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Advanced Communication Technologies and Services:
Design Configuration and Stakeholder Interests in Europe

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1.   Introduction [1]

The European Information Society requires a rapid and even 'take-up' or diffusion and use of advanced communication technologies and services. Upgrading the existing telephony-based telecommunication network to deliver new applications and support new terminal equipment involves private investment and public policy decisions. Private decisions depend on a large number of factors including the speed of technological innovation, the structural characteristics of the supply side of the market, the requirements and preferences of users, and the macro-economic conditions. Policy decisions depend on the same factors as well as on developments in the political, legislative and regulatory environment. As many factors will influence the implementation and use of new technologies and services, the future is very uncertain.

Even in the face of this uncertainty it is possible to focus on specific changes in supply and demand and to establish how these are linked to developments in the policy environment. The different possibilities for combining supply, demand and policy influences suggest different outcomes for the diffusion of European technology and services and these can help to inform public and private decision-making.

This paper presents scenarios based on analysis of the configurations of technologies and stakeholder interests that are likely to emerge in the short, medium and long term in Europe. The analytical approach differs from most efforts to describe the future of advanced communication technologies and services. First, it does not depend on hypothetical assumptions about the behaviour of firms and governments; it is based on observations of the actions of key actors or stakeholders who influence the development of new markets. Second, it is not based only on extrapolations of expected user behaviour; but on analyses of likely outcomes generated by relationships between developments in technologies, markets and policy.

The approach assumes that the diffusion and use of advanced communication technologies results from decisions taken by people and organisations with varying interests in the development of the European Information Society. Unlike simple demand-led projections of the diffusion and use of new services and applications, the scenarios are intended to present outcomes which reflect actual developments in the market. They point to actions that can be taken by technology developers, firms and policy-makers to shape the path toward the Information Society. These actions involve coordinating policy, institutions and technological developments through common recognition of issues and deliberate choices taken by private and public actors.

The objective of this paper is to suggest how a focus on problems of coordination and market players can lead to an identification of much needed institutional, policy and technological decisions.
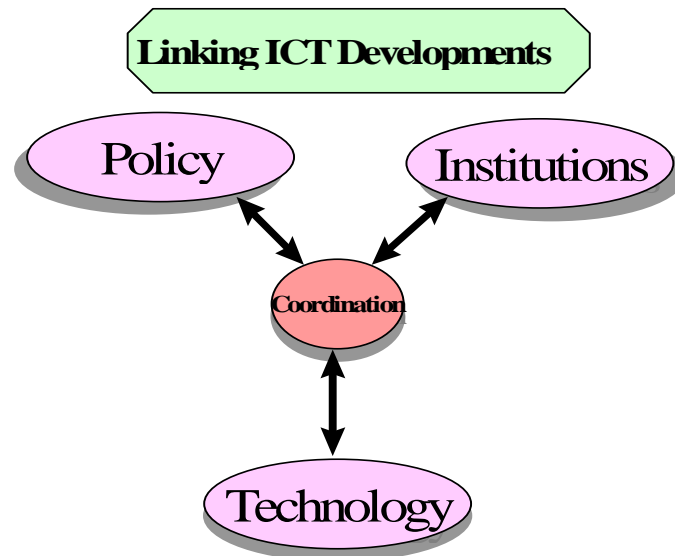
2.   The Common Consensus Vision of the European Information Society

A common consensus vision is influential in current public understanding of the future of advanced communication services and it is implicit in many of the published forecasts of developments in this area. The common consensus vision is based on demand-led projections of diffusion and use of technologies given a set of assumptions about developments in the macro-economic environment and the extrapolation of supply trends in the telecommunication infrastructure. The point of departure for common consensus forecasts is assumptions about how much users will be willing to spend on new information and communication services. To complete such forecasts, further assumptions are made about the specific combinations of new services that users will prefer and when these services and the underlying technological infrastructure will be in place.

All too often such forecasts are wrong both in overall direction and detail. Some innovative technologies and applications take off and others do not. Some assumptions about user behaviour and preferences prove to be accurate, while others fail to detect the capacity of users to accept or resist what is offered in the marketplace. Whether based on prediction or hope, some suppliers prove to be enormously successful, while others, who show promise, fall by the wayside. In addition, legislation and regulations that are expected to enhance competition in the marketplace have intended and unexpected or unintended effects.

The common consensus vision rests on two pillars: price-led market expansion and 'just in time' demand.

Price-led Market Expansion
Price-led market expansion is expected as a result of market liberalisation and privatisation, competition driven price reductions and highly elastic demand. The gaps between Europe, North America and Japan are expected to be reduced as telecommunication infrastructure and service markets are opened to competition. Competition is expected to drive prices down

resulting in greater demand for telecommunication services. Lower prices are expected to bring substantial increases in the quantity of services demanded by users. The resulting increases in revenues, due to highly elastic demand, are expected to fund investment in the advanced communication infrastructure and in new service development and use.

European Public Telecommunication Operators (PTOs) have operated until recently under political mandates that assigned a high priority to job creation, domestic sourcing of equipment, and, in the late 1970s and the '80s, the extension of voice telephony to achieve universal coverage. By exposing these companies to competition from new entrants and by altering their incentives through privatisation, it is expected that major price reductions will occur in local and long distance telecommunication service markets.

In summary, the common consensus vision of the supply side of the market is based on the assumption that by removing entry barriers and by changing incentives, a situation of near perfect competition for telecommunication services will emerge.

'Just in time' Demand
'Just in time' demand is expected to materialise alongside the changes on the supply side of the market. Any shortfall in revenues available for investing in the advanced communication infrastructure will be made up as a result of the expansion of demand. This assumption is needed because even very elastic demand for voice telephony cannot be expected to generate the substantial quantity of revenues needed to construct a European integrated broadband communication infrastructure.

There is much uncertainty about the timing of demand. No-one knows precisely the extent to which consumer demand will be generated by adding new information and entertainment services to the current portfolio of voice telephony, broadcast and cable television, video tape rental shops, and CD-ROM retailers. The extent to which business demand will expand as a result of improvements in performance and price reductions in advanced communication services like inter-networking services is equally uncertain. Nevertheless, the common consensus vision assumes that demand will materialise 'just in time' as new capacity is put into place and tariffs are reduced. The vision incorporates a strong element of faith that consumer and business users will consume a growing array and quantity of advanced communication services if they are deployed at sufficiently attractive prices.

Timing of Supply and Demand Side Changes
There are disagreements about the timing of the arrival of increases in demand. Some expect it to materialise first among business users due to their willingness to pay higher prices and the growing richness of the information and communication technology environment within modern business enterprises with its related uptake of inter-networking services. Consumer demand eventually will materialise, but only after substantial delay and after further investments in infrastructure are funded by business-related revenue growth. The principal players in this vision are large business enterprises with sophisticated communication needs and a host of competing service providers led by the PTOs. It is expected that large businesses will negotiate tariff reductions and that these will spill-over into other markets eventually drawing consumer applications into the mix of services provided.

Others take the view that mass consumer markets for interactive television or multimedia information services will arrive sooner due to the enormous commercial opportunities in this area. This vision stresses the need to tap consumer entertainment and information markets in order to generate the revenues necessary to fund investments in an advanced telecommunication infrastructure. The main players in this case are the PTOs and cable television operators, together with content providers, who are eagerly looking for new ways

of generating revenues.

A few observers have noted another possibility which might be called 'just in time cost reduction'. While demand forecasting approaches assume that the costs of extending the advanced communication infrastructure are high, those who believe in 'just in time cost reduction', are counting on technological breakthroughs to deliver this infrastructure at very low cost, dramatically reducing the need for revenue to cover investment costs. However, very dramatic technological breakthroughs take a substantial time to be deployed and have market impact.

Forecasting the Market

The common consensus vision assumes that market liberalisation and privatisation sooner or later will produce a fully competitive marketplace. In a fully competitive marketplace investment and supply issues will solve themselves.[2] If they do not, the problem is attributed to the uncertainty on the demand side. This way of looking at the problem puts the main focus on the question of uncertainty about the timing of demand and the role of demand side barriers and accelerators. Market forecasts are used as the principal means of discussing future trends.

Explicitly or implicitly, most forecasts incorporate the compound average growth rate (CAGR) approach, the prevailing tool for commercial market forecasting. Underlying this approach are the economic assumptions that price reduction will generate greater consumption by moves downward along a demand schedule and that price reductions will bring new users and services into the market. This is expected to result in outward shifts in the demand schedule (so that even if higher prices were to be restored, greater consumption would occur). The 'compound' growth rates incorporated in the CAGR approach mean that as time progresses the size of the market expands very dramatically (technically speaking, it is an exponential growth process). There is an inexorable quality to CAGR projections that does not easily admit possibilities of macro-economic fluctuation, 'pauses' in growth as users become paralysed with uncertainty about the next step, or crises in supply when 'shakeouts' or other industry changes eliminate groups of suppliers and their offerings.

3.   Alternative Information Society Visions

The common consensus vision is a useful rhetoric in achieving public consensus on the need to introduce pro-active policy measures to stimulate the innovation and investment needed to support the European Information Society. The rhetoric has helped to dislodge the historical inertia of existing market and organisational structures in telecommunications and to set out new paths of development. However, there are substantial problems with this vision as a basis for understanding the implications of current developments and trends in the European market.

To accept this rhetoric as reality is to place undue faith in its promised outcomes. This means that the substantial costs of adjustment and misadventure in moving from state-owned to corporate enterprise are ignored. The major differences between the European and North American policy and regulatory contexts, and the substantial differences in social, cultural and political values and the way these are reflected in legislation, policy and regulation, are also ignored. It fails to consider the extremely complex technical, policy and institutional co-ordination problems involved in restructuring the most complex socio-economic and techno-economic system in existence, the telecommunication infrastructure.

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[2]   R. Mansell (1993) *The New Telecommunications: A Political Economy of Network Evolution*. London: Sage.

The journey toward the Information Society is not an overnight trip to a familiar destination. Like any major journey it requires careful thought and adequate preparation. In travelling to a distant land, few people would presume that their own language or customs would be shared or that there would be familiar food, drink, or other amenities upon arrival. Unlike a holiday, the journey to the Information Society does not enable us to return to a familiar home. This journey not only involves uncertainties and perils but is likely to change fundamental aspects of our everyday lives. This makes it crucial that the choices that are made along the way are responsive to the needs of all citizens and to the many different interests and requirements of the suppliers, users and other stakeholders.

The journey toward the Information Society is about much more than the rate of price reductions for telecommunication services. Even with substantially lower prices, the extent and nature of participation in the Information Society will depend on many other issues. These include the degree of public trust and confidence that develops as the result of decisions made about security and privacy in advanced communication networks and services or the confusion about legal liability that may result from the proliferation of claimants of intellectual property rights in information services. Competition will not necessarily resolve co-ordination problems in implementing standards for interconnectivity and interoperability, nor will it necessarily prevent the creation of new forms of monopolistic control. These are all elements in a complex system that involves routines, procedures, and customs. These are slow to change and they are likely to change in unpredictable ways. Thus, scenarios about the future of advanced communication technologies and services need to build upon analyses of social, political, economic and technological developments.

The shortcomings of the 'common consensus' view and the demand-based approach to understanding advanced communication market development creates a policy paradox. If rapid progress toward the Information Society is desired, then waiting for demand to materialise is a passive action. The available policy options will focus on supply side initiatives in improving the quality and reducing the price of advanced communication technology based on the assumption that this will hasten the arrival of demand.

4.   Social and Economic Policy Considerations

Our research has focused on developments in several key areas of policy concern.[3] These are reviewed here as background to the scenarios which are outlined in the following sections.

Usefulness and Social and Economic Viability
The demand for new technologies and services is not predetermined. Major factors that are crucial to the social and economic viability of new applications and services include the nature of communities and the forms of electronic sociability which emerge and their consequences for

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[3]   Analysis of demand projections, employment, and regional development issues has been undertaken by Gabriella Cattaneo, Databank Consulting, Milan; see Databank Consulting (1995) 'Review of developments in Advanced Communications markets and in ACTS WP2-WP8', FAIR, Ref: AC093 TBK/-/DS/R/002/a1, 20 December. For a full discussion of the other issues see, R. Mansell and W. E. Steinmueller (1996) 'The Way Forward: Socio-Economic and Policy Issues & Advanced Communication Technologies and Services', A report for the ACTS FAIR Project AC093, 'Analysis of ACTS-SEP Matrix Issues - Part C: Techno-Economic and Socio-Political Analysis of Infrastructure and Service Deployment', 5 March.

all aspects of everyday life.[4] Emergent 'virtual communities' may fragment traditional communities that are constrained by space and time. They may also produce new forms of empowerment although having access to information is not the same as having the knowledge to use it effectively. However, new applications and services can, in some cases, be used to help to overcome exclusion, social inequalities and marginalisation. This may be possible when there is a sensitivity to the fact that those at the margins (the unemployed, lone parents, the elderly, the ethnically isolated, the regionally distant, the rural) will find it increasingly difficult to gain the resources necessary to access new services.

The potential for applications of advanced communication technologies and services to help to overcome social inequalities, exclusion and marginalisation is providing the basis for a number of experimental trials throughout the European Union in the Advanced Communication Technologies and Services (ACTS) and Telematics Programmes. However, advanced services also may perpetuate inequalities or create new forms of disadvantage. The viability of many new services depends on the way they alter relationships between traditional public and private spheres of activity including those between the home and the outside world; those private and public spaces within home; and the role of private spaces in public places.

The relative decline in public fora and participation in political life will be influenced by different models of democracy, which, in turn, will encourage different roles for new services. No application can guarantee greater, or better quality, participation and some applications may be used to subvert democratic processes.

Complementary Technical Developments
The characteristics of the diffusion process in the telecommunication technologies and services environment also influence developments in the market. There is a growing need to understand more clearly how complementary developments influence trends in the take-up of advanced communication technologies and services. One of the key issues in this area concerns the market drivers for an integrated broadband communication infrastructure and the relatively recent rapid diffusion of Local Area Networks (LANs) in the European market. The widespread diffusion of LANs in Europe and their continuing upgrade to higher communication speeds is creating a bottleneck for Wide Area Network access that will heighten expectations for early delivery of high speed data communication access.

Competing modes of information content distribution via networks and CD-ROMs have been examined to determine whether CD-ROMs will provide a substitute or complement for network-based information distribution. There is the possibility of an avalanche in European CD-ROMs and this is creating a potential 'blind spot' in technology planning. Developments in the CD-ROM market are likely to have important implications for the distribution of information services and developments in this area.

The Internet is widely believed to offer a new 'paradigm' in personal computing and in accessing information resources. These developments are creating major challenges for the delivery of information services via networks. These will shape the up-take and use of advanced communication technologies and services. Use of the Internet and World Wide Web-based methods is creating the potential for a dramatic shift in the nature of personal computer operating systems and software distribution. There are also major controversies over the way in which the Internet should be reorganised to support the traffic generated by both commercial and public users. The major public telecommunication operators are

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[4]   Research in this area by Professor Roger Silverstone and Dr. Leslie Haddon, Graduate Research Centre in Culture and Communication (CulCom), University of Sussex.

moving into this market and their traditional practices of managing revenue sharing arrangements among themselves may have a considerable impact on the practices which have enabled the Internet to expand to date. Discussion about how to establish prices which differentiate services available to users in terms of speed, quality and timeliness of delivery, is already underway.[5]

Regulation and Coordination Policies
Tends in the liberalisation and harmonisation of the supply conditions in the European telecommunication market will have a major impact on outcomes. Trends in pricing policy and the introduction of a new regulatory apparatus - whether at European or member state level - will influence the diffusion and use of advanced communication technologies and services in the coming years.[6]

There is no widely accepted model in Europe for updating definitions of universal service in the context of advanced communication services and there continues to be people who are excluded from accessing and using basic telephony services.[7] The problem of eliminating the gap between those included within the commonly-accepted definition of universal access to telecommunications, i.e. access to a copper wire pair, and those who are excluded, is becoming more difficult to address as views change on the need for access to newer services.

A transparent means of identifying the costs of universal service and a way of sharing the cost burden needs to be developed potentially by further exploring the feasibility of a 'bit tax' or other redistributive measure.[8] Two major goals include the need for incentives to promote technical innovation (e.g. the provision of services and a commitment to overall upgrading); and the promotion of educational services and access to networks and information applications for schools, libraries and hospitals.

Regulatory coordination problems for the 'convergent' sectors participating in the construction of advanced telecommunication networks and services are substantial and growing. Current

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[5]   D. C. Clark (1996) 'Adding Service Discrimination to the Internet', *Telecommunications Policy*, 20(3): 169-181; M. A. Blanco Bermejo and F. J. Martinez del Cerro (1996) 'Internet: A New Space for Business', ITS 11th Biennial Conference, Seville, Spain, June; L. D. Taylor (1996) 'Towards a Framework for Analyzing Internet Demand', ITS 11th Biennial Conference, Seville, Spain.

[6]   M. Cave (1994) 'The Lean Controller: The New Patterns of Regulation', *Demos*, 4, pp. 16-8; M. Cave and P. Crowther (1996) 'Determining the Level of Regulation in EU Telecommunications: A Preliminary Assessment', paper prepared for a CEPR/GEI Workshop on Competition, Regulation, Standards and Trade Policy for Information and Telecommunication Services, 2-3 May, London.

[7]   Commission of the European Communities (1995) 'Proposal for a European Parliament and Council Directive on interconnection in telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP)', COM (95)379 final, 19.07.1995, Brussels.

[8]   See European Commission (1996) 'Building the European Information Society for Us All', Interim report of the High Level Group of Experts, Brussels, January and A. J. Cordell and T. R. Ide (1994) 'The New Wealth of Nations', paper prepared for the annual meeting of The Club of Rome, Buenos Aires, 30 Nov.-2 Dec.

models for pricing network access and use are obsolete but they are likely to carry forward into the implementation of advanced communication services. This will increase uncertainty and complicate regulatory decision-making.

A critical issue for price restructuring is the cost of network access. If priority is given to the stimulation of advanced services for the Information Society, then the pricing of network access and capacity substantially above cost will depress the take up and use of these services. The explosive growth of Internet and World Wide Web access is challenging the capacity of the public sector to subsidise the high capacity links on which these services are based. Congestion and new pricing rules for Internet services will establish precedents for cost allocation and direct charges to users.[9]

Techniques for restricting network and service access are likely to include conditional access to services, erection of barriers among user interfaces, and development of interfaces that 'channel' users to preferred services (a practice similar to the manipulation of airline schedules in passenger reservation systems).

Standards and Coordination
Recent developments in the organisation and mandates of standards development organisations suggest the emergence of new consortia dominated by private sector actors.[10] Key areas of activity include digital audio/visual/data applications; Universal Mobile Telecommunication Systems, the Intelligent Network and Universal Personal Telecommunication; and Asynchronous Transfer Mode (ATM) and Synchronous Digital Hierarchy (SDH) standards.

In Europe there is need for a stronger focus among those concerned with traditional 'telecommunication' standards on data networking. The interaction between international and regional standardisation activities in the audio-visual field needs to be carefully monitored. Wireless technologies offer potential for European suppliers and there is likely to be a need for greater public domain information on the development of smart antennae to avoid coordination problems and the possible exclusion of the European companies from key developments.

The development of Applications Programming Interface (API) standards also is important for Europe because of the links to Asynchronous Transfer Mode and developments by private US companies. An API is essential to facilitate interworking between independently developed service-related software applications and ATM communications protocols. It is possible that private consortia might produce two API standards that are virtually proprietary and this will affect the accessibility of services.

Privacy and Security
The digitalisation of information is placing new pressures on legislative and regulatory institutions in the area of intellectual property protection. Security for advanced communication services is immature and this is raising concerns about public trust and confidence in the information infrastructure. Technological approaches to security often ignore institutional and human fallibility. Substantial implementation problems will raise

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[9]   OECD (1995) 'Information Infrastructure Convergence and Pricing: The Internet', Working Party on Telecommunication and Information Services Policies, 11 December; G. Brock (1995) 'Adapt the Internet Interconnect Model', *CommunicationsWeek International* 10 July, p. 8.
[10]   Telecommunication Technology Committee (1995) 'Survey Report on Telecommunication-Related Forums' Activities', Tokyo, March.

costs and

potentially slow the diffusion and use of new applications. A key issue is a perception of the need for enhanced security and the ways that public and private organisations will respond in the future.

Cultural and social norms of privacy in network environments are immature and controversy in this area is likely to grow. The European Commission's directive on the privacy of name-linked databases will have a major impact on service development. Advanced communication technologies and services play a two-fold role in the context of individual freedoms. They can enhance them by offering increasing flexibility, options and access to information or they can reduce them as a result of surveillance in public spaces and in the home.

There are inconsistencies between the achievement of wide use of advanced telecommunication services and the pursuit of strong intellectual property protection policies.[11] There are significant gaps in the implementation and enforcement of copyrights and this could slow the development of some commercial services and products. The structure of copyright collection and enforcement institutions is fragmented and complex. This increases the costs to producers and users of acquiring legal rights to the use of information.

Network Service Access Conditions
Provisions for universal service and access to networks, including policies and practices for interconnect policies, are important factors in the diffusion and use of advanced communication services. The application of the Open Network Provision framework to the 'set top' box is an urgent issue with implications for customer 'lock-in' to supplier-specific services.[12] The paradox of advanced communication networks is that intelligent systems give customers new choices and greater control over information in terms of timing, format, destination and billing. However, the customer runs the risk of paying high access costs and being 'locked in' to packages of electronic services through conditional access systems.

The Open Network Provision Framework may not be sufficiently comprehensive to address issues of market power under conditions where there is convergence of the broadcasting, telecommunication, computing and publishing industries. Consolidations that limit entry in content provision can create market power in distribution markets and exclusive arrangements may prevail.

Regional Development Policies
Advanced communication technologies and services bring both opportunities for and constraints to the reduction of regional disparities. The introduction of advanced communication systems can increase the gaps between regions. On the supply side, the need for a critical mass of users means that less developed areas are rarely the focus of new investment and often have a less well developed telecommunication infrastructure. Even when

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[11]   R. Mansell and W. E. Steinmueller (1995) 'Intellectual Property Rights: The Development of Information Infrastructures for the Information Society', Final Report, A study carried out for the STOA programme of the European Parliament, 17 October.

[12]   European Commission (1995) 'Opinion of the Commission pursuant to Article 189 b (2) (d) of the EC Treaty on the European Parliament's amendments to the Council's common position regarding the proposal for a European Parliament and Council Directive on the Use of Standards for the Transmission of Television Signals', COM(95) 319 final - COD 476, 6 July.

the provision of infrastructure and services is ensured, in peripheral regions the pre-requisites for effective use of services such as education and training, skills and knowledge, organisational flexibility, etc., are still often absent.

Success depends upon several factors including the need to take account of the conditions for effective use and the integration of policy measures with wider policies for regional development; the need for targeted applications selecting sectors and/or users within a wider economic growth strategy tailored to the local economy; and the need to avoid technology-driven approaches.

Employment and Working Conditions
Trends in employment practices are blurring the boundary between the home and the workplace and advanced communication services are playing an important role. These services often are introduced and used within the home in unexpected ways. In a complex education and training environment, new services can provide stimulating new resources as well as access to distance learning. However, knowledge of the learning process and the criteria for good content design and practice are undeveloped areas. There is a danger that new information 'haves' and 'have nots' will be created as a result of differential access to technology and appropriate skills.

All these developments interact with those in the advanced communication technologies and services producer and user areas. In order to generate realistic scenarios it is necessary to consider the groups of producers and users who play important roles in determining how new technologies and services are designed, implemented and used. There are many different 'design' configurations that could emerge from technological innovation and learning on the part of technology and service producers. The roles of users must be expected to vary depending on their economic and social resources and their capacity to ensure that their specific requirements are met by technology producers.[13]

5. Design Configurations and Stakeholders in the Information Society

All the stakeholders have expectations about the benefits of the Information Society. The suppliers in Europe - the Incumbents, the Insurgents and the Virtual Community Providers - generally expect that price-led market expansion and 'just-in-time-demand' will assist them to build new markets for services. The users, including global businesses, smaller firms, consumers and citizens, are likely to benefit from a wide array of new services but their requirements and expectations are extremely uncertain.[14]

Changes in social and cultural practices and the way these affect the home and the workplace could lead to widespread acceptance of new services. Alternatively, there could be resistance to a new array of services and it is this aspect which causes the greatest uncertainty for all the

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[13]   R. Mansell (1996) 'Rapporteur's Summary, OECD Workshop on the Economics of the Information Society', Porvoo (Helsinki), 6-7 June. Among the key issues for further exploration are: occupational shifts and structural changes in the labour market, the role of intangible assets and the knowledge base; the relationships between types of knowledge and learning and the role of formal education, retraining and lifelong learning; new forms of rivalry between skilled and the unskilled workers; and formal accounting and measuring for the Information Society.

[14]   See C. Graham, D. Lewin, C. Milne, J. Moroney and E. Skouby (1996) 'The Consumer in the Information Society: A Discussion Paper for Identifying Priority Issues', Ovum Ltd., London.

stakeholders in the Information Society. There will be a need to encourage participation from marginal and disadvantaged users, to emphasise the importance of education and skills, and to understand more fully how social barriers affect the diffusion and use of advanced communication technologies and services, if the information 'have nots' are not to increase in number.

The Supply Configurations
Supply configurations in the organisation of the supply side of the advanced communication infrastructure and service markets based on complex webs of alliances and joint ventures are emerging. The players have conflicting needs and interests. The choices and decisions taken by these actors influence the availability and pricing of services. They determine the framework in which demand growth can occur. Three main sets of suppliers have been identified:

The Insurgents
The companies that have been created in the course of this personal computer revolution have enormous forward momentum. These companies include Microsoft, Netscape, Sun Microsystems, and Oracle. They are vying for the role of architect of the global information society. IBM and Apple are also doing their best to get into this group. Other potential players are the consumer entertainment electronics giants, Sega and Nintendo, whose videogame terminals are becoming powerful computers. These companies have privileged access to the key user market - boys and male adolescents. They have shown a strong interest in providing on-line services and the Sega channel is active in the United States. European companies are largely absent from this group. These companies are taking advantage of the dramatic developments in information and communication technologies in the last decade which allow the personal computer to be used as an information terminal for access to networks. This potential is visible in the growth of LANs, the construction of on-line service networks, and the proliferation of multimedia information distributed on CD-ROMs. These developments are only a small part of the future possibilities offered by integrated broadband communication.

The Incumbents
This group includes the European audio-visual companies, public telecommunication operators, cable operators, and their international partners who produce content and either currently provide infrastructure or may opt to do so in the future. These companies historically have controlled the development of the communication infrastructure and defined new services. Market liberalisation is encouraging them to vie for a central role in the design of services and infrastructure for the information society. These companies have enormous and unique, capabilities for extending and deepening the physical infrastructure. Nevertheless, their core competencies are oriented predominantly to the development of mass market services. It is uncertain whether they can make a successful transition to the development of personalised interactive services for highly segmented markets which require an 'applications culture'. This is where the strengths of the Insurgents lie.

Virtual Community Service Providers
The third group of companies and individual producers of electronic information and services includes those taking advantage of the Internet's rapid growth. This group includes information service providers who come from very different worlds than the telecommunication, computing or media companies. The core of the Internet players is drawn mainly from the education, government, and research communities. Many of the service providers in social and public services are non-profit organisations. Their lack of any clear orientation to business goals influences their marketing strategies in terms of pricing and service provision conditions.

There is a growing amount of activity and experimentation by very large companies in the banking, financial services, advertising, tourism, retailing and entertainment service sectors, and a proliferation of new small companies. The service producers in this group seek to take advantage of the formation of virtual communities in the 'internetwork' and to exploit new modes of communication and interaction with their clients/users. Many of these producers also play significant roles as users and consumers of public and private information.

The Demand Constituencies
A common battleground for the players in each of the supply configurations is the site of access to the user. This site includes the transport infrastructure and especially the local loop; the service platform (which may be the television or the personal computer, a cable modem or an Internet-toaster; the customer support offered including technical assistance, billing, etc.; and the ability to offer an integrated content portfolio.

The Global Information Society vision is based on universal access by individuals and organisations to a range of services through a transparent and integrated 'network of networks' - the Global Information Infrastructure. The present reality is very different. It is characterised by a plurality of networks serving fragmented markets with very different dynamics. The convergence that is evident on the supply side of the market is only beginning to emerge on the demand side.

Global Businesses
This is the constituency with the clearest profile. It is composed of large organisations capable of aggressive price and access negotiation. These users need coordinated and integrated solutions to their telecommunication and advanced services needs. Their actions are driven by the need to compete in international markets. They are adopting new organisational models and information processes and systems supporting decentralisation. These users face considerable business process reengineering problems and this is assumed to drive their demand for advanced services such as co-operative information processing, teleworking, videoconferencing and desktop videoconferencing, and the large scale implementation of electronic commerce.

Small and Medium Sized Enterprises (SME)
*Small Office - Home Office Users (SOHO)*
This group represents the aggregation of demand for a variety of interactive and innovative services that are at the core of the vision of the Information Society. It includes consumers who are willing to spend money on interactive services. It also includes organisations active in social and public service domains such as governments, universities, research centres, etc. This group is growing with the success of Internet services but the scale of demand for commercial services and its timing are very uncertain.

This group is highly segmented and driven by specific needs and requirements. Mass marketing strategies are inappropriate at present with the partial exception of generic communication services. Most users are at the beginning of the learning curve and they need to develop cultural and professional skills to transform access to information into useful knowledge and to exploit new modes of interaction and communication.

Residential Users
This demand constituency generally is assumed to be interested mainly in entertainment and communication services. The media and telecommunication markets are expected to converge most rapidly in this area. This is expected to become a mass market with substantial economies of scale and very high demand elasticity. User needs are likely to be

met using the television set as a platform and by the diffusion of a one-way broadband infrastructure into the home. The services that are expected to appeal to this group include video rentals, pay television, and digital satellite television with near-video-on-demand.
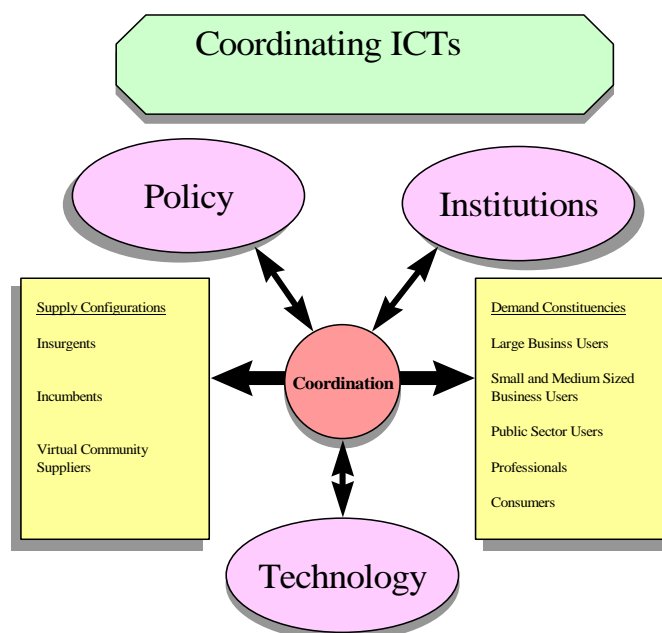
The interaction between these supply configurations and demand constituencies is the site of technology and institutional and policy coordination issues. Coordination problems are the result of uncertainty on the part of technology developers, companies, public sector organisations, policy makers and consumers about how the developments on the supply and demand side of the market will mature in the coming decades. The diffusion and use of advanced communication technologies and services in Europe will be a reflection of all these developments.

An analysis of future outcomes for the Information Society must be based on initial or 'starting' conditions of the telecommunication infrastructure.

Projected Infrastructure Availability in 1998

|	**France**	**Germany**	**Italy**	**Spain**	**UK**
Number of Households (m)	22.5	36.7	19.8	11.7	22.3
PSTN: digital main lines (%)	100	95	89	90	93
ISDN: no. of equiv. lines (m)	3.2	8.0	0.8	0.7	2.7
Households passed by BB networks:(%)	39	87	10	23	35
Cable subscriber homes/homes passed (%)	31	82	45	45	34
Satellite dishes (% of households	7	27	5	9	32
GSM Mobile subscribers (m)	4.20	6.75	3.7	1.4	4.0
Internet (% of households)	2.5	2.0	1.5	1.0	3.0

Source: Databank Consulting estimates

Although the telecommunication infrastructure will be changing in the short term, substantial lags and delays are expected in its upgrading. This will lead to uneven regional and social development, even if the potential for strategic actions on the part of suppliers to serve more

favoured regions and socio-economic groups is disregarded. The following provides an overview of the infrastructure availability in the European Union expected in 1998.

Public Switched Telecommunication Network
— Telephony
— Modem Communications (28.8 kbps)
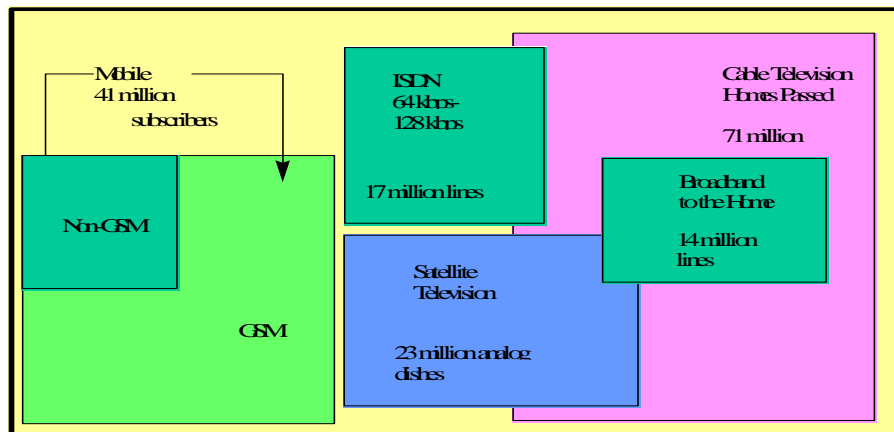
Drawn based on 216 million main lines for EU in 1998.

The expected infrastructure availability in the European Union for 1998. The components of the infrastructure are drawn to scale with the enclosing box representing the public switched voice telephone network which is expected to provide 216 million lines in 1998.
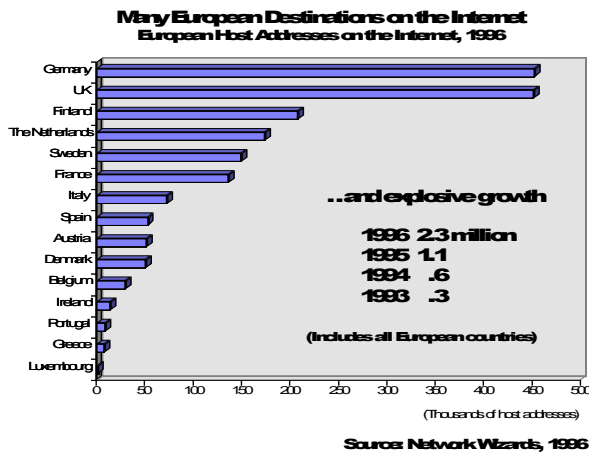
Internet access via public switched networks plus modems is likely to be available to all households and businesses. Integrated Services Digital Network (ISDN) access will be available to the majority of businesses in the main European countries, except for geographically marginal sites. It is likely that it will be available only in major urban centres in Ireland, Spain, Portugal and Greece.

High speed Wide Area Network connections will be available to link ISDN access in the 2Mbit/s range, less so in the 34 Mbit/s range, and mainly on a dedicated circuits basis. Under the pressure of growing competition prices will decline substantially (Analysys has estimated a reduction of about 20% on 1995 levels) but, given the high starting point, will be accessible only for large businesses who will negotiate attractive pricing packages with the carriers.

Cable television networks will continue to grow, passing almost half of European households and reaching 43 million subscribers. Much of this growth will occur in Germany where the number of homes passed is very high and the percentage of subscribers is also much higher than in the other countries.

Digital satellite services will cover most of Europe and offer multiple channels and Near-Video-on-Demand services, but only an estimated 3 million of the 23 million satellite dishes installed in the homes will be digital, restricting the potential market for Near-Video-on-Demand. The outlook for planned availability of broadband to the home infrastructures includes the ambitious plans of Deutsche Telekom and STET. BT and France Telecom are being more cautious.

Internet usage in Europe also is expected to grow as suggested by the following figure indicating the number of European addresses.

Many European Destinations on the Internet
European Host Addresses on the Internet, 1996

Germany
UK
Finland
The Netherlands
Sweden
France
Italy
Spain
Austria
Denmark
Belgium
Ireland
Portugal
Greece
Luxembourg

...and explosive growth

1996 2.3 million
1995 1.1
1994 .6
1993 .3

(Includes all European countries)

0   50   100   150   200   250   300   350   400   500

(Thousands of host addresses)

Source: Network Wizards, 1996

6.   Design Configurations and Scenarios for the European Information Society

The impact of these influences leads to a highly likely short term scenario to 1998. This is followed by the prospect of a 'disjuncture' of possible future paths for development towards the end of the century. These paths are distinguished by the relative dominance of different supplier configurations. In addition, under any of the scenarios, a failure to address the coordination issues could lead to 'worst case' variations with dramatically lower positive and larger negative socio-economic implications.

In the medium term, from 1998 to 2003, extensive infrastructure upgrading may be conducted not only by Incumbent telecommunication operators but also by cable and wireless companies.[15] If alternative infrastructure suppliers become viable, the strategy of major companies, including broadcasters and other content suppliers, may change from reliance on and cooperation with the Incumbents. These companies may adopt a strategy of gaining access to the users via the new infrastructure suppliers. The possibilities for effective competition may lead to very different outcomes in service provision. The relative positions of the Insurgent and Virtual Community supplier groups as leaders may change quite dramatically.

The actual outcomes will be influenced by : a) changes in the balance of power among the supplier configurations resulting from regulatory and competition policy decisions; b) differences in the rate of development of demand by the main demand configurations arising from institutional and market developments; and c) unexpected impacts of technical developments such as in the areas of wireless technologies and the World Wide Web-Internet as a computing platform.

*Short-Term Scenario - Incumbent Leadership*
The first scenario is virtually certain in the near term. In Europe, there is a strong bias toward continuing dominance by the Incumbents. Current supplier structures are likely to persist or even strengthen as the result of accommodation between large content providers, i.e. media companies and the public telecommunication operators (PTOs). This outcome involves an active role for the PTOs in expanding network services. It is coupled with the goal of assuring that all of its elements contribute to PTO revenues and preserve PTO control over the timing and extent of competition among service providers. In a more open

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[15]   Commission of the European Communities (1995) 'The Consultation on the Green Paper on the liberalisation of telecommunications infrastructuure and cable television networks: Communication from the Commission to the Council and the European Parliament', COM(95)158, 3.5.95, Brussels.

interconnection environment, this strategy involves following demand developments closely to reduce the size of 'niches' supporting competitive entry and making agreements and accommodations with large content suppliers so that they do not create alternative distribution channels for their offerings.

Medium and Long Term Scenarios

Incumbent Leadership
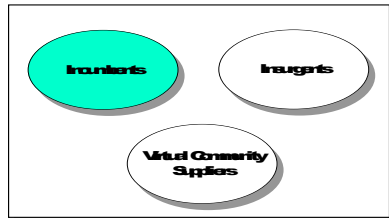
In the medium term, the Incumbents could continue to be the dominant producer group. Their dominance will be reinforced by alliances between large media companies or content providers and the telecommunication operators. This dominance is likely to continue indefinitely if the Incumbents can absorb enough of the demand to limit competitive infrastructure or service entry.

Advantages of Incumbent leadership
- Incumbents have an incentive to expand services such as access to the World Wide Web using ordinary telephony circuits to limit entry opportunities of rivals.
- In markets where demand leads to revenue increases from price reduction, prices will be reduced.
- Public procurement for educational, health, library and public information services may be easier to accomplish with Incumbents.

Disadvantages of Incumbent leadership
- The likelihood that advanced communication services will be developed as broadcast media where audiences are sought for their advertising revenue.
- Other services including Internet or Internet-like services may only be provided as an 'afterthought' with diminished telephony and multimedia capabilities.
- Absence of competition will slow service development and decrease variety in advanced service offerings.

Insurgent Leadership
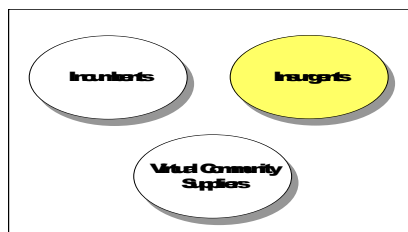
For Insurgents to assume a leadership position, major content producers - broadcasters and media production companies - must defect to the Insurgent group, forming alliances with companies like Microsoft, Netscape, and other computer and software producers. These suppliers will seek widespread access to the portions of the infrastructure that have been upgraded, enter into agreements with cable television or digital wireless operators for cooperative development of competing infrastructure, or construct their own infrastructures.

Insurgent leadership implies that a different mix of technologies will be deployed in upgrading the infrastructure including intelligent 'set top' boxes and new wireless services introduced to compete directly with fibre-based broadband-to-the-home. Decentralisation policies in Europe may also support the Insurgent scenario, as regional authorities join forces, and alternative network operators and content providers create regional infrastructures.

Advantages of Insurgent leadership
- For small and medium sized enterprises and small office-home office users, this scenario is more attractive than the Incumbent-led scenario since it is likely to be based on more rapid software development cycles addressing specific vertical markets.

Disadvantages of Insurgent leadership
- Insurgents will control concentrated markets and prices for content and value added services are likely to remain relatively high.
- The Insurgents are strongly dominated by US companies or by US-Japanese alliances, reducing opportunities for European producers.
- Regional and income disparities may be worsened since Insurgents will focus on urban areas and higher income users, excluding other, less profitable, regions, businesses or consumers.

Some of these negative aspects might be addressed by regulatory intervention extending the definition of universal service to advanced communication services.[16] Substantial change will be necessary if the negative aspects of this scenario are to be avoided.

Virtual Community Renaissance
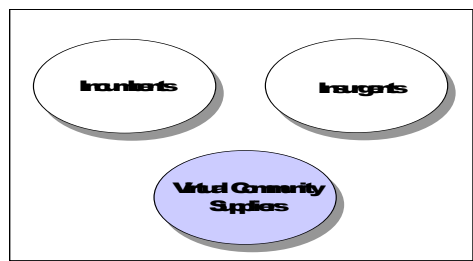
The third scenario involves very strong development of Internet or Internet-like services as the foundation for the advanced communication technologies and services. Under this scenario the telecommunication infrastructure is opened up to service competition between large, medium and small content producers because of a stalemate in the competition between Incumbents and Insurgents or due to vigorous pro-competitive policies for interconnection and user access. A greater variety of services would be offered on a 'pay as you go' basis and would be based on

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[16]   C. Murroni (1995) 'Universal Service Obligation in UK Telecommunications'. London: Institute of Public Policy Research; Analysys (1995) 'USO in a Competitive Telecoms Environment'. Cambridge: Analysys; Analysys (1995) 'The Costs, Benefits and Funding of Universal Service in the UK'. Report for Oftel, Cambridge: Analysys; Oftel (1995) 'Universal Telecommunications Services. Consultative Document on Universal Service in the UK from 1997', London; Commission of the European Communities (1995) 'Proposal for a European Parliament and Council Directive on interconnection in telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP)' COM (95)379 final, 19.07.1995. The EU proposal for a directive on universal service and interoperability calls in an Annex for detailed accounting to demonstrate costs.

advertiser supported models like magazines, or be provided as public goods as in the case of current university-based Internet services.

Advantages of Virtual Community renaissance
- A blossoming of variety in service offerings and entry opportunities.
- Support for more regional and local variety than the two leadership scenarios.
- Potentially easy and low cost access for non-profit and education purposes.

Disadvantages of Virtual Community renaissance
- Potential problems in establishing interconnectivity and interoperability standards.
- Privacy and security issues are likely to be greater.
- Problems of intellectual property protection will be more difficult to coordinate since no single 'coordinating' actor will oversee individual access to information services.

The Virtual Community Renaissance scenario will only be viable if it receives public policy support since there are no well-organised champions of it. The following table summarises the key features of each of the three scenarios in the medium term.

Incumbent Leadership	Insurgent Leadership	Virtual Community Renaissance
No full scale infrastructure entry	Alliances - real threat of competing infrastructure	Open infrastructure and service competition
Mass market services	Specialised service markets	Growing variety of services
Slow innovation in services	Rapid software applications development	Rapid innovation in technologies and services
Some price reductions	Fewer price reductions	Multiple price models (pay-as-you-go, advertiser-supported, pubic goods)
Improved access for public institutions	Growing regional disparities	Reduced disparities in infrastructure and service access
Improved universal service	Market fragmentation and 'lock-in'	New concepts for universal service
Light regulation	Regulation to extend universal service, enforce open access	Coordination of technology, social and economic policies and regulation
Market Instability	US supplier dominated	Opportunities for smaller European firms and citizens

In the long term, 2010 and beyond, the possibilities for competing infrastructures increase due to cost reductions and greater variety as a result of technological progress. These developments will make it difficult to achieve dominance through the control of the infrastructure for distributing information or carrying telecommunication traffic. The long term will be dominated by service competition, but this does not necessarily lead to the Virtual Community Renaissance. If the Incumbents can preserve, or the Insurgents can attain, a leadership position in the medium term, they may be able to extend it into the long term as users become 'locked into' particular solutions in ways that discourage entry and competition.

7. Policy Issues for the Information Society

Social and economic policy considerations are crucial to which of these scenarios is likely to predominate. It is widely believed that advanced information and communication technologies and services will be helpful in minimising social exclusion, enhancing the growth prospects and the wealth creation potential of the European Union, and in contributing to measures which help to encourage the maintenance of European cultural diversity.

However, disparities in access to networks will continue to exist throughout the European Union and, in many cases, the gaps between the information 'haves' and 'have nots' are widening. Measures are needed to improve access to networks but this is only part of the problem. Social exclusion will be exacerbated if users do not have the resources to use the services which are available, to acquire the skills necessary to turn information into useful knowledge, or to take action as a result of the acquisition of such knowledge.

In addition, the 'learning society', in which advanced information and communication technologies and services are expected to play an increasing role, will emerge only if coordination is strengthened between technical developments, public and private institutions, and social and economic policies.[17] Initiatives continue to be needed to build links between research and technology development programmes concerned mainly with innovation and early experimentation and other programmes focusing on the effects of social exclusion from the Information Society.

Advanced communication services displace workers from traditional roles and occupations at the same time as they create new opportunities and new forms of business. The most severe problems associated with the changes that are currently underway involve mismatches between the skills of those workers who are displaced and of those who find new opportunities. This problem is exacerbated by the widespread failure of retraining programmes to respond to the demand for rapid changes in the skills profiles which are needed in the workplace.

Competition policy will play an important role in the future emergence of new coalitions of suppliers and users in the Information Society. Competition policies are concerned with ensuring that advanced communication services markets are opened to new entry within the European Union and that the barriers to entry are reduced. In order to achieve this goal it will be necessary to reach consensus on the application of legislation in a rapidly changing market. The potential to exercise undue market power will continue to exist under each of the scenarios described above. Policy responses will be crucial to the rate and type of investment in new infrastructure and to the content (including software) of new services. Particular care will be needed to avoid outcomes that favour coalitions among the existing major players which foreclose entry by new players or lock new entrants into alliances with the existing players. Although such coalitions may be favoured in order to strengthen the competitiveness of European-based firms in global markets, special attention will need to be paid to the impact of such strategies if they erect barriers to competition from smaller or newer players.

While individual policies and measures addressed to the European Information Society tend

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[17]   See European Commission (1996) 'Building the European Information Society for Us All', Interim report of the High Level Group of Experts, Brussels, January; European Commission (1995) 'Teaching and Learning: Towards the Learning Society', White Paper on Education and Training, Luxembourg.

to be specialised and focused, a systematic reduction of coordination problems could have a major effect in supporting market growth. The two most likely scenarios for advanced communication technology and service development (Incumbent and/or Insurgent Leadership) threaten to reduce variety in content and to emphasise mass market culture. The least likely scenario (a Virtual Community Renaissance) has the lowest entry barriers for non-profit and commercial organisations to reach their users. This is especially important in the area of education where mass market solutions are neither desireable nor appropriate to preserve European cultural diversity.[18] However, the interests of the 'Internet Community' will need to be supported by those who seek to extend and deepen cultural diversity if this scenario is to thrive alongside the others.

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[18] Commission of the European Communities (1994) 'Europe's Way to the Information Society. An Action Plan. Communication from the Commission to the Council and the European Parliament and to the Economic and Social Committee and the Committee of Regions', COM (94)347 final, 19.07.94, Brussels.