Policy options for the new telecommunications

Report

Policy Options for the New Telecommunications

FINAL REPORT

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by

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Executive Summary

This report was commissioned to examine the policy choices and regulatory mechanisms for telecommunication infrastructure and services that will be needed to achieve the European Union's (EU) goal of acquiring a leading position in the Information Society. The need for political action at the European level has been recognised if the social, cultural, political and economic benefits of the investment in information and communication superhighways is to be realised. This report aims to distinguish between techno-economic myths and realistic options that are available to the policy and regulatory communities. This requires a special focus on the trends that are occurring in decision making control over the design, construction and use of the telecommunication infrastructure and services.

The first section of the report introduces the main challenges facing the market players and the various stakeholders and highlights the main features of two models of market development: the *Idealist* and the *Strategic* models. Section 2.0 provides an overview of recent technological and market developments among the players in markets for information and communication networks and services. Section 3.0 considers these developments in the light of the *Idealist* and *Strategic* models of telecommunication evolution. Section 4.0 outlines key issues for policy makers and regulators including specific recommendations for reform of policy making institutions and actions to achieve the goals of constructing the Information Society in Europe.

Options Brief

Recommendation 1:
Actions to improve transparency, access to information, open systems implementation, non-discrimination and equality of access among organisations should receive priority in the policy making process. Regulatory and competition policy should focus on any network or service supplier who is able to achieve control over access to customers in the new telecommunication markets, e.g. as a result of vertical or horizontal linkages among suppliers. These players are likely to include organisations in addition to the PTOs.

Recommendation 2:
Innovation and experimentation with information and communication technologies by end-users and initiatives by smaller firms and by public organisations to test and develop new information services will contribute to the total stock of knowledge and competence available within Europe. Such activities should be candidates for public support to encourage widespread experimentation. Attention needs to be given to determining which public authorities should be charged with broad responsibilities for defining access to public information or for evaluating the value and use of public information.

Recommendation 3:
The outcome of negotiations among industrial players and their subsequent investment strategies is shaped by regulatory choices. Innovative forms of regulation that are responsive to the convergence of the underlying technologies and to the interdependence of telecommunication, audio-visual and software markets are needed. The EU should form an 'independent agency' that continuously monitors developments in overlapping markets and recommends intervention to achieve public policy goals.

Recommendation 4:
The bundling of relationships between infrastructure and service providers brings opportunities for learning and experimentation with new technologies and services, but it also creates the potential for inefficiencies and market dominance. Renewed attention to this issue and to the role of competition policy is needed to ensure an appropriate balance among international competitive pressures, the development of European enterprise, and the public interest.

Recommendation 5:
The new methods by which market players are 'competing for control' over access to networks, customers, and market information are shifting network access issues away from the underlying infrastructure to the design and implementation of software and peripherals embedded within networks. Policy and regulatory institutions must monitor and respond to these developments to preserve public interests in the development of the new telecommunication markets.

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1.0 Introduction: Policy and Regulatory Perspectives [1]

This report examines the policy choices and regulatory mechanisms for telecommunication infrastructure and services that are needed to achieve the EU's goal of acquiring a leading position in the Information Society of the 21st Century.[2] The choices and mechanisms have the goal of encouraging the rapid development of broadband, interactive information services such as electronic data interchange and video-on-demand as well as assuring that such developments bring desirable social outcomes such as improvements in access to cultural, educational, and informational resources. A criterion in setting these policies and measuring their success is whether they also produce social benefits such as improving the condition of the environment, workplace safety, and health. If private investors prove reluctant to develop new networks and services in the time-scale required or with the desired social benefits, there are questions as to whether, and to what extent the European Parliament and the European Commission should become more involved in their development.

The rapid and sustained pace of innovation in electronic information and communication technologies is opening up exciting new frontiers for both commercial and non-commercial activities. While the potential of these innovations is large, they also call into question most long-accepted assumptions about how best to organise markets for the production and consumption of new information and communication products. To realise the potential of this new technology, it is necessary to make policy choices and to create regulatory environments that foster appropriate incentives and rules for social stakeholders as well as producers.[3] Policy choices and regulatory decision making involve both economic and political issues. The economic issues include the organisation of the markets for supplying these technologies, the growth and structure of demand, and the response of private actors to the rules and incentives established by government policy. The political issues include the competing priorities among producer and social stakeholders that influence the choice of policies for achieving affordable widespread access to high quality and reliable telecommunication services.

Our aims are to distinguish between techno-economic myths and options and to examine the political and economic choices that are shaping recent technological and market developments. Any such examination must be based upon a model that describes the relations among actors, technologies, and markets. The present analysis uses the contrast between *Idealist* and *Strategic* models of telecommunication evolution to illuminate recent developments in the industrial and policy environment.[4]

In the *Idealist* model, competing communication network and service suppliers are assumed to meet all demand in the market. Any imperfections in the competitive market are assumed to be short-term distortions. Insofar as there is any role for government policy or regulation it is to ensure that there is a 'level playing field' upon which the forces of competition can flourish. In economic terms, the *Idealist* model suggests that communication network and service supply markets are, or soon will be, perfectly competitive. In the *Strategic* model, outcomes are the result of intense rivalry that only occasionally approximates the market conditions envisaged by the *Idealist* model. Outcomes in the market are shaped by the strategies of corporate actors and by policy or regulatory choices and these strategies need to be assessed in the light of their impact on producers and consumers. The economic foundation of the *Strategic* model is the theory of oligopolistic rivalry (a market with a few dominant players).

Technological change has created opportunities to open up telecommunication infrastructures and services to competition. Existing and new entrants are supplying alternative networks (long-distance networks, cellular mobile systems, satellite networks, and cable television networks) and services (value-added services, digital voice and data services, multimedia, etc.). The relaxation of competitive entry restrictions began in the US and culminated in the divestiture of the local operating companies from AT&T in 1984. This development was accompanied in 1984 by the privatisation of BT and the licensing of Mercury as the second national operator in the UK. Privatisation and liberalisation in other national European telecommunication markets have followed (see Table 1).

Table 1. Liberalisation Indicators - A = High B = Medium C = Low Movement as of 1994

Member State	Liberalising Markets	Corporatisation & Privatisation	Est. New Regulatory Regime
Austria	C	C	C
Belgium	C	C	C
Denmark	B	C	B
Finland	A	B	B
France	B	C	B
Germany	B	C	C
Greece	C	C	C
Ireland	C	C	C
Italy	C	B	C
Luxembourg	C	C	C
Netherlands	B	B	C
Portugal	B	B	A
Spain	B	B	C
Sweden	A	A	C
UK	A	A	A

Source: Based on OECD *Communications Outlook 1995*.[5]

The changes in telecommunication market organisation in continental Europe have involved less radical approaches to the pressures and challenges of technical innovation. Privatisation and liberalisation policies are being adopted as much as five to ten years behind the early reformers.

Adherents to the *Idealist* model believe that, even if delayed by lags in liberalisation, the process of technological change in telecommunications will produce changes in the nature of control that amount to a major paradigm shift. This shift entails a move from a centralised and hierarchical telecommunication network controlled by a single operator and isolated cable infrastructures towards a completely open and decentralised 'network of networks' in which infrastructure operators access each others' networks to compete in providing access to service providers and customers.[6]

Under the assumptions of the *Idealist* model, the problems of standardisation, tariff adjustment, network and information access, and content supply will be solved by market processes. To the extent that problems of social exclusion occur or social goals such as privacy, quality, and improved health and safety are sought, they may be addressed by mandating responsibilities to the market actors. The *Idealist* model is a scenario about the future whose assumptions must be carefully examined before its policy implications are accepted.

Developments in the technical and organisational aspects of the physical telecommunication infrastructure, in network management and operation, and in service applications are leading to changes in the dynamics of decision making by public and private players. These changes make it essential that the following questions be addressed:

- What are the trends in the redistribution of decision making control over the design, construction and use of the telecommunication infrastructure and services?
- Who is likely to control decisions about the development of 'basic' and new services?
- In the newly emerging network, are there new possibilities for the creation and exercise of control by a limited number of actors?

The answers to these questions, as well as a more careful examination of the underlying technical and economic assumptions of the *Idealist* model, indicate the need for the alternative, *Strategic*, model. The *Strategic* model recognises that major technical and economic changes are occurring in telecommunications and that new policies and approaches are necessary. However, the *Strategic* model questions the likelihood that full competition will emerge across all segments of emerging markets. It concludes that there are substantial reasons to believe that major segments of telecommunication markets are likely to evolve in the direction of oligopolistic control and rivalry with a competitive 'fringe' of actors that lack the political and economic power to develop more fully competitive markets. It also concludes that insofar as the assumptions underlying the *Idealist* model are not met, outcomes are likely to be incompatible with the achievement of social and economic goals. Achieving these goals will require specific policy actions. In reaching these conclusions, the *strategic* model reasons that the control of the design, construction and use of the telecommunication infrastructure and services is likely to remain with the historically dominant players in these markets, the Public Telecommunications Operators (PTOs) and the cable operations (or with new dominant players), and that decisions about the development of 'basic' and new services are likely to be dominated by confederacies and alliances among new actors and the PTOs or cable operators. Among the reasons that these outcomes are likely are the new strategies for control in the telecommunication market that may be used to limit entry, the immense size of new international vertical alliances and mergers, and the uncertainties about the future evolution of demand for telecommunication services.

A central problem for government policy in the new telecommunication environment is the need to navigate a route between the possibilities of: 1) monopoly-based network integration with continuing political intervention to achieve economic and social goals; 2) free market competition leading to network fragmentation with the possibility of social exclusion that may be difficult to resolve; and 3) oligopolistic dominance of markets with the possibilities of market fragmentation, unregulated monopoly power, and social exclusion. Merely proclaiming an intent to achieve competition will not make it so, nor can the consequences of any of these outcomes be ignored by policy and regulatory decision makers.

While some telecommunication markets are taking on the attributes of 'commodity' markets, their special characteristics continue to call for policy and regulation to ensure that the 'public interest' is preserved. The 'public interest' in telecommunication includes implications for democratic processes and social issues as well as economic efficiency and innovation. The nature of these interests is changing and the balance among conflicting interests needs continuous discussion and negotiation. The institutional mechanisms of the political decision making process must enable views to be exchanged and decisions to be taken in an effective way - and on an on-going basis.

This report highlights opportunities and constraints to innovative policy action and implementation through regulation. We draw attention to areas where the limited resources of the state at the EU level, in terms of finance, expertise and authority can be most effectively directed to achieve the goals for the development of information highways in Europe.

2.0 The New Telecommunications

This section begins with an overview of some of the pressures for change in the new telecommunication markets. The main technological trends are reviewed together with the current status of the PTO, the terrestrial broadcasting and the cable television sectors, as well as the new media and infrastructure entrants. The implications of technological convergence for market outcomes and regulatory policy are examined and current issues in economic policy and regulation are identified.

The telecommunication market in the EU faces three significant pressures for change that have been gathering momentum over the past decade. First, there is the internationalisation of telecommunication supply to respond to the requirements of the highly profitable customer segment of large corporate users. If improvements in domestic services offered by incumbent operators are not sufficient to retain the business of this customer segment, large users may select foreign operators, from within or external to the EU, to carry their telecommunication traffic. If substantial volumes of corporate telecommunication traffic, including, from 1998, voice traffic, are diverted over the networks of foreign operators or service providers, some of these large operators may enjoy further advantages of economies of scale and scope. The market share of smaller PTOs may erode and these companies risk being downgraded to suppliers of bulk capacity and 'local access' to other global operators.

Second, incumbent telecommunication operators are beginning to face competition in their local service markets. Mobile communication technologies and developments in fibre optics, satellites and compression techniques permit the provision of a range of cable television, data communication, Internet access, entertainment and other multimedia services. Domestic and foreign operators, terrestrial and satellite broadcasters, and operators of GSM (Global System for Mobile communications) networks, are providing wireless and fixed networks which challenge the monopolistic position of traditional fixed network operators.

Third, the incumbent operators must respond to the opening of the EU market for telecommunication services initiated by the Green Paper on Telecommunications published by the European

Commission in 1987.[7] The Council of Ministers has issued a timetable that will bring an end to monopolies on voice telecommunication services on 1 January 1998 in many of the member states.

These pressures for change are forcing changes in the behaviour of incumbent and entrant actors in telecommunication markets.

2.1 The Actors and the Stakeholders

Policy making and regulation have drawn a distinction between content and carriage or between infrastructure (all means of transporting information using analogue or digital techniques) and 'services' (transporting and routing traffic, managing networks and making connections using the underlying infrastructure). Different policy frameworks have applied to these spheres of activity. Users have had access to largely separate sets of infrastructure and services. The market position of traditional infrastructure and service providers is also influenced by the new telecommunication and media producers, classified here as microwave broadcasters (e.g. direct broadcast satellites), mobile communication systems, multimedia content and service providers, and global service providers.

2.1.1 Public Telecommunication Operators

Point-to-point telecommunication infrastructure and services (two-way individual services) have been exclusively controlled by PTOs until recently. These organisations held exclusive concessions for operating public switched telephone, telex and data bearer services with uniform tariffs within their national territories. The fixed telecommunication infrastructure is organised in a hierarchical and centralised technical structure. Telephone calls are routed through switches from local exchange operations, through inter-local switches linking larger regions, to a few high-capacity international exchanges for links to other countries.

The *Idealist* view is that this infrastructure is being transformed into a more decentralised structure with greater opportunities for access by service providers and by competing infrastructure providers because of the flexibility offered by software-based distributed computing in the operation of telecommunication switches. The *Strategic* view is that the infrastructure is becoming more highly centralised because of the operation and control requirements of new services offered to intermediate and end-users.

In practice, the competitive possibilities in point-to-point telecommunication infrastructure are shaped by policy. PTOs have little incentive to distribute control of network operation to new entrants. The requirement that the PTO unbundles the software-based functions supported by its networks (e.g. network control, interfaces for interconnection and access, and prices for desegregated bundles of network resources), has been introduced, in part, as a response to the European Commission's *Framework Directive on Open Network Provision.*[8] This directive may be supplemented by further action such as implementation of the *Draft Commission Directive of 1996.*[9] These directives are key policy decisions that appear to force open infrastructure competition. The implementation of these directives by national telecommunication authorities as well as the commercial responses of the PTOs and their competitors will influence the competitive possibilities that result.

Until the late 1980s, European PTOs had supply-driven approaches which focused on exploiting economies of scale in the carriage of large volumes of traffic using modern trunk networks. However, by the early 1990s, these companies were promoting new demand-led approaches guided by the principle of responsiveness to customers. Corporate strategy statements have claimed that increasing competition, decreasing costs of new technology and diverse user needs have produced different types of networks, designed for specific requirements, linked together into a 'network of networks'. To provide applications to match the requirements of new market segments and individual users, national PTOs have been expanding the capacity of existing networks, constructing new networks and adding intelligence (software) to their networks.

The most important commercial development in capacity expansion is the prospect that PTOs will be able to compete in video entertainment markets. Capacity expansion to realise this potential is being pursued through a variety of technological methods including the selective introduction of optical fibres to neighbourhood distribution points, experimentation with technologies for increasing the capacity of existing copper wiring including ISDN (Integrated Services Digital Network), ADSL (Asymmetric Digital Subscriber Loop), and HDSL (High-rate Digital Subscriber Loop). PTOs are also experimenting with compression techniques that will allow transmission of video services using their existing connections with business and residential customers.

Rather than championing a technological 'bandwagon' like the fibre optic broadband information superhighway, the European PTOs are following flexible strategies towards network evolution in which ISDN and leased lines are major areas of activity. The integration of voice, data and image services over the network is currently being led by recent growth in ISDN subscribers.[10] Some operators are introducing discounts on connection charges and lower ISDN line rental charges to boost the number of ISDN lines. New applications such as Internet access are expected to stimulate growth in the residential as well as the business market.

PTOs also provide leased lines for business customers. Until recently installation requests met with considerable waiting times in many countries in Europe. However, leased lines are now being treated as a generic service and availability is improving throughout the EU. 64 Kbit/s and 2 Mbit/s digital leased lines are being provided using a combination of optical fibre and copper cables but higher capacity connections remain scarce in many of the member states and prices remain high as compared to the US.

In most cases the operators' strategies are focused on strengthening positions in home markets through strategic partnerships, joint ventures and co-operation with other companies. These strategies are intended to provide platforms for realising ambitions as providers of pan-European or international services. They are believed to be necessary to meet the requirements of corporate customers, to increase the scale of operations, and to explore investment opportunities outside the national territory of the PTOs.

2.1.2 Terrestrial Broadcasting

Point-to-multipoint terrestrial broadcasting is often controlled by a public limited liability company with shares owned by the State and public broadcasters. These organisations operate the transmitters for the national television channels, regional and some local radio broadcast transmitters, and supply channel capacity to national public broadcast organisations, plus regional and local public

broadcasters. European broadcast organisations are a mixture of state-owned and joint-stock companies.

Although in Europe the number of broadcast organisations and channels expanded during the 1970s, the new configuration has been quite stable over the past decade with virtually all of the expansion in available video programming coming either in cable television markets or as the result of satellite subscription services. Entry into terrestrial broadcasting is still subject to tight member state licensing and this situation is changing slowly as new digital technologies reach the commercialisation stage.

Although broadcasters have been seeking a means of implementing new television formats including wide screen programming and High Definition Television (HDTV), problems of achieving a significant installed base in receivers have so far prevented these developments from going beyond the experimental stage. At this point, it appears that this 'chicken and egg' problem will have to be resolved through the spread of new receivers to serve niche markets using high-quality pre-recorded media.

Broadcasters are also seeking to promote new services such as Digital Audio Broadcasting, Digital Video Broadcasting, and data casting services. Datacasting services fall into a grey area between broadcasting and telecommunication and PTOs often claim that they fall within their monopoly concessions.[11]

Table 2. Cable Penetration in EU Member States in 1993 [1]

				Cable Penetration	
Country	**Total Homes (000s)**	**Homes Passed (000s)**	**Homes Conn. (000s)**	**All Homes (%)**	**Homes Passed (%)**
Austria	3,070	1,600	910	30	57
Belgium	3,950	3,815	3,550	90	93
Denmark	2,339	1,700	1,173	50	69
Finland	2,240	1,300	780	35	60
France	22,000	5,283	870	4	16
Germany	33,400	21,519	13,495	40	63
Ireland	1,033	500	372	36	74
Netherlands	6,370	5,920	5,530	87	93
Spain	15,000	920	130	1	14
Sweden	3,500	2,100	1,800	51	86
UK	21,600	3,000	600	3	20

(1) Data were unavailable for Italy, Greece, Portugal and Luxembourg
Source: *Cable Satellite Europe*, May 1995, p.32.

2.1.3 Cable Television

The penetration of cable television varies considerably throughout Europe. Table 2 provides recent statistics on the availability of cable services for most of the EU member states. In Belgium and The Netherlands, cable television connections are available for more than 90 per cent of households. However, there are few switching facilities in these cable television networks. Many are owned and controlled by municipalities and local public utility companies or by a special joint-stock cable holding companies. In the UK there has been extensive entry by foreign-owned cable operations while in other EU member states, joint-stock cable companies also have foreign financial participation.

Most cable operators provide a standard programme package. The programmes are distributed by the cable television operator from central off-the-air or satellite reception, and, increasingly, by radio-relay or broadband optical networks. Whereas the operators of national telecommunication infrastructures generally must offer uniform national services, cable operators are generally permitted to differentiate prices according to the services they provide.

The present economic and technological challenges for the cable operators are to transform the cable infrastructure from a loop configuration (one-way system) into a star-like structure (which enables switching and the provision of point-to-point two way services). In order to provide new services in the future on a commercial basis cable operators need to introduce a 'set-top box' or a gateway (e.g. using smart cards) at the 'head end' of networks which enables billing and the collection of customer usage and related data. The set-top box allows the cable operator to offer *Conditional Access* where services are made available to users for additional fees beyond a standard charge for basic services in the ways service markets are segmented, e.g. pay television, pay-per-view television, video-on-demand, etc. In addition, cable operators are diversifying into the provision of videoconferencing, video telephony and fax services, often through acquisitions and joint ventures.

2.1.4 Mobile Communication Systems

The significance of mobile communication systems for the competitive future of telecommunications is controversial. The *Idealist* model suggests that mobile communication systems offer the potential to provide direct competition with fixed telecommunication networks. The extent to which this potential can be realised will depend upon the charges for interconnection between mobile networks or between a mobile network and the fixed telecommunication infrastructure as well as technological developments to increase the capacity of these networks and reduce congestion problems in their use. From a *Strategic* view, it is likely that there will be continuing incentives to set interconnection charges at a level that will continue to suppress direct competition with the fixed telecommunications infrastructure. Moreover, limitations in capacity (although becoming less restrictive over time), suggest that the mobile communication systems will continue to be peripheral for many of the new data telecommunication services for some years to come. Nonetheless, mobile communication systems are one area where a major breakthrough in competitive entry is possible. As yet, however, the market appears to be developing in ways that will not make a direct competitive challenge to the fixed telecommunication network.

In the EU member states analogue networks for mobile car phones are operated alongside the new digital GSM networks. In Sweden, Finland, Denmark, Italy, The Netherlands, Germany, France, Spain and the UK, two operators have been granted licences to operate a GSM network. These networks are being established by consortia of national and foreign firms.

Cellular service providers buy capacity from PTOs and repackage capacity into customised services. In Europe, these providers include several large companies as well as the PTOs. These companies offer services mainly to the business market, especially small and medium-sized firms, and sell mobile equipment from manufacturers such as Motorola, Ericsson and Nokia.

The cellular service resellers are customers of the mobile capacity suppliers as well as their competitors in cellular service provision. In most countries, the traditional PTO continues to control the fixed telecommunication infrastructure, to operate a cellular network, is one of several service providers, and controls a chain of retail outlets selling services to the end-user. In contrast, competitors to the PTOs in this market are fragmented.

2.1.5 Direct Microwave Broadcasters

Technological innovations that allow increased power of satellite transmissions and that reduce the cost of microwave receivers are new potential competitors for broadcasters and cable operators. Whether satellite or terrestrially based, direct microwave transmission allows broadband transmission to line of sight receivers which require rooftop receiving dishes. The size of these dishes can be reduced due to the increased power of transmissions. As yet, there have been few licenses for either type of microwave broadcasting in Europe.

In the US, both types of transmission are in operation with terrestrially-based microwave transmission being referred to as 'wireless cable' and satellite-based systems referred to as 'direct broadcast satellite'. A surprising development in this area is the possibility of offering video on demand services on terrestrial systems, an application that was previously thought to be feasible only through the use of the cable or telecommunication infrastructure. In the US regulatory framework, the regulatory barriers to entry of such broadcasters are modest due to reforms of Federal government regulation of the cable industry which allows direct competition in cable markets. As yet, this sort of liberalisation has not occurred in Europe. Nonetheless, there are a modest number of home satellite receiver systems with larger 'backgarden' dishes designed to capture the lower power signals sent to cable companies and a legal and black market for decoders of encrypted cable programming.

The future prospects for direct microwave transmission in Europe are a matter of policy choice. Liberalisation of broadcast entry would suggest that such broadcasters should be admitted. If admitted, however, their entry may come too late to have much impact. This is because competition between cable and PTOs in entertainment services is likely to expand in programming options, making entry of yet another entertainment broadcasting service less attractive.

2.1.6 Multimedia Content and Service Providers

A large number of multimedia services are being developed by suppliers associated with national PTOs and domestic and foreign investors. Separate subsidiaries and vertically integrated business units are being formed to develop applications emerging from the horizontal convergence of services. These services include information and interactive services, screen-based services through cable television networks, Internet access, videotex services, publishing and home shopping services. In these newly emerging markets, the focus is on entertainment and electronic retail markets, but there are plans to enter tele-education, teleworking, home management and other communication markets.

The development of multimedia applications is being *unbundled* from the physical transport infrastructure and a pattern of co-operation and competition is emerging between powerful industrial conglomerates involving content providers and international telecommunication service providers - such as BT-MCI-BBC and Bertelsmann-Canal Plus-Deutsche Telekom-France Telecom. These actors are expected to dominate the up-stream supply of multimedia applications.

2.1.7 Global Service Providers

Many of the PTOs and their parent companies are seeking to secure a strong position in their home markets, with connections reaching into almost all market segments. This is regarded as a prerequisite for survival in international markets. To achieve these goals, market reciprocity is vital since new operating entities based in national markets need access to alternative network providers in other EU member states, in the US, and around the world.

Foreign operators in Europe are leasing capacity from PTOs to launch their own networks and services. France Telecom is building data networks in other member states along with AT&T and BT. Other entrants have specialised in responding to the telecommunication needs of large customers with global operations, services that directly compete with the international operations of PTOs. Technological innovations have not yet played a significant role in this market. The global operations of PTOs and of the specialised new entrants are primarily based upon tariff arbitrage for international telecommunication traffic.

2.1.8 Stakeholders

Figure 1 shows the players and stakeholders who stand to benefit from developments in advanced information and communication technologies. Table 3 indicates the requirement for important application classes. Stakeholders clearly have an interest in the development of high speed data network and thus a direct concern with whether access arrangements will support their activities and interests. Three of the five high speed applications are non-commercial in nature and involve stakeholders in learning and healthcare organisations. Healthcare applications include remote consultation with physicians, surgeons and consultants; patient tracking facilities including transmission of high resolution images from x-ray and CT scanner equipment; remote booking of appointment; and access to global databases of donor organs.

Figure 1: The Players and Stakeholders

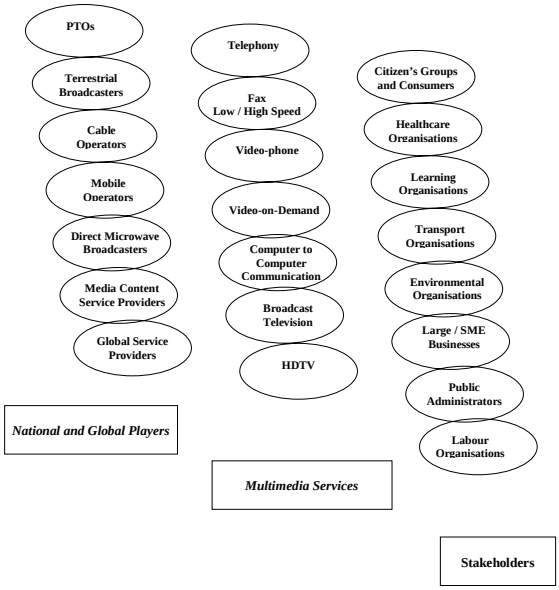

Table 3. Requirements for Important Application Classes	
EURO-APPLICATIONS	**NETWORK SPEED IN AN ISSUE OF LOW,MODERATE, OR HIGH IMPORTANCE**
Citizen Network	Moderate
Healthcare	High/Low
Learning	High/Low
Transport	Moderate
Rural Areas	Low
Environment	Low
Network of Competence and Science	High
Industry Networks	High
Business Network	Moderate
Administrative Network	Low
Media Network	High

Source: ACTS Workplan, August 1994.

In research, telecommunications supports international collaboration; the remote use of scientific instruments; access to large scientific databases; and, the distribution of research findings. In education, telecommunications supports the distribution of educational material; access to interactive learning software and services; the distribution by video of lectures and laboratory demonstrations; and interaction among teachers seeking information about content and technique. Environmental organisations use of telecommunication will be important in programmes to monitor global climatic change; accessing terrestrial and satellite-based observation systems; and developing databases supporting biodiversity, environmental hazard control, and water management. Many of these applications may be used to encourage or require further improvements in the telecommunications infrastructure.

2.2 Technical Convergence and Market Response

Technical convergence is leading to overlapping infrastructures. For example, from a technical point of view cable operators will be able to offer telephone service; broadband video, HDTV and multimedia services can be offered over a broadband switched network, over upgraded cable television networks, and over broadband wireless networks; broadcast distribution can be provided by cable operators, public broadcast networks and satellite broadcasters; and point-to-multipoint data downloading (datacasting) can be provided by broadcasters, satellite broadcasters and the PTOs.

Much attention is being focused on the convergence of telecommunication, cable television and broadcasting infrastructures, and on the unbundling of services. As the different infrastructures begin to converge towards transport systems capable of carrying all forms of digital services, they are beginning to resemble each other.

Vertical *unbundling* is occurring and telecommunication services can be separated from the operation of particular infrastructures. For example, voice telephone services can be carried by cable television networks, video and television services through telephone networks, and data traffic via terrestrial broadcasting networks. Vertical unbundling facilitates the horizontal integration of services provided over public infrastructures, enabling two, or even all three, infrastructures to support the whole range of telecommunication and broadcasting services.[12] Vertical convergence of telecommunication services also occurs as computer and telecommunication networks are interconnected. 'Intelligent' telecommunication networks consist of separate and interchangeable modular components that provide separate access, standardised interconnection and the potential for competition in their supply and operation.

The fact that the cable and fixed telecommunication infrastructure eventually will be able to support the full range of information and communication services has stimulated debate in all national markets as to whether there should be one, or more than one, connection into the businesses, homes and public facilities. Since PTOs and the cable operators need to upgrade their infrastructures, the question is whether they should be merged into one coherent, advanced system. The potential gains from the exploitation of economies of scale and scope through network integration have been recognised. The emergence of cellular mobile and satellite delivery systems (such as direct-to-home satellite broadcasting) have suggested that there are substantial risks in making the investments to bring fibre optic technologies into the local loop (the link to the customer's premises). There are also technological and cost uncertainties about how much capacity can be delivered by making more modest changes in the local loop such as compression techniques. These risks and uncertainties make it hazardous to opt for a single integrated broadband network.

A further source of uncertainty lies in the willingness of customers to pay for advanced information and communication services. There are few accurate estimates of overall consumption of media information products over the past several two decades despite growth in the capacity of networks and the diversity of available services. It is therefore difficult to determine whether new information and communication and media products will have to rely mainly on substitution within the general media spending category and will fight an uphill battle to attract consumer spending away from traditional products.

Despite the prospect of quarrelling for shares of an uncertain market in the consumer domain, telecommunication, cable television and broadcasting groups are seeking to enter each others' markets. They can invest large amounts of money in their networks now or they can wait to commit

financial resources until they have a better understanding of how much customers will be prepared to pay for advanced services. Investment decisions to support advanced services are influenced by expectations about future market share. These expectations are shaped, in turn, by a combination of factors, external and internal to each national market in which policy and regulatory choices play a central role.

The telecommunication community has been described as a rent-seeking coalition. The coalition enabled the extraction of selective advantages and the redistribution of the 'surplus' among influential stakeholders. The monopoly position of PTOs and the domestic equipment industry were historically supported politically by central governments, trade unions, and other stakeholders. In many cases, diversification strategies have been used to bring new facilities and services within exclusive monopoly concessions. As a result of this history, in the EU member states, the transformation of the public monopolies is taking a number of distinctive forms. In some cases a parent company includes a number of smaller operating companies and related units and the PTOs have strategies for transforming themselves into profitable and flexible private companies. In others, highly vertically integrated structures continue to embrace all telecommunication-related activities.

Regardless of the form of the transformation, it may be expected that the organisations evolving from the public monopoly structure will endeavour to find new means of controlling their environment to produce profits. The adequacy of policy and regulatory institutions for dealing with these developments needs to be carefully examined.

2.3 The Current State of Policy and Regulatory Institutions

Recent trends towards liberalisation of markets and the privatisation of public utilities have altered the primary role of the state from that of a producer of goods and services to that of a regulator of activities in a marketplace characterised by competitive entry.

The decision to privatise has often been motivated by a desire to improve the management of assets of public corporations by reducing government intervention and stimulating efficiency, innovation and customer responsiveness. It implies a change in legal form, i.e. from public to civil law, and considerable corporate reorganisation. Privatised utilities are granted access to capital markets and encouraged to introduce more flexible personnel policies. One motive for privatisation can be the desire to use proceeds from the transfer of public assets into private ownership to reduce current budget deficits.

Although privatised companies are expected to operate at arm's length from the state, these companies often retain direct links with the government which generally has remained a key shareholder. Public policy objectives such as universal service, price controls, innovation and competition, must be achieved via new institutional mechanisms such as market co-ordination, administrative regulation and legislative techniques.

In the EU, public utilities have lost their statutory immunity from competition legislation and their business activities are subject to the competition policy provisions of the Treaty of Rome. A major question is how to replace burdensome command-and-control legislation, with flexible administrative systems to ensure that social, economic, and political policy objectives are met.

In the US and the UK, the supervision of utilities is the responsibility of independent single-industry agencies or commissions with a mandate to regulate prices, enforce licence conditions and ensure quality of service. These agencies are supported by other institutions responsible for competition policy. In continental Europe, however, there has been reluctance to rely on specialised, single-purpose administrative agencies; instead important regulatory functions have been assigned to the departments of central government or to inter-ministerial committees.[13] Nevertheless, some European governments have started to emulate the Anglo-American approach towards administrative regulation. In these cases, the state continues to influence the conduct of actors and the conditions under which the economic game is played. The justification for administrative regulation is the need to redress imperfect market outcomes that are unacceptably suboptimal in terms of efficiency and/or equity. The aim of regulation is to achieve a balance between the public service and commercial roles of licensed public operators. General competition policy and legislation provide another avenue for addressing potentially anti-competitive practices, but some member states are only beginning to introduce separate and effective legislation on mergers and acquisitions. There have been varying degrees of tolerance for practices arising from market dominance which could be regarded as anti-competitive.

There has been discussion in most of the member states about the need for radically new legislative frameworks that would abandon the content/carriage and sectoral distinctions of the past. The issue is how the institutions responsible for the regulation of content and of carriage of services should be organised. Content regulation traditionally has been concerned with cultural policy and ownership rights in information. Carriage regulation has been concerned with access to infrastructure and provision of services that meet universal service objectives. Service obligations for cable concern 'must carry' channel obligations, while those in telecommunication generally concern the definition of universal service. Other issues involve the treatment of vertical integration between content and carriage activities and the need for separate accounting systems and/or subsidiaries. There is also continuous debate and disagreement on matters of regulatory competence and the applicability of existing legislation.

Although at a technical level, there is increasing potential for the *unbundling* of the supply of information content from the supply of carriage or infrastructure, there is a parallel process of *bundling* in which major players are seeking to be active in both areas. This is evident in the diversification of business activities of PTOs and in the formation of new conglomerates with strengths in the content business. As a result, it is increasingly difficult to introduce legislation and regulatory institutions premised on a clear division of responsibilities between segments of the market.

As a growing number of suppliers seek to provide multiple types of network infrastructure and services, the dividing lines between business segments will become more difficult to draw for policy or regulatory purposes. Actions in one area which affect carriage and one set of dominant suppliers will have repercussions in other areas involving content and various kinds of hardware and software supply.

At present the problems confronting 'telecommunication' policy and regulation are relatively narrowly defined as concerning the areas of standards, directives supporting competition, and

directives regarding universal service. There is generally a perceived need to balance policy objectives for industrial development, consumer protection and competition. Examples include:

Directives Affecting Standards

- Open Network Provision in the area of standards
- Number provisioning and portability

Directives Supporting Competition

- Open Network Provision affecting tariffs and interconnection
- Radio frequency spectrum allocation for telecommunication and broadcasting services
- Provisions against abuse of market power

Directives Regarding Universal Services

- Defining the level of universal service
- Transparency of costs of service obligations

Whether current policy and regulatory institutions should be regarded as adequate to the challenges of technological and market change depends upon the extent to which movements toward the *Idealist* view of competitive markets is likely to shape the future of telecommunications markets. The above outline of policy and regulatory responses suggest that reforms should be sought primarily in the areas of competition policy and the scope of regulatory review of increasingly inter-related markets. Insofar as the *Strategic* model is a more accurate indicator of developments in the market, there will be a need for more fundamental reform.

Table 4. Status of Entry Conditions in EU Member States, 1994

Countries/ Liberalise Markets	**Competition in Public Switched Telecommunication Networks**			**Data Communications & Leased Lines**		**Mobile Communication**		
	Local	Trunk	Internat.	X.25	Leased Lines	Analogue	Digital	Paging
Austria	M	M	M	M	M	M	M	C
Belgium	M	M	M	1993	M	M	M	M
Denmark	M	M	M	1993	M	D	C	M
Finland	C	C	C	C	C	D	D	D
France	M	M	M	1993	M	D	D	D
Germany	M	M	M	C	M	M	D	1994
Greece	M	M	M	1997	M	-	D	M
Ireland	M	M	M	1993	M	M	M	M
Italy	M	M	M	1993	M	M	D(1994)	M
Luxembourg	M	M	M	1993	M	M	M	M
Netherlands	M	M	M	1993	M	M	D(1994)	1993
Portugal	M	M	M	C	M	M	D	C
Spain	M	M	M	C	M	M	M	C

Sweden	C	C	C	C	C	C	C	C
UK	C	C	D	C	C	D	C	C

Key: C Competition, D Duopoly, M Monopoly, 199X Competition expected to be introduced this year
Source: OECD *Communications Outlook 1995*

3.0 The Interactions between Strategy and Policy: Network and Service Control

The preceding section has outlined initiatives by the incumbent telecommunication operators to secure their future in national and international markets. It has also highlighted areas in which new entrants are beginning to secure a foothold in the market. This section considers these developments in the light of the *Idealist* and *Strategic* models of telecommunication evolution. The core of the discussion is an analysis of how changes in markets and technologies may create new forms of market control and power. The potential impacts of these new forms of control for investment strategies in information superhighway capacity, standardisation, network interconnection, competencies, employment, and universal service issues are discussed. Table 4 shows the entry conditions which presently exist in the EU member states.

If these actors behave in a way that is in line with the *Idealist* model, a level playing field may be expected to emerge. The primary need for government intervention would be only to ameliorate distributional problems resulting from the exclusion of groups that could not pay the costs of gaining access to telecommunication services. However, if these actors' behaviour is in line with the *Strategic* model, there will be indications of the use of monopolisation tactics to secure market power and, correspondingly, a need for a more active role for government intervention to represent the interests of excluded individuals and organisations.

3.1 The Rhetoric of Players and Stakeholders

The rhetoric associated with the two models may be expressed succinctly and in direct opposition on a wide variety of issues. For example:

IDEALIST MODEL	***STRATEGIC MODEL***
A level playing field in telecommunication is assumed to exist now.	Oligopolistic rivalry is the most likely outcome in many telecommunications and related markets.
Interconnection and interoperability will be a market outcome.	Interconnection and interoperability issues will require continuous regulatory attention.
Ownership structure and service provision are market issues.	There are substantial public interests in ownership structure and service provision.
Cross-ownership will not create market power.	Cross-ownership is likely to create market power.
No new regulation is needed.	Regulation is necessary to protect the public interest and, where desirable, to create more effective competition.

3.2 Controlling the Gateways

The above examples suggest that there is a broad front of disagreement between proponents of the two models. In this section, we examine the issues arising from the control of interconnection, standards, and information control by large players. Each of these issues plays an important role in determining costs, the limitations of monopolisation, and universal access in the new telecommunications.

3.2.1 Controlling Access to the Network

In the *Idealist* model, the interconnection of a seamless network is assumed to be a purely commercial arrangement whereby competitors requiring access to each others' facilities negotiate in the light of full information about the technical characteristics of networks and the likely structure of demand. In the *Strategic* model the expectation is different. The incumbent operator is expected to use a variety of technical and economic strategies in a bid to retain market share. One interpretation of such behaviour is that it is a competitive response; another is that the incumbent operator has an arsenal of resources at its command that prevents negotiation of commercial agreements under fair terms and conditions.

Interconnection disputes are difficult to resolve with respect to both leased and switched infrastructure facilities. In virtually all markets where interconnection is a requirement for competitors to enter the market, the public policy stance has been to encourage parties to reach agreement without intervention by the state. In many of the EU member states, this issue is being encountered first in the context of interconnection agreements for mobile telephony operators. In countries outside the UK, the cable operators have yet to begin detailed negotiations on interconnection with incumbent PTOs.[14]

Interconnection provisions are important at a technical level as well. For example, discussions between incumbent operators involve sharing capacity and their respective rights and obligations.[15] When the incumbent is vertically or horizontally integrated with a potential new entrant these business links may imply no formal co-ordination. However, even though the incumbent PTO is committed to commercial market relationships with other players in the market, problems of co-ordination in the joint use of ducts to carry cables and sharing costs of digging up roads among integrated companies can represent barriers to entry for non-integrated independent companies.

A purely commercial arrangement can be very disadvantageous for new entrants if the structure of charges is used to create unequal competitive conditions. Failure to reach consensus on network interconnection issues could be an early warning of opportunistic behaviour on the part of new entrants, or it could signal anti-competitive behaviour on the part of the incumbent operators. The regulatory challenge is to distinguish between the two types of behaviour because time is likely to favour the incumbent.

3.2.2 Controlling Access to the Customer

The vision created by the Idealist model is one in which the technological changes in hardware and software enable the development of fully permeable and seamless networks characterised by inter-operability. The services supported by the network in this model utilise open systems for software applications. Common interface standards emerge at all the points at which competing suppliers and

customers might reasonably be expected to require access and to engage interactively with electronic services. This model creates the expectation that the economic interests of actors will encourage an appropriate degree of standardisation to ensure that open systems and open access are achieved.

In imperfectly competitive markets, standardisation may be used as a strategic tool to strengthen the position of incumbent and/or dominant network and service operators.[16] The resulting degree of compatibility among network and service interfaces may not be in the economic and social interests of all the suppliers and users in the market. When suppliers seek to differentiate their services, standards can offer a strategic tool to lock-in customers in a way that helps to secure market share.

In EU telecommunication markets, there is some evidence of the monopolisation tactics suggested by the *Strategic* model. It is not, however, the consequence of PTOs' failure to provide open interfaces to facilitate access to the underlying network. In this area the European Commission's Open Network Provision requirements appear to be creating incentives to open network access. However, a new set of tactics is emerging. Defensive strategies are focusing on the interface between the customer, the multimedia or content provider, and the network operator. This is an area where open systems have yet to be fully agreed for higher capacity switched networks and where service development is still at a relatively early experimental stage.

For the PTOs, the cable television operators and companies producing and/or distributing multimedia and other new services, the ability to gain exclusive access to customers is critical. There is a wide range of views in the EU with respect to whether government should intervene, or it should be left to the market, to ensure compatibility via standards for the new equipment that will enable the delivery of advanced information and communication services to the business or residential end-user.

A significant recent challenge in a convergent content/carriage marketplace is the introduction of set-top boxes or decoders. This equipment will be used to provide conditional access to new services. It also will provide a vehicle for encryption techniques to prevent unauthorised access. Some service providers already are relying on proprietary technologies that give exclusive access to the subscriber. They are doing so in order to lock-in subscribers and to achieve greater control over their share of the market. Many of the available technologies supporting interactive entertainment services via screen-based services (education, video-on-demand, games or shopping) are based on proprietary systems: content (exclusive rights), content packaging and conditional access systems (databases, decoders) and distribution. The critical issue is the location and control of the intelligent features in terminal equipment which is attached to networks, as well as the intelligent or software-based features which are embedded within networks.

Conditional access is an extension of the existing infrastructure. It makes it feasible to implement Open Network Provision requirements in the infrastructure and traditional telecommunication bearer services while, at the same time, creating a basis for the extension of market share. Conditional access has the potential to become a gatekeeper. Proprietary systems software in support of billing ensures that programming and services are paid for in advance; and the software also enables recording of consumer behaviour. When this information is embedded in cable or other systems, it creates a proprietary system that is not openly available to competitors.

Suppliers familiar with computer network architectures and standards and the development of software argue that the telecommunication and cable operators are obsessed with technology and

supply-driven markets. Nevertheless, the development of screen-based interfaces (computer dialogue, ergonomics, search mechanisms), and data mining (creation of new information out of data generated by transactions), provides a base upon which to build up a dominant market share and, potentially, to foreclose entry to smaller companies.

These developments suggest that standardised encryption and conditional access technology standards will need to be mandated by public policy. The focus of the European Commission has been on conditional access systems for broadcast digital television. However, this will not address the range of new advanced switched systems that are being planned by network operators and other suppliers.

A preference for open access systems is associated with strength of market position and the ability to use other means of control or gatekeeping. The enforcement of measures intended to ensure that dominant market position is not used to exclude suppliers or users from accessing networks or services depends on how monopoly power is defined. In effect, the players in the market are exploring new ways of gaining control of access to the customer via the set-top box.

3.2.3 Controlling Access to Market Information

The rhetoric of the *Idealist* model rests on an assumption that the traditional telecommunication operators, the cable operators, publishers, film producers, broadcasters, software and systems developers, hardware manufacturers, and users are equally well-endowed with the knowledge needed to develop, market and use services. When companies do not have the requisite expertise in-house, they are assumed to be able to acquire it at non-discriminatory prices on the open market.
The *Strategic* model begins from a different set of premises. It assumes that knowledge and experience may create competitive advantages and may be acquired through mechanisms entirely outside of normal market transactions. These may appear to one actor to be reasonable and effective aspects of innovation. To an excluded actor, the same exchange of knowledge may be perceived as anti-competitive exclusive dealings among companies, subsidiaries or divisions with a common interest. What is being acquired and learned in these relationships is information about what customers are willing to pay for services. This is both highly valuable commercial information and a likely source of market power. Despite claims by PTOs that they do not influence the decisions of their subsidiaries and associated companies, these relationships are often perceived by new entrants to work to the benefit of the dominant companies.

For example subsidiaries of PTOs may gain access to infrastructure capacity on terms that are advantageous to their own businesses; parent and spin-off companies in the multimedia and other advanced services markets may benefit from the flow of knowledge between them; and mobile network operations may be connected by divisions within PTOs enabling transfers of information, staff and funds within these organisations. Such exchanges are part of the process of innovation and they are essential to building up intelligence about as many aspects of technology and the market as possible. These exchanges will occur in spite of formal assurances that the organisations operate independently.

The viability of competitive entry in a liberalising market cannot be assessed on economic and technical considerations alone. The organisational, cultural and social conditions which enable the build-up of new competencies and learning are equally or more important to business prospects. The

emergence of these kinds of relationships resulting from vertical or horizontal integration must be taken into account when markets are being contested and competition is being promoted by public authorities.

From the perspective of the *Idealist* model, these kinds of relationships are of no interest because they are assumed not to exist. From the perspective of the *Strategic* model, the sharing of knowledge among actors in the marketplace is expected as part of the process of developing new services and applications. It is not feasible to mandate the disclosure of the kind of market information that is gained through these kinds relationships. The issue is whether relationships that do emerge are suppressing competition in domestic markets and whether this supports national or EU policy goals.

3.3 The Implications of Strategic Behaviour for Regulation

The foregoing issues are important for the development of Europe's Information Society and the development and use of future information highways and service applications. They directly affect infrastructure capacity and investment strategies and the future definition and role of universal services.

3.3.1 Infrastructure Capacity and Investment

In the perfectly competitive market model - the *Idealist* model - investment in capacity is responsive to demand of all kinds. In a demand-led industry, those permitted to invest in the telecommunication market would ensure that there is sufficient capacity with appropriate technological features to support the requirements of business and residential customers. In this theoretical case, the market would be characterised neither by a capacity constraint nor by oversupply.

However, the timing of investment using an array of advanced information and communication technologies - fixed and radio based - is one of the most controversial questions in the information super-highway debate. Neither governments nor private sector investors want to be confronted by under-utilised facilities as a result of projections for growth in service markets that fail to materialise. When markets are liberalised, the problem of determining the appropriate timing of investment in digital facilities and/or fibre optic links is exacerbated by the fact that investors must consider whether to use existing infrastructure; build infrastructure to older specifications; or build infrastructure to new specifications to take advantage of technical innovations.

The rhetoric of the *Idealist* model suggests that there is an urgent need to construct the broadband infrastructure capacity envisaged by the champions of the new superhighways. The *Strategic* model suggests, however, that investment will be largely supply-led and that it will be unevenly distributed geographically and among operators. Investors will try to minimise risks to themselves when they face uncertainty and competitive entry. Investment decisions are influenced, for example, by the existence of under-utilised analogue and digital leased line and switched network capacity; adoption of innovations which enable intensified use of available radio frequency spectrum; and projections which suggest that only a small percentage of connections to the home currently can be economically replaced by higher capacity two-way facilities. Investment behaviour is also a reflection of how the

policy environment influences the services that suppliers are permitted to offer and the way the behaviour of the incumbent operator affects new entrants' prospects.

Governments cannot be expected to make judgements about the appropriate scale of investment once they transfer investment risk to the private sector and to private shareholders. The important question is why private investors might seek to build over-capacity or to curtail the availability of capacity based on past or new technologies reaching the commercialisation stage. At present, optical fibre technologies offer a cost-effective way of meeting demand projections such as the need for capacity to deliver conventional broadcast channels, interactive information services and to support a migration towards HDTV. The players are seeking to bundle their activities together in a search to extend their markets and to reduce the risk associated with new investment. The incentive to engage in monopolisation, i.e. gaining control in the market, need not necessarily result in monopoly. It may result in rivalry among two or more major large players in the market, but this will not result in the outcomes predicted by the *Idealist* or fully competitive market model.

The outcomes of capacity investment need to be evaluated in terms of wider economic policy considerations and their impact on consumers. For example, the actors which come to dominate the market may be the incumbent national PTO, or an operator from another company in Europe or the US; it may be Microsoft, or a film distribution company. The outcome will result in incentives to over- or under-invest in capacity. The key issue for government policy is not to predict how much capacity should be available in a given period (using specific technologies), but the implications of investment strategies for access by intermediate and end-users.

3.3.2 Definition and Role of Universal Services

The future definition and role of universal services is also affected by the interactions between company strategies and policies and the way technical changes enable new forms of competition to emerge. The *Idealist* model provides little guidance with respect to either the definition of universal service or whether future infrastructure and service development will be responsive to the requirements of users. The *Strategic* model draws attention to the fact that there are strong incentives for competition in some product submarkets and weaker ones in others. This affects the relative rates of diffusion of an increasingly heterogeneous mix of services.

Innovations in network and service technologies in recent years have raised concerns about the universality of the networks and services that will be provided in the future. The universality of Plain Old Telephone Service using a copper wire pair has been defined in terms of geography, affordability, quality and non-discriminatory access.[17] In the UK the possible definitions of universal service and the requirements that could be met by designated infrastructure operators range from individual access to the network via analogue or digital switches for the provision of voice telephony, to individual access to a broadband multiservice network, allowing access to all services with bandwidths of the order of 20 Mbit/s in both directions.[18] Only the former is delivered universally at present. Debate on this issue centres on who will pay the costs of providing universal service if it is defined to include more than the commonly accepted definition which supports voice telephony. Niche players are able to serve lucrative markets, leaving the less profitable or loss-making regions or customer segments to the incumbent PTO. There is controversy between incumbent operators and new entrants about the magnitude of costs of network components required to modernise networks and the additional costs of achieving universal service.

When voice telephony is provided by multiple infrastructure providers including cable companies, the cost and price relationships for universal services become more complex. The delivery of telephony, multimedia, entertainment programming, and a range of tele-shopping, tele-banking and other services raises questions as to whether and what universal service obligations should be imposed on cable and other operators.

In most EU member states, policy makers and regulators argue that they should play a role in ensuring access to rights of way and ensuring that obligations to offer a 'basic' universal service are met. However, universal service debates in the context of the Information Society are beginning to extend to the availability and affordability of new information and communication service applications such as access to the Internet. These debates focus on the future accessibility of information superhighways and their information and communication applications. The issue here is the social and economic consequences of an uneven diffusion of broadband switched networks and applications which may result in a society of information rich and information poor. When the policy debate shifts to a focus on applications, it raises issues about how definitions and obligations to achieve universal access to service applications will affect freedom of speech and fundamental democratic processes. These are not currently regarded as telecommunication problems by regulators of today's telecommunication networks.

3.4 Policy and Regulatory Choices

The *Idealist* model assumes that there is intense competition between the actors in the market and that behaviour will be characterised by fairness and equity. The need for policy and regulation is restricted only to the imposition of effective competition policies and the amelioration of distributional problems involving customers who cannot pay, but should receive access, to some basic level of services. This model assumes that technical innovation, entrepreneurship and the continuous search for efficiency erodes any residue of monopoly - and protects against its re-emergence in the future. There are no grounds for asymmetric regulation. There is no need to consider the introduction of restrictive cross-ownership rules or to insist on the separation (or separate accounting) of the business activities of larger suppliers because market dominance is not taken into account in the model.

In contrast, in the *Strategic* model, the monopolisation strategies of a small number of oligopolistic rivals or monopolists in the domestic market creates tendencies in some markets to lock-in customers and to reduce the effectiveness of new entrants as competitors. The main issue is how to gain control over the customer, that is, to develop strategies that will ensure business success. In this model, the issue is whether the positions of companies in the market enable them to exercise market power and to suppress opportunities for innovation and new market entry.

As new strategies to achieve control emerge, they may be opportunistic responses to a highly competitive market or they may be anti-competitive depending on the definition of the market and product which is being produced. This does not indicate whether the result will be beneficial or detrimental to the interests of domestic or foreign-owned industrial actors on the world market or to the interests of individual consumers. There are two arguments here.

The first is the association of domestic 'national champions' with strengths encouraged by the state which enables companies to build platforms for successful participation in global markets. The larger and/or incumbent firms argue that they need to achieve substantial economies of scale and scope in order to operate effectively in the international market. Government policy and regulatory responses aimed at creating greater incentives for competition in the domestic market are regarded as threatening to the viability of key domestic firms.

The second argument is that inefficiencies resulting from diseconomies of scale and scope which complement gains from large scale and diverse operations may jeopardise the very success of the companies that government policy is designed to enhance.[19] In addition, larger competitors, whether domestic or foreign-owned, may be disadvantaged in the EU member state markets because of inefficiencies associated with their large scale, difficulties in responding to distinctive local requirements, and a host of other factors.

The economic viability of larger and smaller operating entities is uncertain and depends on numerous factors such as the way such operators are managed. There is no reason to expect that public authorities will be able to forecast outcomes with a greater degree of accuracy than the companies themselves. As a result, the relationship between the promotion of competition in EU markets and the competitiveness of European companies on the world market will continue to be controversial. The main policy and regulatory issue should be whether consumers will be better off if they are served by a more efficient foreign-owned company; a mix of foreign and domestically-owned companies alone or through alliances between foreign and domestic medium-sized network operators and service providers; or by domestically-owned companies alone.

Some argue that the rapid opening of the EU market to foreign network and service providers would stimulate investment, innovation, and experimentation and that this would be beneficial to the European economy. Others insist that rapid market liberalisation will threaten policy goals and the viability of large European firms. The EU must tread a difficult path between incentives to strengthen competition in member state markets and measures that will strengthen the competitiveness of key players in international markets.

The political response needs to continuously assess the appropriate balance among the objectives of policy embracing these economic considerations and many social, cultural, and political issues. The *Strategic* model suggests that the EU must find effective ways of implementing regulation that addresses the market power of dominant operators where their activities are anti-competitive or exclusionary; and of creating incentives for new market entry when market liberalisation and competition are given political priority. These are usually associated with the tasks of an independent regulatory agency or with the role of competition policy.

The *Strategic* model also adds a third role: ensuring co-ordination among multiple actors in the supply of complex information and communication systems to meet a variety of social (including consumer protection) and economic objectives. Regulation must be responsive to potential conflicts with respect to public interest issues such as universal services, privacy protection, control of access to networks and service applications and employment as well as issues of trade-related reciprocity between countries. The policy issue is what form of co-ordination is consistent with policy priorities.

Neither the *Idealist* nor the *Strategic* model offers a clear recipe for the structure and organisation of the institutions of policy and regulation. Table 5 shows the various models which have been implemented by the member states.

The actual practices of independent regulatory agencies in all countries are characterised by continuous experimentation and varying degrees of enforcement of rules of market conduct. Thus, the creation of independent regulatory institutions does not offer solutions to policy problems on its own.

Table 5. Regulatory Regimes in EU Member States

Country	Regulatory Regime
Austria	Regulatory body is part of the Federal Ministry of Public Economy and Transport
Belgium	RTT and the Ministry
Denmark	Telecom Inspectorate, a public authority created in 1990
Finland	Telecommunications Administration Centre of the Ministry of Transport & Communication
France	DGPT, a body under the Ministry, created in 1993 (previously DRG, created in 1990)
Germany	Department of Regulatory Issues (under the Ministry), created in 1989
Greece	The Ministry regulates the sector
Ireland	Department of Communications (under the Ministry)
Italy	Several bodies assist the Ministry in the Regulation of Telecommunications
Luxembourg	P&T and the Ministry regulate the sector
Netherlands	HDTP, Directorate under the Ministry, created in 1988
Portugal	ICP, an Institute under the Ministry, created in 1989
Spain	A department of the Ministry, since 1987
Sweden	OFCOM (Federal Department of Transport, Communication & Energy), part of the Ministry
UK	OFTEL, an independent body, since 1984

Source: The 1994 *Panorama of EU Industry*; OECD *Communications Outlook 1995*

The European Commission has called for the establishment of independent sector specific regulatory agencies by the member states. However, the emergence of powerful new conglomerates which traverse the boundaries of formerly distinct sectors, i.e. telecommunication, audio-visual, etc., will prove increasingly difficult to address via such sector specific agencies. Issues concerning freedom of speech/information (guaranteed access to affordable and culturally diverse electronic information; and competition policy (fair competition within all levels of information transport and information production) will need to be considered for their impact on one another.

The resources of European policy and regulation will need to be targeted and organised in a way that can address key developments in the market. To meet the challenges of convergent technologies and changes in the structure of the European market, continuous negotiation with all the interested parties will be required in an institutional setting that is relatively autonomous from the parochial interests of suppliers and stakeholder groups.

4.0 Conclusion: Strategies and Policies

In a convergent and liberalising European market, the players are not competing on a 'level playing field'. They are seeking strategies that will allow them to 'capture the customer'. They are doing so in a market characterised by growing concentration and where PTOs retain exclusive rights and/or considerable market power.

4.1 Redistributing Decision Making Control

Decision making control over the design and construction of the transmission components of the physical infrastructure for the information superhighway is located with a small number of manufacturers and network operators. In the software area there are signs of change. At the periphery of networks there is a shift in control away from traditional operators, illustrated by battles over the set-top box. New players are seeking to gain control but they are becoming linked to traditional players. There is rivalry over standards as all players seek to maximise access to customers and to market information.

Use of satellite, mobile and other radio-based systems is increasing and the transformation of the fixed telecommunication infrastructure and the coaxial systems of cable operators into digital fibre systems is underway. However, only a small proportion of customers will have access in the near future to a broadband network that reaches all the way into the office or home. Compression technologies will gradually make possible the more extensive use of existing facilities and new investments in high-capacity systems will be undertaken in selected areas.

Technological trends are complemented by trends in decision making control in the management and operation of the physical infrastructure in support of service provision. Here control over the design and implementation of software used for billing and gathering customer-related information is becoming a critical issue. The primary decision-makers are the telecommunication and cable system operators, but service providers are challenging their control. If media conglomerates succeed in locating the sophisticated software used for billing and the software that records customer behaviour in a set-top box, they will want to manage and operate this aspect of the system. If these companies enter alliances with telecommunication/cable operators, the scale economies of generating billing and transaction-related information via the same system are likely to be substantial. There is little evidence of diversification of control in this area and the privacy implications are substantial.

There is also evidence that these information control systems and gateways to services can be provided effectively by companies who perform systems integration functions. Computing and software companies, direct marketing companies, financial institutions, etc., may all become candidates for managing and processing information relating to the consumption of information that flows through networks.

Although decision making control over the design, operation and use of advanced networks and services is being redistributed among new players, the incumbent PTOs exercise a considerably greater degree of control than some of the smaller new entrants. Others are gaining some control as a result of the scale of their operations and linkages up and down the information chain.

4.2 Defining Universal Service

The traditional concept of a basic public telecommunication service is beginning to lose meaning as far as commercial services are concerned. In markets with a very high penetration of voice telephone service, issues about how to extend network connections to any unserved population and of ensuring that the penetration rate for this 'basic' service does not decline will continue to be present. This also applies to subscriptions to cable systems and their extension (or substitution by other technologies) to unserved areas.

A distinction needs to be drawn between basic access to *networks* at reasonable prices and basic access to *information*. With respect to access to networks, no country has succeeded in defining a universal service obligation for any operator beyond individual access to the network via analogue or digital switches for the provision of voice telephony. Many countries have policies encouraging access to ISDN, the Internet and broadband switched networks. It is unlikely, however, that these levels of service will be imposed as obligations on network operators in liberalising markets.

The issue of basic access to information is far more complicated. Governments in democratic societies have mandated the reception of public broadcasting channels via 'must carry' rules imposed on cable operators. It is not clear whether similar principles should apply to other kinds of public information (e.g. health, education, transport, government information). Operators who control gateways for accessing customers may have an incentive to screen out certain kinds of non-revenue generating information. No public authority is presently charged with broad responsibility for defining access to public information or evaluating the value and use of public information by users.

4.3 Co-ordinating Policy and Regulation

There is a need to address policy and regulation for telecommunications in the context of all the infrastructures available for the carriage of signals and the services providing information content. The information superhighway concept is an inappropriate metaphor because it focuses attention mainly on carriage or distribution as an end in itself, and narrowly on the economics of the production and use of these distribution systems. The more important goal is related to the knowledge and information that are produced and consumed as a result of the distribution process. These goals are more commonly associated with social or cultural questions although they are also related to the economics of the production and consumption of information. By focusing on information content and carriage issues in a more co-ordinated way there is a greater likelihood that both social and economic goals will be addressed.

Despite the convergence of technologies and applications across the telecommunication, computing and audio-visual industries, the technical details of regulation - standards, tariffs, interconnection, numbering, quality standards - remain quite separate in terms of those who participate in technical decision making. There is a case for the separation of these regulatory tasks at the implementation level, but this separation could be achieved by separate working groups within a single organisation.

The case for a single regulatory organisation addressing telecommunication and audio-visual (cable - broadcasting) interests is strong. The question of how such competence should be institutionalised is not addressed in detail here. Regulatory action with respect to the behaviour of incumbent PTOs has implications for the cable industry and other segments of the telecommunication and information services markets. As foreign- and European-owned companies gain a stronger foothold in the telecommunication market they will want to protect their investments. They will argue that the EU authorities should ensure their investment is not jeopardised by the residual monopoly power of incumbent players in the market.

Changing technologies and the internationalisation of markets will force issues to be addressed both nationally and at the EU level. As a telecommunication-specific 'independent regulatory agency' model has yet to be implemented firmly in Europe, the Union has an opportunity to lead in the regulatory field. By establishing an *integrated* institution, it would be in a position to build the expertise needed to address regulatory issues that arise in a rapidly changing market.

The organisation of regulatory institutions has an impact on how priorities are decided between potentially conflicting social and economic policy goals and within social and economic policy. For example, the rights of individuals to privacy as compared to the collective needs of society for information about individuals' behaviour often come into conflict. There are continuous tensions between local or sub-regional economic objectives, those at the national level and those of the EU. The organisation of policy and regulation to enable negotiation of priorities and to recognise the interdependence of issues will be increasingly important.

4.4 Competing for Access

The majority of customers over the next ten years will have links to two main access points of networks - the telecommunication and the cable link. The penetration of radio technologies (mobile and satellite) will increase but they are likely to complement terrestrial systems rather than to substitute for them.

A key question is whether competing private investors will install two very high capacity fibre links into every household (one by telecommunication operators and the other by cable operators). Estimates of the optimal scale of operation needed to sustain such investment depend on uncertain projections as to future demand and changing technical conditions which affect business plans. The size of investments will be substantial and will be undertaken largely by private investors who will base their judgements on perceived government policy and the likelihood of generating profits.

Public authorities have an obligation to private investors to provide clear signals for investment and to ensure that, whatever strategies are chosen by private (or soon to be privatised) companies, the outcome for customers is as efficient and equitable as possible. In the present environment, there is little transparency. Business units are being *bundled* together (local, long distance telephone, data, and other services, cable, mobile, and interests in content production) at the same time that technical innovations are making it possible to *unbundle* the provision of infrastructure and services.

The EU will need to establish an institution that can effectively implement measures that tilt the market in favour of opening and diversifying access. All instances of vertical and horizontal integration cannot be discouraged. This would be an impossible task. However, key areas need to be monitored and regulatory action taken when negative impacts for companies and individual consumers are found.

a) Access to the Network: The network interconnection issue provides a focus for regulation around which other issues including universal service obligations, numbering, 'must carry' rules, etc., can radiate. Incentives for investment, wider geographical distribution, accessibility and affordability of services, can be created through broader and more forward looking interconnection directives.

b) Access to the Customer: The 'set-top box' is one manifestation of control in this area. The wider issue is control of the software that supports billing systems and customer-generated transaction-related information which raises issues of protection of customer privacy. The control of information gateways (or the toll booth of the information super-highway) is important for democratic processes and commercial and consumer freedom in accessing information and thus requires direct investigation by public authorities.

c) Access to Market Information: The bundlin*g* of the chain of relationships between infrastructure and service providers in complex organisational structures facilitates opportunities to learn what services customers will be willing to pay for. Vertical and horizontal integration are likely to benefit the major players and to reduce opportunities for entry into certain segments of information and communication markets. Such relationships may stimulate innovation in some cases, whereas in others, they may simply encourage inefficiencies and market dominance which suppresses competition. Renewed attention to these issues is needed by policy makers concerned with competition policy.

4.5 Policy for the Information Society

The focus of policy and regulation for the Information Society needs to be oriented to the creation of institutions that *jointly* address innovation, competition and social policy issues. The foregoing analysis of the strategic interests of the players in the new telecommunication markets of the EU highlights key areas in which there are risks that various stakeholders' interests in access to, and use of, advanced information and communication networks and services may not be met fully in the absence of innovative regulatory intervention. The limited resources of the EU must be targeted at those areas in which there is the greatest likelihood of influencing outcomes in the marketplace to achieve an improved balance between equity and efficiency considerations.

Our analysis points to four key recommendations for regulatory action that can be considered both at the EU and member state levels.

Recommendation 1:

Actions to improve transparency, access to information, open systems implementation, non-discrimination and equality of access among organisations should receive priority in the policy making process. Regulatory and competition policy should focus on any network or service

supplier who is able to achieve control over access to customers in the new telecommunication markets, e.g. as a result of vertical or horizontal linkages among suppliers. These players are likely to include organisations in addition to the PTOs.

Recommendation 2:

Innovation and experimentation with information and communication technologies by end-users and initiatives by smaller firms and by public organisations to test and develop new information services will contribute to the total stock of knowledge and competence available within Europe. Such activities should be candidates for public support to encourage widespread experimentation. Attention needs to be given to determining which public authorities should be charged with broad responsibilities for defining access to public information or for evaluating the value and use of public information.

Recommendation 3:

The outcome of negotiations among industrial players and their subsequent investment strategies is shaped by regulatory choices. Innovative forms of regulation that are responsive to the convergence of the underlying technologies and to the interdependence of telecommunication, audio-visual and software markets are needed. The EU should form an 'independent agency' that continuously monitors developments in overlapping markets and recommends intervention to achieve public policy goals.

Recommendation 4:

The bundling of relationships between infrastructure and service providers brings opportunities for learning and experimentation with new technologies and services, but it also creates the potential for inefficiencies and market dominance. Renewed attention to this issue and to the role of competition policy is needed to ensure an appropriate balance among international competitive pressures, the development of European enterprise, and the public interest.

Recommendation 5:

The new methods by which market players are 'competing for control' over access to networks, customers, and market information are shifting network access issues away from the underlying infrastructure to the design and implementation of software and peripherals embedded within networks. Policy and regulatory institutions must monitor and respond to these developments to preserve public interests in the development of the new telecommunication markets.

Competition in the new telecommunication market will bring social and economic benefits. However, this is not the competition of the *Idealist* model. It is a process of competition that will bring commercial and social benefits to some participants in the Information Society but not to others. Regulation at the EU and member state levels will not be able to address all the problems that will arise, but neither were they able to do so in the monopoly era. The foregoing recommendations are targeted at those areas in which intervention is likely to be most urgently needed to address imbalances between the respective interests of the larger players and the numerous stakeholders in the market. Particular attention will need to be given to enabling innovation and experimentation on the

part of small and medium sized firms and to ensuring that social goals and consumer interests are respected.

The European information and communication markets are subject to the forces of global rivalry and they are becoming more difficult for the policy and regulatory apparatus to control. Nevertheless, communication traffic and information applications are consumed within the boundaries of the EU and the gateways to information are located within Europe. EU policy and regulation can be used to shape outcomes to a degree that often is underestimated by the proponents of globalisation and effective regulation can facilitate the achievement of a wide range of social and economic goals.

The European information superhighway markets are not characterised by the free competition of the *Idealist* model. This is a reflection of the history of public policy, the dynamics of technological change, and market behaviour. Failure to engage public policy and regulation to minimise mis-alignments of social, political and economic interests in the Information Society will jeopardise positive visions of the benefits to the EU.

Notes and References

1 This report draws on research supported by the Rathenau Institute (formerly the Netherlands Office of Technology Assessment) and this contribution is gratefully acknowledged. Dr. Andrew Davies and Willem Hulsink contributed substantially to the earlier research. The earlier research is published as R. Mansell, A. Davies and W. Hulsink (1995) *The New Telecommunications in the Netherlands: Strategic Developments in Technologies and Markets*. The Hague: Rathenau Institute.

2 European Commission (1993) White Paper on *Growth, Competitiveness and Employment - the challenges and ways forward into the 21st Century*, Brussels, December 1993; High Level Group on the Information Society (1994) 'Europe and the Global Information Society: Recommendations to the European Council', [Bangemann Report], Brussels, 26 May; European Commission (1995) Action Plan, 'Europe's Way to the Information Society', Brussels.

3 The distinction between social stakeholders and producers used throughout this document reflects the STOA explicit exclusion of producers and regulators as stakeholders. This distinction facilitates the discussion of the social welfare implications of our analysis. Producers are, of course, a kind of 'stakeholder' in these developments.

4 These models are developed in R. Mansell (1993) *The New Telecommunications: A Political Economy of Network Evolution*. London: Sage Publications. The models are applied to developments in the United States, the UK, France, Germany, and Sweden. See also, R. Mansell (1994) 'Strategic Issues in Telecommunications: Unbundling the Information Infrastructure', *Telecommunications Policy*, Vol. 18(8), pp. 588-600.

5 These indicators were derived from qualitative information in OECD (1995*) OECD Communication Outlook 1995*, OECD ICCP, Paris. The liberalising markets indicator is based on the structure of market for eight services and telecommunications equipment reported on p. 14. Corporatisation and privatisation is based on the extent to which the Public Telecommunication Operator has become a public stock company with widely dispersed ownership, pp. 12-13. Establishment of new regulatory regime is a qualitative indicator based on the extent to which an "independent regulatory agency" or similar model has been adopted, pp. 121-221.

6 See for example, E. Noam (1987) 'The Public Telecommunications Network: A Concept in Transition', *Journal of Communication*, Vol. 37(1), pp. 30-48; and E. Noam (1994) 'Beyond Liberalization I: From the Network of Networks to the System of Systems', *Telecommunications Policy*, Vol. 18, pp. 286-94; 'Beyond Liberalization II: The Impending Doom of Common Carriage', Vol. 18, pp. 435-52; 'Beyond Liberalization III: Reforming Universal Service', Vol. 18, pp. 687-704.

7 European Commission (1987) 'Towards a Dynamic European Economy: Green Paper on the Development of a Common Market for Telecommunication Services and Equipment', COM(87) 290 final, 30 June.

8 Council of the European Commission (1990) 'Council Directive on the Establishment of the Internal Market for Telecommunication Services through the Implementation of Open Network Provision (ONP), 90/387/EEC, OJ L 192/1, 28 June.

9 European Commission (1995) 'Draft Directive 90/338/EEC Regarding the Implementation of Full Competition in the Telecommunications Market', Brussels, 19 July.

10 Narrowband Basic Rate ISDN provides each subscriber with a socket with an inlet for two fully switched digital connections: two 64 kbit/s channels carrying customer traffic and a single 16 kbit/s channel for signalling and intelligent network services. Higher capacity ISDN provides 30 switched 64 kbit/s channels for customer traffic and a single 64 kbit/s channel for signalling.

11 Datacasting is point-to-multipoint data communication using the radio frequency spectrum.

12 See also OECD (1992) *Convergence Between Communications Technologies: Case Studies from North America and Western Europe*. Paris: OECD; OECD (1992) *Telecommunications and Broadcasting: Convergence or Collision?* Paris: OECD.

13 G. Majone (1989) 'Regulating Europe: Problems and Prospects', *Jahrbuch zur Staatsund Verwaltungswissenschaft*, 3, pp. 159-77; F. McGowan and R. Mansell (1992) 'Utilities in the EC: A Regime in Transition', *Futures*, Jan/Feb, pp. 65-82.

14 European Commission (1995) 'Proposal for a European Parliament and Council Directive on Interconnection in Telecommunications Ensuring Universal Service and Interoperability through Application of the Principles of Open Network Provision (ONP)', COM(95) 379, Brussels, 19 July.

15 Office of Telecommunications (1994) 'A Framework for Effective Competition: A Consultative Document on the Future of Interconnection and Related Issues', London, December; (1995) 'Effective Competition: Framework for Action', London, July; and (1995) 'Beyond the Telephone, The Television and the PC', London, August 1995.

16 See R. Hawkins, R. Mansell and J. Skea (1995) *Standards, Innovation and Competitiveness: The Politics and Economics of Standards in Natural and Technical Environments*. Cheltenham: Edward Elgar.

17 See also N. Garnham and R. Mansell (1991) *Universal Service and Rate Restructuring in Telecommunications*, Paris: OECD; Council of the European Communities (1994) 'Council Resolution 94/C 48/01 of 7 February 1994 on universal service principles in the telecommunications sector', OJ C48/1, 16 February 1994.

18 Office of Telecommunications (1994) 'A Framework for Effective Competition: A Consultative Document on the Future of Interconnection and Related Issues', London, December, p. 42.

19 There is some evidence that smaller telecommunication operators and the independent operating companies in the US have achieved excellent performance records on standard efficiency indicators. See also A. Davies (1994) *Telecommunications and Politics: The Decentralised Alternative*. London: Frances Pinter.