Internet @ Europe: Overcoming institutional fragmentation and policy failure

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Abstract

For more than a decade the Internet was confronted with ignorance and resistance in many European countries. National and European technology policies were unfavorable to “not invented here” technologies and committed to “open networks” of a different kind. The incumbent network operators in telecommunications, most of them enjoying a monopoly status for a long time, declined tolerating deviant modes of data communication and service provision, which might trigger competition and uncontrollable use of their networks. This situation was not simply a matter of attitudes and beliefs of the managerial and political élite. It was rather an expression of constraints of a traditional institutional setting which had produced industry structures and industrial policy strategies that were not compatible with the Internet. Only recently can we observe changes. Telecoms liberalization in the European Union and the emergence of market competition in this industry coincide with a new Internet policy that recognizes the infrastructural significance of this network for a European information society and the need to involve Internet users in order to exploit the potential of this network.

Kurzfassung

Länger als ein Jahrzehnt ist das Internet in vielen Ländern Europas auf Ignoranz und Widerstand gestoßen. Die Technologiepolitik auf nationaler und Europäischer Ebene behinderte Technik, die nicht im eigenen Lande erfunden wurde, und war „offenen Netzen“ anderer Art verbunden. Die eingesessenen Telekommunikationsgesellschaften, von denen die meisten lange Zeit eine Monopolstellung innehatten, waren nicht bereit, ihnen „fremde“ Techniken und Dienste der Datenkommunikation zu tolerieren. Man befürchtete Wettbewerb und unkontrollierbare Netznutzung als deren Folge. Die Schwierigkeiten, die das Internet hatte, waren insgesamt nicht so sehr auf die ablehnende Haltung der politischen und unternehmerischen Elite zurückzuführen. Vielmehr hatten die traditionellen institutionellen Bedingungen mit dem Internet inkompatible industrielle Strukturen und industriepolitische Strategien hervorgebracht. Erst in den letzten Jahren zeichnen sich Veränderungen ab. Die Liberalisierung der Telekommunikation in der Europäischen Union und die Entstehung von Wettbewerbsmärkten in diesem Sektor fallen zeitlich mit einer Internetpolitik zusammen, die die infrastrukturelle Bedeutung dieses Netzes für die europäische Informationsgesellschaft und die Notwendigkeit der Nutzerbeteiligung zum Zwecke der optimalen Nutzung des Netzpotentials erkannt hat.

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1 Introduction

The Internet has had a hard time in Europe. Only in the second half of the 1990s, after a long period of ignorance and resistance, did Europeans gradually start to accept and use the network of networks. In this chapter I analyse the Internet's career in Europe. After providing a short sketch of the evolution of the Internet in the USA and an overview over the present state of its diffusion and utilization in Europe and the USA (2), I examine why it took so long before European policy makers realized the Internet's potential for innovation and economic growth. The central institutional obstacles to the Internet will be identified and policy failures evolving from this backdrop will be illustrated (3). I will then show that it required radical institutional change to open a window of opportunity for the Internet and unleash its dynamic potential (4). The last section (5) – followed by a short conclusion (6) – illustrates the contours of a new European Internet policy emerging from a changing institutional setting and a new user-oriented strategy to promote the Internet as the electronic backbone of a European information society.

2 Evolution of the Internet and its present state in Europe

As is well known, the Internet started as ARPANET – a network that served research and, to a minor degree, military purposes when it was launched by the US Department of Defense's (DoD) Advanced Research Projects Agency (ARPA). The pioneering Transmission Control Protocol/ Internet Protocol (TCP/IP) protocol stack, which facilitates the interconnection of heterogeneous networks in a way that allows them to be used as if they were one single network, was implemented in the ARPANET at the end of 1982. In the same year, technical recommendations specifying the protocol details of crucial services, including electronic mail, were approved by informal governance committees of the ARPANET. TCP/IP was a US military standard, but it was not classified and could be implemented free of charge by anybody who wanted to use it. In this sense TCP/IP was an open standard.(1)

In 1985, the US National Science Foundation (NSF) became involved in research and education networking. The NSF initiated the NSFNET, a backbone network designed to provide both access to remote supercomputers and a test bed for experiments in data transmission and switching. Early on, the NSF officials responsible for the NSFNET also had in mind to create an encompassing multi-purpose research and education network. Rather than opting for one of the existing proprietary standards for computer networks such as SNA or DECET, the NSF chose TCP/IP to be implemented in the NSFNET. In doing so, the NSF created a niche in which TCP/IP was sheltered from market competition and could develop into a mature protocol stack that attracted the development of complementary software for a variety of applications. University networks and other local area networks linking research organizations to one another could be connected to the NSFNET on the condition that they use TCP/IP as the interface standard.

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With the advent of the World Wide Web (WWW) in the early 1990s, the research and education network exploded and started transforming itself into the commercially viable global Internet. Also in this case the non-proprietary, open nature of the basic protocol (HTTP) proved to be instrumental for the rapid diffusion of the WWW. In 1995 the NSF ceased operating the NSFNET. Today the Internet is owned and operated by private corporations, non-profit organizations and other collective entities. Internet service providers, telephone companies, cable television companies, computer hardware and software vendors, media companies and all kinds of firms that enter into electronic commerce use the Internet as a communications infrastructure and business channel.

In summary, the network of networks appears to be well described by the label ‘the accidental superhighway,’ which was employed by *The Economist* magazine in July 1995. In its early stages the Internet was promoted and funded, but not designed, by the US government. In this sense, the Internet is a product of US science (and technology) policy. However, at no point in time did some kind of master-plan exist to guide the Internet’s evolution, even though there were critical decisions taken by public agencies that powerfully shaped the course of that evolution – such as the NSF decision to implement the TCP/IP protocol in the NSFNET, and the subsequent decision to privatise the NSFNET backbone.

At the time *The Economist* coined the phrase of ‘the accidental superhighway’ the Internet was not a well-known phenomenon in Europe. Today, some six years later, the network of networks is well established in the member states of the European Union. From 1996 to 2001, the number of hosts in the so-called ccTLDs (country code Top-Level Domains) grew from 1.9 million in January 1996 to 5.0 million in January 1998, to 9.5 million in January 2000 and to some 13.7 million in January 2001 at constantly very high growth rates.(2) However, the absolute number of hosts (*Figure 1*) as well as the density of hosts per country (*Figure 2*) varies considerably in different parts of Europe. The number of hosts per 1,000 inhabitants is much lower in Southern than in Northern Europe.

Figure 1

Figure 2

Figure 3

We find a similar picture if we look at the percentage of people with Internet access in *Figure 3*, which contains the most recent data. Again the Scandinavian member states of the EU and the Netherlands have the highest penetration rates. In an encompassing report for the European Commission, the telecommunications consultants Fischer & Lorenz argue that 'cultural differences, language barriers, income levels and the general lack of IT infrastructure (such as PCs)' account for the imbalances in Europe. The consultants also emphasize that 'Europe is generally behind North America in Internet development' (Fischer & Lorenz 2000, pp. 6–8). *Figure 3* shows that, compared with 28 % of the Europeans, 48 % of the Americans have Internet access. At the time the report was finalized the differences between Europe and the USA were even more significant. In November 1999 the total number of Internet users world-wide was estimated at 201 million: 101 million (or 35% of the population) in the USA and 43 million (or 12 %) in Europe (Fischer & Lorenz 2000, p. 28)(3). Apparently the gap between Europe and the USA is narrowing although Europe still lags behind. The reasons for this delay date back to inadequate strategic action and a lack of appropriate incentives in the 1980s and early 1990s.

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3 Obstacles to the diffusion of the Internet in Europe

Trying to detect why the Internet has had difficulties in Europe, we can rule out the suggestion that it was a lack of inventiveness that accounts for these difficulties.

3.1 No lack of European inventiveness

Among the pioneering technical inventions which facilitated the evolution of the Internet were packet switching, the TCP/IP protocol stack and what we today call the World Wide Web (WWW). All these innovations were invented or co-invented in Europe (*Figure 4*).

Figure 4

Packet switching describes a switching and transmission technology which splits complete messages into small packets. These packets can be transmitted along different lines of a network (in a store-and-forward mode), and they are re-assembled into the original message by the receiving host when they reach their final destination. In the middle of the 1960s packet switching was invented simultaneously by Paul Baran at the RAND corporation in the United States and Donald Davies at the National Physical Laboratory (NPL) in England.(4) While Baran's ideas became one of the technical foundations of the Internet's forerunner ARPANET, Davies' proposals to base a new network on packet switching was rejected by the British General Post Office, which at the time also operated the public telephone network. Davies' own organization, the NPL, did not have the resources and the authority to build such a network. A smaller restricted network (called Mark I) sponsored by the NPL was started in 1967 but developed slowly. It came to be used by researchers at the NPL but did not have the impact that the ARPANET had in the USA (Abbate 1999, pp. 7–41).

TCP/IP, the protocol stack which constitutes the technical basis of the network of networks because it facilitates the interconnection of technically heterogeneous networks, was developed by Robert Kahn and Vinton Cerf at ARPA. It was presented to the public for the first time in 1973. The protocol, among other functions, sets up connections between hosts and provides reliable transmission of data packets in diverse environments as far as design and basic protocols of networks are concerned. The packets transmitted are called *datagrams*. They can be compared with envelopes which transport all kinds of binary data (including voice or video) across a network. Each datagram contains the address of its destination – whether it is a traditional host or a personal computer desktop. This allows for what the experts call connectionless transmission. Datagrams are handed over from one host to another, and they do not require a channel to be set up from the sender to the final receiver before the transmission process starts. Thus, using datagrams, interconnecting different networks is not very demanding. Long before datagram transmission technology was employed in the ARPANET, it was used in an experimental network project in France called Cyclades. Funded by the French government and invented by Louis Pouzin and Hubert Zimmerman, Cyclades had been explicitly designed to facilitate internetworking. TCP/IP reflects the design of Cyclades. Pouzin and Zimmerman struggled to convince France Telecom, the French public (monopoly) telecommunications carrier, to employ datagram transmission in the public data network (Abbate 1999, p. 123–127). However, France Telecom and most other European telephone administrations (PTTs) opted for another, a connection-oriented, technology, which emerged in 1974 and was later adopted as an international standard (X.25) by the International Telecommunication Union (ITU). X.25 networks are homogeneous and more centralized than TCP/IP networks. Their architecture parallels that of the public switched telephone networks (Schmidt and Werle 1998). X.25 technology cannot be used to interconnect networks with different basic protocols.

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Finally we turn to the *World Wide Web* (WWW), which provides another, well-known, Internet-related example of European inventiveness. Initially, one drawback of using the Internet was the difficulty of locating and retrieving online information. At the beginning of the 1990s a service called the Gopher system was developed at the University of Minnesota. However, Gopher like other hierarchical systems of information representation was very soon outperformed by the WWW. Its foundation was laid by Tim Berners-Lee and Robert Cailliau at CERN, the European Particle Physics Laboratory, in 1990 (Berners-Lee and Fischetti 1999). Since the early 1980s CERN used TCP/IP as the common protocol for its various networks. Berners-Lee created a hypertext system (hypertext markup language, HTML), which could handle different data formats and which would run on TCP/IP (using the hypertext transfer protocol, HTTP). An addressing scheme was employed (uniform resource locator, URL) for locating files on the Internet. CERN made the software available on the Internet but did not regard it as lying within its responsibility to promote further development of this technology towards commercial viability. In 1993 the basic ideas were taken up by the National Center for Supercomputer Applications (NCSA) at the University of Illinois, which obviously had no problem integrating WWW-related activities into its work programme although they had nothing in common with supercomputer applications. Marc Andreessen and his colleagues developed a web browser called Mosaic. In 1994, Andreessen left NCSA to set up his own company Netscape. In the same year Tim Berners-Lee left CERN to join the Massachusetts Institute of Technology (MIT) and become director of the World Wide Web Consortium, which was affiliated to the MIT (Dertouzos 1998, pp. 3–54). Today (April 2001) the Consortium, which develops and adopts web standards, has over 500 member organizations including all relevant players in the computer, telecommunications and Internet industry.

3.2 Telecommunications monopolies

The examples of packet switching, TCP/IP (datagram) protocols and the World Wide Web demonstrate that Europe did not lag behind the US in terms of inventiveness. Yet, the first two examples in particular indicate that the institutional opportunity structure of European telecommunications was unfavourable to these kinds of innovations at the time they were invented. Organizations enjoying a monopoly status either were not interested in packet switching – as in the case of the British General Post Office – or were committed to X.25 rather than datagram-based packet switching – as in the case of France Telecom. Both organizations may have had good reasons for their choices, but their monopoly position left no room for other organizations to take up the innovations and develop them into attractive software products.

The public monopolies dominated the ‘market’ for telecommunications services in most European countries at the time the Internet started to gain a standing as a research and education network in the USA. Here competition prevailed in the telecommunications industry. Concerning data communication services, for instance, several competing providers of so-called value-added networks such as Telenet, Tymnet, CompuServe and GE-Information Services served companies and later in the 1980s also the general public providing dialup and leased-line connections. After the divestiture of AT&T in the early 1980s, also the Bell Operating Companies striving for new commercial opportunities entered the market for data services. Many of them also got involved in funding and building regional research and education networks in collaboration with universities and state and local authorities (Mandelbaum and Mandelbaum 1996). Although it was promoted by federal government agencies the Internet was not uncontested either. Several research and education networks based either on proprietary or on open standards, but not on TCP/IP, competed with or complemented the Internet. One of these networks was BITNET – a co-operative university network which was based on IBM technology (VNET). In the first half of the 1980s more universities were connected to the BITNET than to the Internet. This network directs our attention to another example of European constraints on networks outside the PTT domains.

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BITNET's European sister was EARN – the European Academic and Research Network. The IBM Corporation launched and sponsored EARN in the early 1980s. The network was welcomed by the research community. In the mid-1980s more than 500 computers in the research organizations of 19 countries were linked to EARN. This was only possible after the European telecommunications monopolies – for the first time in history – had accepted data transmission across national borders along private lines. The EARN board of directors had to struggle hard to secure the permission for this. This included problems with governments, among them the German government, which only gave the green light on the condition that EARN evolve in a system based on open systems standards as defined by the official international standardization organizations (OSI standards, see below). The German position reflected a widespread governmental concern, shared by the European Commission, that EARN might be part of IBM’s strategy to expand market dominance, to which some substance was lent by the fact that initially only IBM mainframes and Digital Equipment’s Vax computers could be linked via EARN. The open systems standards requirement for EARN was conceded by the board of directors, but in the event it never came to be implemented.

The German government, like other governments, reacted to EARN through initiating a national science network. This was in line with government programmes to support the German computer industry and the national champion Siemens. Also the European Union reacted. In 1986 it set up RARE (Réseaux Associés pour la Récherche Européenne) to promote coordination of national operators of science networks and fund network-related R&D projects with the ultimate goal of stimulating the development of a European data network. One strategic component – controlled by RARE with the European Commission acting as project coordinator – was COSINE (Cooperation for Open Systems Interconnection Networking in Europe). COSINE’s aim was to create an international packet-switched network for researchers based on the X.25 standard.(5)

3.3 Failed standards policy

Technical standards played a strategic role in the area of science networks, public data networks and in the European computer industry. The central focus was on the already mentioned OSI standards. OSI, the Open Systems Interconnection Reference Model, was adopted as an international standard in 1984. OSI's seven-layer protocol architecture was meant to provide a reference system for defining inter-networking protocols and coordinating the standardization of data communications systems. It was the product of an engineering programme that was organized mainly in Europe. The engineering activities were complemented and backed by the emerging Open Systems Movement, whose members were industry consortia, voluntary standards-development organizations and government agencies that were committed to OSI with regard to realizing the vision of universal non-discriminatory access to communications via a global network. The design, standardization and public procurement of information and communication technology should pave the way for a truly open non-proprietary network (Schmidt and Werle 1998).

For some participants in the movement the principle of non-discriminatory open standards had a rationale beyond that of an open global network. European computer vendors, European governments and, in particular, the Commission of the European Union saw the OSI programme also as an instrument of industrial policy to protect the European manufacturers against US competition – especially since many US vendors were already well entrenched as the dominant vendors of proprietary network solutions for business. OSI was specifically intended to arrest the widespread deployment of IBM's SNA network standard in Europe (Werle 1997).

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In the second half of the 1980s, also the US government officially declared that it would switch to OSI with regard to its procurement policy. The Department of Commerce (DoC) and the National Bureau of Standards (NBS) promoted OSI, but they also accepted other standards as long as OSI products were not available. In the American Internet community TCP/IP was obviously preferred to OSI. Criticism tended to be levelled against the poor technical performance of specific standards. Strong opposition was focused on X.25, the already mentioned international standard for connection-oriented packet-switched networks. Being essentially a pre-OSI standard, X.25 was incorporated into OSI, but it could not be used to interconnect heterogeneous networks. Internet enthusiasts never adopted an explicitly favourable stance towards OSI. In the eyes of many observers the battle between the partisans of TCP/IP and OSI network protocols degenerated into a 'religious war' (Drake 1993). In this war the European commitment to OSI did not tolerate any 'deviant' activity (Malamud 1993). Computer scientists could not expect to receive public funding for TCP/IP-related research. The US government, in contrast, took a more pragmatic stance, in particular after it became apparent that many of the hopes focusing on OSI were to be disappointed because it was taking extremely long until OSI products appeared on the market – too late for OSI to be regarded as a serious competitor to TCP/IP.

The European Commission and many European governments did not promote the Internet and TCP/IP until the increasing commercial viability of this network of networks made acceptance of this innovation inevitable. Until this official change of mind, TCP/IP had only been used in private networks with the exception of the so-called European Backbone (EBONE) – a hybrid network with regard to standards and funding. Launched in 1992 with many promoters in Northern Europe and in the Netherlands, EBONE was a multi-protocol network, which included TCP/IP and was partly funded by RARE. The early openness of the Scandinavian countries and the Netherlands towards TCP/IP accounts for the leading position of these countries with regard to Internet penetration and use (see above: Figures 2 and 3).

In summary, the European standards policy towards OSI on the part of the EU Commission and of many governments turned out to be a failure. The tendency to keep up a strong commitment to OSI without considering the prospects of TCP/IP account to some degree for the fact that Europe is significantly behind the USA in Internet diffusion and utilization.

3.4 Fragmented industrial policy

European standards policy evolved in an institutional setting that was shaped by a weak and declining computer hardware industry, a stagnating software industry, monopolistic structures in telecommunications services and a comparatively strong telecommunications manufacturing industry that to some degree relied on sheltered national home markets. Technology policy and standards policy was industrial policy – and it was nationally fragmented. European policy fragmentation and concomitant barriers to trade also account indirectly for the problems European policy makers had accepting – let alone promoting – the Internet.

One of the most spectacular examples of fragmented and parochial technology policy in Europe can be found in an area where telecommunications, data processing and TV broadcasting overlapped. It focused on what was called ‘interactive videotex’ in the terminology of the International Telecommunication Union (ITU). In the late 1970s and the early 1980s, almost simultaneously, telecommunications operators in the United Kingdom, France and Germany, as well as in the USA, Canada, Japan and a few other countries, planned and heavily promoted an information service for the public with a potential for professional application. Some functions were similar to the Internet – though at the time, of course, not as sophisticated. The system was called Prestel in the UK, Bildschirmtext in Germany and Télétel/Minitel in France.

In contrast with the efforts in the other countries, the French undertaking not only achieved the status of an industrial *grand projet* with an extremely high degree of concerted political and industrial action but also turned out to be a success at the national level. Télétel, however, never developed into a transnational or global system. The other European systems did not even take off within their national confines. Each country followed the strategy of exporting the system to other countries while keeping the national market closed. For the actors involved, future market shares in a global market were tied to getting their standard accepted as the single world standard for interactive videotex. But they never achieved consensus, neither internationally nor at the regional European level (Schmidt and Werle 1998, pp. 147-184). In an open European market without telecommunications monopolies, interactive videotex might have developed into a successful European service with national variants on a common technical platform. In terms of the market, Télétel demonstrated early on that European consumers were prepared to buy information and transaction services on screen. Before the Internet started to gain ground in France the Télétel system had more than six million private and business subscribers and had created many new jobs, directly and indirectly.

4 Breaking institutional barriers

The last section illustrated that it was not a lack of inventiveness, but rather the institutional "lock in" in monopolistic structures and the fragmented national industrial policy, combined with policy failure in an area of standardization where a European consensus was achieved, that to a high degree accounts for the delayed and slow development of the Internet in Europe. Some of the institutional barriers to the Internet have been removed but, as will be examined now, some obstacles have remained.

The inherited telecommunications regime is suspected of having posed a serious obstacle to the diffusion of the Internet. Only since 1998 are the markets for telecommunications services and networks open to competition in most of the member states of the European Union. It took a long time to *deregulate* and *liberalize telecommunications* if we consider that the first crucial step towards liberalization and deregulation was taken with the European Commission's 1987 Green Paper on telecommunications. It marked the starting point of a long series of directives, communications and reports, all of which brought about the largest liberalized telecommunications market in the world. As a result, in countries such as Germany the rates have gone down dramatically, in particular for long-distance and international telephony.

On the side of the EU Commission, telecommunications policy was initiated and driven by the goal of liberalization and market integration according to the Internal Market Programme (1982) and the Single European Act (1986), though *industrial policy concerns* also played a role. From this perspective a common market without any internal barriers to trade would be instrumental as a home base for European conglomerates to improve their respective positions in the export markets (Schneider and Werle 1990). Early on, telecommunications was regarded as being part of the information technology industry. Therefore early technology-focused programmes such as ESPRIT (European Strategic Programme for Research and Development in Information Technology, 1984) and RACE (Research and Development in Advanced Communications Technologies in Europe, 1987) embraced both communication and information technology. They aimed at promoting trans-European and cross-sectoral collaboration. Both programmes had a strong bias towards large private corporations (the Big Twelve) and the operators of public telecommunications networks. RACE had a strong infrastructural component. The ultimate goal of the RACE projects funded by the EU was to facilitate integrated broadband communication. In this context, the promotion of ISDN (Integrated Services Digital Network) and of European standards played an important role. From the point of view of Internet diffusion in Europe, the plan to modernize and expand the telecom infrastructure appears to be a helpful step. However, in the 1980s the European technology programs in effect created a *technology push without an equivalent user-oriented demand pull*.

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In the early 1990s, therefore, the Commission tried to gear its policy to a comprehensive model, which we can call the *old Information Society Approach*. Building on the Commission's 1993 White Paper on growth and competitiveness (the Delors paper), the so-called Bangemann Report (1994) specifies this approach deemed necessary to guide Europe's transition to an information society. The report mimics components of the 1993 US national information infrastructure initiative (NII) but carefully avoids referring to the Internet, which is only mentioned in passing, whereas the American initiative is modelled on the Internet and its governance structure (CSTB 1994; Kahin 1997). Another difference is that the action plan of the Clinton/Gore administration left more activities to private initiative and the market than it did in the past, while the Bangemann report calls for public ‘assistance’ in ten exemplary areas (including a network for universities and research centres) where uncoordinated market forces alone might fail to reach a critical mass of users. The information society's need for an efficient and internationally competitive telecommunications infrastructure had already been emphasized in the Commission's White Paper, which tends to regard provision of infrastructure as the responsibility of the public sector because markets might not provide them in the politically desired manner. This has found an expression in the TEN (Trans-European Networks) programme (McGowan 1993), which originally included an ambitious investment plan but later was cut back to a number of voluntary agreements among member states of the EU. An important element of TEN is the provision of telecommunications infrastructure in peripheral regions of the EU to which markets might not actually deliver what is needed. Other elements focus on Advanced Communications Technologies and Services (ACTS) in continuation of RACE (Fuchs and Werle 1993). They include ISDN and integrated broadband communication, in particular ATM (Asynchronous Transfer Mode) technology.

The old Information Society Approach was affected by the dawn of telecommunications liberalization. The incumbent network operators were preparing for market competition and hesitated to commit themselves to infrastructure programmes whose commercial viability was insecure. Moreover, while the approach included an attempt to align the projects to market demand and involve users, this often only occurred after the projects were launched. This is why observers from the USA applauded this approach as "a step in the right direction" but at the same time criticized it as being not well attuned to changing user demands (McKnight and Neumann 1995, pp. 145–146.). More often than not the critical remarks explicitly referred European policy makers to the *Internet*, which for a long time – perhaps too long a time – remained in the background as a kind of *hidden agenda*.

However, if we inquire into the merits of the old Information Society Approach, two points must be stressed. The first is that the European Commission and the Council started to promote this concept earlier than most European governments, which triggered similar programmes in the member states (Chatrie and Wraight 2000). Germany, for instance, followed two years after the Bangemann Report with the policy plan ‘Info 2000: Deutschlands Weg in die Informationsgesellschaft’ (Germany's Way to the Information Society). The second point is that the Commission managed to convince corporations and governments to abandon national egotism and parochial policy and to establish a supranational telecommunications regime (Sandholtz 1998).

5 Towards European Internet policy

The European Summit in Lisbon in March 2000 endorsed the Commission's *e*Europe proposal which aims at ‘bringing every citizen, home and school, every business and administration into the digital age and online’ (COM (99) 687). At last with this endorsement – exactly three years after an Internet Advisory Group stressed the Internet's ‘truly enormous influence on all citizens of the Union and on the implementation of the Single Market’ and advised the Commission and the Council to get involved in these developments ‘very significantly’(6) – a period came to an end which was characterized by considerable passive ignorance and initially even active resistance towards the Internet and the underlying TCP/IP protocol technology. Early European attention to the Internet appeared to be drawn by risks rather than opportunities. In a communication of 1996 the Commission deals with ‘Illegal and harmful content on the Internet’ (COM (96) 487). A complementary Green Paper ‘On the Protection of Minors and Human Dignity in Audiovisual and Information Services’ issued in the same year examines the challenges that society faces in the light of the Internet.

The Commission's reaction to the problems is critical but balanced insofar as not only the risks but also the opportunities of the Internet are stressed. However, although the Internet Advisory Group recommended participating rather than fence sitting in the process of Internet diffusion, European policy makers remained relatively passive. The Commission, for instance, initially played a marginal role in the process of reorganization of Internet naming and addressing – a central issue with regard to techno-economic *governance* of the network of networks. When, in 1997, the US Department of Commerce issued a Request for Comments concerning the future role of governmental and non-governmental organizations in this area after privatisation of the Internet, the Commission’s response unveiled a lack of detailed knowledge about naming and addressing procedures. Thus, the Commission only emphasized the need to establish an internationally recognized transparent system and to ensure adequate European representation.(7) Eventually the private non-profit Internet Corporation for Assigned Names and Numbers (ICANN), which guides and oversees registration, was set up perfectly in line with the US government initiative to exclude international organizations such as the International Telecommunication Union (ITU) from governing the Internet and leave it to private sector self-regulation. The Commission could live with the latter but heavily criticized the exclusion of intergovernmental bodies with the effect that a Governmental Advisory Committee (GAC) to the ICANN board of directors was established (Leib 2002).(8) This minor success of European interest policy in the process of reorganization of Internet techno-economic governance indicates that the Commission was not very well prepared to become involved in Internet-related issues. The Commission's relative indifference towards the institutionalisation of the naming and addressing procedure corresponds with a delayed emergence of private registration firms (registrars) in the EU. The registrars, which need an ICANN accreditation, assign names and numbers competitively. If we look into ICANN's list of accredited registrars we find only 34 EU, compared to 89 US, firms (*Figure 5*).

Figure 5

In the context of the debate on Internet governance, the EU realized the growing significance of this network. Digital technologies were seen as the key factor for growth and employment and in 1998, in a Communication of the Commission, the Internet was acknowledged – if somewhat reluctantly - to be the principal infrastructure for electronic communications (COM (98) 111). In particular, issues related to *electronic commerce* have evoked the Commission's and the Council's engagement. In December 1999, the Commission launched its *e*Europe initiative, in which the Internet is qualified as the backbone of the European information society (COM (99) 687). It was endorsed by the European Summit only four months later.

The recent effort to establish a .eu Internet Top-Level Domain (TLD) complementary to the national TLDs is more than just a symbolic action.(9) It signals Europe's presence in a network whose technical specifications, functions and services have to a considerable degree been shaped by the users and by small firms – a striking difference to the traditional telecommunications networks. From this angle the .eu-effort relates to other *activities geared at increasing user involvement*, such as the Information Society Technologies (IST) programme, which provides funds for research, development and demonstration projects towards a ‘User-friendly information society’.(10)

A series of regulatory actions aimed at enabling or accelerating electronic commerce fits into this picture. They include digital signature, encryption, intellectual property and privacy issues. None of these problems is trivial, and it is also an open question whether EU-regulation, self-regulation, public-private co-regulation or no regulation at all turns out to be the most appropriate. Adequate answers require a broader participation of those involved in the provision and use of the Internet. The number of actors who are either interested or have a stake in the Internet is growing at a fast rate in Europe. We can observe that in the EU policy arena, which has become more open to Internet-specific issues, an Internet policy domain is evolving which will provide appropriate collective responses to the ‘regulatory needs’ of electronic commerce and other Internet areas. In the USA such an *Internet policy domain* has already achieved an autonomous status vis-à-vis the telecommunications or the media domain. The set of corporate or collective actors in the Internet domain includes technology vendors, network operators, service providers, business interest organizations, consortia and forums of technical and organizational coordination, in addition to civil rights groups, funding organizations, government agencies and parliamentary committees, to say nothing of the diverse mailing and discussion groups with a genuine Internet base (Werle 2000). Similar trends can be detected in Europe. One indication is the emerging European network of an association representing the Internet service providers (ISPs) (*Figure 6*).

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Figure 6

Ten national Internet Service Providers Associations (ISPAs) with a constituency of up to 221 members (in Germany) are members of the EuroISPA. Compared to other associations, EuroISPA is still a small organization. Considering, however, that some other associations also represent ISPs, both nationally and at the European level, this development provides evidence of a multifarious process of interest formation and the constitution of an Internet policy domain.

In the American Internet policy domain, the belief is widely shared that the Internet constitutes the pivotal infrastructure of the information society. Therefore accommodating the institutional environment in a way that promises the greatest benefit of this network is a common desire. Organizations rooted in the US Internet domain struggle to keep away regulatory impositions stemming from the telecommunications or the media domain. Similar problems are encountered by the actors in the European Internet domain. The problems are aggravated by the domain's somewhat transient state. The question remains open as to whether the European domain has already achieved self-sufficiency.(11) Its stability and leverage will grow first and foremost to the extent that barriers to *access to the Internet* are removed. Widespread access will also mark a crucial step towards a European information society.

There can be no doubt that the high cost of Internet usage including data transmission is still a significant barrier to access. The European Commission's *e*Europe Progress Report stresses the negative correlation of Internet access cost and penetration (COM (2000) 130). Consequently, in an *e*Europe Action Plan issued by the Commission in June 2000 several actions are proposed to provide cheaper (and faster) Internet access.(12) Most effective in terms of cost reduction has been the deregulation and liberalization of telecommunications in Europe. Ongoing monitoring of this process through the EU Commission helps spur on liberalization. It appears likely that in the near future Internet access providers are going to offer flat rates instead of charging for time, as has been one of the prevalent features of the traditional business model of the telephone network operators.

If, in order to catch up with the USA, Internet usage is to be increased within a relatively short period of time and if a ‘digital divide’ within the European society is to be avoided, the EU will have to address other barriers to entry to the Internet such as computer illiteracy and lack of public access to the network in peripheral regions. In the USA, where a comparatively extensive understanding of the universal service concept prevails, we find, for instance, ‘E-rate’ and other federal programmes which, in combination with a series of public and private initiatives at the state and the local level, promote Internet access. They aim at connecting all schools and libraries to the Internet and providing training and technical support – thereby imparting the required competence for the use of the new medium. Some of the American efforts are copied others are debated by the Europeans. They embody elements of a *new Information Society Approach* which is not only passively open to the Internet but evolves from and actively takes up the needs, preferences and interests articulated in the European Internet policy domain. In the new approach the user plays a more prominent and active role than in the earlier European efforts.

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6 Conclusion

The Internet’s diffusion in Europe is significantly below the level of the United States. But it is not a lack of inventiveness with regard to computer, telecommunications and software technology that explains the European difficulties to catch up with the USA. Rather institutional barriers and policy failure account for the fact that Europeans lost valuable time to convert inventions into marketable products and gain experience with the development and use of components of the Internet. In the second half of the 1980s and in the early 1990s when the TCP/IP protocol stack established itself in the landscape of computer networks in the USA, European computer scientists and software engineers were confronted with virtually unsurmountable resistance if they tried to mobilize funds for Internet related development projects in the public as well as in the private sector of most countries. In this period public agencies and private corporations in the member states of the European Union – usually unwilling to coordinate industrial policy and strategy with each other – were united concerning their goal to counterattack the US predominance in information technology including computer networks. Guided by the European Commission they saddled the wrong horse committing themselves to technology and products based on OSI standards. Only recently more favourable conditions for the Internet have evolved, triggered by

- institutional changes in particular in the European telecommunications industry,
- a growing sense of the Internet's infrastructural significance
- and – as a result of a painful learning process – a reorientation of European technology policy towards user involvement and the requirements of competitive markets.

However, given the well known technological and organizational lock-in effects with network technologies (Shapiro and Varian 1999), the legacy of the past which accounts for the time lag and accordingly the competitive disadvantage of European corporations in the area of computer networks and network services will not be overcome in the near future.

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Endnotes

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(1) This also indicates the in most parts civilian nature of the ARPANET. “The Internet grew out of the Department of Defense’s need to interconnect its various research networks” (Norberg and O’Neill 1996, pp. 193, 194; see also Leib and Werle 1998). ARPA has been an agency “that is really charged with civilian technological innovation but hides its mission behind the smoke screen of national defense interests” (Kitschelt 1991, p. 489).

(2) Country codes are standardized by the International Standardization Organization (ISO). Examples of national domains are .nl for the Dutch, .de for the German or .it for the Italian Top-Level Domain. By far the largest number of hosts (about 44 million) is registered in the global .com domain. But also the global .net domain includes 32 million host registrations. The .us, .gov, .edu, .mil domains can be regarded as national US domains. They comprise about 12.8 million hosts (all figures as of January 2001).

(3) In the late 1990s, according to different sources, the Internet penetration rate was highest in the USA (estimations vary from 34% to 42%) and in the Scandinavian member states of the EU, in particular in Sweden (estimations vary from 42% to 52%). In Germany and the UK between 11% and 17% were estimated to have access whereas the penetration rate in Spain varied between 5% and 7%. The EU average was estimated between 8.5% and 12%.

(4) “Davies initially developed his ideas without any knowledge of Baran’s work” (Norberg and O’Neill 1996, p. 161). One of the goals – but neither the only nor the most important goal – of RAND’s research and development activities in the first half of the 1960s was “devising a communications system that could survive an enemy attack” (ibid., p. 160).

(5) The very first European activity to set up a European Informatics Network (EIN) dates back to the early 1970s. EIN was designed to promote computer science and provide a test bed for networking techniques rather than offering communications services.

(6) http://www.cordis.lu/esprit/src/i2eurepo.htm

(7) http://www.ntia.doc.gov/ntiahome/domainname/email/late.htm

(8) However, the US government insisted that the role of governmental and intergovernmental organizations should be strictly limited to advisory functions (http://www.ntia.doc.gov/ntiahome/domainname/6_5_98dns.htm).

(9) ICANN agreed in principal to delegate jurisdiction on this domain to the EU.

(10) The IST programme (1998–2002) is part of the Fifth Framework Programme. It has an initial budget of 3.6 billion EURO. See http://www.cordis.lu/ist/home.html

(11) In a recent report on impact and priorities of the *e*Europe initiative the European Commission stressed that ‘the Internet sector is now big enough to exert an influence on the entire economy’ (COM (2001) 140; March 2001).

(12) http://europa.eu.int/ISPO/docs/policy/docs/e_europe/action_plan_june_en.doc

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formated and tagged by S.H., 20 .6.2001

Figure 1

Internet Host Count - January 2001

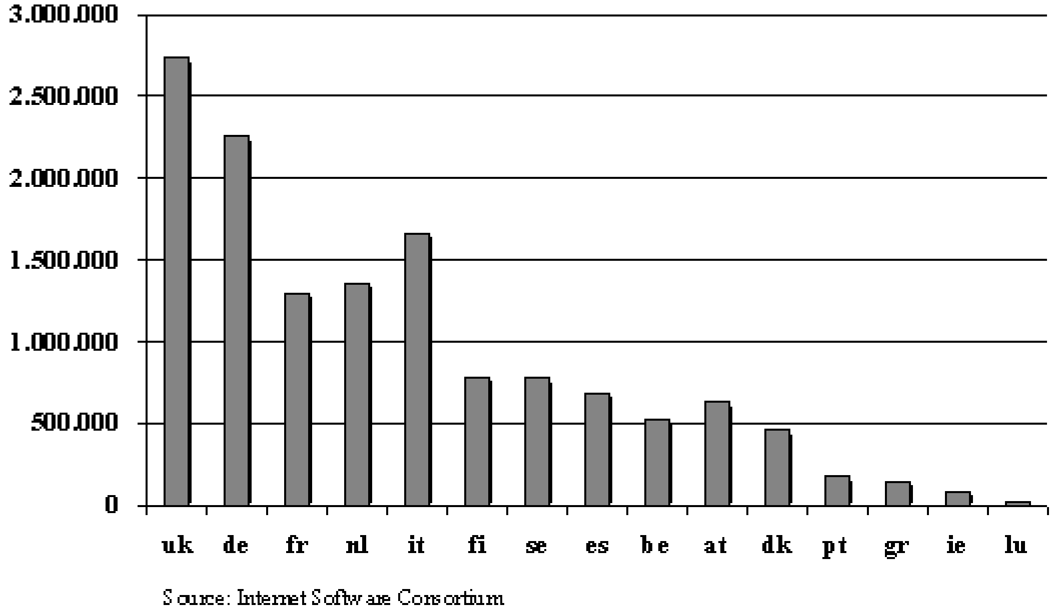
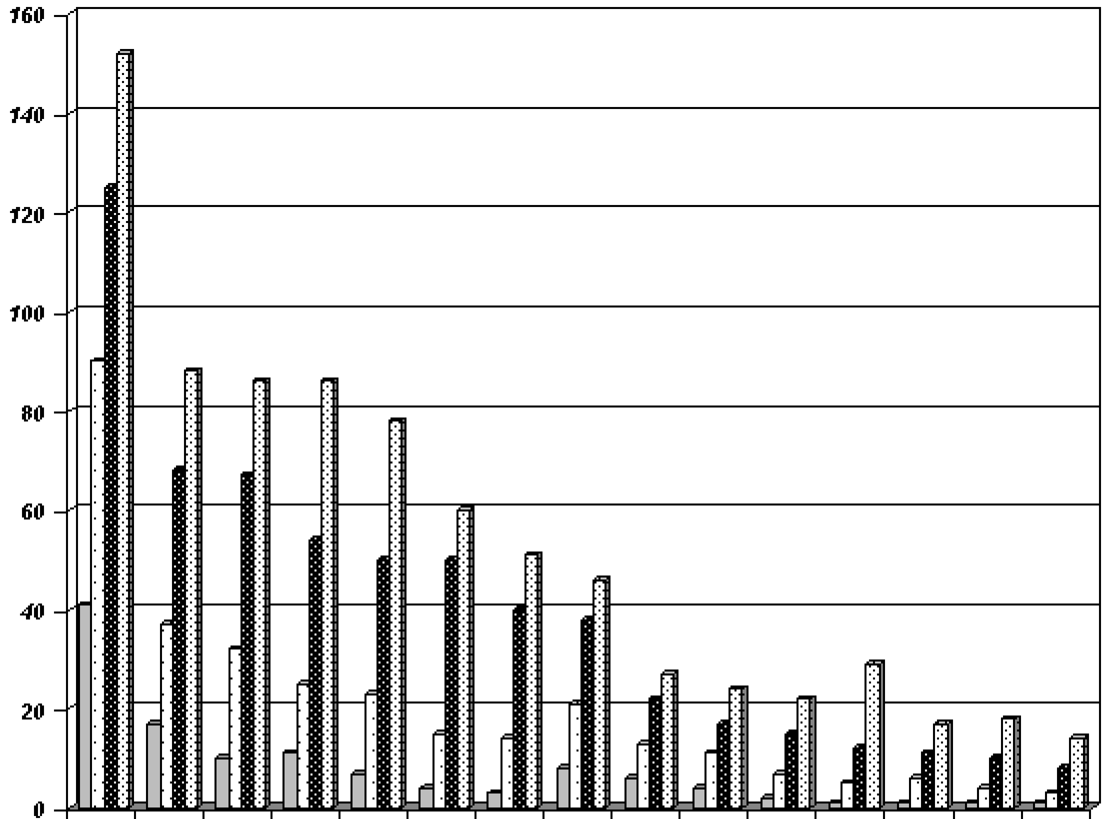


Figure 2

Development of Hosts per 1,000 Inhabitants: 1996-2001



	fi	se	dk	nl	at	lu	be	uk	de	ie	fr	it	es	pt	gr
1996	41	17	10	11	7	4	3	8	6	4	2	1	1	1	1
1998	90	37	32	25	23	15	14	21	13	11	7	5	6	4	3
2000	125	68	67	54	50	50	40	38	22	17	15	12	11	10	8
2001	152	88	86	86	78	60	51	46	27	24	22	29	17	18	14

Source: Internet Software Consortium/ own calculations

Figure 3

Internet Penetration in EU Homes (%) - October 2000

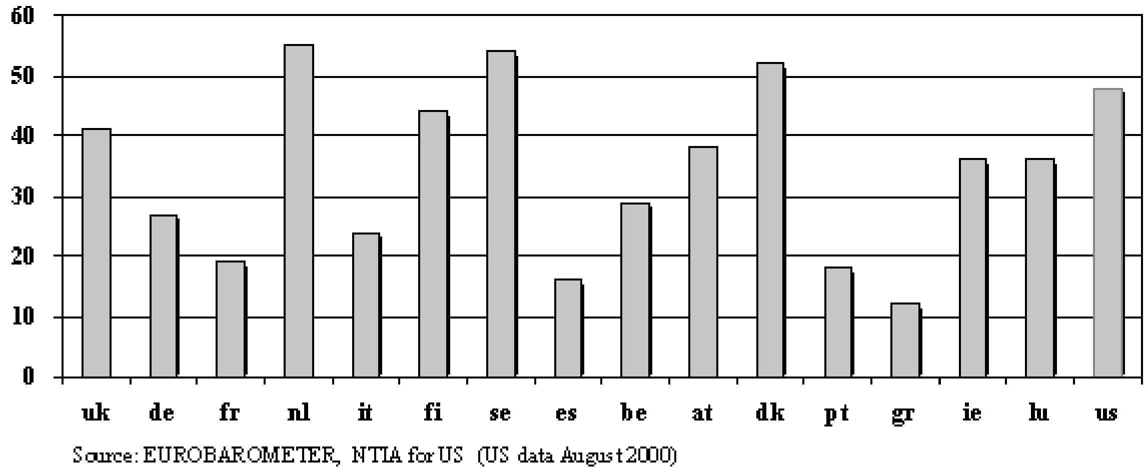


Figure 4

Pioneering Inventions in Computer Networking

	EUROPE	USA
PACKET-SWITCHING First half of the 1960s	**Donald Davies** National Physical Laboratory, United Kingdom	**Paul Baran** RAND Corporation
DATAGRAM TECHNOLOGY (TCP/IP) First half of the 1970s	**Louis Pouzin/ Hubert Zimmerman** Cyclade Project, France	**Vinton Cerf/ Robert Kahn** Advanced Research Projects Agency (ARPA)
WORLD WIDE WEB (WWW) Early 1990s	**Tim Barners-Lee/ Robert Calliau** European Particle Physics Laboratory (CERN)	**Marc Andreessen** National Center for Supercomputing Applications (NCSA) Later: NETSCAPE Corporation

Figure 5

Internet Domain Name Registrars

Region	Number of Registrars
USA	89
Germany	9
France	6
United Kingdom	12
other EU member states	7
worldwide	170

Source: ICANN (April 04, 2001). Only generic Top Level Domains (.com; .net; .org)

Figure 6

European and National Internet Service Providers Associations

(*question marks indicate: no membership data available)