriptions for public and private ISDN, which required close cooperation with standards organizations such as ECMA. This attempt already indicated the failure of the Commission's initial PTT-oriented ISDN concept. Any viable ISDN network of the future would have to be constructed on the basis of some kind of cooperative agreement between private and public network operators.

In March 1990 the second report on the progress of ISDN was delivered by the Commission. It stated that 60–70% of the work of harmonization of standards had been completed, thanks especially to ETSI and the procedures governing its work. The report also acknowledged the attempts by the four core countries – Germany, France, Italy and the UK – to interconnect their ISDN networks at an early stage. They were praised as forerunners, and there was still hope that by the end of 1992 all EC member countries would offer ISDN services. The Council, however, also had to admit that new types of action were necessary, such as increased market activities, a user forum (modelled after the North American User Forum, NISF), and a European ISDN atlas. Furthermore, it stressed the importance of cheap equipment as a necessary precondition for the success of ISDN as well as its portability throughout Europe. The EC progress report noted that the few ISDN terminals currently under development would not be capable of connecting to all ISDNs, and that many European suppliers were cautious about future network development.

When the second progress report was published, the consensus on ISDN activities was already shaky. Even within the core group, British Telecom became more hesitant about its support for the ISDN plans. By the time the Council demanded new marketing efforts and the creation of user forums, the UK was already curtailing its activities. This might be interpreted as the familiar trend of substituting EC-sponsored activities for national activities. But more

at the heart of the matter were the pressures coming from liberalization and a tendency to expect quick returns on investment – which seemed unlikely to happen in the case of ISDN. Users were also worried about the growing array of services offered by the network operators. Initially, ISDN was conceived as a new universal network. Meanwhile, a variety of competing networks were under development, as well as services that did not need ISDN. Furthermore, the private networking market attracted more investment than the public one, and there ISDN developments were the exception rather than the rule. Nevertheless, there was still a considerable degree of cooperation among the different organizations, mainly the network operators. Phase 1 services, which were supposed to be offered across all EC networks by January 1993, were also covered by the CEPT MoU and were in the current programme of ETSI-ISM. Phase 2 was expected to be in place by January 1994. No date had been set for phase 3 services (Table 1).

What does the 1992 status look like? Towards the end of 1991 the third EC progress report was published. Without any doubt the mixed evaluation offered in the previous reports is continued here. At the moment, five countries offer commercial ISDN services, another five countries offer pilot services and two countries have no ISDN at all.³⁸

As competition for market shares within the Single Market increases between the more entrepreneurial telecommunications administrations, it may become more difficult for them to fulfil all their commitments. Interconnection of the member states is lagging behind schedule. A variety of differing protocols are being used in international gateways; only five operators use the protocol suggested by the Council recommendation. Little information is available on the range of services provided via international interconnections. The existing implementations of the user–network interface show considerable differences with regard to signalling protocols, addressing mechanisms for terminals and support for supplementary services. Four different plugs are used, although only one has been recommended. Frequently stated reasons for these problems are that not all necessary standards are yet available and that cheap and compatible equipment is not on the market.³⁹ Underlying all these problems, however, seems to be the crumbling consensus on what ISDN will actually mean in the future and what role it will generally play in network developments.⁴⁰

On the positive side, it must be acknowledged that, in spite of being behind schedule, the standard-

Table 1. Timetable for ISDN services.

	Phase 1 (1993)	Phase 2 (1994)	Phase 3 (later)
Bearer services	Circuit-mode 64 kbit/s unrestricted bearer service Circuit-mode 3.1 kHz audio bearer service	Circuit-mode 64 kbit/s unrestricted bearer service on reserved or permanent mode Packet-mode bearer service case A and case B	Circuit-mode speech Circuit-mode 2×64 kbit/s unrestricted
Supplementary services	Calling line identification (CLI) Calling line identification restriction (CLIR) Direct dialing in (DDI) Multiple subscriber number (MSN) Terminal portability (TP)	Closed user group User-to-user signalling Reverse charging Terminal addressing Network-management service PSPDN interworking	Advice of charge services Number-identification services Call waiting Completion of calls to busy subscriber Conference service Diversion service Freephone Malicious call identification Subaddressing Three-party service

ization efforts are impressive. The consensus may be crumbling, but there is still a commitment by all EC members that will lead to some kind of ISDN implementation in all countries; France and Germany are the closest to keeping up with the introduction schedule. The market for ISDN end-user equipment, which totalled only US\$60.1m in 1990, is projected to skyrocket to US\$3.8 billion in 1995.⁴¹

Compared with the initial expectations, ISDN remains at least a partial failure. This is a result of deregulation and liberalization, which seem to be incompatible with the aim of building up a strong European telecommunications sector by central design. This mismatch of political control and market forces has been built into the programme from the beginning. The introduction of ISDN is not only a technological innovation process, it is also a policy process. Contrary to the early phases of electrical power, railway or telephone system development, ISDN like other telecommunications innovations, has been planned as a nationwide and European-wide system from the very beginning. The basis of the planning process in the European countries was the existing telephone monopoly that offered both the central government and its telecommunications administration a focal role in the planning and construction of the network. ISDN plans have been worked out by a tightly knit policy community: a well-established network without much public discussion. Economic considerations were secondary since PTT plans dominated all considerations of development policies. Concepts such as universal access, common architecture and standards mirror the old preconception of the PTTs. Besides, ISDN also seemed to be a very elegant solution on technical grounds. The planners among the manufacturers were pleased because long-term plans by the PTTs could secure profitable and worry-free market

shares in the future.⁴² The EC was pleased not only because of the obvious consensus, but also because of the existence of partners with whom it could conduct a seemingly long-term and reliable policy: public network operators and big business. Thus the Commission was also prepared to guarantee the further existence of somewhat reduced telecommunications monopolies. Concepts based on the old telecommunications monopoly and on the idea of universal access prevented the Commission from looking at technological alternatives that were developing at the same time but with more limited influence of the PTTs.

While the EC talked to network operators, which were identical with the regulators, at the beginning of the planning process, today it talks primarily with the regulators alone as the representatives of the member states. The regulators have increasingly diverging interests from the network operators. They also have a different outlook on network planning. A few years ago, for example, the German PTT and its ministry were proud of themselves for supporting a wide-ranging concept of a universal ISDN network. Today, after the German reform that brought a separation of the regulatory from the operational competences, the ministry as regulator does not even demand that the PTT consider ISDN as an obligatory service.⁴³ Furthermore, the spread of data networks set up by computer companies such as DEC or IBM, and the increasing number of network operators as a result of deregulation, do not only pose a threat to the old network operators but also signify a change in who is important in telecommunications. Faced with a more competitive situation, the old network operators now have to concentrate more decisively on profitable undertakings, as otherwise the likelihood for further deregulation increases. Parallel to this reorientation in a very

dynamic situation, the network plans of the operators also have changed. The idea of universal networks for promoting ISDN is gradually losing importance, while custom-made, client-oriented networks and services become more popular.

Ironically, the EC has shown tremendous interest in deregulation – even more so as it has moved towards 1992. Following the UK, most of the countries in the EC have enacted institutional reforms in the meantime. The telecommunications industry, partly under pressure from the EC, was forced to internationalize and to accept competitive pressures coming from non-EC companies. On the world market, however, ISDN is of less interest to users than more powerful specialized data communication networks or broadband capabilities.

Conclusion

Political programmes like that on the development of trans-European networks indicate – notwithstanding all reservations one might have with respect to feasibility – the growing weight of EC institutions, and especially of the Commission in the European polity. The European Community is developing towards a political system of its own right. It is not any longer an intergovernmental bargaining system or an international regime without central power. This was already the case well before Maastricht. In particular, the CEC is on its way to becoming a dominant player, if not some kind of government, in the Community. It therefore has to take responsibility for matters which traditionally were part of the exclusive jurisdiction of national governments. One constituent element of a catalogue of the new responsibilities is that for an efficient infrastructure.

With respect to policy formulation and implementation, the Commission is in a position similar to that of national governments, which often have difficulties in mobilizing the necessary resources to put legislation into force. In many policy domains these resources are dispersed to such a degree that, without the cooperation of relevant target actors, a policy programme would remain ineffective. This situation is even more complicated in the EC. Besides national governments and their ministries, national and European interest groups and organizations of all kinds claim to participate in European policy processes. In addition, like national governments the Commission is fragmented into General Directorates (DGs) with competing and sometimes contradicting goals. In order to secure cooperation and support the Commission and single DGs increasingly get involved in sociopolitical configura-

tions which are currently conceptualized as ‘policy networks’.⁴⁴ Potential conflicts in these networks may be resolved or prevented through early bargaining and interest accommodation.

In European telecommunications for more than a decade the policy network was quite small.⁴⁵ Relevant actors in this network were the national PTTs which maintained an almost symbiotic relationship to the national manufacturers of telecommunications installations. Besides the PTTs there were only very few, if any, service providers. Users of telecommunications services were not organized. Regulatory functions were not clearly separated from operational ones. The small network containing only the PTTs or their affiliated ministries, the CEPT as their European interest organization and the Commission, constituted a splendid constellation to develop and further the idea of ISDN. It was – and among these actors is – seen to be the backbone of a highly integrated trans-European market. Such a network would improve the infrastructure of a common market and by this also contribute to social integration. But very early under the surface of the common goal to introduce Euro-ISDN, national rivalries and competition arose, especially between those EC member states which are the home base of strong telecommunications manufacturers. The current state is that national ISDN systems differ with respect to technical specifications and to the velocity of their introduction. All in all, introduction is lagging behind schedule, and it is not difficult to predict that in a decade Euro-ISDN will considerably diverge from the initial plans.

This does not mean that there will be no technical integration of telecommunications networks. A look at the structure of the current European policy network in telecommunications suggests that it has expanded significantly. Today more organizations and agencies have a stake in this domain. This is due to technical changes as well as to political liberalization and deregulation in this sector. In the aftermath of the Green Paper, which was paralleled by and interdependent with comparable activities in the EC member states, entry barriers to telecommunications have been removed. A multitude of service providers, user groups with special demand profiles, hardware and software producers, carriers and network operators, regulators, trade unions, experts and consultants have entered the stage. Most of them seem to have an interest in a telecommunications infrastructure which facilitates easy trans-European communication in a differentiated array of services. There is controversy on how much harmonization and compatibility is required to fulfil these needs,

but no one disputes that at least a supportive coordination is necessary to make European markets work. The Council and more so the Commission actively engages in coordination. They negotiate and eventually formulate policy programmes which give an idea of future economic and technical developments in telecommunications.

In a comparatively large and heterogeneous actor network, often only indirect modes of coordination prove to be adequate. The establishment of ETSI – the new European Telecommunications Standards Institute – is an example for the Commission's effort to coordinate indirectly through institution building. Only partly controlled by the Commission, ETSI develops standards which help to facilitate interworking of different telecommunications networks. In particular, interface standards when reciprocally implemented in network components make it possible to interconnect them in a way that leaves their internal structure mostly unaffected. Therefore, through initiating standardization and the commitment to the resulting standards, the Commission tries to lay the foundation for an integrated European telecommunications network which can be built up, maintained, operated and used by many autonomous organizations. Shifting the production of those standards which are used for ISDN to ETSI can prepare the ground for a common approach in a constellation in which no unquestioned common interest in ISDN exists any more.

What might a future trans-European network look like? Probably ISDN will provide basic connectivity between the industrial and economic hubs of the EC. It will not be a network that connects all EC citizens in the foreseeable future. The ISDN approach has to be altered, if it is to be successful. It has to be adapted to a deregulated environment. As an initiative, however, it remains valid. For the PTTs, which are losing power, ISDN gives support and incentives to develop a common active approach. In the long run, ISDN cannot be concentrated on defining in detail steps and services to be offered to all European citizens. But standards and elements of the ISDN architecture may be integrated in other networks, and a reduced basic ISDN can be opened for standards which make it compatible with competing solutions. This then points to the crucial role of European standardization. The production of European standards – strategically planned and developed on the basis of cooperation of those who are concerned – can help to reach a satisfying degree of integration of heterogeneous technical networks.

From this perspective every plan for a trans-

European network in telecommunications and elsewhere has to take into consideration the growing range of affected interests in Europe. Active networking on the one hand, and the building of coordinative institutions on the other, can provide a basis for reconciling the only partly compatible goals of liberalization and integration.

¹Jacques Pelkmans, 'The new approach to technical harmonization and standardization', *Journal of Common Market Studies*, Vol 25, 1987, pp 249–269.

²Peter F. Cowhey, 'The international telecommunications regime: the political roots of regimes for high technology', *International Organization*, Vol 44, 1990, pp 169–199.

³Commission of the European Communities, *Communication on Telecommunications* (COM (84) 277).

⁴Council Directive of 24 July 1986 on the initial stage of the mutual recognition of type approval for telecommunications equipment (86/361/EEC).

⁵Council Decision of 22 December 1986 on standardization in the field of information technology and telecommunications (87/95/EEC).

⁶Volker Schneider and Raymund Werle, 'International regime or corporate actor? The European Community in telecommunications policy', in Kenneth Dyson and Peter Humphreys (eds), *The Political Economy of Communications. International and European Dimensions*, Routledge, London, 1990, pp 77–106.

⁷CEC Green paper on the development of the common market for telecommunications services and equipment (COM (87) 290).

⁸Herbert Ungerer, *Telecommunications in Europe*, Office for Official Publications of the European Communities, Luxembourg, 1988.

⁹There was a controversy, especially with the UK, as to whether interworking should be prescribed as an essential requirement to be imposed by the EC.

¹⁰CEN-Cenelec would have accepted the establishment of ETSI as a sub-unit under its own control.

¹¹Stephen Temple, *A Revolution in European Telecommunications Standards Making*, Kingston Public Relations, Hull, 1991.

¹²Indicative voting requires only a simple majority of the members involved. For a somewhat speculative analysis of the effects of ETSI's decision rules see Stanley M. Besen, 'The European Telecommunications Standards Institute. A preliminary analysis', *Telecommunications Policy*, Vol 14, 1990, pp 521–530.

¹³Besen, *op cit*, Ref 12.

¹⁴Philipp Genschel and Raymund Werle, 'From national hierarchies to international standardization: historical and modal changes in the coordination of telecommunications', *MPIFG Discussion Paper 92/1*, Cologne, 1992.

¹⁵Commission Green Paper on the development of European standardization (COM (90) 456).

¹⁶Temple, *op cit*, p 26, Ref 11.

¹⁷Empirical evaluation of ETSI is still missing, but several hints suggest that this new unit is confronted with a lot of problems similar to those of other standardization organizations. See Richard W. Hawkins, 'Changing expectations: voluntary standards and the regulation of European telecommunication', paper presented at the International Telecommunications Society, Ninth International Conference, Sophia Antipolis, France, June 1992.

¹⁸W. Brian Arthur, 'Competing technologies, increasing returns, and lock-in by historical events', *The Economic Journal*, Vol 99, 1989, pp 116–131.

¹⁹Joseph Farrell and Garth Saloner, 'Installed base and compatibility: innovation, product preannouncements, and predation', *American Economic Review*, Vol 76, 1986, pp 940–955.

²⁰Council Directive of 17 September 1990 on the procurement procedures of entities operating in the water, energy, telecom-

munications and transport sector (90/531/EEC).

²¹Council Directive of 28 June 1990 on the establishment of open network provision (90/387/EEC).

²²Other parts refer to the harmonization of usage conditions and, heavily debated, of tariff principles.

²³This coordinative function of standards is demonstrated by George V. Thompson, 'Intercompany technical standardization in the early American automobile industry', *The Journal of Economic History*, Vol 14, 1954, pp 1-19, using the automobile industry as an example. For a more general treatment of this aspect of standards see Susanne K. Schmidt and Raymund Werle, 'Koordination und Evolution, Technische Standards im Prozeß der Entwicklung technischer Systeme', *MPIFG Discussion Paper 92/8*, Cologne, 1992.

²⁴For an early discussion of this aspect of standards see P.H.M. Vervest, 'Standardization as a government policy tool', in George Muskens and Jacob Gruppelaar (eds), *Global Telecommunication Networks: Strategic Considerations*, Kluwer Academic Publishers, Dordrecht, 1988, pp 39-56.

²⁵George Muskens, 'Global networks: a descriptive study', in Muskens and Gruppelaar, *op cit*, Ref 24, pp 15-37.

²⁶Tjakko M. Schuringa (ed), *EuroComm 88. Proceedings of the International Congress on Business, Public and Home Communications*, Amsterdam, December 1989, pp 343-366.

²⁷CEC, Telecommunications (COM (83)329).

²⁸Council Recommendation of 12 November 1984 concerning harmonization in the field of telecommunications (84/549/EEC).

²⁹Council Recommendation of 22 December 1986 on the coordinated introduction of the integrated services digital network (ISDN) in the European Community (86/659/EEC).

³⁰Proposal for a Council Recommendation on the coordinated introduction of the integrated services digital network (ISDN) in the European Community (COM (86) 205).

³¹Eli M. Noam, 'The political economy of ISDN: European network integration vs American system fragmentation', paper presented at the XIV Annual Telecommunications Policy Research Conference, Airlie, Virginia, April 1986.

³²Michel Carpentier, Sylviane Farnoux-Toporkoff and Christian Garric, *Les Télécommunication en Liberté Surveillée*, Lavoisier, Paris, 1991.

³³Council Regulation of 27 October 1986 instituting a Community programme for the development of certain less-favoured regions

of the Community by improving access to advanced telecommunications services (86/3300/EEC).

³⁴Communication from the Commission concerning the implementation of Council Recommendation 86/659/EEC on the coordinated introduction of the integrated services digital network (ISDN) in the EC (COM (88) 589).

³⁵S.G. Carter, 'European telecommunications: liberalization by regulation', *Electronics*, 1989, pp 418-420.

³⁶Proposal for a Council Resolution on the strengthening of the integrated services digital network (ISDN) in the Community up to 1992 (COM (88) 695).

³⁷Memorandum of Understanding on the Implementation of a European ISDN service by 1993. Among these services are 7 kHz telephone calling, telefax group 4, ISDN telefax, services for 'PC-Communication'. It was submitted to the CEPT and was signed in April 1988 by 23 network operators from 17 countries.

³⁸Commercial ISDN services: Belgium, France, Germany, Netherlands, United Kingdom. Pre-ISDN services: Denmark, Ireland, Italy, Portugal, Spain. No ISDN services: Greece, Luxembourg.

³⁹Kurt König, 'ISDN - a strategy for Europe', paper delivered at the 3rd EIUF meeting in Brussels, November 1991.

⁴⁰The controversial discussion is highlighted in *Communications Week International* of 19 August 1991, p 1 and p 8. This paper regularly reports on ISDN failures and publishes recommendations not to invest in ISDN equipment.

⁴¹Cf *Wirtschaftswoche*, No 12, 13 March 1992, p 106.

⁴²The situation in Germany is analysed in more detail in Gerhard Fuchs, 'The implementation of ISDN in West Germany', paper presented at the Annual Meeting of the American Political Science Association, Atlanta, September 1988.

⁴³The ministry also claims that by no means can the Commission argue that its recommendations, directives or proposals do demand the introduction of ISDN as an obligatory service.

⁴⁴Bernd Mariu and Renate Mayntz (eds), *Policy Networks: Empirical Evidence and Theoretical Considerations*, Campus, Frankfurt a.M., and Westview, Boulder, Colorado, 1991.

⁴⁵For a more detailed analysis of the telecommunications policy network in Europe see Volker Schneider, Godefroy Dang-Ngyuen and Raymund Werle, 'Corporate actor networks in European policy making: harmonizing telecommunications policy', *MPIFG Discussion Paper 93/4*, Cologne, 1993.