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REPORT FROM THE COMMISSION

TO THE COUNCIL, THE EUROPEAN PARLIAMENT AND THE ECONOMIC AND SOCIAL COMMITTEE

on the main events and developments in the information market 1993-1994

IMPACT programme

(EC programme for the establishment of an information services market)

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INTRODUCTION

This report is a communication of the Commission to the Council, the Economic and Social Committee and the European Parliament. Hence, it addresses key policy makers. The report also addresses decision makers in the industries concerned with and related to the subject, and all people who have an interest in information market issues. These issues are increasingly raising political attention and were widely discussed during the reference period of this report.

The strategic value of information is now generally recognised. The Commission's White Paper, *Growth, Competitiveness, Employment - the challenges and ways forward into the 21st century*, stresses that information and communication technologies have the potential to promote steady and sustainable growth, to increase competitiveness, to create new job opportunities and to improve the quality of life of all Europeans.

The report reviews the main developments in the European information services market since the completion of the previous report in this series in July 1993. These reports originate from the European Commission's Information Market Observatory, the aim of which is to improve the understanding of the information market. The annual reports are just one aspect of the work of the Information Market Observatory, which also publishes Working Papers, commissions research into specific market issues and organises workshops and meetings which provide a platform for the presentation and discussion of recent findings. The Information Market Observatory is part of the European Commission's IMPACT (Information Market Policy Actions) programme.

This report includes information collected during the second half of 1993 and the first half of 1994. The content is not exclusively concerned with developments in the EU; wherever possible, data and analysis have been included on the EFTA countries, on the US and Japan. This reflects the increasingly global nature of the information industry, as well as the need for international comparisons in order to assess the competitive position of European information companies in world markets.

Previously, the Information Market Observatory and its annual reports have concentrated on a relatively narrow industry: namely the professional electronic information services sector and its 'classical' ASCII on-line database services, videotex and CD-ROM publishing activities and closely related areas such as audiotex and fax-based services. During 1993 and 1994, the focus of the Information Market Observatory's work has been widened to take into account the wider context in which the information services industry now operates. It reflects the convergence of a number of information-related sectors, including the hardware and software industries, telecommunications, cable and satellite industries, as well as those industries concerned with information content, such as film, television, music, print publishing and, of course, the electronic information services sector. All of these industries now appear to be converging in their market aspirations and in common technology developments.

As a result of this extended focus, the following report covers a wider range of issues and market sectors than its predecessors. As far as possible, it takes into account such diverse topics as telecommunications infrastructure development, multimedia and Video on Demand markets, take-up of applications such as electronic data interchange (EDI) and electronic mail by industry, and the effects of convergence on the information content industry. Inevitably, this means that there has not been space to cover all subjects in exhaustive detail. However, the report should provide a fairly comprehensive overview of the forces at work in the wider information sector and of current and future information markets.

EXECUTIVE SUMMARY

From among all markets, technologies and trends discussed in this report, four key issues can be emphasised which have emerged during the study period of this report. These are issues which will have a crucial impact on future developments in the information market.

Firstly, the emergence of electronic superhighways, and the debate which this has stimulated on the Information Society, should be highlighted. These ideas have captured the attention of the world and brought the concept of electronic information services to many people for the first time. Convergence is also a theme which requires special attention. It has featured strongly in the discussions of the business community and has already had a marked impact in terms of industry repositioning. The third issue dealt with in this summary is the creation of a clear and stable regulatory framework. Finally, the dramatic take-off of CD-ROM and multimedia during the second half of 1993 and first half of 1994 should be highlighted as an indicator of the growing strength of the electronic publishing sector.

Governments around the world are increasingly convinced that the development of information infrastructures is essential if businesses, public administrations and individuals are to benefit from the 'digital revolution'. Most of the policies and actions which will be required in order to realise the vision of a global information society are only just being formulated.

It is almost impossible to make sound predictions as to the exact nature of an information society, or to suggest when it might finally emerge. Yet the industries and governments of the major industrialised countries are confident that their societies will be transformed and that the benefits will be substantial. Exponential growth in Internet users over the course of the year, (estimated by the Internet Society in June 1994 to have reached 30 million), and in the number of applications available, has given us a feeling for the level of opportunities and demand we can expect.

Countries such as the USA, Japan, Canada and the European Union are laying the foundations for an information society. The European Union, which has lagged behind the USA and Japan in the digitisation process, is now trying to make up lost ground with a bundle of initiatives including the Common European Information Area, the White Paper on Growth, Competitiveness and Employment, the Bangemann Report and the Action Plan on Europe's Way to the Information Society. These initiatives are important for Europe: they will help the Union to take its place amongst those countries setting the ground rules for the global information society.

Like the USA, the European Union considers that it is primarily the private sector which must rise to the challenge of the information revolution. Private investment should be the driving force even for investment in infrastructure. The role of the Community and the Member States will be to back up this development by giving political impetus, co-operating with the private sector in experimental applications, and creating a clear and stable regulatory framework. The

latter will be particularly important in relation to access to markets, interoperability of networks and basic services, intellectual property rights and data protection.

It remains to be seen how readily the private sector will generate the initial investment required. Furthermore, the full implications and impact of an information society are difficult to assess. There will certainly be significant opportunities, but there are also concerns over the socio-economic and cultural effects which accompany technological revolution.

While information infrastructures are being established, work is taking place to develop information and entertainment applications to be delivered via the superhighways. Applications which are being developed in the context of electronic superhighways range from on-line games and Video on Demand, to video conferencing and multimedia database access, to name but a few dealt with in this report.

Services such as these are likely to require different forms of technology development and different levels of investment. They will also require partnerships between previously diverse industry sectors, such as consumer electronics and IT industries, infrastructure providers such as telecommunications, cable and satellite operators, as well as information and entertainment content owners. Telecommunications and cable companies are already beginning to build the necessary infrastructure. Software giants and major content companies are collaborating in order to bring products to the market. This leads us to the second issue of convergence.

Convergence is a term which has been widely used by the press and by business analysts, and can be defined in terms of the development of a common technology base by industries sharing a similar objective: the creation of a mass market for integrated communications, computing, information access and entertainment products. A good example is CD-ROM technology, which can now be found in computers, electronic games players and multimedia players for television sets. Standardised memory cards, smart cards and modem cards feature in set-top boxes for televisions, handheld organisers and communicators as well as computers. But at a more fundamental level, convergence is the result of the ability to convert all kinds of content - including text, images and sound into a common digital format which can then be manipulated and exploited across a number of platforms.

All of this is good news for the information sector in so far as it helps to build a range of new outlets for information products and services, which nevertheless share many of the technology characteristics of existing electronic information services.

Convergence has also led to a certain amount of industry repositioning. The need to address global markets and to offer integrated information, entertainment and communications services has led to a wave of merger and acquisition activity and a growing number of strategic alliances and partnerships. Hence we see telecommunications companies joining forces, and hardware and software companies buying into their competitors and counterparts throughout the world. But we also see information sector companies buying into related new markets through acquisition. The purchase of a 25 per cent stake in Time Warner Entertainment by US West, Pearson's acquisition of Software Toolworks and the purchase of Thomson Directories by US West are all recent examples of such deals.

The increasing availability of high quality infrastructure will necessitate a mass market for information products and services as a means of generating return on investment and ensuring long-term cost effectiveness. The importance and value of the content industry (including print and electronic publishing, films, video, audio and television programme production) is likely to increase as a result. The current repositioning of the information industry supports this view.

The content industry now has a great deal to live up to. The expectations of users have been raised and they are demanding increasingly high standards of information content and presentation. ICT industries look to the information and entertainment services sectors to provide content for running on the computers, consumer electronics goods and networks which are now being developed. Governments around the world are looking at the information industries as a whole to generate employment and stimulate economic growth.

The biggest challenge to the content industry in meeting these expectations will be its ability to invest time, labour and financial resources in the development of innovative information products and services. Such investment will be essential if European content companies are to compete with their counterparts in the USA and Japan, and share the rewards of industry growth with ICT industries.

The enormous implications of convergence have meant that legal and regulatory issues have come into the foreground of discussion, and featured strongly in the Bangemann report on the Information Society. Deregulation of telecommunications and the directive on Open Network Provision will be instrumental in allowing European telecommunications companies to compete internationally, but there are many other regulatory issues which still need to be addressed, both at a national and European level. Not least of these is cross-media ownership and the restrictions which may apply to telecommunications and cable TV companies in entering each others' markets.

The process of trying to reach a European consensus on major legal issues such as the legal protection of databases and personal data protection is underway. Meanwhile, the industry itself is developing a self-regulatory framework for cross-border audiotex and videotex services and for information brokers, and may do so in other areas as well.

The flurry of interest and excitement associated with electronic superhighways and convergence, and the prospect of clarification of the legal framework has, of course, made this a very interesting time for the electronic information services industry. But they have not yet brought immediate market opportunities. Even the Internet, which is now firmly at the centre of research and experimentation for many information companies, has so far brought limited rewards for the commercial information industry.

Under these circumstances, it is not surprising to find that many content companies are reluctant to invest heavily in developing electronic superhighway applications. The European content industry is faced with particular challenges in that it is made up of a greater number of smaller, less vertically integrated, and more nationally focused companies than its US counterpart. To take advantage of the global opportunities which lie ahead, European content

companies will often need to enter joint ventures and alliances with companies in other regions. At the same time, policies at a national and European level will be required in order to guarantee the continued availability of a diverse, multi-cultural information content and to strengthen the competitiveness of small European companies.

Building on the results of the IMPACT programme, the European Commission will reflect on ways to stimulate the creation of favourable conditions for information providers to adapt their skills and products to the changing environment and to stimulate increased usage.

As debates have continued over electronic superhighways, convergence, information legislation, and European competitiveness, a dramatic take-off has occurred in the CD-ROM and multimedia CD industry. CD-ROM drives, once a rare sight in offices and almost unheard of in homes, have become commonplace. The installed base of CD-ROM drives is estimated to have grown by 155 per cent during 1993, bringing the worldwide total to around 11.4 million. Nearly 5,400 CD-ROM titles were in circulation at the beginning of 1994, and overall revenues for CD-ROM commercial and in-house titles have been estimated at ECU 8.25bn. Commercial CD-ROM titles alone are expected to bring in revenues of nearly ECU 35bn by 1996. Sales of multimedia CD-ROMs through retail outlets increased enormously in the US during the second half of 1993, and the same trend is beginning to take hold in Europe.

The on-line industry, however, still dominates the professional electronic information services market in Europe. The professional on-line sector has performed well, especially considering the economic climate and had a turnover of more than ECU 3.6bn in 1992. This represents growth of around 17 per cent since the previous year. The on-line industry will benefit from the growing awareness of electronic information services within the business community and amongst the general public. In Europe, awareness has in the past been low in comparison with the US, but now appears to be increasing steadily. This argument is supported by the results of case studies in the transport, insurance and biotechnology sectors which were undertaken by the IMO in 1993.

Within the European on-line market, financial information services are particularly strong. Print publishing and content creation are also areas where Europe is considered to be in a strong competitive position. The overall European information sector (comprising hardware and software manufacturing, consumer electronics, service delivery and content industry) was estimated to be worth approximately ECU 370bn in 1992, of which content accounted for more than a third. When compared with the US, however, it seems that there is still plenty of room for expansion in content markets.

The electronic information services industry has high added-value and strong growth potential, but the European market for information services is still fragmented. In the financial and academic sectors, a pan-European market does exist to a greater extent. Elsewhere, a number of barriers still exist to the emergence of a European market for information services, not least of which is language. Efforts continue to seek a technological solution to language barriers, and the European Commission's Language Engineering programme will contribute to this work.

But technology alone will not solve all of the problems. In order to address fundamental problems, such as the increasing dominance of a few languages over others, there will be a need for awareness and action on the part of politicians, the public sector and the general public. In particular, we will need a greater understanding of language use in the evolving information society and of the relationship between market size and language versioning for information products. To this end, the Commission is preparing a new strategy document for the Council and the European Parliament with the working title 'Language and the Information Society'.

The uneven penetration of information technology and infrastructure in Europe also presents a barrier to the development of a European information services market, and a combination of legal and political barriers still impedes the development of pan-European videotex and audiotex interconnections. But there has been greater communication and collaboration between European network operators and new efforts have been made to create links between European research networks, as well as bi-lateral interconnections between national audiotex and videotex systems. The legal barriers are also being addressed.

The realisation of the information society described by the Bangemann report and the Commission's Action Plan will depend to a large extent upon the ability of the information industries to take the initiative in addressing new markets and adopting new technologies. National governments and the European Commission will also have a role to play. Finally, citizens of the information society will need to adapt themselves to the digital environment if they are to take full advantage of the new opportunities it will offer in employment, leisure, education and training.

1 BUILDING THE INFORMATION INFRASTRUCTURE

1993 was a significant year for the information services sector. In both the European Union and the United States major infrastructure investment programmes were launched and, in the years to come, they will greatly stimulate the supply of, and the demand for, information.

These infrastructure programmes mark a recognition of the fact that information is an important resource in a modern society. Effective communication and use of information can contribute to increased productivity and competitiveness in industry and commerce; it can make a valuable contribution to public services like education and healthcare; it can give effect to the rights of citizens; it can change employment and working patterns and create new jobs, and it can open up new opportunities and markets for leisure and recreation.

What the developments in Europe and in the United States have done is to acknowledge that large-scale investment in communications networks is needed to make these things possible. These network investments need to be supported by the development of standards, regulations and protocols and by the creation of information content services.

In the European Union, the United States and in Japan, the creation of the information infrastructure is being stimulated by government policy but is reliant on the investment impetus of the private sector.

1.1 The Common European Information Area

The aim of the Common Information Area is to create within the European Union an environment within which information is widely and easily communicated and used as a resource to promote growth; to increase competitiveness; and to expand employment.

The plans for development are set out in the European Commission's White Paper, *Growth, competitiveness and employment: the challenges and ways forward into the 21st century*:

'A system of information highways for the Community that will allow the best means to create, manage, transfer and access information. It involves:

- the creation of infrastructures (cable and land or satellite-based broadcast communication), including integrated digital networks;
- the development of services (electronic images, databases, electronic mail);
- promoting applications (teleworking, teletraining, telemedicine and linked administrations).'

The plan for a Common Information Area is part of-a wider strategy to develop and improve European transport, energy and communications networks.

The idea for network improvement to stimulate growth and employment was first set out at the Edinburgh meeting of the European Council in December 1992. It was developed further at the Copenhagen Summit in June 1993 and the full plans were embodied in the *White Paper* that was agreed at the Brussels Summit in December 1993. The discussion was continued in 1994, with the presentation of a report entitled *Europe and the global information society; recommendations to the European Council*, presented at the Corfu Summit. Finally, it has resulted in a Communication from the Commission to Council and Parliament entitled *Europe's Way to the Information Society - An Action Plan.*

The proposals for the Common Information Area involve much more than the creation of the telecommunications networks. The *White Paper* emphasises the importance of developing services and applications that will stimulate demand for the networks. The action plan is based on five priorities:

*1 **Promote the use of information technologies***

- Launch European projects on applications and public service and strengthen co-operation between administrations.
- Promote teleworking.
- Ensure closer involvement of users in the drafting and implementation of technology policies.

*2 **Provide basic trans-European services***

- Develop the basic ISDN and broadband networks.
- Ensure network interoperability.
- Ensure closer co-operation between telecommunications policies and aid from the Structural Funds.

*3 **Create an appropriate regulatory framework***

- End distortions of competition.
- Guarantee a universal service.
- Speed up standardisation.
- Protect privacy and ensure the security of information and communication systems.
- Extend intellectual property law.

4 Develop training on new technologies

- Encourage acquisition of the basic knowledge required to use the new technologies and to exploit their potential.
- Ensure widespread use of new technologies in teaching and training.
- Adapt the training for engineers and researchers.

5 Improve industrial and technological performance

- Increase the RTD effort and adapt it to the new market conditions.
- Promote industry and technology watch.
- Take up the results of RTD in industrial applications.
- Negotiate equitable conditions of access to the competitive market at world level.

To achieve these goals the *White Paper* sets out nine strategic projects that are planned to take place between 1994 and 1999. These projects are listed in Table 1.1.

Table 1.1 shows that the strategic projects will require an investment of ECU 67bn. This is only part of a total investment of ECU 150bn that is estimated to be needed over the next six to ten years. Most of this investment will come from the private sector. The Member States and the European Union will play a marginal role to provide the incentive for private investors. ECU 5bn could be contributed from the Union's Structural Funds and from the Fourth Framework Programme. It is clear, however, that the main cost of creating the Common Information Area will fall to the private investors. The role of the European Union will be:

- To act as a catalyst in providing a financial contribution for feasibility studies, pilot projects, developing common standards, etc.
- To promote co-operation and co-ordination between operators.
- To create platforms to bring together customers, industry and operators with a common goal of interconnectivity and interoperability.
- To reduce uncertainty by creating a stable regulatory framework and by studying market demand.

Table 1.1 Strategic Projects for the Common Information Area

Network elements	Strategic projects	Investment required 1994-1999 (BECU)
Interconnected advanced networks	Establishment of high-speed communication network	20
	Consolidation of integrated services digital network	15
General electronic services	Electronic access to information	1
	Electronic mail	1
	Electronic images: interactive video services	10
Telematic applications	Teleworking	3
	Links between administrations	7
	Teletraining	3
	Telemedicine	7
	Total	67

To take forward the *White Paper* recommendations a Task Force on European Information Infrastructures was established with a direct mandate from the European Council. The Task Force was Chaired by Martin Bangemann, Commissioner for Industry and Telecommunications. The Task Force established two working groups. One, headed by Carlo de Benedetti of Olivetti, examined the economic and technical aspects. The other, lead by Etienne Davignon of the Société Générale de Belgique, considered the regulatory and political aspects. The Task Force was responsible for the submission of a report entitled *Europe and the global information society; recommendations to the European Council* at the Corfu Summit in June 1994.

The Bangemann report stressed that the creation of an information society was an inevitable result of the technological revolution currently underway, and that it was therefore essential for government and industry to develop strategies for the exploitation of new opportunities. The strategy proposed for Europe was based upon the opening up of markets to competition and the deregulation of those infrastructures and services which are still under monopoly. The objective of such action would be to stimulate information infrastructure and service markets, so that they rapidly achieve a critical mass.

The report's main recommendations to Member States were to:

- accelerate the continuing process of liberalisation of the telecommunications sector;

- implement interconnection and interoperability of information infrastructures and services;

- review the European standardisation process so as to increase its speed and responsiveness to markets;

- adjust tariffs in order to bring them into line with rates in other advanced industrialised regions;

- establish a common and agreed regulatory framework for the protection of intellectual property rights, privacy and security;

- make a swift decision on the Commission's proposed Directive on data protection;

- pay attention to the adverse effects of national media ownership rules with a view to harmonisation.

- ensure an efficient application of competition rules to allow for market forces to drive innovation and development of the new markers.

The report stressed the need to strengthen the network infrastructure, and special priority was given to the extension of Euro-ISDN and broadband infrastructure. The need for reduction of mobile and satellite network tariffs and the promotion of global systems in Europe and internationally was also discussed. Immediate applications for the new infrastructure would need to be demonstrated, and the report suggested ten priority areas: teleworking; distance learning; a network for universities and research centres; telematics services for SMEs; road traffic management; air traffic control; healthcare networks; electronic tendering; trans-European public administration networks and city information highways. The investment required for infrastructure development should come from the private sector, although the public sector would have a role in refocussing existing expenditure.

Following the European Council's discussion of the report, the Greek Presidency concluded that '*the current unprecedented technological revolution in the area of information opens up vast possibilities for employment and the quality of life while simultaneously representing a major challenge*'. Member State governments would have an important role to play in backing up technology developments, giving political impetus and providing a clear regulatory framework. They would also need to set an example in the ten application areas recommended by the report.

Given the complexity of the issues at stake, it was suggested that a permanent co-ordination instrument was set up to ensure all parties involved were working along the same lines. It was also suggested that each Member State should appoint a person at ministerial level to co-ordinate political, financial and regulatory aspects and to ensure a co-ordinated approach in the Council.

In response to the Bangemann report and the discussions held at the Corfu Summit, a Communication from the Commission was presented to the Council and the European Parliament on *Europe's Way to the Information Society - An Action Plan.*

The Communication embraced the principles of the Bangemann report and focused in particular on the legal and regulatory framework, the need for liberalisation of networks and provision of basic services, applications and content, social and cultural implications, and the Commission's promotional activities. For each area, a timetable was provided, outlining targets for adoption of directives, implementation of research and development programmes and the submission of Commission proposals on future action.

1.2 The US National Information Infrastructure

The election of the Clinton Administration in the United States marked the beginning of a programme of investment in the information infrastructure. The goal is very similar to that of the Common Information Area:

> to create 'a seamless web of communications networks, computers, databases and consumer electronics that will put vast amounts of information at users' fingertips. Development of the National Information Infrastructure can help to unleash an information revolution that will change forever the way people live, work and interact with each other.' (*The National Information Infrastructure: Agenda for Action* 1993.)

The programme is the culmination of a number of initiatives taken by the US Congress in recent years and it is closely associated with Vice-President Al Gore who, for example, introduced the high performance computing and communications initiative in 1991 when he was a Senator. Many commentators have drawn the analogy between the National Information Infrastructure programme and the creation of the inter-state highway network in the 1950s following the initiative of President Eisenhower.

The expected scale of the development is considerable. John Scully, Chairman of the Apple Corporation is quoted as having estimated that by the beginning of the next century, the information infrastructure will be generating annual revenues that are equivalent to half of the current US GNP. Such revenues will not, however, be possible without major investment. The US Government has estimated that a total investment of over ECU 86bn will be required between 1994 and 1997. ECU 52bn of this had been announced by the end of 1993. Just as in Europe, however, the private sector was the main contributor with the government contributing only ECU 4.3bn over the period from 1993 to 1997.

The expected role of the US Government is quite clear: its prime purpose is to create the conditions that will stimulate private sector investment. To do this it will implement a programme of deregulation, create tax and other incentives and undertake direct investment through grants for public-sector projects. These direct grants are expected to ensure that public services like schools, research institutes, libraries and healthcare services benefit fully from the programme.

During 1993 the process of deregulation began. For example, the 1984 Cable Act was amended to remove the cross-ownership restriction. This enables telephone companies to offer cable television. In exchange, the telephone companies are required to make their networks available to independent providers of telephone and cable services. Another barrier removed during the year was the regulation that prevented local telephone companies competing with AT&T and MCI for long-distance traffic.

Encouraged by these deregulatory measures, there has been a flurry of mergers and joint venture deals. One of the most widely reported was the Nynex/Viacom/Paramount deal, which reflected the converging interests of telecommunications, cable and content industries. The largest of the deals announced in 1993 was the proposed ECU 28bn merger of the Bell Atlantic corporation and Tele-Communications Inc. This would have been the biggest corporate merger ever. Although the deal was called off early in 1994, the companies are continuing to work together on joint ventures and the failure of the merger is seen by many to be a temporary halt in a general trend towards merger and corporate acquisition. Other deals that were successfully completed, such as that between US West and Time Warner, brought together information infrastructure and information content services to take advantage of the opportunities offered by the National Information Infrastructure. (See Section 2.3.1.)

There is considerable debate about the technological nature of the development. Some people argue that the goal should be a full optical fibre network. Others claim that to connect all US homes and businesses with optical fibres would cost ECU 345bn and would take over 20 years. They argue instead for optical fibres to be used for the main trunk routes and long-distance lines but for the local connections to be by means of coaxial copper cable that has a similar capacity over distances of up to 0.5 kilometres. Some influential commentators, like Mitchell Kapor from the Electronic Frontier Foundation, argue that an ISDN network would be sufficient to meet foreseeable needs, while others criticise this approach arguing that it can only ever be an interim solution. It is clear that there is still a long way to go before the operational parameters of the infrastructure are decided upon. 1993 saw the terms of the debate being more clearly defined.

To carry through the development, the US Government has established an Information Infrastructure Task Force chaired by Secretary of Commerce Ron Brown. This will work through a series of four committees and an advisory council.

In September 1993 the Task Force published its *Agenda for action*. This sets out the basic principles and objectives that will shape future developments. The principles and objectives are to:

- promote private sector investment through appropriate tax and regulatory policies;
- extend the 'universal service' concept to ensure that the information resources are available to all at affordable prices;
- act as a catalyst to promote technological innovation and new applications;

- promote seamless, interactive, user-driven operation of the National Information Infrastructure;
- ensure information security and network reliability;
- improve management of the radio frequency spectrum;
- protect intellectual property rights;
- co-ordinate with other levels of government and with other nations;
- provide access to government information and to improve government procurement.

It is clear that there is a great deal to be achieved before the National Information Infrastructure becomes a reality. There are also obvious parallels between the drive towards a National Information Infrastructure and the European Union's Common Information Area. Currently the US has a significant lead in developments. The existing networks are better established and there are fewer barriers than in Europe where national borders and cultural and linguistic differences complicate the development of trans-European networks. There also appears to be a greater public awareness of, and enthusiasm for, the development of information networks in the US than there is within Europe.

1.3 Developments in Japan

The Japanese Government has also identified the need to develop information networks and information services to stimulate growth and to improve further the productivity of Japanese industry and commerce. There are, however, significant differences in the way they have approached the development.

The first point to note is the fact that the approach has been gradual and has been taking place over a number of years. The Japanese Government also plays a more significant role in stimulating and in meeting the cost of the development.

The initial emphasis in Japanese information policy was firmly directed towards scientific information. In the mid-eighties, however, the scope of policies broadened and became more concerned with the use of information as an industrial and commercial resource to improve the overall level of productivity within the Japanese economy. There have been a range of policies to stimulate the computer industry, the telecommunications network and the information services and content sectors. 1993 saw the advancement of the Japanese information sector on all these fronts.

The Japanese Government has been investing heavily in the telecommunications infrastructure for many years. Recently, two programmes have been launched to increase the carrying capacity of the network. The government has announced plans for a ECU 24m high-speed network linking academic and research communities through a series of national institutes.

This will provide access to database services and to computing resources. The network should be complete by 1997.

In May 1994, MITI's Industrial Structure Council issued a report entitled *Program for a Communication Infrastructure* which dealt with the diversification of Japan's information infrastructure strategy, covering the need for optical fibre networks and multimedia applications. At the same time, the Telecommunications Council of the Ministry of Posts and Telecommunications produced a report on *Reforms to Build an Intellectually Intensive Society Towards the 21st Century*. According to this report, multimedia industries will overtake the automobile industry in economic significance and job creation. The report forecasts that by 2010 a market worth over Y 123,000bn (ECU 820bn) will have been created, thanks to the availability of high capacity network infrastructure. It also forecasts 2.4 million jobs by the same year, with 75 million people having access to interactive and multimedia services via optical fibre. Investment of Y 128,000bn (ECU 850bn) will be required for the installation of 'fibre to the pavement' and 'fibre to the home', with private enterprise playing a central role.

Meanwhile, Japan has signed an agreement with South Korea to create links between the two countries' information infrastructures. The South Korean Minister of Communications recently announced that a high speed information network would be completed by 2015 - a project of some US$ 55bn (ECU 47.3bn). Investment money will come partly from the sale of Korea Telecom shares by the government.

A number of other developments have taken place in Japan which are linked to its network strategy. The government has done much to stimulate the development of the Japanese database industry. It is estimated that in 1993, the government spent in excess of ECU 400m on direct activities to stimulate the database industry and the use of electronic information services. In addition to these direct activities, the Ministry of International Trade and Industry has initiated a wide range of measures to strengthen the Japanese database industry, including tax concessions to cover the cost of compiling databases. Initially these were aimed at strengthening the internal Japanese electronic information services market. In recent years the emphasis appears to be shifting towards globalisation and exporting.

Japan has not identified an overall goal to compare with the Common Information Area or the National Information Infrastructure. What it has is a range of policy initiatives, some of which began ten or 15 years ago, that are backed by substantial levels of public investment. The outcome, however, is likely to be similar to that which is planned for Europe and the US: an information-intensive society.

1.4 Singapore: A Case Study in Information Infrastructure Development

The country that has gone furthest in developing an information society is Singapore. The scope for expanding its economy is limited by the size of the country and, in particular, by the necessary constraint on population growth. To achieve higher levels of prosperity, the government embarked in the early 1980s on a programme of economic development aimed at

increasing the value-added per worker in Singapore. The means of achieving this was the creation of an information-intensive society or, as they put it, the creation of an intelligent island.

The overall strategy involved a combination of strong government and free market-forces, linked to a growth plan that emphasised both the supply side and the demand side of the information technology sector, coupled with the importation of technology and the development of an indigenous information technology industry.

The first phase of development was aimed at stimulating the use of computers in government. From 1980 to 1985 the government invested heavily in the education and training of computer professionals and worked to stimulate the demand for information technology by introducing computing throughout the public service. It established the National Computer Board to oversee the work.

From 1985 to 1989 the emphasis shifted to the extension of computing use throughout the country, linked to the development of telecommunications networks. The island now has the world's most sophisticated telecommunications system offering high speed and high capacity at very low cost. To stimulate use of the networks, the government launched a number of key applications like Electronic Data Interchange to handle administrative transactions in the Port of Singapore. This alone brought about net savings estimated at over ECU 850m a year.

The third phase, running from 1989 to 2007 is the creation of a fully intelligent island. In this phase the emphasis has shifted from computing and telecommunications to information content. Further efforts are being made to introduce electronic applications and information services to make full use of the capacity of the system. Support is also given to the creation of information content services like the educational programmes that are being made available through the Singapore videotex service.

Throughout, the development has been firmly led by the Singapore Government and the creation of the information infrastructure has been seen as a key element in the overall national economic strategy. It has set out its overall aims and objectives in clear policy documents and has taken the lead in developing products and services and in stimulating take-up by the private sector. It has also invested heavily in education and training at all levels and has sought to ensure that all parts of the public sector make full use of the electronic information opportunities that exist.

The result is the emergence of a significant nodal point in the global information system - an information-rich society that is proving to be an attractive location for multi-national companies. More significantly, the process of development has been associated with consistently high annual rates of growth of GNP. In 1993 the GNP increased by 9.7 per cent.

1.5 The Internet

The Internet provides an example of what could happen if the information infrastructure developments take off. In the US, the Internet is expected to represent a major focus for

infrastructure development, at least in the short term. (The development and use of the Internet is considered in greater detail in Section 7.8.1.)

During 1993 use of the Internet has grown exponentially. In June 1994 the Internet Society said that 3.2 million host computers were connected, linking 45,000 networks and 30 million users in over 100 countries. The number of users and the volume of traffic has grown so quickly that the network is slowing down, but for the moment this does not appear to have deterred new users from joining. Slow response times do, however, represent an annoyance to frequent users.

The Internet originated in a telecommunications network developed for military and civil defence purposes by the US Government. In 1983 the non-military functions were separated out into Arpanet, a public access network mainly for the support of communication between academics and researchers, with the National Science Foundation as the co-ordinating body. Since then it has grown beyond recognition.

It is misleading to describe it as a network. In reality it is a federation of computer networks throughout the world, linked by a set of protocols known as TCP/IP. These protocols were widely adopted by universities in the US and in the late 1980s spread worldwide through their incorporation into the UNIX operating system. Within Europe an attempt was made to adhere to the ISO/CCITT standards but these have, to a great extent, been overtaken by TCP/IP. The system was easy to operate and the access that it provided was very cheap. The Internet took off first among the academic community and, more recently, within industry and commerce.

Three applications dominate Internet use: electronic mail, interactive access and file transfer. Together they are encouraging people to make much more use of information as a resource. Users are also encouraged by the fact that they do not require dedicated contracts and passwords for information access.

There are, however, problems. The quantity of information available through the Internet is so vast that users experience significant difficulties navigating their way around the system. Software of varying degrees of sophistication, such as the World-Wide-Web and Mosaic, has been introduced to reduce the navigational problems but they have not been fully overcome. It is also easy to become over-loaded with information through participation in electronic bulletin boards and other services. Other problems concern the quality of the information. The lack of any editorial control means that there will always be doubts about the accuracy and currency of the information contained in the system.

Users have to subscribe to an agency that provides connections to the Internet. In some cases these connection agencies are themselves networks linking institutions together, like EARN, the European Academic Research Network or EUnet the European Network that links companies and institutions. Other connections are provided by specialist agencies like DEMON. In some cases the connection agencies provide a range of added value services.

Until now the Internet has made relatively little impact on most conventional commercial on-line database services. Many users do, however, access databases, mainly those aimed at academic markets, through the Internet and it is likely that this form of use will increase

significantly in the future. Commercial hosts, publishers and information providers are beginning to explore the opportunities and there is likely to be a gradual emergence of a range of new information services on the networks. The extent to which the Internet is used to access commercial information services will depend on the establishment of procedures and practices to deal with issues such as pricing, copyright and usage metering. Some progress has been made in this area, and CommerceNet is an interesting recent example of an attempt to create a commercial `space' on the Internet where business can be transacted.

Above all else, the Internet provides some form of confirmation that the increased capacity that will be offered by the Common Information Area or the National Information Infrastructure will be taken up.

1.6 Uncertainty

Many confident forecasts have been made in support of these large-scale information infrastructure development plans. Commentators have drawn analogies with the creation of the railway and road networks and have argued that the information super-highways will make a major contribution to future economic success. Yet, despite all this confidence and enthusiasm, there is still a considerable amount of uncertainty about the viability of the plans and a degree of scepticism about the return on the investments involved.

The uncertainty is, in part, due to the confusion that surrounds the plans: confusion about the appropriateness of the technologies; confusion about the scale and the nature of the demand; confusion about the measures that will be needed to trigger use of the networks; and confusion about the respective roles of the public and private sectors.

The current pace of change is such that infrastructure policy formulation is inevitably somewhat tentative at this stage. The plans being developed in Europe, the USA and in Japan represent positive first moves which can be built upon as the technology and market environment settles down. Clarification of legal issues should bring some stability, as will the co-ordinating activities of governments and the widespread introduction of public sector applications.

2 THE INFORMATION SECTOR IN THE EUROPEAN ECONOMY

There is a general consensus amongst industrialists, technologists and politicians that the dawn of the Information Age is upon us. Information, and access to electronic information delivery channels, is expected to have a fundamental impact on the way in which we work, learn and spend our leisure time. The increased demand for electronic information and entertainment will have implications for all companies involved in these industries, whether they supply the networks, computers, televisions or other consumer electronics. In anticipation of this demand, companies in IT and communications are investing in new technologies from fibre optic networks to intelligent set-top boxes for televisions.

The expected growth in demand for electronic information and entertainment will stimulate investment in technology development, and the information sector is likely to take on a greater overall importance in the European economy. If the predictions are correct, then the sector will grow significantly in terms of revenues and employment. It also seems likely that the various different elements of the information sector, previously represented by a number of disparate industries, will come together to work on projects of mutual interest. In the longer term, these alliances will be formalised through mergers and acquisitions - indeed, we are seeing the beginnings of this process (see section 2.3.1). This phenomenon is one of the factors which has led to an almost obsessive discussion of 'convergence' in the information sector, encompassing the information content and media industries, network providers, software industry, computer and consumer electronics manufacturers.

2.1 The Convergence Phenomenon

Traditionally, the electronic information services industry has been considered to be made up of the providers of information services and, to a lesser extent, the organisations involved in providing the means of distribution and processing of such services. Thus, within its traditional boundaries, the major stakeholders of the industry were the on-line database providers and vendors, the real-time information service providers, the CD-ROM publishers and so on. As such, the electronic information industry was an innovative, fast-growing, but nevertheless small concern.

However, the range of organisations now wishing to claim a stake in the industry is far wider. In particular, the organisations which provide the distribution infrastructure and the equipment which we use to access information services are consciously moving towards a position where they form an integral part of the information industry, rather than acting as providers of products or services to that industry. At the same time, the traditional electronic information services industry, (and in particular, those who provide the information content), have recognised the importance of making alliances with the companies which provide the means of access to their services. These trends, together with technology developments across the

content, delivery and processing sectors, are increasingly being discussed under the umbrella term - convergence.

The advent of multimedia and the promise of new markets in the provision of interactive information and entertainment to consumers has perhaps been the decisive element in bringing about these trends. Without the promise of interactive TV, CD-based multimedia and the like, the opportunities offered by the traditional information industry would perhaps have been insufficient to draw the interest or participation of media giants such as film and cable companies and that of politicians.

The fact that the film, cable and telecommunications industries are gearing themselves up to participate in the future of electronic information and entertainment services has meant that general awareness of the electronic information world has been significantly raised. For the first time, the concept of an information industry is beginning to take on meaning for a much wider range of sectors and for the public in general. Governments have also recognised the strategic importance of information infrastructures, as highlighted in the first section of this report.

Convergence is also a feature of technology change. In one sense, this can be seen in the movement of consumer electronics and computing manufacturers towards a common technology base. In broad terms, a computer was previously for processing text and figures and a television was for viewing images - these distinctions are now being broken down and computers and television sets are likely to resemble each other more and more in terms of technology components.

In a wider sense, technology convergence can be seen in movements towards the creation of the all-in-one information machine, incorporating a range of elements such as voice and fax communication, word processing, access to local and remote data sets through portable storage media and data networks and, of course, video, film and television viewing. A machine capable of all of these functions is still a long way off, but during 1993 it became clear that it was technically possible to integrate three or four of them quite successfully. At an even more fundamental level, technology convergence is about the ability to store all kinds of data in a digital format, and to exploit that data across a range of delivery channels.

2.1.1 The Composition of the Converging Information Sector

It is becoming increasingly difficult to scope and define the composition of the wider information sector because so many organisations are moving beyond their traditional areas of activity and operating across the full range of information-related industries. A symptom of this trend is the growing number of cross-industry mergers, acquisitions and strategic alliances, and the extent to which companies are making major investments in order to enter related industry sectors. Nevertheless, Table 2.1 provides a broad view of the main components of the consolidated information industries. The three broad groupings used in this table consist of:

information content - the intellectual property which forms the basis of an information service, whether this be a piece of text, a collection of photographs, a film or a piece of music;

information delivery - electronic communications channels (such as telecommunications, cable and satellite), or off-line distribution channels which are used by information content providers to distribute their services, and by users to access these services;

information processing - the hardware, software and communications equipment required by users in order to view and process information and entertainment services, and by information content producers in order to develop and design their services.

It is generally considered that the highest level of value resides with the information content. After all, the delivery and processing sectors are there to fulfil the demand for information (and to stimulate that demand), but are of little value without the content itself. Some manufacturers and network providers now seem to be moving along the value chain towards information content. Companies like Microsoft, as well as many of the public telecommunications operators, are buying into content as a way of ensuring that they have a role in the high-value end of the market. Again, this is dealt with in greater detail in the section on Mergers and Acquisitions below.

Table 2.1 is by no means intended to be exhaustive in the primary and secondary industry elements it includes, but provides an indicator of the breadth of products and services which can be placed within the information sector grouping.

These elements form three very different industries, each with its own structure and value-added service elements, and the differences between them in terms of scale and revenues are enormous. And yet, these three industries are finding that, without a high level of co-operation, they will be unable to take full advantage of the information future. Without alliances and, in some cases, investment in, the channels of delivery and viewing/receiving equipment, information content producers have little hope of getting their services to the users. Equally, the hardware manufacturers are finding that their products will not sell unless their potential customers have a range of suitable content applications from which to choose. For the carrier companies, multimedia, interactive TV and Video on Demand all offer good prospects for major traffic increase. It is therefore in their interests to ensure that there is a lively content industry to stimulate demand and network traffic. It may also be in their interest to become content originators or suppliers themselves.

2.1.2 The Scale of the Converging Information Sector

There are, of course, dangers in over-stressing the convergence factor, and it would be foolish to suggest at this stage that a coherent industry will arise incorporating electronics, information technology, carrier, entertainment and information businesses. Neither, in the first instance, will the amalgamated turnovers, competitive strengths and employment capacities of each sector be combined to form a super-industry with a huge influence upon the rest of economy and society.

Table 2.1 The Composition of the Wider Information Industry

INFORMATION CONTENT	INFORMATION DELIVERY	INFORMATION PROCESSING
PRIMARY PRODUCERS	PRIMARY INFRASTRUCTURE	PRIMARY EQUIPMENT
Print, electronic and multimedia publishing Film, video and TV programme production/publishing Audio production/publishing	Public telecommunications (PSTN) Fibre optic networks Cable networks Satellite networks Radiowave, cellular and mobile networks	Computer & peripherals manuf. Processor manufacturing Consumer electronics Telecoms/satellite receiving equipment Operating software Applications software
SECONDARY AGENTS & SERVICES	SECONDARY INFRASTRUCTURE	SECONDARY PRODUCTS/SERVICES
Trade, retail and specialist distribution Design, specialist production and replication Rights brokerage and clearance	TV/radio broadcast channels Value-added network services Intelligent `superhighways'	Distribution, bundling and replication Specialist programming/ interface design Software production tools
Source: Policy Studies Institute		

Whilst keeping this proviso in mind, it is useful to look at the comparative sizes of the industries likely to play a role in the wider information sector. In particular, employment in this sector is the subject of close attention, largely because the EC White Paper on *Growth, competitiveness and employment* looks to the development of an information infrastructure and an information society as one of the key opportunities for employment growth. (See also section 1.1.)

Table 2.2 Key Figures from the Information Sector, 1992

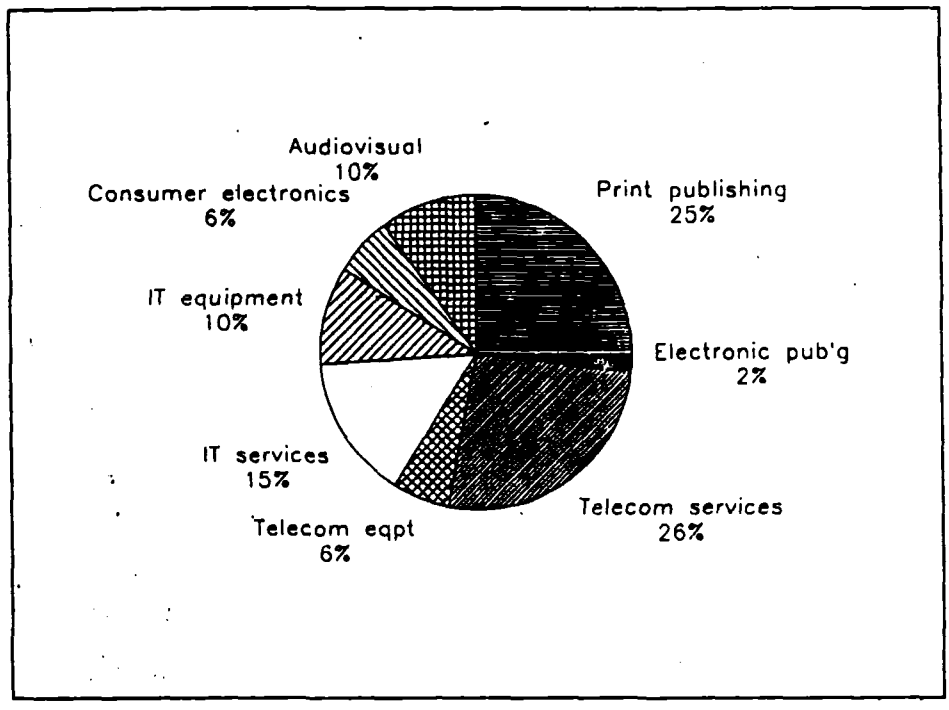
	Employees (Thousands)		Market Size (BECU)	
	EU	US	EU	US
Print Pub.	885.5	1,500.0	93.4	128.0
Electronic Pub.	43.5	-	8.4	12.8
Audio-visual**	313.2	-	35.6	54.1
Telecom	1,231.8	1,210.0	118.0	145.0
IT	670.0	1,048.1	95.0	120.0
Consumer Elec.	110.0	78.0	21.0	17.0

Source: *Key Indicators of the Information Industry 1992*, IDATE
** Excludes the music industry

One of the dangers of devising comparative tables such as these is the difficulty in reconciling discrepancies between market figures for the various sectors. IDATE's figures on print publishing, for instance, vary from those of Consulting Trust quoted in section 7.10 of this report. Neither is it particularly easy to make a comparative judgement of IDATE's audio-visual figures against those of OMSYC provided in section 7.9. Such discrepancies can only partly be explained by the slightly different time periods referred to. Whilst accepting that these figures are not necessarily definitive, they do enable a preliminary comparison of the various industry elements.

Placing all of these elements together, IDATE has estimated that the EU information sector was worth some ECU 371bn in 1992 and around ECU 477bn in the US. Table 2.3 indicates that the content sector as a whole makes up over a third of this total.

Table 2.3 Breakdown of the EU Information-Sector, 1992



Source: IDATE

2.2 The Component Sectors

Having assessed the scale of the wider information sector as a whole, it is worth looking in closer detail at the sizes and key trends in the component sectors: content, delivery and processing.

2.2.1 The Content Sector: Changing Roles and Opportunities

Within this great scheme of things, the traditional electronic information services sector begins to look very small and insignificant. Certainly, there can be little comparison between the combined turnovers of database producers, CD-ROM and multimedia publishers, and those of the IT and telecommunications giants. Even within the sector we have called information content, the electronic publishing sector is dwarfed by the film and music businesses. IDATE's calculations show electronic publishing to represent a mere 2 per cent of the total information sector. (Detailed information about the size of the content markets is provided in section 7 of this report.)

On the other hand, the perceived value of information content is rising rapidly. In particular, the value of data sets from which individual data elements can be retrieved for interactive searching (as opposed to linear data resources such as films) are becoming increasingly sought-

after. The early signs are that this will manifest itself in a spate of acquisitions, industry flotations and investments in content companies in the immediate future, pushing up the market value of the content business.

Certain elements of the electronic information services sector are likely to become closely allied with, and structurally similar to, the applications software, games software and video and audio industries. This will be particularly true of CD-ROM and other portable media, including high-capacity floppy disks. Consumer and general interest CD-ROM publishers are making use of distribution mechanisms already established in the mainstream software, games and audio sectors, such as bundling of 'free' software with hardware, mail order and specialist retail. As the market grows in terms of volume sales, such distribution methods are likely to become more widely used by the information industry, beginning in the consumer sector and spreading to the business sector. The information industry in turn will almost certainly be influenced by the pricing and deal structures for rights and distribution which have become established in other software industries.

The trends towards convergence discussed here represent both a threat and an opportunity to the electronic information services sector. The threat comes in the shape of the hardware, software and delivery giants, many of which look set to develop their own electronic content, avoiding expensive rights deals and taking greater control of their markets. Almost all of the companies involved in the development of multimedia hardware, for instance, have their own publishing programmes: Philips, Sony, 3DO, Apple and, of course Microsoft. Much of their publishing activity is still based on licensing materials produced by third parties, but it is likely that they will move towards content creation as well.

Another threat comes in the form of the hundreds of small multimedia development companies which have sprung up over Europe. They started out as development houses for content publishers, but many now aspire to electronic publishing and rights ownership themselves. Franklin fore-shadowed this trend in the early 1990s by re-styling what was previously a small handheld electronics company into an electronic reference publisher in its own right - and, indeed, changing its name to Franklin Electronic Publishers. Similarly, moves by entertainment and telecommunications network operators to acquire or invest in content companies are a symptom of the desire to avoid dependence on the outside content industry.

It is not suggested that convergence will sweep away the electronic information services sector. These trends will undoubtedly pass some electronic information companies by, just as electronic publishing has so far passed by some print publishing companies. Such companies will not necessarily collapse as a result, but their inability to adapt restricts the market opportunities open to them.

So what opportunities are offered by the market forces which form the basis of convergence? Companies which own content, and which are able to present that content in a digital format for manipulation in a number of applications are in a strong position. In the short to medium term at least, there is likely to be greater network capacity than there is suitable content, placing such resources under considerable demand. This position will be re-inforced as industries are further deregulated and competition between operators of delivery channels and networks gets fiercer.

To exploit this opportunity, content companies will need to pursue alliances with the technology and network providers, or set up rights deals with electronic publishing partners for third-party development across a suitable range of sectors and technologies. It is likely to be some while before the high capacity networks are fully functional, and content companies therefore have a little time to develop their rights acquisition strategies, build up a portfolio of electronically manipulable products and foster expertise in software development.

The CD-ROM, multimedia and on-line businesses which have been built up by publishing and information companies will not be destroyed by the availability of other forms of distribution or by the effects of convergence. The efforts of converging industries to create a mass market for electronic information and entertainment products can only help to raise awareness of, and demand for, such products, whether they be delivered on optical disc for computer use, down a telephone line or as part of a handheld reference device.

The professional information sector is likely to be under less of a threat from the computing and network giants: their expertise and market penetration would be much harder to replicate than those in some of the entertainment sectors. Furthermore, the skills and expertise offered by the publishing industry in commissioning, editing, rights handling and distribution will continue to have a unique value in the new information world.

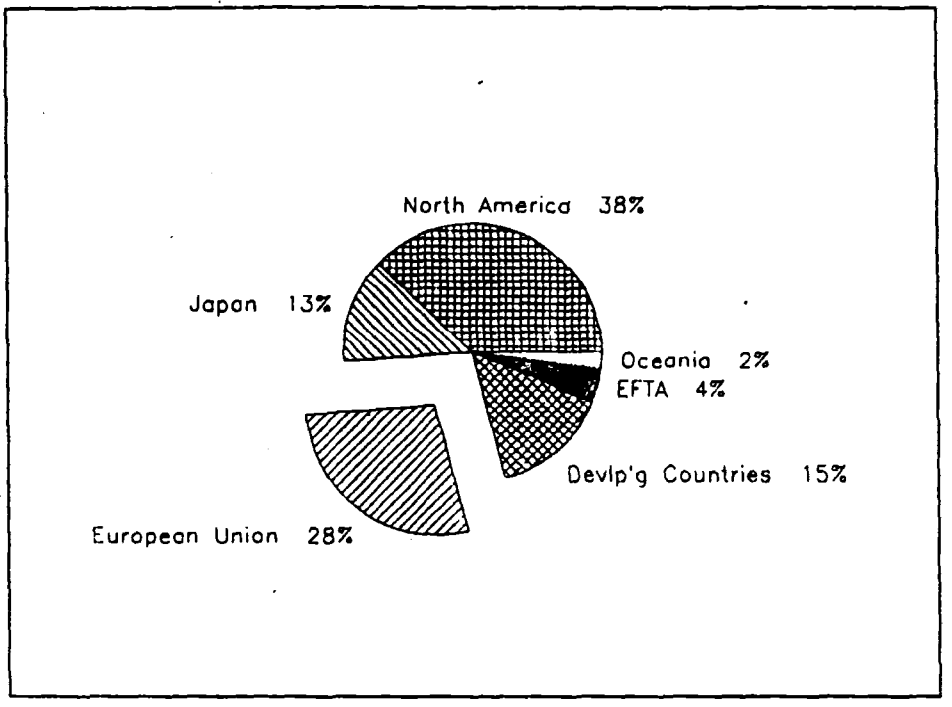
2.2.2 The Delivery Sector: Telecommunications, Cable and Satellite

The world market for telecommunications services (as opposed to services *and* equipment, indicated in Table 2.2) was worth ECU 328.7bn in 1992, according to research carried out by IDATE. Of this total, the EU accounted for an estimated ECU 91.9bn, or approximately 28 per cent of the total, as indicated in Table 2.4 below.

The breakdown of the EU market by service type shown in Table 2.5 indicates that data networks, value-added network services (VANS) and mobile services account for a relatively small proportion of the total, but are experiencing high growth rates.

The penetration of PSTN lines per 100 inhabitants varies considerably throughout the EU, with only 27.3 lines per 100 inhabitants in Portugal by 1992, but 59.1 in Denmark. Similarly, the development of digital telephone networks in the local area (local loop) varies considerably. Table 2.6 shows that in Germany, the proportion of the local loop digitised was estimated at 13 per cent in 1992, whilst in France it may have been as high as 83.2 per cent.

Table 2.4 Geographical Distribution of the World Market for Telecommunications Services, 1992



Source: IDATE

Table 2.5 Breakdown of the EU Telecommunications Services Market by Activity, 1991-1992

Services	1991 BECU	1992 BECU	Annual Growth - %
Basic services on the PSTN	71.7	74.6	+ 4.1
Telex, teletex and telegraph	1.1	1.0	- 10.0
Data transmission	6.8	7.8	+14.0
Generic services and VANS	2.9	3.5	+20.0
Mobile telecomms services	4.2	5.0	+20.0
Sources: Operators' Annual Reports, IDATE, CIT Research, Sagatel, ITU			

Table 2.6 Telecommunications Infrastructure in 1992

	Main telephone lines in operation (millions)	Penetration of PSTN lines per 100 inhabitants	Digitisation rate of the local loop (% estimates)
Belgium	4.3	42.3	52.0
Denmark	3.0	59.1	40.0
Germany	35.6	44.8	13.0
Ireland	1.1	31.1	65.0
Spain	13.8	35.7	36.4
France	30.1	53.0	83.2
Greece	4.4	43.7	20.0
Italy	23.7	41.1	48.4
Luxembourg	0.2	50.6	56.0
Netherlands	7.4	49.3	80.0
Portugal	2.9	27.3	50.0
UK	26.1	45.9	61.6
Total/Average	152.6	44.3	49.0
Source: ITU, BIS Strategic Decisions, IDATE			

The widespread availability of standard and digital telephone lines is an essential feature of the electronic information industry. Moreover, an even coverage of telecommunications infrastructure is fundamental to the concept of a Common Information Space. Policy-making and investment decisions (both public and private sector) will therefore need to be made in the light of these issues. Meanwhile, as deregulation gathers pace and further attention is paid to reducing and harmonising tariff structures, an increased demand for telecommunications services is expected, especially for international and mobile communications.

Tariff reductions for mobile communications were recommended by the Bangemann report and Commission Action Plan, and the Green Paper on Mobile and Personal Communications proposed a number of deregulation and network interconnection activities. These developments, together with the prospect of an upsurge in demand, will encourage private sector initiatives to create global, mobile communications networks for a mass market.

The Green Paper sets out four key objectives:

- to allow the creation of an EU market for services, equipment and mobile terminals;
- to establish common principles for the establishment of an infrastructure for mobile communications;
- to promote the transformation or the market for mobile communications into a mass market for personal communications;

- to facilitate and promote the creation of pan-European networks and services and ensure that the sector develops according to the public interest.

The support given to these principles by the Bangemann report and by the Action Plan produced by the Commission in response to the Bangemann report is likely to encourage rapid action. The target date set out in the Action Plan for adoption of the Green Paper on Mobile and Personal Communications by the Commission is the end of 1994 or early 1995.

Meanwhile, deregulation in the US has led to a flurry of activity in the area of global satellite networks for mobile communications. During the spring of 1994, a number of communications giants put proposals into the US Federal Communications Commission for the development of such networks.

Teledisc, for instance, is a Washington-based company with investment from McCaw Cellular and Microsoft. Teledisc's proposal involves launching 840 satellites and is intended to provide wireless access to data communications channels of all bandwidths and be available to users worldwide, regardless of the sophistication of national telecommunications infrastructure. Motorola's Iridium will use 66 sophisticated satellites to offer mobile services all over the world. Networks such as these will allow fast delivery of complex digital signals, enabling teleconferencing and access to multimedia services. They will therefore have a significant impact upon the creation of a mass market for such services and will not be constrained by the ability of national administrations and PTOs to invest heavily in fibre optic infrastructure.

However, following the excitement surrounding the initial announcements, there has been some scepticism as to the actual implementation of these proposals. At this stage, it seems unlikely that high-bandwidth, mobile satellite networks will be fully functional much before the end of the century. Although there are some rather less ambitious projects which will bear fruit in the next couple of years (Orbeomm in Virginia, for example, hopes to have a 26 satellite network in place by 1996 for simple digital message transmission), the impact of mobile communications on the market for electronic information and entertainment services is likely to be relatively minor in the short term. Over a longer period, however, the signs are that they will have a fundamental effect on the transmission and use of multimedia services.

According to the International Telecommunications Union (ITU) *World Telecommunications Development Report* published in March 1994, globalisation in telecommunications markets is a growing trend and structural changes in the market in response to the globalisation and deregulation processes will continue to take place.

Liberalisation in European telecommunications policy has already served to encourage competition amongst operators and, indeed, to stimulate investment in Europe from US companies, in particular from AT&T, MCI, Sprint and the Regional Bell companies. US investment and joint venture projects are likely to play an important role in the development of an advanced information infrastructure in the EU, but there are concerns within the telecommunications industry that, in the longer term, this may result in European operators having less control over their home market.

European PTOs have tended to perform quite well against their counterparts worldwide, and in 1992 accounted for four of the top ten. The US accounted for five and Japan one. (See Table 2.7.)

Table 2.7 Top Ten Public Telecommunications Operators, 1992

Operator	Country	Revenues US$bn	Revenues BECU
NTT	Japan	51.354	44
AT&T	USA	39.580	34
DBP Telekom	Germany	34.550	30
BT	UK	23.379	20
France Telecom	France	23.164	20
SIP	Italy	17.492	15
BellSouth	USA	15.202	13
Nynex	USA	13.155	11
GTE	USA	12.644	11
Bell Atlantic	USA	12.093	10
Source: International Telecommunications Union			

The cable and satellite sectors both grew substantially in 1993, mainly on the back of television services, but with a certain amount of penetration into the telecommunications sector and a promising outlook for satellite-based business services. According to *Cable and Satellite Europe*, there were at least 10.7 million satellite dishes installed in Europe in 1993, of which up to 64 per cent could be accounted for by Germany and the UK. Around 1.1 million dishes are thought to have been installed throughout Europe in 1993. Surprisingly, Poland emerged as Europe's third largest market, with conservative estimates putting the installed base at around 750,000. The penetration of cable, which is likely to be a crucial factor in the early development of intelligent, interactive network services, also increased substantially during 1993. (See Table 2.8.)

The lion's share of cable and satellite industry revenues continues to be concentrated around consumer entertainment services, although there are signs that business markets are growing rapidly. The European market for satellite business services was estimated to have grown by nearly 27 per cent in 1992 from ECU 267m to ECU 339m (source: CIT Publications, 1994). Major European players in the provision of satellite communications for business include DBP Telekom and Maxat (a France Telecom / Cogecom subsidiary), as well as SIS, a private UK operator which also dominates the market for the distribution of racing data to betting shops in the UK.

Business information services delivered by satellite constitute a small market and are mainly concentrated around financial and trading information. The use of satellite for video conferencing has grown insubstantially, possibly as a result of the wider availability of ISDN. In 1992, video conferencing service revenues amounted to around ECU 11m, a rise of ECU 2m since the previous year. Meanwhile, one of the biggest growth areas in the satellite market is expected to be business television.

Table 2.8 Cable and Satellite Penetration in Europe, 1993

Country	Cable Connections (000s)	Cable Penetration Per Cent*	Satellite Dishes (000s)**
Austria	967	32.3	500
Belgium	3,725	98.0	10
Denmark	1,323	57.3	150
Finland	780	36.3	15
France	1,206	5.9	350
Germany	13,116	39.3	4,200
Hungary	749	21.4	180
Ireland	400	40.0	50
Italy	negl.	negl.	100
Luxembourg	117	81.4	2
Netherlands	5,700	92.0	250
Norway	643	36.6	160
Poland	600	6.0	750
Portugal	10	0.3	100
Spain	749	6.6	150
Sweden	1,931	50.3	325
Switzerland	1,908	77.1	40
UK	504	2.3	2,662

Source: Cable and Satellite Europe, January 1994

* indicates per cent penetration into TV homes
** rough estimates only

2.2.3 The Processing Sector: Hardware, Software and IT

The European IT market has suffered alongside many others from the effects of recession. The hardware sector has faced considerable difficulties in adapting to a number of new market conditions: shrinking demand for mainframes, dramatic falls in PC prices and the emergence of a new form of demand from the small office and home office sectors. Meanwhile, price competition and battles between applications manufacturers for market domination have made this a challenging period for the software industry. Hardware and software growth rates during the last half of 1992 and first half of 1993 slowed considerably throughout most of Europe, although general economic recovery during 1994 was expected to prevent growth rates from falling further. Growth rates in double figures, however, are only expected in countries where IT market development started later, such as Greece and Portugal. Table 2.9 shows growth rates between 1990 and 1994 in European countries.

Lack of substantial growth in the IT sector can largely be accounted for by the decline in the hardware market, which has been particularly severe for multi-user systems, especially large and medium-scale computers. The European Information Technology Observatory (EITO) estimates that hardware revenues shrank by 3.1 per cent during 1993. Table 2.10 shows that,

in comparison, the software market has performed well, achieving growth rates of 8.2 per cent, expected to rise to 8.5 per cent during 1994.

Table 2.9 Percentage IT Market Growth by Region, 1990-1994

	1990/1991	1991/1992	1992/1993	1993/1994
Austria	1.4	4.1	5.6	6.2
Belgium	5.9	1.1	3.0	3.2
Denmark	3.0	-1.0	3.0	3.0
Finland	-2.4	-6.0	0.2	4.0
France	3.1	1.7	0.6	3.2
Germany	7.7	6.2	2.0	4.9
Greece	19.3	16.6	17.3	19.0
Ireland	5.0	6.6	5.2	5.5
Italy	5.8	2.0	0.5	2.4
Netherlands	4.2	2.9	1.5	3.9
Norway	6.3	-1.8	1.0	1.4
Portugal	20.6	18.5	16.3	16.4
Spain	5.6	-1.2	-0.2	2.0
Sweden	2.0	-5.7	-0.7	3.2
Switzerland	1.2	-0.6	1.7	3.2
UK	1.2	3.5	2.4	5.5
Western Europe	4.4	2.5	1.6	4.2
Source: EITO				

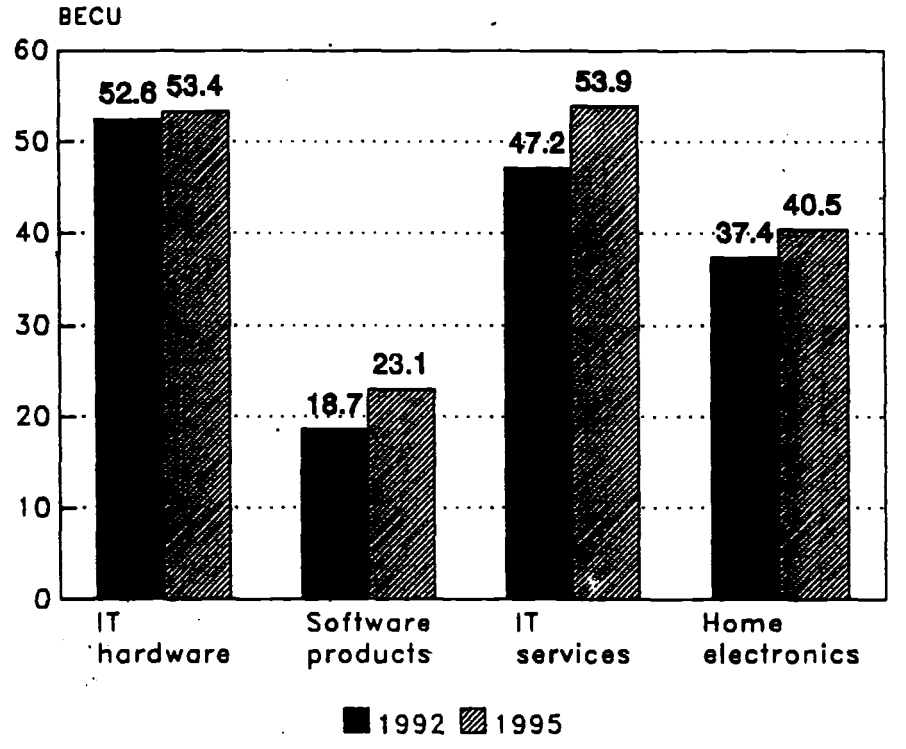
The home market is becoming increasingly important for the PC industry. A growing proportion of demand is generated by professionals using computers at home, self-employed professionals and small, home-based companies. Such demand is already thought to be outstripping traditional office demand in the US. In 1993, 5.3 million PCs were shipped for home use by professionals in the US, compared with 4.3 million for professional use at the place of work (source: Inteco). These figures are expected to rise to 9.5 million and 6.3 million respectively by 1997. The technology base in homes is dealt with more thoroughly in section 7.7, Electronic Information Services in the Home.

In the home market, expenditure on consumer entertainment media as a whole is expected to grow by some 7.9 per cent a year, but home electronics spending is likely to remain fairly stable, with stronger growth expected in the second part of the 1990s. Table 2.11 shows the relative sizes of the European software, hardware, IT and home electronics markets in 1992, with projections for 1995.

Table 2.10 Percentage European IT Market Growth by Product Grouping, 1990-1994

	1991/ 1990	1992/ 1991	1993/ 1992	1994/ 1993
Large scale systems	-10.0	-5.8	-19.1	-15.0
Medium scale systems	-3.7	-9.0	-11.3	-9.0
Small scale systems	1.2	-2.5	0.7	7.1
Workstations	20.1	11.0	10.8	13.3
Personal computers	-2.0	-4.5	-0.8	4.0
PC Printers	9.0	-2.9	-2.8	0.0
LAN hardware	17.3	29.1	15.3	5.1
Datacom equipment	9.0	9.0	8.0	-0.6
Office equipment	2.1	2.3	-1.6	-1.3
- Total IT hardware	-0.2	-1.9	-3.1	0.0
- Software products	12.6	9.3	8.2	8.5
Professional services	11.0	7.6	7.0	8.2
Network/process servs.	6.7	5.5	5.6	5.2
- Services	9.6	7.0	6.6	7.8
- Support servs.	4.2	2.1	0.4	1.4
Total IT market	4.4	2.5	1.6	4.2
Source: EITO				

Table 2.11 European Hardware, Software and Home Electronics Markets, 1992-1995



Source: EITO-BIS

2.3 Industry Repositioning

The globalisation of the information market and the trends in technology and industry convergence have already led to a certain amount of repositioning. Some of the trends noted in the convergence discussion are reflected in merger and acquisitions in information industries. Repositioning of this kind is expected to gather pace over the next few years, as companies seek to penetrate new geographical markets and to fulfil technology and content demand with an integrated product range. Where a range of content and delivery options are contained within a single company, cross-media ownership regulation tends to come into play. Companies from the same sector which merge in order to exploit local and global markets also run the risk of contravening media ownership regulations. The need to globalise and diversify may make differences in these laws (which seek to safeguard pluralism) become far more apparent than in the previous typically national market situations. It is because of this that regulators and the content and delivery industries are currently considering whether there is a need to harmonise these laws such that more effective market strategies could be undertaken whilst ensuring that pluralism is protected.

2.3.1 Mergers and Acquisitions

The mergers and acquisitions which have taken place in the information sector in the last year or so can be placed in two categories: those which are intended to extend penetration in existing or new geographical markets, and those whose rationale is diversification into new, but related markets. Many of the headline deals have taken place in the US, although European activity is gathering pace.

In their report *Mergers and Acquisitions in European Information Technology Companies*, Broadview Associates detailed 895 mergers and acquisitions in the European IT sector in 1993, worth some US$ 14.3bn (ECU 12.3bn) in total. Almost half of these were accounted for by the information services sector, where the average deal size was US$ 11m (ECU 9.5m). An IMO Working Paper of May 1994 dealt with nearly 45 deals in the database and information services sector during the period 1993 to early 1994. It is impossible in a report of this size to describe the full range of merger and acquisition activity. The objective of this section is therefore to identify a selection of deals in key areas and examine emergent trends.

The deals which have attracted most attention over the last year or so were the purchase of a 25 per cent stake in Time Warner Entertainment by US West, the Viacom/Blockbuster merger and their joint purchase of Paramount and, of course, the proposed TCI/Bell Atlantic merger, called off in February 1994. These few deals, and the wranglings which took place before they finally went through, were the subject of countless newspaper column inches - most of which explained them in terms of convergence. Thus, US West is expanding from telecommunications into entertainment content, whilst Viacom and Blockbuster are strengthening their positions as distributors by combining their cable delivery and media retailing activities. Both are extending their control over content by their purchase of Paramount films. Such analyses are, of course, simplistic, but such deals indicate that convergence is more than a media myth.

In Europe, a number of deals have taken place which have tended to be slightly smaller but which are no less interesting. From the vast number of mergers and acquisitions which have taken place over the last year or so, we have selected the sample presented in Table 2.12 below.

Table 2.12 A Selection of Mergers and Acquisitions Involving European Information Companies, 1993/1994

Year	Target Company	Nature of Business	Acquirer	Price / Comments
1994	Thomson Directories (UK)	Telephone directories	US West (US)	Buying into content/new market
	Software Toolworks (US)	Multimedia software/ videogames	Pearson (UK)	New market entry/expertise (US$ 460m)
1993	Thames TV (UK)	TV broadcasting	Pearson (UK)	TV expansion (US$ 150m)
	Official Airline Guide (US)	Airline data & reservations	Reed/ Elsevier (UK/NL)	Extending market share (US$ 417m)
	InfoPro (US)	On-line host	Questel (FR)	Buying market share (US$ 15m)
	Extel (UK)	Financial data services	Financial Times (UK)	Buying market share (US$ 110m)
	Quotron (US)	Real-time financial data services	Reuters (UK)	Buying into US market share
	Vamp Health (UK)	Computer services for UK doctors	Reuters (UK)	Expanding into medical sector (US$ 20m)
	Data-Star (Ch)	On-line host	Knight Ridder (US)	Buying market share (US$ 25m)
	Elsevier (NL)	Publisher	Reed (UK)	Merger

Source: *Mergers and Acquisitions in the Electronic Information Services Industry* (IMO Working Paper 94/2) / *Interactive Media International*

This is by no means a comprehensive list, but is intended to give an indication of the range of deals taking place. Microsoft's purchase of a stake in image content via Dorling Kindersley is now a widely quoted example of expansion into content by hardware and software companies. The deals listed also provide examples of delivery companies buying into content and content companies extending their product range and software capabilities.

Also worthy of specific mention is the purchase of a significant stake in the publishing and multimedia company Andromeda Interactive by the UK PTO, Mercury, and the proposed purchase of multimedia developer and publisher Broderbund by Electronic Arts. Broderbund's pull-out from the latter probably has much to do with its awareness of the increased potential value of the company as an established and respected software developer and publisher, especially in the light of the price paid by Pearson for Software Toolworks.

Outside the information services and publishing sector, a number of related information sector deals have taken place involving European companies. In 1993, British Telecom bought a 20 per cent stake in the US telecommunications company MCI, thereby expanding its international interests. In the same year, PolyGram bought Motown records, again expanding its interests into new geographical markets.

Further merger and acquisition activity can be expected in Europe during 1994 and into 1995, and a number of companies have made no secret of the fact that they are on the acquisition trail. Philips, for instance, told the press in May 1994 that it intended to expand its media interests through acquisition. Thorn EMI has said that it will build upon its experience of copyright management in the music industry by expanding its book and CD-ROM publishing activities. Pearson's chairman Lord Blakenham, speaking in connection with the Software Toolworks bid, told *The Times* newspaper that he saw many opportunities ahead for Pearson's book and newspaper publishing activities, but that 'as the multi-media markets become a reality, we must grow the television and software capabilities that will be needed in the longer term to make the most of what we have'. Other publishing and information content companies which are in a position to do so would be wise to follow a similar course.

In addition to formal merger and acquisition activity, Europe has seen many announcements of joint ventures in the information sector. Springer Verlag and AT&T have announced that they will collaborate in Europe to explore opportunities in the delivery of STM information. The Italian PTO, Stet and Bell Atlantic will work together in a joint venture to create Video on Demand and interactive information services in Italy and to upgrade Italy's copper wire network. Olivetti and Redgate Communications in the US will form a joint venture to exploit the European multimedia market. Meanwhile, French and German PTOs France Telecom and Deutsche Telekom are to enter a partnership with Sprint and are said to be seeking similar alliances in Japan.

Strategic alliances and joint ventures in the US information sector have been even more numerous, with Microsoft and TCI to work together on interactive TV experiments (Microsoft is also said to be working with Japan's NTT on multimedia networks), and Paramount Publishing entering a joint venture with the multimedia software company Davidson & Associates, to name but two. Some of these ventures will no doubt turn out to be transient, as companies settle down to practical working relationships - Microsoft was quick to play down its role in developing operating software for Sega's Saturn CD-ROM games machine after collaboration between the two companies was widely reported in the press.

Some of the deals which have taken place in the information sector have undoubtedly been opportunistic, and some reflect a consolidation process already well underway. Nevertheless, a significant proportion of deals reflect movement of information sector companies beyond their

traditional boundaries of activity and their desire to penetrate international markets, bringing together content, software development and delivery capability in order to exploit new market opportunities.

2.3.2 Cross-Media Ownership and Media Concentration

Industry repositioning and the resultant mergers, acquisitions and joint ventures mentioned above have helped to bring cross-media ownership, media concentration, monopolies and related regulation to the forefront of discussion, especially in audio-visual and delivery industries. In particular, regulation dealing with the participation of companies in a range of media activities has come under scrutiny in Europe.

Since the mid-1980's, the Member States have put in place (alongside their national competition law) specific rules on media ownership in order to prevent media concentration becoming a threat to pluralism. At the Community level, disparities between national rules on media ownership ceate a number of obstacles to the smooth operation of the internal market.

Following the presentation of the Green Paper "Pluralism and media concentration in the internal market" and after more than a year of consultation with interested parties, the Commission adopted a communication on the follow-up to the Green Paper. The communication analyses the results of the consultations and concludes that (i) a Community initiative on media ownership might prove necessary; (ii) a second phase of the work is therefore going to be embarked upon in order to examine certain questions in more detail, in particular those concerning the content of a possible initiative; (iii) after this second phase, the Commission will adopt during 1995 a definitive position on the need and the content of a possible initiative.

The Bangemann report on Europe and the Global Information Society highlighted media ownership as one of the areas of regulation requiring particular attention. According to the report, there is a risk that inconsistent national media ownership laws could impede companies from taking advantage of opportunities in Europe and could place them at a competitive disadvantage in world markets. The development of regulation at a European level will be essential in order to avoid undermining the single market and to ensure the competitiveness of Europe's media industry.

At present, for example, the UK PTO British Telecom is not permitted to deliver entertainment services, although it has argued that the building of an optical fibre network in the UK will only become economically viable if it is permitted to participate in the ensuing content delivery market. Meanwhile, some of the alliances struck by European PTOs with their US counterparts are likely to attract the attention of US regulators. The proposed alliance between France Telecom, Deutsche Telekom and Sprint has already provoked fierce argument in the US, where AT&T has said that the alliance should be blocked unless France and Germany open their markets to competition before 1998.

The complex regulatory environment has been blamed as one of the causes for the failure of the TCI/Bell Atlantic Merger. The proposed merger of Rogers Communications and Maclean Hunter, Canada's two largest cable television operators, has also suffered considerable delay as a result of investigation into media concentration. Regulation in media concentration and in cross-media ownership will need to adapt to allow companies to take full advantage of global markets and multimedia opportunities. The difficulty will be in finding a balance between the prevention of abuse in media ownership and the creation of an environment which fosters competition and diversification - and in reaching consensus on these issues at a European level.

2.4 The Role of the Advertising Industry

Advertising is a well-established form of revenue generation in the print and audio-visual media businesses, representing the biggest single source of income for many newspapers, consumer and business magazines, radio and television channels. The relationship between the advertising and electronic information industries, however, is only just being established, with some new media formats proving more suitable than others as advertisement carriers. Advertising on videotex and teletext, for instance, has a long history, but is rare in on-line services, at least in Europe, and is only just beginning to penetrate into CD-ROM. In the case of emergent services, the role of advertising is likely to vary from one format to another: interactive television, for instance, will offer significant opportunities, whereas there is little prospect for on-screen advertising on the Internet at present.

The availability of mechanisms to monitor the retrieval of advertising information by service users will have a significant impact on the willingness of advertisers to use new media formats, as will the ability to deliver images and sound as part of an on-line advertisement. The reaction of users to advertisements embedded within the general content of services, and their ability to distinguish between an electronic advertisement and editorial material will need to be thoroughly tested. In this respect these advertising and other forms of commercial communication services must be able to circulate freely across borders, given the international dimension of the networks. In this respect the Commission's Green Paper on commercial communications will examine, on the basis of a recently completed extensive European survey undertaken by DG XV, the extent to which differing national regulations could prevent such services from circulating across the networks.

Whatever direction new media advertising takes, it is certain that it will have a profound impact upon both the media and the advertising industries. The ability to include advertisements in electronic information products would encourage more publishers to develop electronic versions of their titles, and enable them to make them available more cheaply. On the other hand, the impact of such developments on advertising spend across other media is difficult to predict. The potential importance of advertising for the electronic information industry, and the wider significance for the advertising and media industries has been recognised by the European Commission. This is reflected in the preparation of the Green paper on Commercial Communications due to be published later this year and the more specific study initiated by the Information Market Observatory of DG XIII/E during 1994.

3 RELATIVE STRENGTHS AND WEAKNESSES

Electronic information services are to a large extent traded on a global market. Within Europe much of the demand for electronic information is met by companies based outside Europe. Most of these companies come from the United States. Increasingly, however, Japanese information suppliers are perceived to be potential exporters of information to Europe.

At the same time, European information suppliers are active in export markets and, in some cases, derive substantial proportions of their revenue from export sales outside the European Union. Clearly, in such circumstances the competitive position of the European information services sector relative to counterparts in the US and Japan is an important factor in determining the long-term viability of the industry. Not only must European suppliers compete successfully in home markets, they must also be able to compete globally.

During 1993, the Information Market Observatory conducted a study of the relative strengths and weaknesses of the information services sectors in Europe, the US and Japan. The results of the study indicate that European information suppliers face a range of constraints that are not experienced by their counterparts in the US. In particular, economies of scale in the home market tend to give a competitive edge to US companies. Within Europe, language, cultural, administrative and technical barriers tend to fragment the market into a series of national sub-markets, thus reducing the potential for scale economies and raising production and distribution costs, with the consequence that European firms are in a disadvantageous position compared to US competitors. Language barriers in Japan have tended to discourage Japanese suppliers from trading on global markets although there are signs that the government is encouraging Japanese database providers to enter export markets.

The development of the Common Information Area in Europe and comparable developments in the US and in Japan are likely to increase the amount of global competition.

3.1 The Relative Position

At first glance, the European Union has a larger home market than either Japan or the US. The population of the European Union in 1993 was 344 million compared to 252 million in the US and 124 million in Japan. Despite this, the electronic information services sector is more than two and a half times bigger in revenue terms in the US than it is in Europe.

Table 3.1 Relative Sizes of the European, US and Japanese Electronic Information Services Sectors

Electronic information service revenues (BECU)					
	1988	1989	1990	1991	1992
EU	2.5	2.8	3.1	3.3	3.6
USA	5.0	6.0	6.9	8.2	9.3
Japan	0.7	1.0	1.2	1.3	1.3
Source: Information Market Observatory					

The relatively large size of the US sector is mainly accounted for by the fact that some 30 per cent of revenues are derived from the export of information services, the European Union being the largest export market.

The US is not just big in revenue terms. The US has almost twice as many database producers as the European Union and almost twice as many gateway services. Rates of growth have been higher than in Europe although in recent years these appear to have slowed, probably as a result of the recession.

The European market is almost three times as big as the market in Japan but this corresponds to the relative population sizes. After rapid growth in the late 1980s the turnover of Japanese database suppliers actually decreased slightly at the beginning of the 1990s. Despite this, the Japanese electronic information services sector is strong, following a sustained period of support from the government. The Ministry of International Trade and Industry is actively encouraging Japanese information suppliers to be more active in global markets.

3.2 The European Union

It is difficult to identify a European market for electronic information services. For many of the information services, the demand generated within Europe forms part of a much broader global market. Other information services operate in a number of local, niche markets that are often delimited by national, language, cultural or regulatory boundaries. The market for such services remains strong and has considerable potential for development.

The existence of local, niche markets presents the European information suppliers with both problems and opportunities. The small size of the markets prevents firms from benefiting from economies of scale in production and distribution. The fragmentation also hampers the creation of a truly common market for European Union information services. On the other hand, market fragmentation offers opportunities to some European firms because it makes it difficult for suppliers from outside the Union to compete - there is, for example, significant demand across all sectors for local services in the national language.

Some non-European companies, particularly those based in the US, have formed strategic alliances with companies in Europe in order to take advantage of the niche market

opportunities and to overcome some of the problems that market fragmentation causes. There has also been a spate of acquisition activity, an important recent example being the acquisition during 1993 of Data-Star, one of Western Europe's leading distributors of on-line information services in the areas of business and biomedicine, by the US-owned Knight-Ridder Inc. Knight-Ridder is the owner of DIALOG Information Services against whom Data-Star had been struggling to compete and retain its market share. The acquisition doubled DIALOG's presence in the European market. (Details of other mergers and acquisitions can be found in Section 2.3.)

Concerns that such activity leads to increasing domination by US providers can be countered by arguments that this can actually improve the level of service offered to users and thereby enhance the overall efficiency (and competitiveness) of European enterprises. US partnership in R&D activities is also a real advantage to many European hosts, for whom there would otherwise be insufficient capital available.

Collaboration seems to work particularly well for small and medium sized enterprises as it opens up additional distribution opportunities and spreads the cost of marketing. There is little evidence to show that a loss of ownership by European Union players inevitably leads to a loss of presence in the marketplace. This is largely because many of the functions of an information company are location-specific. Thus, even where an information provider is owned by a global player, control of distribution, marketing and personnel needs to take place at the local level. For example, one of the biggest world suppliers of corporate information, (Dun & Bradstreet), is a US company that derives 30 per cent of its total revenue from Europe and employs 3,500 people within the European Union.

On the supply side, the European Union electronic information service sector is characterised by a small number of large firms and many smaller firms who in general are less vertically integrated and more nationally oriented than their US counterparts. European Union information providers are nevertheless strong in certain sectors, such as chemicals, pharmaceutical and financial services.

The competitiveness of European Union electronic information service providers depends on a number of key factors. These include: quality and reliability; reputation or brand image; product range; price; product differentiation; user friendliness; geographical or market spread; marketing and after-sales support, and exclusive distribution rights.

The strengths and weaknesses of European Union players in the global market place for professional information services are set out in Table 3.2.

Table 3.2 Perceived Strengths and Weaknesses of the European Union Electronic Information Services Sector

Strengths	• Presence of world-ranking information and media conglomerates • Long publishing tradition and rich information content base • Large and established markets for professional electronic information in key industrial sectors • Wide availability of ISDN services and rapid migration to Euro-ISDN standards • European Commission's Fourth Framework programme's emphasis on ICT • Language diversity: an advantage for penetrating new markets
Weaknesses	• Market fragmentation • Perceived overpricing of services • Cross-border transactions costs • Regulatory and infrastructural difficulties • Technical barriers, for example, the incompatibility of national standards • Restricted access to government-held information in some Member States • Relatively expensive telecommunications services

3.3 Electronic Information Services in the US

The US electronic information industry is the largest in the world. It has developed over a longer period. It has benefited greatly from the existence of a large domestic market that has enabled firms to take advantage of economies of scale and, in particular, to spread the high compilation costs of databases over a large number of users. The strength of this home market, however, may have encouraged some companies to neglect the export potential of markets overseas even though the use of English language as a world language enables them to compete on favourable terms.

US suppliers have also benefited from public support, both in the creation and development of databases within federal agencies and in the relative ease and freedom of access to government

information. The government actively supports the use of the private sector for the dissemination and exploitation of government information.

Many US companies have used their competitive position to advantage on world markets. The US electronic information services sector generates about 30 per cent of its revenue overseas and a large proportion of this comes from sales in the European Union.

The number of users of electronic information services in the US is increasing. In many organisations there is a shift towards direct use by end-users, partly stimulated by the take-off of publicly accessible information services, notably the Internet, which are increasing awareness and familiarity. The National Information Infrastructure proposals are likely to stimulate demand further.

Despite these trends, the highest volumes of use are generated by large organisations. Small and medium-sized enterprises continue to make relatively low levels of use of electronic information services.

Table 3.3 Perceived Strengths and Weaknesses of the US Electronic Information Services Sector

Strengths	• Economies of scale in large domestic market
	• English language provides access to export markets
	• Economies of scope through major host services
	• Mature information market
	• Increasingly sophisticated user community
	• Strong hardware and software industry
	• Good general access to government information
	• Market-driven investment in fibre-optic
Weaknesses	• Slower domestic growth due possibly to maturity
	• Relatively low use of information services by SMEs
	• Relatively weak co-operation between government and private sector
	• Need to focus more on real needs of export markets
	• Relatively weak in consumer electronics

3.4 Electronic Information Services in Japan

The Japanese electronic information services sector has grown rapidly throughout the 1980s and has strong further potential, both at home and overseas. The Japanese Government has actively supported and encouraged the development of the sector through a range of measures. It supports, for example, the Database Promotion Centre and provides tax incentives and low-interest loans to creators of databases. Through these and other measures a relatively strong Japanese electronic information sector has emerged. Japan's strengths and weaknesses are summarised in Table 3.4 below.

Table 3.4 Perceived Strengths and Weaknesses of the Japanese Electronic Information Services Sector

Strengths	• Large potential domestic market • Considerable overseas market potential, especially in South-East Asia • Strong in computers, consumer electronics and CD-ROM • Highly competitive telecommunications infrastructure • High investment in IT and IT-related R&D • Strong policy commitment to the development of the sector • Strong public sector vision of the information economy and society
Weaknesses	• Language barriers • Cultural barriers to information as a commodity • Immature information market • High production costs, poor profitability • Relatively weak in software • Relatively weak in database construction, quality and development • Weak in export markets

Language remains the greatest issue in the development of the sector and it is expected that the focus will remain on the domestic market. With a population of over 120 million there is

enough scope to realise economies of scale for database production and distribution. Furthermore, whilst language may have acted as a barrier for further development of the sector, it has also prevented foreign firms entering the domestic market and has thus provided Japanese companies with a breathing space in which to get established. In recent years, a great deal of research into machine translation has been funded and it is hoped that this will help reduce Japanese-English translation costs.

There are signs, however, that the emphasis is shifting to export markets. The Ministry of International Trade and Industry has recently commissioned a study of the scope for internationalisation of Japanese databases and it seems likely that government policy will encourage firms to explore overseas markets more actively. The strongest potential for international sales may lie in the first instance in the South-East Asian market.

3.5 Conclusions

Compared with the US, the European electronic information services sector is weak and fairly uncompetitive. It is stronger than the sector in Japan but there are signs that the Japanese information suppliers are growing in strength and that European suppliers may well face significant competition from their Japanese counterparts, particularly in the markets of South East Asia.

The relative position of the information services sectors in the US, the European Union and Japan can, to a great extent, be explained by the home market conditions within which the sectors have developed. US suppliers have been able to take advantage of a large and relatively mature home market. This has provided significant economies of scale. US information companies have also been well-placed by their use of the English language to compete on global markets. English is an international language and, increasingly, it is the common language of global business and commerce as well as science and technology.

Japan also benefits from a relatively large home market which provides for economies of scale. It is, however, a market that is isolated by the Japanese language which makes it difficult for non-Japanese language information services to compete within Japan. The language also places a barrier on Japanese information suppliers wanting to export. It is likely that the Japanese information services sector will continue to expand and to strengthen without necessarily posing a significant threat to European suppliers either within Europe or in global markets.

European suppliers are hampered by their lack of a large home market. Within Europe there are a number of local markets which are mostly defined by linguistic and cultural factors. Where markets for information services stretch across Europe they are, in fact, part of a larger global market. For example, there are few significant local markets for real-time financial services within Europe but there is not a distinctive pan-European market either. The market for such information is global.

European suppliers are therefore in a position where they can aim to meet the needs of niche markets and local markets that are linguistically and culturally defined. In both cases the size

of the market does not permit any significant economies of scale. Alternatively, they can compete on the much larger global markets that do offer economies of scale. In such markets, however, they are competing directly with US suppliers which have been able to benefit from the economies of scale provided by their large home market in the States. Furthermore, other than suppliers in Britain and Eire, European suppliers face the added costs of producing information services in English if they are to compete globally.

It seems likely that, with some exceptions, European information suppliers are destined to remain weak relative to those in the US. They will, however, be able to compete successfully in world markets against Japanese suppliers for some years.

The emerging markets in central and eastern Europe or in Latin America offer a range of market opportunities for European suppliers. These markets could be thought of as extensions to the linguistic or niche markets that already exist within Europe. They offer attractive possibilities to information service suppliers that are used to working in German, Spanish and Portuguese. They also present opportunities to exploit further databases and other information resources that are held in these languages. It seems likely, however, that these markets will take some time to develop to a position where they generate significant flows of revenue.

The markets within which information services companies compete are volatile. This offers opportunities to companies that can innovate and develop new products to take advantage of changed market requirements or new streams of demand. The rapidly expanding market for CD-ROM products is a case in point. If European suppliers can innovate successfully and bring new products and services to the market more rapidly than their US competitors they may be in a good position to capture a significant share of the market.

Recent discussions on Europe's relative weakness in the information market have focused on the comparative availability of infrastructure and the extent to which this is exploited in the EU. In a paper entitled *Construire un Marché Européen de l'Information*, René Mayer has argued that, in many ways, the European information sector as a whole is on a par with the US. Turnover and numbers of employees in the IT and telecommunications sectors are comparable, and although the US has tended to enjoy slightly higher revenues in these sectors than the EU, European growth has outstripped that of the US in recent years. In content sectors, however, the US is clearly way ahead of the EU in revenue and employment terms.

According to Mayer, the comparative weakness of the EU electronic information services industry is not a result of the lack of necessary technology. The installed base of computers is similar, as is the overall availability of telephone lines. Expenditure on satellite equipment in 1993 was about the same in Europe and the US, and in Europe US$ 784m (ECU 682m) was spent on fibre optic networks, compared with US$ 424m (ECU 369m) spent by the US.

Where Europe falls far behind the US is in the actual use of telecommunications services and in the installed base of modems. Mayer takes this as being symptomatic of the fact that the EU, whilst enjoying a sound infrastructure base, has been slow to exploit these resources to the full. Thus, Europeans may be equipped with computers and have access to the relevant network infrastructure, but are much less likely to use them to search and retrieve the information services available to them.

This is largely a problem of awareness and education. The Common Information Area initiatives and the growing attention paid by the media to electronic information services should both help to improve awareness, as will the teaching of computer-aided research in European schools.

4 THE FUTURE DEMAND FOR INFORMATION

An 'information society' is emerging where information is a valuable resource. Easy access to information, the quality of that information and speedy methods of exchange are essential elements of economic success. This was reflected in the announcements of major information infrastructure investment programmes made in 1993 by the European Union and the US Government. These acknowledge that mobility of, and access to, information have become key economic and social issues. In this climate the demand for information is likely to expand rapidly.

The evidence is that those organisations which make good use of information in decision-making, and which use new technologies to access, process and exchange information will be best placed to survive in increasingly competitive world markets. The extent to which information and information technology are being exploited varies widely between different sectors and particular regions within the EU.

But prediction is never easy, and forecasting demand for information is no exception. It is particularly difficult in the absence of reliable data to describe the present situation. Later on in this section, some of the research which has taken place in assessing future growth in demand for information services will be reviewed in a range of sectors. Firstly, however, it is useful to take a preliminary view of the extent to which companies are using other IT-based applications, as this may provide a useful indicator of growth.

It has been argued that growth in the use of electronic information services will be closely linked to the take-up of applications such as Electronic Data Interchange (EDI) and electronic mail. The gains in efficiency and competitive advantage offered by such applications are more immediately obvious and more easily quantifiable than those offered by use of electronic information services. Nevertheless, through the adoption of EDI and electronic mail, companies will acquire much of the technology required in order to access information services. Furthermore, they are increasingly likely to become aware of information services through their use of these applications. In using electronic mail, the availability of bulletin board information services may become apparent. Users of EDI networks are increasingly likely to come across electronic information services. Dunn & Bradstreet, for example, announced in 1994 that it would make its company information services available over EDI networks, and the insurance community is already served by news and information services delivered via trading networks.

As a pointer to the potential growth in demand for electronic information services, the uptake of EDI and E-mail may therefore be significant. Whilst adoption of these facilities has been slower than originally anticipated, there are signs that they are now spreading more rapidly, especially in Europe.

4.1 The Growing Use of Electronic Communication Facilities

Companies wishing to trade effectively are coming under increased pressure to adopt EDI and E-mail. Large organisations, particularly in the retail and automotive sectors, may insist that suppliers use EDI. Gradually this trend is spreading into other sectors. There are also moves to eliminate the one-sided nature of many EDI links between large organisations and their smaller suppliers, as this often leads to a situation where incoming EDI messages are printed out and re-keyed into the in-house system or processed manually by companies without fully integrated EDI facilities. This problem also presents a barrier to EDI communication between SMEs. Software houses are being lobbied to include EDI capability in standard business software, and this may also help to encourage wider implementation.

The European Electronic Messaging Association (EEMA), promotes the use of all forms of electronic messaging, including EDI and E-mail, and the European Commission funds a programme entitled Trade Electronic Data Interchange Systems, (TEDIS), which aims to promote EDI and resolve the barriers currently hindering more widespread implementation. There are many other sector-specific and regional initiatives. In Italy, for instance, EDIFORUM is supporting a network of regional centres to promote EDI among small and medium sized enterprises.

4.1.1 Electronic Data Interchange

EDI originated as a means of exchanging trading information electronically, an answer to the 'paper mountain', and a possible route to the paperless office. So far, the impact has been less dramatic with only 1 per cent of transactions in Europe taking place electronically.

Within Europe, the UK is one of the leaders in terms of numbers of EDI users. However, despite somewhere in the region of 10,000 organisations at the end of 1993, most organisations make use of only two or three message types, typically those for ordering and invoicing. This confirms that even within those organisations which have adopted EDI, there is scope for greater exploitation of the facility. However, despite the slow start, expectations are that by the end of 1994 70 per cent of UK firms employing at least 2,000 people will be using EDI.

There is no reason why non-trade-related information should not also be exchanged via EDI and indeed it is becoming increasingly common for administrative data to be circulated in this way. In the UK, for example, there are a growing number of educational establishments using EDI to exchange information. Another example is the EC sponsored, pan-European Frame project, which is intended to develop systems for monitoring and controlling the movement of hazardous goods. The construction industry, through EDICON, is exploring the use of EDI for the exchange of CAD drawings and project documentation.

Electronic transfer of data has several attractive features: reduction in manual processing and avoidance of repeated data entry; reduction of errors and repetition of errors; time flexibility; permanent availability not constrained by time-zone barriers; and speedy processing for the exchange of up-to-date information. It is also useful in the implementation of just-in-time

ordering, warehousing and delivery procedures. These advantages can represent significant time and cost savings making organisations more productive and efficient.

There are, however, issues of security and legality, which have to be addressed and resolved before EDI becomes a commonplace method of data exchange. Given that one of the major benefits of EDI is the ease of exchange irrespective of distance and national borders, any solutions to security and legal issues must also be applicable across national boundaries. These issues are being investigated as part of the EC TEDIS programme.

The European Article Numbering Association International reports that among its membership (whose area of operation extends throughout Europe to South and Central America, Asia Pacific, and South Africa) the number of EDI end users of national EDI standards reached 18,089 in 1993, an increase of 26.7 per cent on 1992. In 1994 this figure is expected to increase to 25,583 (although there may of course be other users not associated with the European Article Numbering Association). In addition, in 1993 there were 2,889 users of the EANCOM Electronic Data Interchange standard, a rise of 199 per cent with a 100 per cent increase projected for 1994. The EANCOM standard operates within the framework of the UN/EDIFACT standards and is intended to provide a multi-industry EDI communication standard.

The potential importance of EDI as a contributor to competitive advantage in world markets has led the European Commission to try to ensure that all regions and all sectors are able to take advantage of EDI. In particular, it recognises the need to focus particularly on SMEs and the less favoured regions. Whilst the UK is one of the leading users of EDI, other countries, for example Spain, are only just beginning to participate in electronic trading networks.

EDI has been given a boost in the US, with the Clinton Administration announcement that there will be 'government-wide implementation of electronic commerce for appropriate federal purchases by 1997'. Electronic tendering was also one of the ten areas where action was recommended by the Bangemann report to the Corfu Summit.

4.1.2 Electronic Mail

In 1993 there were estimated to be about 30 million electronic mail users worldwide. Annual growth rates in the order of 20-30 per cent are expected, so that by 1995 at least 50 million users are anticipated (source: Electronic Mail Association).

Use of electronic mail by organisations is certainly increasing, particularly as an internal communication mechanism. Governments are also stepping forward to take advantage of the technology and to give a lead to encourage other organisations to do likewise. The General Secretariat of the Council of Ministers of the European Union is to be supplied with electronic mail software that will give access to 1,700 users across five sites in Brussels. The existing Commission electronic mail facility system is being replaced by an X.400 system which will eventually give access to over 60 sites. The Commission currently generates some 180,000 E-mail messages a month (figures for June 1994), of which around 35,000 are external communications. About 13 000 of the public officials of the European Commission are already

equipped with E-mail facilities and about half of the officials use it on a regular basis also with the 20-30% growth rate mentioned above. With the replacement of its in-house developed E-mail system by a fully X.400 (88) conformant system, the Commission plans to have a homogeneous advanced system available at almost every workplace by the end of 1995. The choice of X.400 (88) in all European Institutions permits a high quality E-mail communication. Moreover, every E-mail work-place at the Commission can also exchange messages with INTERNET and has electronic access to telex and fax services. In the US it is possible to send E-mail direct to the President and Vice-President via several commercial services as well as the Internet. The UK Government has said that it will implement similar measures for communication with government ministers.

The major European public electronic messaging services are now interconnected using the internationally recognised communications standard protocol, X.400. The European Electronic Messaging Association (EEMA), is promoting electronic mail communication, issuing a regularly updated matrix indicating which European ADministration Management Domains, (ADMDs), are connected to each other and to other ADMDs worldwide. As yet there is no equivalent for the X.500 standard protocol for electronic directory services. The X.500 standard is intended to make it easier to perform directory searches via an E-mail connection to networks such as the Internet.

During 1993 EEMA developed closer links with the Internet community and sponsored projects looking at the interworking between X.400 E-mail users and the Internet, recognising that overall growth in E-mail traffic is best promoted by co-operation across different delivery systems.

E-mail is a popular facility in large, multi-site organisations where it is a cost-effective communications link between employees. Whilst smaller organisations have a less pressing need for internal communications mechanisms, the benefits which they can derive from E-mail for external communications are arguably greater for SMEs than for larger organisations. The full potential of E-mail is, as yet, nowhere near realised and there is scope for a much wider application of E-mail as a communication tool between organisations.

4.2 Information Use within Selected European Industrial Sectors

The European Commission has attempted to confront the problem of lack of accurate data on information demand through a series of research studies. The European Commission's Information Market Observatory has commissioned research to identify how organisations are using information, how this impacts on their competitiveness and how the situation will develop in the future. These studies are particularly interesting because they review the use of applications such as EDI and electronic mail as well as electronic information services.

In 1993 studies of the transport, insurance and biotechnology sectors within Europe were undertaken. In addition, telephone surveys were carried out with 2,000 executives across Europe, 750 from each of the transport and insurance sectors and 500 from the biotechnology sector. The main aim of these surveys was to establish the significance of information in relation to competitiveness. Executives were questioned about a variety of information and

technology related issues and were specifically asked to comment on their organisation's current use of electronic media and expected use in the future.

In the three sectors surveyed in 1993 there was a clear indication that information is thought to play an important role in competitiveness. This is represented in Table 4.1 below.

Table 4.1 Views on the Influence of Information on Competitiveness

Influence of information on competitiveness	Sector		
	Transport	Insurance	Biotechnology
Strong	38%	47%	40%
Medium	43%	40%	35%
Low/unknown	19%	13%	25%
Total	100%	100%	100%
Sample size	750	750	500

Source: *Impact of Information Usage on Companies' Performance,* BIS Strategic Decisions

Where organisations are coming to recognise the relationship between information and competitive advantage, the trend towards an increasing demand for reliable, timely and easily accessible information is likely to continue. This will certainly hold true if the European Commission's efforts to communicate the commercial advantages of information to small and medium sized enterprises succeed. At present the evidence is that smaller companies (less than 50 employees) believe that information has a low influence on competitiveness. This emphasises the need for a continuing programme of education and support for SMEs.

4.2.1 Transport

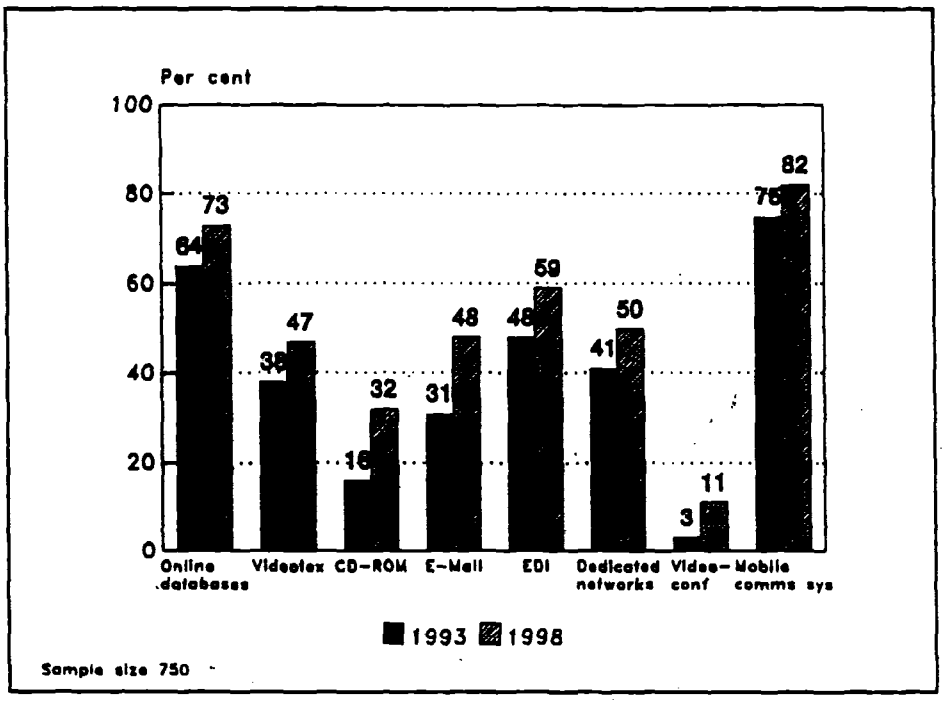
The transport sector in Europe suffers from overcapacity and competition is intensifying with the additional pressure from eastern Europe. The evidence from the case studies is that the application of information technology can significantly improve the reliability and speed of delivery of transport mechanisms. Applications such as EDI are becoming more widely used. Within the larger organisations there is already a realisation that the choice may be 'EDI or die'. In small and medium sized enterprises the message has yet to be received. In a sector dominated by price and not by service quality and where SMEs are reluctant to invest in information technology which is perceived to be of primary benefit to the customer, there is clearly an urgent need for continuing education and awareness programmes.

A further barrier to the flow of information in the transport sector is the lack of standardised messages and communication links. The European Commission is addressing this with activities such as supporting the standardisation project, International Forwarding and

Transporting Message Framework, IFTMR. This is necessarily a long and complex process, but is seen as an essential contribution to dismantling barriers to electronic trading and communication.

The extent to which electronic media have penetrated the transport sector in 1993 is shown in Table 4.2 below along with the projections for use in 1998.

Table 4.2 Transport Organisations Reporting Use of Electronic Media in 1993 and Expected Use in 1998



Source: *Impact of Information Usage on Companies' Performance*, BIS Strategic Decisions.

The anticipated increases in the use of CD-ROM (100 per cent), E-mail (55 per cent), videotex (24 per cent), EDI (23 per cent), and dedicated networks (22 per cent) and the continued popularity of on-line databases, expected to be in use in 14 per cent more organisations by 1998, confirms that the message of the electronic information age is reaching a wider audience, and that these technologies are not in competition but are a complementary set of facilities in the new electronic business framework.

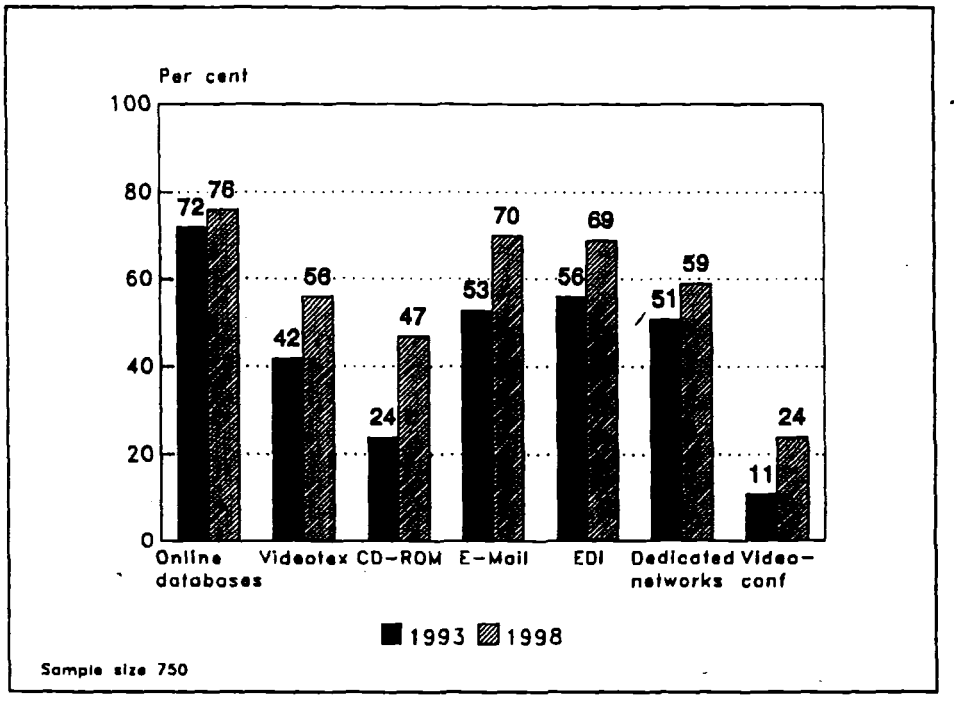
4.2.2 Insurance

The Insurance sector is also highly competitive, with high growth rates not only in the less developed markets such as Spain, Italy and Portugal but also in more mature markets, for

example, in Germany and the UK. As deregulation in Europe proceeds the pressure will increase for competitive products and premiums across Europe via international brokers. These developments will increase the need for speedy access to flexible electronic information services and communication links.

Survey participants from the insurance industry were asked which electronic media were in use in their organisations in 1993 and which they expect to be using in 1998. Their responses are shown in Table 4.3 below.

Table 4.3 Insurance Organisations Reporting Use of Electronic Media in 1993 and Expected Use in 1998



Source: *Impact of Information Usage on Companies' Performance,* BIS Strategic Decisions.

Insurance is a sector where many organisations, particularly the larger companies, have already seized upon the advantages which new technology, and particularly electronic information exchange, can convey. Therefore it is not surprising to find that 72 per cent of organisations are already using on-line databases and that by 1998 approximately 70 per cent also expect to be using EDI and E-mail. This despite the uncertainties about the legal status of electronic documents.

The prime reason for adopting electronic media is the potential for time saving. In this sector, as for the others surveyed, cost savings are of less significance than access to a wider range of better quality information.

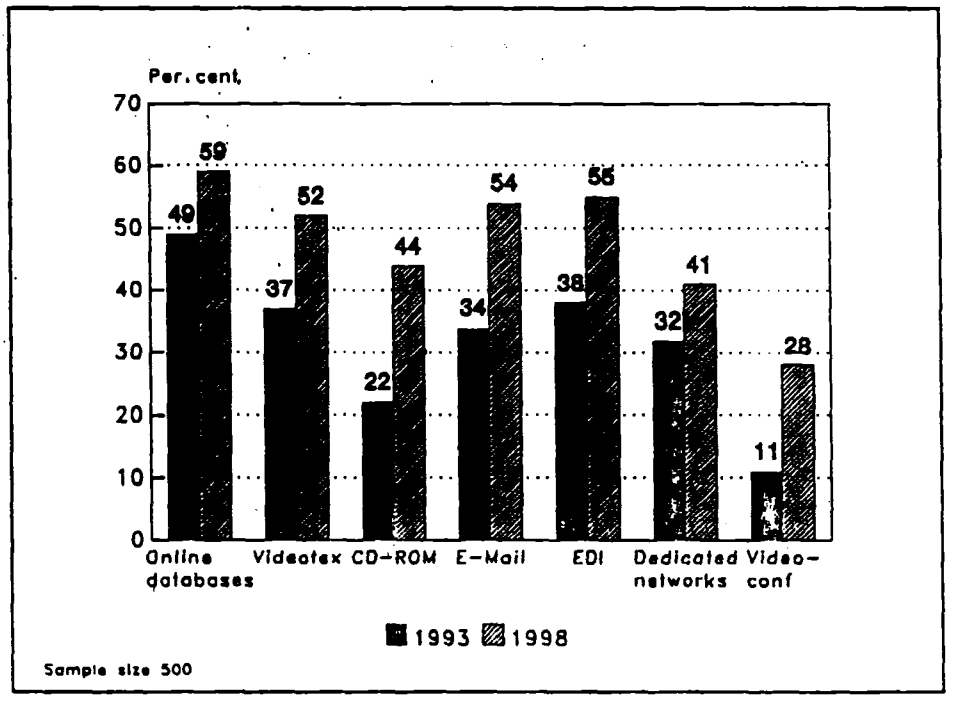
4.2.3 Biotechnology

The case studies and telephone surveys suggest that, although this is a sector which is aware of the importance of access to information and the advantages which electronic storage media and networks can offer, there is still scope for significant growth in the use of new technology and the new sources of information.

At present, printed matter is the dominant form of exchange for both internal and external information. A third of organisations reported using E-mail though this was typically an internal mechanism, extending to multiple sites. The comments in the case studies suggest that even where E-mail is in use it is not yet being used to its full potential. A similar pattern emerges for EDI and dedicated networks.

Table 4.4 illustrates how use of electronic media is expected to develop over the next five years, showing how many organisations were using each medium in 1993 and how many expect to be using them in 1998. It also seems likely that, in addition to the increase in the number of users, there will be more widespread use of existing E-mail facilities for external communications.

Table 4.4 Biotechnology Organisations Reporting Use of Electronic Media in 1993 and Expected Use in 1998



Source: *Impact of Information Usage on Companies' Performance*, BIS Strategic Decisions.

By 1998 over 50 per cent of organisations in the biotechnology sector expect to be using on-line databases, EDI, E-mail, and videotex. Also 44 per cent of organisations will be using CD-ROM and 41 per cent dedicated networks. There is less variation in the types of electronic media in use in biotechnology than in the other sectors where on-line, EDI and E-mail tend to dominate.

4.3 Employment, Education and Training Implications

The impact which the growing demand for information will have on employment, education and training is under consideration by European governments. For the success of the proposed European Common Information Area, and for Europe to realise the full potential of the coming information-age, it will be necessary to ensure that the population is well educated and trained in the skills demanded by the new technologies. There is a need for a commitment to 'life long learning'. Given that the required skills are subject to continual and rapid change, there must be access to training and development throughout life. It is highly desirable that all segments of the population have equal access to information and the ability to use it. Two documents published by the European Commission in 1993 discuss these issues. The White Paper, *Growth, competitiveness, employment: the challenges and ways forward into the 21st century* and the Green Paper, *European social policy: options for the Union.*

The acquisition of a variety of information-related skills is likely to become essential for full participation in society for the individual. At work the growth in demand for information will be matched by a growth in demand for individuals who can access and interpret the information. In addition to increased opportunities for information specialists there will also be a need for other individuals to adjust to the new ways of working which the information-rich future will demand. It will be necessary to improve everyone's information-processing skills, such will be the extent of the permeation of information technology applications into all aspects of life.

5 RESEARCH AND TECHNOLOGICAL DEVELOPMENT (RTD)

For the European electronic information services sector to achieve its full potential there remain a number of barriers to be dismantled. The diversity of languages within Europe means that for companies to reach the pan-European market, products and services must be accessible in a variety of languages. Ease of access to the technology and retrieval of information is also critical. Individual organisations are investing in research programmes to address these issues. The European Commission is also providing support in this area. There is widespread acknowledgement that research and technological development (RTD) activity is critical to European economic performance, particularly in the less favoured regions, and that therefore RTD will be one of the critical factors in any economic recovery.

The European Commission's proposals for RTD, under its Fourth Framework Programme, were completed on 16 June 1993 and have subsequently been accepted by the European Council, on 26 April 1994, and by the Parliament two weeks later. The programme follows the successful implementation of the three earlier programmes. Whilst the Fourth Framework Programme builds on the achievements of the Third Framework, there is a new emphasis. Earlier programmes focused on technology with little scope for practical application. The co-ordination of research and dissemination of the results and the need for practical applications are now priorities. The transfer of results from the research laboratories to companies across different sectors is seen as a key element in the stimulation of innovation.

The importance of private and national RTD activity is acknowledged and the programme aims to support and enable the fullest exploitation of these initiatives by facilitating co-operation between Member States and European firms. The intention is also to create the conditions for collaborative research efforts on a scale to compete with the US and Japan.

In the current economic climate a high priority is attached to RTD activities which will sustain current employment and create new employment opportunities. The research will therefore be a contribution to strengthening the competitiveness of the European economy. There is high growth potential in new markets which could arise from successful telematics applications. There are opportunities in fields as diverse as distance learning and road traffic management and in creating opportunities which facilitate the independence of the elderly or disabled.

The European electronic information industry is expected to generate new commercial opportunities for other sectors. By providing access to, adding value to, or making use of, the products and services of the electronic information industry, sectors such as education, health, leisure and manufacturing should achieve additional growth. For this to be possible, products and services have to meet the needs of the potential users and be easily accessible.

The Fourth Framework Programme has been allocated ECU 12.3bn. Its objectives are to implement research and technological development (RTD) programmes and demonstration programmes by promoting co-operation with and between enterprises, research centres and

universities, to promote co-operation in the field of Community RTD and demonstration with third countries and international organisation; to disseminate and optimise the results of Community RTD and demonstration activities, and to stimulate the training and mobility of researchers in the Community.

The scientific and technological objectives are built around four activities:

- The first activity (ECU 9,432 million) covers research, technological development and demonstration programmes. For information and communications technologies ECU 3,405 million has been allocated, for industrial technologies ECU 1,995 million, for environment ECU 1,080 million, for life sciences and technologies ECU 1,572 million, for non-nuclear energy, ECU 1,002 million, for research for a transport policy ECU 240 million and for targeted socio-economic research ECU 138 million.

- The second activity (ECU 540 million) covers the promotion of co-operation in the field of Community research, technological development and demonstration with third countries and international organisations.

- The third actvity (ECU 330 million) covers dissemination and optimisation of the results of activities in Community research, technological development and demonstration.

- The fourth activity (ECU 774 million) will stimulate the training and mobility of researchers in the Community.

Specific programmes relevant to the information industry and market are described briefly below.

5.1 Telematic applications of common interest

The specific programme of RTD and demonstration in the area of telematic applications of common interest 1994-1998 has a budget allocation of ECU 843 million. The objectives are to develop and technically validate telematics systems and services that are interoperable throughout the European Union. These should satisfy user requirements and, maximise the use of generic infrastructures and equipment to them as economically viable as possible.

The programme is composed of five areas of activity:

- telematics for services of public interest;
- telematics for knowledge;
- telematics for improving employment and the quality of life;
- horizontal RTD activities;
- horizontal actions.

5.2 Information Technologies

The specific research and technological development programme in the field of information technologies 1994-1998 has a budget allocation of ECU 1,932 million. The objectives are to contribute towards the construction of a European information infrastructure in order to ensure the future competitiveness of European industry as a whole and to improve the quality of life.

Programme activities are organised under three headings:

- software technologies;
- technologies for IT components and subsystems;
- multimedia technologies.

5.3 Advanced Communication Technologies

The specific programme of RTD and demonstration in the area of advanced communications technologies and services 1994-1998 has a budget allocation of ECU 630 million. The programme objectives are to develop advanced communication systems and services for economic development and social cohesion in Europe, taking account of the rapid evolution in technologies, the changing regulatory situation and opportunities for the development of advanced trans-European networks and services.

Advanced Communication Technologies are composed of six areas of activity:

- interactive digital multimedia services;
- photonic technologies;
- high-speed networking;
- mobility and personal communications networks;
- intelligence in networks and service engineering;
- quality, security and safety of communication services and systems.

A number of horizontal actions exist which include: consensus development and concertation of national and regional activities; international co-operation; dissemination and exploitation of results; and, professional training in advanced communications technologies and service management.

5.4 Socio-Economic Research

The specific programme of targeted socio-economic research 1994-1998 has received a budget allocation of ECU 138 million. Its objectives are to elucidate decision-making at decentralised, national or Community level and lay the foundation for the sustainable development of Europe's economies, enabling them to withstand international competition and create jobs. The activities will concentrate on:

- evaluation of science and technology policy options in Europe;
- research on education and training;
- research into social integration and social exclusion in Europe.

5.5 RTD in the fields of information and language engineering and libraries

The horizontal RTD activities, which include information engineering and language engineering, are those which impact across the boundaries of other research areas, and are of particular importance for the development of the electronic information services market and European competitiveness. Issues such as accessibility, ease of information retrieval and language barriers are addressed by the programmes outlined below. A brief description of the libraries programme ,which is also key to developing and meeting demand for electronic information, is also provided.

5.5.1 Information Engineering

Information Engineering (IE) is a new sphere of activity under the Telematics Applications area of the Commission's Fourth Framework R&D programme. The driving force is user involvement and the aim is to permit easier and more selective access to and better usability of information in all its forms.

The primary activity will be the development of pilot applications covering the three main areas of the information chain

- electronic publishing;
- information dissemination;
- information retrieval.

Following a call for proposals for exploratory actions in multimedia publishing (ref. OJ C78/S51 of 15th March 1994), 22 feasibility projects were selected to run over a six-month

period. Their objective is to define and test the feasibility of pilot applications in the following areas:

- asset trading;
- technical services and documentation;
- electronic newspapers and magazines;
- multimedia catalogues;
- scientific, technical and medical (STM) publishing.

The results of the feasibility projects will contribute to the first call for proposals in IE under the 4th Framework programme, to be published on 15th March 1995. Other exploratory actions have also been undertaken, including studies in the following areas:

- Europe-wide high capacity network - what is available?
- information transactions;
- project organisation, structure and management;
- telepublishing survey;
- usability study;
- status review of non-text based information retrieval;
- information Engineering 2001 - identifying the influential technologies and their effects;
- corporate publishing.

The studies will run in parallel with the feasibility projects, and the results will provide input into the call for pilot applications to run under the main phase of the Telematics Applications programme. IE pilot applications will be accompanied by supporting actions in the following areas:

- IE research centres network;
- IE academic connection;
- standards;
- usability test centres;
- international co-operation.

Work has already begun in two of these areas. A research panel has been established to develop links between the programme and the academic information science community, while the investigation of the feasibility of a pan-European network of IE research centres is the subject of a current study.

5.5.2 Language Engineering

With widespread use of information technology to access an increasing range of information services, both at work and in the home, the development of a strong European Information Services sector will in large part depend on how successful the industry is in overcoming language barriers in domestic and global markets.

An important objective of the Language Engineering programme is to support the incorporation of language engineering techniques into telematic systems to ensure that access is not limited by language. This will allow the applications developed to play a two-fold role, broadening the base of participation in a society increasingly dominated by information, and ensuring that the potential market for these applications is sufficient to make these, and future projects, viable undertakings, particularly for SMEs.

The language engineering research activities under the Third Framework generated significant scientific and technological results, and sought an opportunity for industrial impact. The need for practical applications is now a driving force behind RTD activities and projects will be undertaken in the following areas:

- management systems for the life cycle of electronic documents in multiple languages;
- transactional teleservices such as telebanking and electronic directories;
- electronic mail and teleconferencing facilities;
- telematic translation services;
- tools for language acquisition and use in an interactive and multimedia environment.

RTD activities will enhance the linguistic infrastructure. Dictionaries and typical expressions are among the most important of the linguistic databases to which direct access will be required by any information system implying the use of written or spoken language. Progress will be made towards a fine-grained network of these linguistic tools accessible throughout Europe.

5.5.3 Libraries Programme

Developments within libraries will influence, and be influenced by, developments in the electronic information services market. By providing a point of access, and offering value-

added services, libraries have a role to play in the stimulation of demand for particular products and services.

The long-term aim of the libraries programme is to assist in the creation of a modern libraries infrastructure in support of economic, social and cultural life in the European Union. Under the Fourth Framework Programme, the aim is to achieve further progress towards making the vast store of information within European libraries accessible to a much wider audience, and to facilitate user access through libraries to the world of networked information.

While ensuring continuity with current work, the new programme is more clearly focused on telematics priorities for libraries backed by stronger horizontal co-ordination. It consists of three action lines designed to enhance the role of libraries in providing services linking the more traditional collection-based resources with the evolving world of electronic information:

- network-oriented internal library systems, designed to prepare individual libraries for entering the networking world;

- telematics applications for interconnected library services, the key part of the programme, encouraging libraries to work in networked environments providing interconnections between libraries themselves as well as with their suppliers and end users;

- library services for access to networked information services, catering for links with the evolving electronic information world at large.

The general objective of the new work programme is thus to achieve systems integration based on an applications-oriented approach rather than one which is driven by technology.

Special emphasis has been given to the reduction of disparities at various levels (types of library, degree of access to technology, regional and cultural differences), the development of human resources and skills and the need to achieve concrete practical results (e.g. through demonstrators).

The new programme will therefore build on the achievements of the start-up programme (1990-1994) while allowing libraries to adapt their skills and expertise to better access-based services for a wide variety of users across Europe. Two calls are planned, the first for 15 March 1995.

6 KEY LEGAL AND REGULATORY ISSUES

Legislation and regulation are required in the information industry in order to protect the interests of the users of services and to preserve the rights of service producers and content owners. In theory, they should provide a framework within which information and communications industries can flourish. This section looks at a few of the most pressing legal issues faced by the industry today.

At present, national and European law is under examination in the light of the development of the information society. This is partly because technologies are changing so rapidly and legislation in the Member States varies widely. This has proved to be a significant cause of delay for debates on data protection, copyright, the legal protection of databases and, more recently, media concentration law. In spite of these difficulties, it is recognised that efforts must continue to reach consensus if a truly European market is to be established for information and communications services.

One of the key statements of the Bangemann report to the European Council on *Europe and the global information society* was that it was essential to develop `a common regulatory approach to bring forth a competitive, Europe-wide, market for information services.' The report also acknowledged that `disparate national regulatory reactions carry a very real threat of fragmentation to the internal market'. The areas which required priority attention were: protection of intellectual property rights; personal data protection and privacy; electronic protection (encryption), legal protection and security; media ownership and competition policy.

The Commission's Communication on *Europe's Way to the Information Society - An Action Plan* also focused on the areas noted in the Bangemann report, and set out a timetable for adoption of legislation. The emphasis placed on legal and regulatory issues by both of these reports is likely to mean that legislation and regulation will be pushed forward more rapidly than would otherwise have been the case.

Meanwhile, progress has already been made on harmonising copyright legislation in Europe. The following directives have been adopted with regard to:

- the legal protection of comuter programs,
- the rental and lending right and certain neighbouring rights,
- the term of protection of copyright and neighbouring right, and
- certain rules concerning copyright and neighbouring rights applilcable to satellite broadcasting and cable retransmission.

However, there are still many areas of law where harmonisation is a long way off, and this may contribute to barriers to trading outside national boundaries. Moreover, the degree of

variation between national information-related legislation outside Europe makes it difficult for publishers and others to protect and manage their information services in export markets.

During 1993 and 1994, the copyright debate took on another dimension with the investigation of the Financial Times by the UK Monopolies and Mergers Commission (MMC). The enquiry was into the FT Profile database and was sparked off by the FT's decision to discontinue licensing the database to other hosts. The rationale behind the MMC's enquiry was the question of whether the FT's management of its copyright materials constituted an abuse of monopoly power in the on-line historical news market. After a year-long investigation, during which the MMC heard evidence from the Financial Times, its competitors and trade associations active in the industry, the Financial Times was cleared of monopoly abuse - much to the relief of many other copyright holders, who feared that a contrary judgement would have marked a blow to the ability of major information companies to exploit market opportunities through justifiable copyright and licensing management.

In other areas, progress has been made over the last year in self-regulation by the European information industry. This includes the submission of *Guidelines for Cross-Border Control of Audiotex and Videotex* by the European Information Industry Association in July 1993 and which is expected to be finalised by Autumn 1994. Although these Guidelines will not be incorporated into national statutes and are still to be fully agreed, they are expected to facilitate the development of cross-border markets in audiotex and videotex, where there is considerable variation in national regulation. A code of practice for information brokers was also drawn up in 1993 by EUSIDIC, EIIA and EIRENE. Again, this does not have the force of law, but it is hoped that information brokers who subscribe to the code will be recognised by their clients as having sound business principles and a professional approach to their work.

The issue of synergy between the public and private sector in the information market and the exploitation of government-owned information by the private sector was the subject of further study during 1993. The EC-funded PUBLAW 2 project examined the impact of Guidelines for public/private synergy originally drawn up in 1989. The study found that awareness and application of the Guidelines varied considerably amongst Member States, and a further study (PUBLAW 3) is due to take place to suggest ways forward on this issue.

A great deal has already been published on the detail of legal developments in these and other information-related areas. The aim of following sections is therefore to place some of the key legal issues in a practical context, assess their impact on the information community and examine the possible solutions which have come to light.

6.1 Copyright and Intellectual Property Rights

Providing high levels of legal and technical protection of creative content will be one of the essential conditions to ensure the necessary climate for the investment needed for the development of the Information Society. Thus, there is a need for internationally recognised protection for the creators and providers of materials that will be disseminated over the Global Information Infrastructure as was agreed at the G-7 Conference on 25-26 February 1995 in Brussels. However, much of the copyright framework enshrined in national and EU legislation

was originally developed in the context of print media, and there is a growing requirement for additional legislation for the protection of other forms of content, such as electronic databases.

Practical copyright issues have manifested themselves in the form of several distinct problems. Those which have caused particular difficulties for the information industry are the prevention of illegal copying, management of copyright clearances and negotiation of authors' rights.

6.1.1 Illegal Copying

Electronic storage media are much better suited to quick and cheap copying than are print media - and here lies one of the problems which has faced the electronic information industry since its birth. More recently, this problem has been exacerbated by the growing ease with which multiple copies of electronic files can be distributed over networks such as the Internet. Unlike most forms of piracy, this kind of illegal copying can be carried out without the need for a physical distribution medium (such as a floppy disk), at minimal cost and, in many cases, leaving very little trace. The digital environment is well suited to extraction and manipulation of information, and the temptations are strong. The fear of uncontrollable copying is probably the single biggest factor in discouraging information providers from making their services available over networks such as the Internet.

As with most crime, prevention would be better than cure in the case of illegal copying. The best way of tackling the problem may be to make it so quick, easy and cost effective to obtain copies legally, that illegal copying on an individual or large scale basis becomes unnecessary. This may be an unrealistic dream at present, but research taking place into systems for taking on-line payments for information transactions, (such as the EC CITED project), is a step in the right direction. So too are moves on the part of information providers to make it easier for users to make legal copies. In Spring of 1994, for example, Dialog-DataStar announced that it would offer corporate users a service by which they could make legal copies within their organisation. For services such as electronic document delivery, it will be absolutely essential that a workable copyright framework is established, and this will require considerable discussion and negotiation between information providers and users.

A very recent dimension to the copying problem is the question of liability for files illegally copied over bulletin boards. In the US, for instance, CompuServe is fighting a claim by the US National Music Publishers Association that it is liable for the illegal copying of MIDI music files over its bulletin boards. CompuServe says that it takes exhaustive steps to prevent illegal copying, and that as the distributor it is not liable for copyright infringements by users. The outcome of this and other bulletin board disputes will be watched closely by those in the electronic information business.

Looking at other content industries, there is still a great deal to fear from piracy. The Business Software Alliance (BSA) has initiated a campaign in Europe to crack down on software theft. It recently found that, in 1993, the Spanish software industry lost £330m (ECU 256m) in 1993 as a result of piracy, and that illegal copying in Italy costs software houses some £166.5m (ECU 129m) a year. However, the Software Directive passed by the Council in 1991 had to be implemented by 1 January 1993 nto national legislation and there are signs of improvement.

In Italy, for example, the proportion of software in use which is pirated dropped from 86 per cent in 1992 to 50 per cent in 1993, according to BSA. In the UK, business software piracy fell from almost 50 per cent in 1992 to 27 per cent in 1993. Meanwhile, the Software Publishers Association has estimated that in 1993, some £4.4bn (ECU 3.4bn) worth of PC software was stolen world-wide.

6.1.2 Copyright Clearance

The widespread development of multimedia applications will require the clearance of rights for small elements of text, images, video and sound. The publisher of a multimedia encyclopaedia, for example, might be faced with thousands, if not millions, of clearances. The cost of this process, (including a huge administrative cost as well as actual rights payments), could easily account for more of the total production bill than design and software development.

Although a few fixed price databases of copyright cleared materials have been put together for developers to exploit (such as Andromeda's Resource Bank), the volume and range of materials they contain represent no more than a drop in the ocean. The cost and delay of copyright clearing for multimedia products is one of the biggest motivations behind the investment in content ownership by applications developers. In turn, these practical difficulties help to increase the perceived value of content rights and content companies.

One of the possible solutions to the problem may be the establishment of a single electronic information copyright clearing house, which would co-ordinate functions handled by organisations like the UK's Copyright Licensing Agency and Performing Rights Society. This would enable developers to approach a single organisation for its clearances and with which to carry out transactions. This concept is already the subject of considerable debate within the industry, but a great deal more work will be needed to develop a workable solution.

6.1.3 Author Rights

Authors' interests do not always coincide with these of publishers seeking to maximise their revenues through electronic versioning and outside licensing of electronic rights, and tending to view author rights clearances as something which must be accomplished with the minimum cost and time outlay. Originators may be aware of the opportunities which electronic publishing affords, but are rarely in a position to judge the value of intellectual properties in a market of which they may have very sketchy knowledge and where standard author/publisher royalty relationships are yet to emerge.

The very fact that publishers need to get permission from authors in order to create electronic versions of their works is becoming commonly known in the publishing community.

So far, attempts to bring together publishers and originators in discussion over electronic rights have been less than productive. In the longer term, it is possible that standard rights formulas will be developed alongside those used in print publishing. In the meantime, authors, their

agents and the associations representing them will need to inform themselves as to the nature of the opportunity.

6.2 Legal Protection of Databases

The proposed Directive for the legal protection of databases regulates the specific problems which arise as a result of the use of electronic data processing equipment for storage, processing and retrieval of information. It addresses both the creative and economic aspects of the protection of databases to stimulate investment and to keep pace with the demand for on-line information services. The proposed Directive sets out to harmonise copyright protection of compilations of data and other materials that fulfil common eligibility criteria for protection.

One of the fundamental problems associated with copyright in databases is the notion of originality, which forms the basis for much of the national copyright legislation and which varies considerably from country to country. Telephone directories and other reference databases have been the subject of discussion in this context, partly because they do not fit into traditional interpretations of originality and represent a comprehensive dataset, rather than one which requires originality in the method of selection. At present, it is possible for a database to be copyright protected under the legislation of one country and not in another.

In addition, the proposed Directive provides for a legal innovations by giving protection to the investment into a database. It is a *sui generis* right to prevent unauthorised extraction and/or reutlisation from the database that referes to infringing acts committed by users of competitors. Unoriginal databases are not copyrightable. *A posteriori* protection against parasitic behaviour by competitors, is provided by unfair competition law only in some Member States but not in others. *Sui generis* right is therefore intended to create a common legal environment in which investment can be stimulated and protected against misappropriation.

The initial proposal for a Directive resulted in various amendments during the first reading in the European Parliament. An amended proposal (issued by the Commission in October 1993) attempted to clarify some of the issues. In the meantime, additional progress has been made and it is to be hoped that the legislative process will lead to adoption of the Directive without undue delay. It should be recalled that the Commission's Action Plan on Europe's Way to the Information Society indicates that the Council is invited to adopt the Directive on the legal protection of databases as a matter of urgency.

The future Directive will be a cornerstone in the construction of the European Union's regulatory framework related to the intellectual property aspects of the Information Society.

6.3 Data Protection

Since the Convention on Data Protection produced by the Council of Europe in 1981, the storage and use of data concerning individuals has been a significant issue for the industry in general and for the information industry in particular. Following the Convention, developments in legislation have taken place at a national, European and international level which are too numerous and complex to discuss in depth here. However, it is worth considering the key issues at stake and examining the possible implications of the EC's Draft Directive on Data Protection.

Data protection legislation is intended to protect the fundamental rights and freedom of natural persons, and in particular their right to privacy. Depending on the stringency of the national jurisdiction, this might include any electronic file in which names of individuals are found and might even include manual records. Data protection therefore has major implications for the information industry: most obviously for companies involved in activities such as credit rating, list services and direct mail, but also for directory publishers, bibliographical database producers and, in some countries, the press. The problem faced by regulators and by industry at present is the degree to which national law varies, even within Europe. In this field, however, the European Union is ahead of all other regions in the world.

Most European countries share a lowest common denominator of data protection requirements. This includes principles such as the fair and lawful processing of personal data. Moreover, a certain number of rights are granted to the persons whose personal data are processed (data subjects). For example, data subjects have the right to know what information is held about them, to inspect that information and to sue for damage caused by inaccurate data. Naturally, there are exceptions where national security and crime prevention are concerned, but in general, users of personal data must abide by certain general principles and must have systems in place to prevent unauthorised access, deletion or amendment of records.

In addition, in some cases, personal data may be processed only if the data subject has given his/her consent. Some legislation also says that data subjects should know to whom information about them has been passed, and some extend all of their data protection legislation to print records.

For the information services industry, where data collections are increasingly global in their coverage and target markets are often international, the degree of variation can present serious problems. Different media may attract different treatment; in the UK, Ireland and Luxembourg, for example, microfilm is not covered by data protection legislation, although it is in most other European countries. There are differences in the definition of data and of personal data which can lead to debates such as whether real-time or other transitory electronic data is subject to data protection.The problems extend to information users too. For example, buyers of CD-ROMs in some countries are liable to data protection law (on the basis that they can download and manipulate the data if they so choose), although in others they are not (on the basis that the content of CD-ROMs cannot be amended).

The wide variation in national legislation (to the extent that Greece and Italy have not yet ratified the 1981 Convention and even have no law at all) prompted the Commission to press

forward with a European Directive. The Council adopted its common position on the draft directive on the protection of individuals with regard to the processing of personal data and the free movement of such data on 20 February 1995 and final adoption after the second reading the European Parliament is expected at the beginning of 1996. Furthermore, discussion on the proposal for a directive concerning the protection of personal data and privacy in the context of digital telecommunications networks (ISDN) should continue in the Council with a view to adopting a common position.

The general directive seeks to facilitate the free movement of personal data within the Community by affording individuals a high level of protection with regard to the processing of personal data. Harmonisation of the relevant national laws has proved necessary because of the wide divergence between them and of the increasing need to exchange data resulting from the completion of the internal market. The specific directive in the telecommunications field will adapt and complete the general principles in order to ensure protection in this specific environment and the free movement of telecommunications equipment and services in the Community.

The protection of personal data and privacy is essential for the development of the Information Society and the information market at a global level. Therefore, work on the two proposals should be finished as soon as possible. International co-operation should be intensified with a view to establishing an international legal framework on personal data protection and privacy.

6.4 Access to information held by government bodies

One of the largest gatherers of information is government and the public sector, in its various forms. In the United States access to such information by the private sector for commercial purposes is expressly permitted by statute (at least as far as the activities of the Federal government and its agencies are concerned). The information service industry has benefited as a result.

In many European countries, the right of business to use information collected by the public sector is much more restricted. As demonstrated in the PUBLAW study, the legal situation and government policies vary from Member State to Member State. Access to different types of information may be permitted by law, or there may be no general provisions. Commercial re-use of such information may be expressly forbidden. Some countries have restrictive legal conditions on free access, but aim to maximise financial returns.

The PUBLAW 2 study examined the impact of the Guidelines for public/private sector synergy originally drawn up in 1989. The study showed that awareness and application of the Guidelines varied considerably amongst Member States. The North American situation was also examined in detail. A well-attended meeting in 1993 discussed these issues and showed that the private sector was dissatisfied with existing rules, while the public sector was not convinced of the need for Community intervention in the form of a directive.

If the European information industry is to compete effectively in the global market place, considerable attention needs to be paid to practical ways of encouraging co-operation on fair

terms between the public and private sectors. The next step in this direction has been launched with the start of study PUBLAW 3.

7 DEVELOPMENTS IN THE EUROPEAN INFORMATION CONTENT SECTOR IN 1993

The following section is intended to provide an overview of developments across the full range of the information industry over the last year, although it is inevitably impossible to cover all of the technologies and markets represented by the ever-growing information industries. The breadth of coverage in this section, (ranging from traditional on-line databases to music publishing and Video on Demand), reflects the widening context of the electronic information sector as discussed in section 2.1 of this report.

The range of media and platforms available for information service delivery is growing rapidly. This makes it increasingly difficult for information providers to assess the potential of the various technologies for their target markets. The technologies themselves are changing so rapidly that publishers are often wary of developing electronic products because they fear that new technologies will supersede their chosen delivery media and that investment in electronic product development will therefore be wasted.

In fact, it is becoming clear that the publishers and information providers which have most to gain from new media markets are those which maintain their data resources in standardised digital formats, which can then be exploited through as many or as few delivery media as appropriate. Furthermore, the emergence of a specialist electronic publishing and development sector means that information owners can exploit their resources through licensing to third parties, even if they are not yet ready to carry out electronic product development themselves.

The extent to which new technologies will supersede their older counterparts is a question which faces the industry at regular intervals. In the late eighties and early nineties, some forecasters warned that CD-ROM would be the death of on-line. The reality has been that some on-line business has migrated to CD-ROM, but that the two media have very different merits which allow them to co-exist. Indeed, CD-ROM has helped to expand the overall market rather than merely splitting it. In recent months, it has been suggested by some commentators that the Internet will be the agent which finally kills off the on-line business. This is unlikely to be the case, although those on-line companies which are able to exploit network opportunities in addition to their other businesses will be in a strong position.

7.1 On-line Databases

The on-line sector is the oldest and most established of the information businesses and, not surprisingly, it no longer enjoys the exponential growth rates seen in newer areas like CD-ROM and multimedia. Nevertheless, on-line market growth in Europe was around 13 or 14 per cent in the period 1989 to 1991, which is encouraging bearing in mind the overall economic climate. Figures for 1992 suggest that growth since the previous year may have

been as high as 20 per cent. Real-time information services still make up the biggest share of the European on-line market, and the bulk of sales continue to be generated by large corporations with on-line budgets and information professionals at their disposal. Meanwhile, growth in the number and range of databases available continues apace.

7.1.1 The On-line Market

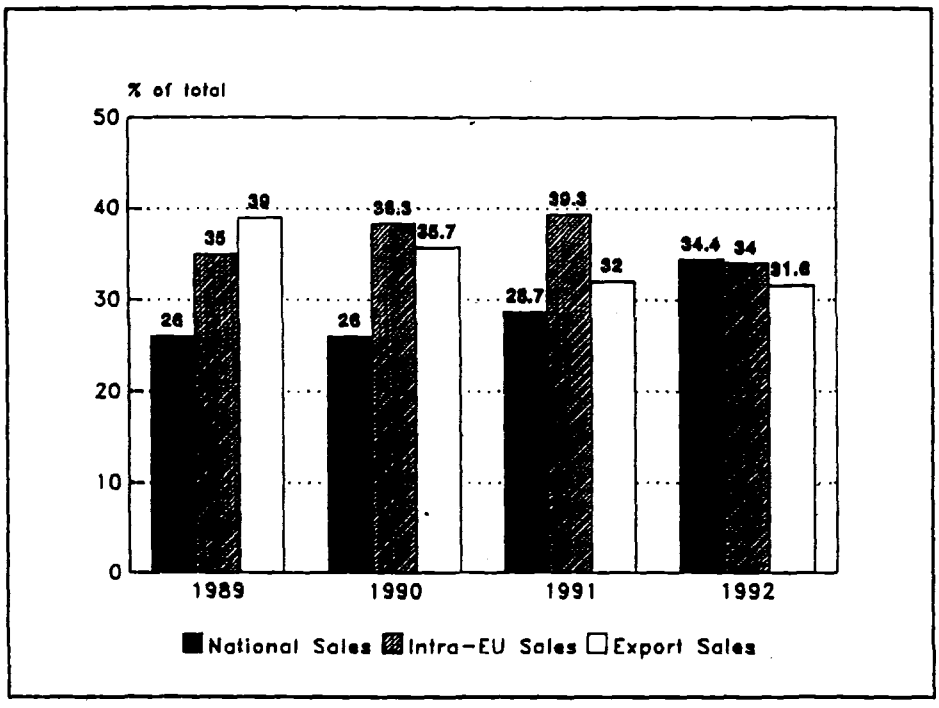
Reliable and up-to-date figures for the on-line sector are still difficult to find. The joint EIIA/EC Co-ordinated Host Survey provides useful European data for the supply side up to 1992, and a few market research reports have been published which cover the demand side, although these have varied in quality and accuracy. The Host Survey provide the most consistent overview of the European situation over a period of years. Table 7.1 shows on-line revenues between 1989 and 1992, and indicates that, in spite of general recession, the on-line industry sustained relatively high levels of growth between 1989 and 1991, and that during the period 1991 to 1992, revenues grew by nearly 17 per cent.

Table 7.1 Professional EU On-line Revenues (Including Videotex), 1989-1992

	EU On-line Revenues (MECU)	Percentage Growth
1989	2,203.1	-
1990	2,491.6	13.1
1991	3,121.7	25.3
1992	3,643.2	16.7
Source: EIIA/EC Fourth Co-ordinated Survey (Figures re-stated at 1992 exchange rates)		

The EIIA/EC survey also breaks down these figures by origin of revenues (see Table 7.2). Interestingly enough, these suggest that the proportion of total revenues earned in export markets outside the EU fell slowly but steadily between 1989 and 1992, from 39 per cent to 32 per cent. This may be partly accounted for by unfavourable exchange rates. The proportion of intra-EU sales also fell back slightly in 1992, whilst national sales grew substantially as a proportion of the total. The largest proportion of non-EU export sales continued to be generated in North America, where exports amounted to 288.2 MECU in 1992. Sales to the US represented 11.5 per cent of the total in 1992, compared with 14.9 per cent in 1989.

Table 7.2 Geographical Analysis of On-line Revenues (Excluding Videotex)



Source: EIIA/EC Fourth Co-ordinated Survey
(Percentages re-stated using 1992 exchange rates)

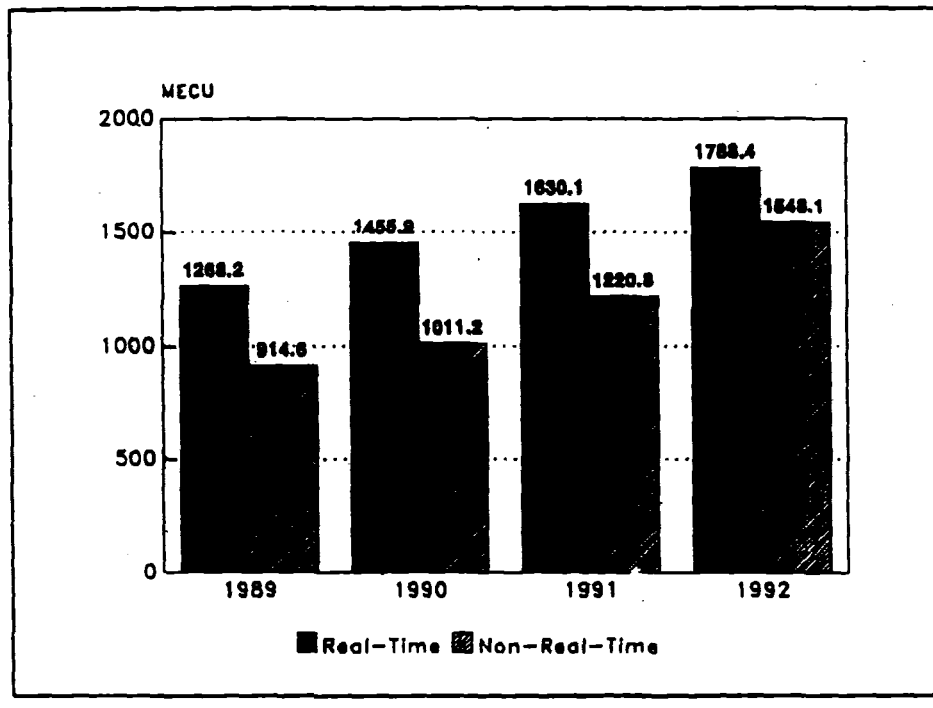
The Simba/Communications Trends 1993 *Online Services* report indicated that in 1992, Europe-based on-line companies generated revenues of US$ 3.24bn (ECU 2.79bn). According to Simba, Europe's overall share of the on-line market fell by three per cent during 1992, bringing it down to 32 per cent. Simba's figures for Europe appear quite low when compared with those produced by the EIIA/EC survey. This might be partly because they have not included independent subsidiary companies based in the EU but ultimately owned by US companies.

In the US, the electronic information services market grew by 16 per cent in 1993, according to the 1994 US Industrial Outlook, reaching US$ 13.6bn (ECU 11.7bn). Around 65 per cent of this total (ie around ECU 7.6bn) was thought to be attributable to on-line revenues. The market for all electronic information services is expected to grow by a further 15 per cent during 1994, with revenues up to US$ 15.6bn (ECU 13.4bn).

Real-time services continue to play a crucial role in the on-line industry, and still represented over half of total EU revenues (nearly 54 per cent) in 1992. Having said that, the proportion of real-time revenues has fallen steadily since 1990, when they accounted for 59 per cent. Falling growth rates in real-time services has partly been a result of general recession in financial and banking industries, but is also a sign of the comparative maturity of this sector.

Non-real-time services, on the other hand, enjoyed growth of nearly 27 per cent in the period between 1991 and 1992.

Table 7.3 Real-Time / Non-Real-Time Revenue Breakdowns



Source: EIIA/EC Fourth Co-ordinated Survey
(Figures re-stated at 1992 exchange rates)

Reuters and Telekurs continue to dominate the European real-time market. In 1993, Reuters acquired Quotron, Citicorp's real-time news, equities analysis and stock price division. Although Quotron is widely considered to be a declining business in the US, it does give Reuters a lever into the US market. Reuters' results for 1993 indicated a turnover of £1,874m, (ECU 2,436m) representing an increase of 19.5 per cent since the previous year. Profit before tax was up 14.9 per cent on the previous year to £440m (ECU 572m).

It is comparatively easy to split out real-time and non real-time revenues, but analysis of industry revenue by subject or sector is rather more difficult. The only subject analysis provided by the EIIA/EC survey relates to electronic information service revenues generally and not just on-line, and these are indicated in Table 7.4.

Table 7.4 Subject Analysis of EU Electronic Information Revenues, 1990-1992

	1990		1991		1992	
	MECU	% Total	MECU	% Total	MECU	% Total
Finance	1,815.6	70.6	1,841.7	60.2	1611.1	60.2
Business	649.5	25.2	883.0	28.8	993.4	28.8
Govt.	41.7	1.6	178.6	5.8	230.2	5.8
STM	50.3	2.0	96.7	3.2	104.4	3.2
Other	15.9	0.6	60.8	2.0	53.4	2.0
Source: EIIA/EC Fourth Co-ordinated Survey (Figures re-stated at 1992 exchange rates)						

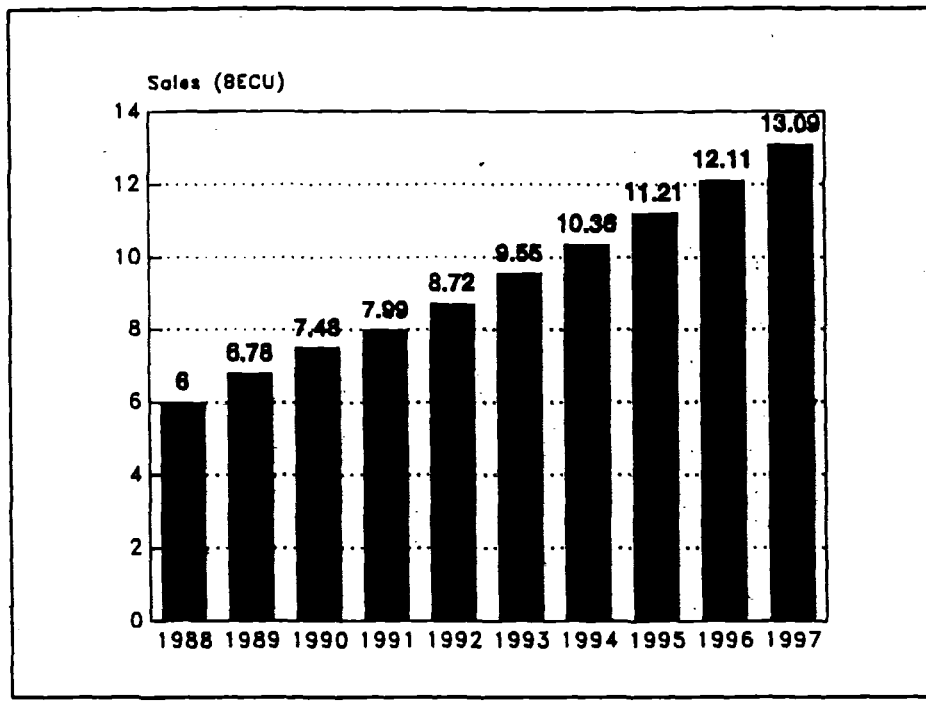
Simba provides a more detailed breakdown of on-line markets by subject, (Table 7.5) although unfortunately, these are not broken down by region.

Table 7.5 Subject Analysis of Worldwide On-line Revenues, 1988-1992

	1988 (MECU)	1989 (MECU)	1990 (MECU)	1991 (MECU)	1992 (MECU)	% of Total in 1992
Brokerage	2,698.2	3,055.8	3,385.3	3,580.9	3,847.7	44
Credit	1,405.2	1,468.9	1,493.8	1,521.8	1,633.6	19
Fin.News/Rch.	1,051.8	1,160.1	1,301.2	1,426.7	1,591.0	18
Legal/Reg.	399.0	509.7	577.5	611.5	649.7	7
Profssnl.	354.5	446.4	499.9	529.0	568.6	7
End User	90.3	123.8	205.3	295.5	398.5	5
Marketing	8.2	12.9	19.3	26.7	34.4	>1
Source: Simba/Communications Trends, 1993						

Forecasting the on-line market becomes more and more difficult as new technologies emerge. The potential impact of the Internet on traditional on-line sales is particularly difficult to assess, and depends largely upon the ability of on-line companies to innovate and diversify in terms of delivery options. Simba have estimated that growth in on-line sales worldwide will be around 8 to 8.5 per cent in the period 1994 to 1997, bringing worldwide revenues up to 13 BECU at the end of that period. (See Table 7.6.)

Table 7.6 Worldwide On-line Service Sales Forecast



Source: Simba/Communications Trends, 1993

7.1.2 Availability and Use of On-line Databases

Work carried out by Gale Research Inc. as part of their 1993 Directory of Databases indicates that the overall volume of on-line searches continues to grow rapidly, with an estimated 44.4 million searches having taken place in 1992, excluding searches on transactional services. The previous year, the figure had been estimated at 34.5 million. The same irectory listed a total of 7,907 databases in its 1993 edition (reflecting the position in 1992), up from 7,637 the previous year and 6,750 in 1990. It is unclear, however, what proportion of databases were available in portable formats (such as CD-ROM) as opposed to on-line. Furthermore, the Gale directory is very much geared towards the American market, although it claims to cover all regions. It nevertheless appears to be the most comprehensive of the on-line directories currently available and is therefore useful as a general indicator of trends.

The breakdown of services by subject area in 1992 is indicated in Table 7.7.

Table 7.7 Databases by Subject Area, 1992

Subject	Number of Databases	Percentage of Total
Business	2,624	33
Science/Technical/Engineering	1,492	19
Law	885	11
Health/Life Sciences	728	9
General	700	9
Social Sciences	447	6
News	385	5
Humanities	314	4
Multidisciplinary (Academic)	296	4
Source: Gale Directory of Databases, 1993		

According to Gale, the proportion of commercial database producers is still rising significantly, and reached 75 per cent in 1992, up from 70 per cent the previous year. Meanwhile, the proportion of databases produced by government institutions and by not-for-profit organisations appears to be falling slowly, making up 15 per cent and 9 per cent respectively in 1992. The remainder is made up of databases published jointly by the public and private sectors. Within Europe, however, the proportion of public sector databases is higher, reflecting the more active role which governments tend to play in information provision.

Details of the provision and use of on-line services in the home are contained in section 7.7 of this report.

7.2 Optical Information Media

Since the publication of the first CD-ROMs in the mid 1980's, industry commentators have been predicting an explosion in optical disc publishing. For many years it seemed as though the prediction was yet another instance of the widening gap between hype and reality which is typical of high-tech industries. 1993, however, will probably go down as the year that CD-ROM really took off, in the sense that many more organisations actually started to make money out of CD-ROM publishing and that optical discs began to enter the consciousness of the general public. 1993 was also the year that many computer hardware manufacturers started including CD-ROM drives as standard on their top range computers, and low-cost multimedia upgrade kits became a common sight in generalist computer mail order catalogues and retail outlets.

7.2.1 Platforms

The availability of these kits and the growing installed base of multimedia-capable PCs has meant that multimedia publishing on the standard CD-ROM XA (extended architecture) format gained much wider acceptance, although the number of proprietary multimedia platforms based on the CD-ROM standard has continued to increase. By the end of 1993, these included not

only Philips' CD-i, Commodore's CD-TV, Tandy's VIS and Kodak's Photo CD, but also 3DO, Sony's MMCD and Commodore's CD32 games console, not to mention the Sega CD-based console, Saturn. Agreement was also reached on a standard for video publishing on CD (Video CD) towards the end of 1993.

7.2.2 Installed Base of Readers

According to the sixth edition of the Optical Publishing Industry Assessment (OPIA) report, (published by Infotech), the installed base of CD-ROM drives grew by 155 per cent in 1993, bringing the total base to a figure of around 11.4 million worldwide. The report suggests that this was mainly a result of bundling of drives and 'vigorous sales of aftermarket readers [ie drives purchased for connection to PCs already in use] especially in American and European markets'. The European installed base by mid-1994 is estimated at between 1.5 to 2 million, whilst the US is way ahead with an estimated installed base of over 7 million. The price of CD-ROM drives have been slower to fall in Europe than in the US, which partly accounts for the difference. Things are changing, though: in France for example, 80,000 drives were sold in 1993 - a fourfold increase since 1992 when 20,000 were sold (source: EuroCD).

Suggestions of growth at the level quoted in the OPIA report came as something of a surprise to the information industry, although Infotech claims that its previous estimates had erred on the side of caution, and that it had not anticipated such a take-off in 1993. At the beginning of 1994, it was thought that over 10 per cent of desktop computers worldwide had CD-ROM drives, the expectation being that by 1999, almost every desktop PC will have access to either a standalone or networked CD-ROM reader. The report forecasts that the installed base of readers will more than double in 1994 to reach almost 24.9 million.

These figures indicate a major take-off in CD-ROM over the past year and, according to a report published by Freeman Associates in California in May 1994, the current installed base of drives may be even greater than that estimated by OPIA, (see Table 7.8 below), although the rate of growth in terms of installed base and shipments is likely to fall off after 1994, according to the Freeman report.

Table 7.8 Worldwide CD-ROM Drive Installed Base and Sales, 1993-1999

	Shipments (000s)	% Growth Since Previous Year	Installed Base at Year End (000s)
1993	8,322	141	12,997
1994	13,699	63	25,696
1995	18,600	37	42,141
1996	22,700	22	60,396
1997	25,600	13	78,245
1998	28,150	10	94,597
1999	29,600	5	108,050
Source: Freeman Associates Inc.			

OPIA, on the other hand, forecasts another rapid growth phase between 1997 and 1999, at the end of which the worldwide installed base of drives will be over 250 million. Of this total, OPIA forecasts that over 50 million will be made up of TV set-top drives.

7.2.3 Availability of Titles

The tremendous growth in the number of CD-ROM titles available continued throughout 1993, with TFPL's figures indicating 3,597 published titles worldwide at the beginning of 1993, rising to 4,731 by the middle of the year. TFPL's 1994 CD-ROM Directory (published in early January 1994 and therefore reflecting the position towards the end of 1993), showed another huge leap in numbers to 5,379. TFPL predicts that if the growth continues at the same rate, 3,000 new titles will be produced in 1994.

The OPIA report indicates an even higher number of titles than that suggested by TFPL. OPIA gives a figure of 8,100 CD-ROM titles in print worldwide in 1993, although this figure includes nearly 3,600 titles produced in-house by companies for internal use, for applications such as in-house training and reference. Such titles are not counted in the TFPL directory. The OPIA report indicates growth of 54 per cent in the number of titles in print during 1992, and suggests that numbers of titles will reach around 10,700 during 1994 and around 13,000 during 1995.

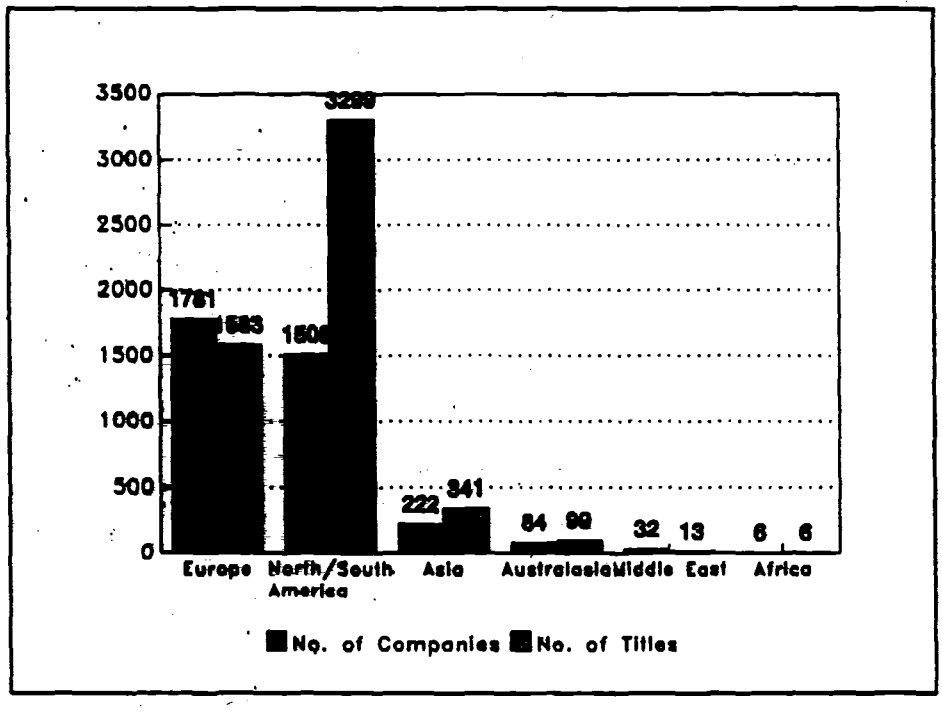
The growing number of consumer and general interest CD-ROM titles is partly responsible for substantial growth in the number of titles available, although the number of arts and humanities, business and language titles all grew by over 60 per cent between 1993 and 1994 according to TFPL. Table 7.9 shows the biggest subject areas for CD-ROM in terms of number of titles published.

Table 7.9 Top Ten Subject Areas for CD-ROM by Number of Titles, 1994

Subject	Number of Titles	% of Total	% Increase 93/94
General Interest, Leisure	1,043	19.0	73.8
Arts, Humanities	724	13.2	61.9
Education, Training, Careers	631	11.5	48.8
Computers, Computer Programmes	510	9.3	47.8
Advertising, Design, Marketing	429	7.8	53.2
Business and Company	426	7.7	60.7
Languages, Linguistics	417	7.6	61.6
Crime, Law, Legislation	399	7.3	34.3
Science, Technology	386	7.0	37.8
Maps, Geography	332	6.0	26.7
Source: TFPL Publishing			

Compared with the US, Europe has a larger number of companies engaged in CD-ROM related activities, but this is a symptom of the fragmented nature of the market. Indeed, the difficulties of selling to the whole of the European market is reflected in the fact that there are almost twice as many distributors in Europe as there are in the US (829 in Europe and 449 in the US according to TFPL's 1994 CD-ROM Directory). The relative positions in the publishing of CD-ROM titles has remained fairly constant since 1990, with the US accounting for a little over 60 percent of titles and Europe around 30 per cent. The geographical breakdown of CD-ROM companies and titles is provided in Table 7.10.

Table 7.10 Origin of CD-ROM and Multimedia CD Companies and Titles, 1994



Source: TFPL Publishing

7.2.4 Markets, Sales and Pricing

Worldwide revenues for CD-ROM titles in 1993 were estimated by OPIA to be US$ 9.6bn (ECU 8.25bn), although this figure includes in-house as well as publicly available discs. Combined revenues for titles and drives were estimated at US$ 12.2bn (ECU 10.5bn), and were expected to reach around US$ 22bn (ECU 18.9bn) by 1994 and around US$ 56bn (ECU 48.2bn) by 1995. Revenues for commercial titles are forecast to reach nearly US$ 120bn (ECU 103.2bn) by 1999, up from around US$ 40bn (ECU 34.4bn) in 1996. However, these figures should be treated with a certain amount of caution. This is a very dynamic and young market and, although prospects for growth are good, it is difficult at this stage to quantify the

impact of developments in other areas, especially those taking place in the network environment.

According to OPIA, the traditional CD-ROM sector, (namely professional, library corporate and government), continues to form the core of the market, largely because of the higher margins which can be achieved on products in this range. Average prices of professional and business CD-ROMs during 1993 were said to range between US$ 700 and US$ 900 (ECU 600-775), whilst consumer multimedia titles, which accounted for a large proportion of unit sales, ranged from US$ 50-US$ 125 (ECU 45-110).

During the period 1991 to 1992, Europe may have accounted for only 20 per cent of the world CD-ROM market, although this is expected to have grown significantly by the end of 1994. Growth in revenues from professional CD-ROM titles in Europe has been dramatic in recent years. The EIIA/EC Fourth Co-ordinated Survey indicated that revenues grew by 173 per cent between 1990 and 1991 to ECU 79.3m, and by a further 93 per cent between 1991 and 1992 to ECU 152.7m.

Retail sales of CD-ROM are growing in Europe, as major retail outlets begin stocking games, entertainment and consumer reference titles. In mid-1993, the market research firm Gallup reported zero sales for retail CD-ROM in the UK, the amounts being negligible in comparison to other media. When Gallup reported again six months later, CD-ROM accounted for 4 per cent of the total. Admittedly, reference CD-ROMs made up a small part of this, with the greatest proportion of sales represented by games formats (1.4 per cent for CD32 titles and 1.6 per cent for Sega titles). Nevertheless, CD-ROM is becoming firmly established in the retail market.

7.3 Multimedia

Despite the huge volume of material published about multimedia in 1993, in both the specialist and the newspaper press, there is still a great deal of confusion as to the meaning of the term. In its broadest sense, multimedia is an expression used to describe services where a number of media elements are combined and an interactive environment created. Such media elements might include searchable text, sound and still and moving images. Multimedia is frequently associated with CD-based products, although it is by no means confined to such media.

The availability of broadband communications and compression technologies makes it possible to offer interactive multimedia services over networks, although in practical terms in the EU, this type of multimedia is at present largely confined to ISDN-based services for business. Two UK-based companies, On-Demand Information and Perfect Information have begun offering business information services via ISDN in the past year, and others are likely to follow, especially in the product information sector. Fully interactive, networked multimedia is unlikely to be a feature in the home until there has been significant further development of cable and ATM switching and of compression techniques. Meanwhile, developments such as interactive TV are also being described under the multimedia umbrella, although the level of interactivity offered by such services is likely to be restricted in the first instance. (See section 7.8.3 for further discussion of interactive TV technologies and markets).

Information Workstation Group in the US predicts that multimedia in its widest sense will be worth US$ 30bn (ECU 25.8bn) by 1998 in North America alone. Their report entitled *Multimedia Opportunities* suggests that the three biggest application areas will be entertainment, with US$ 9.1bn (ECU 7.8bn) multimedia-attributable revenues, the publishing process (multimedia production and publishing activities), US$ 4.7bn (ECU 4bn) and special effects US$ 3.5bn (ECU 3bn). Education and training applications are expected to generate multimedia-attributable revenues of US$ 3.3bn (ECU 2.8bn) by 1998.

CD-based multimedia has captured the imagination of the public and of the press over the last year, although the European market for consumer multimedia is still small in comparison with the traditional CD-ROM market. The OPIA report suggests that consumer multimedia may account for as little as 20 per cent of overall CD-ROM revenues.

However, a consumer boom in multimedia and games CDs was experienced in 1993, mainly during the last quarter of the year. The American Software Publishers Association said that sales of products from 62 major CD-ROM software publishers in 1993 amounted to US$ 202m (ECU 173.7m) from eight million units sold. US$ 102m (ECU 87.72m) of this total came during the fourth quarter, when four million units were sold. Reference products such as encyclopaedias and dictionaries accounted for 40 per cent of sales, games and home entertainment 30 per cent and home education 24 per cent. Whether or not this can be replicated in Europe will depend partly on the willingness of bookshop chains, music and video stores, and consumer electronics retailers to stock CD-ROM products.

Much of the activity surrounding the development of multimedia CD technology has been undertaken by hardware companies and consumer electronics manufacturers. Thus, companies like Philips, Commodore and Tandy have developed multimedia players based on proprietary architectures which often require application developers to pay a license fee or royalties for the right to publish titles for the platform.

More recently, developments in compression standards on CD-ROM (especially the MPEG video standard), has made it possible to create multimedia applications on a standard CD-ROM with eXtended Architecture for audio-visual material (hence CD-ROM XA). CD-ROM XA is an industry standard and is not proprietary to any single manufacturer. Unlike platforms like CD-i or 3DO, it does not require users to buy dedicated hardware, although full multimedia on CD-ROM XA does require add-on equipment such as sound and video cards. The installed base of multimedia PCs appears to be growing enormously and developers of general reference and 'edutainment' titles may therefore decide to opt for CD-ROM XA rather than be tied to an individual manufacturer's platform. The growth in installed base of Windows PCs and the popularity of the Windows environment has led many CD-ROM XA publishers to choose this format. 'Distinct markets are likely to emerge for PC-based and television-based multimedia, and whilst CD-ROM XA and Windows may dominate in the former, the proprietary platforms will continue to play a strong role in the latter.

Philips' multimedia CD player, CD-i, was first launched in the US in October 1991 and European launches began with the UK in April 1992. At the end of 1993, Philips announced that sales of their CD-i player had reached 300,000 worldwide, that there were some 150 titles already on the market and that 75 further titles were to be launched during 1994. They also

indicated that three million discs had been sold so far, which suggests an average 10 titles purchased per player. The number of retail outlets selling CD-i was said to have risen to 13,000.

Digital video upgrades for CD-i players were launched in the US and UK during the last quarter of 1993, and Philips signed a deal with MGM allowing films from their catalogue to be produced in CD-i format. Many industry commentators believe that the availability of feature films on disc will be the stimulus needed for a more widespread take-off of CD-i, and Philips is expected to launch a Digital Video campaign during 1994. A forecast of the market for CD-i titles is provided in Table 7.11.

Table 7.11 European Forecast for CD-i Title Sales

	Europe (MECU)	US (MECU)
1994	59.8	39.6
1997	727.4	545.2
2000	5,676.0	3,096.0

Source: *The Market for CD-i*, Alan Barker 1993

Commodore launched the first consumer multimedia player (CDTV) in April 1991, which was originally expected to compete head on with Philips' CD-i. However, it was later re-positioned as a games machine rather than a multimedia player and has since been superseded by CD32, a 32-bit computer game platform. In the meantime, other proprietary multimedia platforms have continued to emerge, including 3DO. Announced at the end of 1992, 3DO was backed by Matsushita, AT&T and Electronic Arts, amongst others, and the first player was launched by Panasonic in 1993.

7.4 Videotex

Videotex has a very patchy history in Europe, with France's Télétel service as a showcase of government-led videotex initiatives, whilst other markets have shown minimal growth in recent years. By December 1993, 6.5 million videotex terminals were installed in France, and a further 500,000 computers with modems were being used for videotex access using Minitel emulation standards. Videotex services generated 112 million hours of connect time and brought in revenues of some FF 6.7bn (ECU 1bn) during 1993. By contrast, the UK installed base of videotex terminals was just over 100,000 at the same period.

France has the highest penetration of videotex terminals in the world, with Spain a very distant second. Table 7.12 below indicates that growth in the Spanish installed base of videotex terminals has been dramatic in recent years. Italy has experienced high growth, although

overall penetration remains comparatively low. More recently, penetration of videotex terminals in Germany has also grown substantially.

Table 7.12 Installed Base and Penetration of Videotex Terminals, 1993

	Installed Base (000s)	Penetration per 1000 Inhabitants	% Average Annual Penetration Growth, 1988-1993
Germany	378	4.7	14.3
Canada	105	3.7	63.8
Spain	480	12.3	185.8
France	6,540	113.3	8.4
Italy	200	3.5	117.8
Japan	128	1.0	15.1
UK	104	1.8	2.8

Source: *Les Chiffres Clés des Télécommunications Mondiales*, OMSYC

France has also been in the forefront of development of high-speed videotex services. This year, the Télétel Vitesse Rapide service will be put in place, allowing transmission at 9,600 bits per second, which will enable photographic images to be delivered to videotex terminals. The possibility of integrating credit card readers into the Minitel terminal is also being investigated. A comparative view of videotex elsewhere in Europe is provided in Table 7.13.

Table 7.13 Videotex in Europe

Country	Name of Service	Year of Launch	Number of Calls per Month (000s)	Number of Hours per Month (000s)	Date of Update
Austria	Bildschirmtex	1985	-	-	01/92
Belgium	RTT Videotex	1986	250	30	05/93
Denmark	Teledata	1988	25	4	12/91
Finland	Telesampo	1984	320	33	05/93
Germany	BTX	1983	9,000	2,200	08/93
Ireland	Minitel	1990	37	7	07/93
Spain	Ibertex	1986	620	130	12/92
France	Télétel	1982	148,000	9,200	05/93
Greece	Hellastel	1993	-	-	05/93
Italy	Videotel	1987	540	167	10/92
Luxembourg	Videotex	1986	2	<1	02/92
Netherlands	Videotex NL	1990	2,200	200	05/93
Norway	Teledata	1986	55	9	02/92
Portugal	SPV	1988	-	-	10/92
Switzerland	Videotex	1987	1,500	200	07/93
UK	Prestel	1980	-	-	12/92

Source: *La Lettre de Télétel et d'Audiotel*, France Télécom

7.5 Audiotex

Audiotex was first introduced to Europe in 1986 in the UK and France. In the years between 1987 and 1993, almost every other western European country launched either national or regional audiotex services, although in some countries these were later suspended. Audiotex is the term used to describe information and entertainment services delivered by the telephone. Such services are often made available over premium rate lines, although some are offered over standard telephone lines and are charged via credit card billings or subscriptions. Other types of services, such as those providing advertising or government information, might be offered over free phone lines. In Europe, however, most of the audiotex industry is concentrated around the premium rate market.

A report published by Eurodata Foundation in autumn 1993 entitled *Premium Rate Services* suggests that the European premium rate services market will be worth US$ 2bn (ECU 1.72bn) by 1995, up from US$ 1bn (ECU 0.86bn) in 1992. Eurodata's report argues that premium rate is becoming an increasingly acceptable way of accessing information services, and that it no longer has such a strong association in people's minds with 'adult' entertainment.

Eurodata's study included a survey of 1,400 people in 12 countries and, in particular, awareness, usage and willingness to pay premium rate tariffs were assessed. Across Europe, 12 per cent of business people and 9 per cent of consumers had used premium rate telephone services, although in the Netherlands and the UK the figures were significantly higher (20 per cent of business people and 10 per cent of consumers in the UK; 38 per cent of business people and 31 per cent of consumers in the Netherlands). Willingness to pay premium rates for access to information services was found to be particularly high in France, where the market is well established and where widespread videotex usage has increased overall familiarity with the concept of paying for information. Business people seemed most willing to pay premium rates for government and public information, whilst consumers were more likely to be prepared to pay for advice lines and financial information. Table 7.14 shows the breakdown of European markets, launch dates and penetration of DTMF telephones.

Although much of the revenues for premium rate services still comes from 'adult' services, the range of professional and business services available via audiotex has grown in Europe. The Fourth EIIA/EC Host Survey indicated revenues of ECU 97.4m for professional audiotex services in 1992. This suggests that audiotex still plays a minor role in the professional electronic information services market, representing only 2.3 per cent of total revenues in 1992.

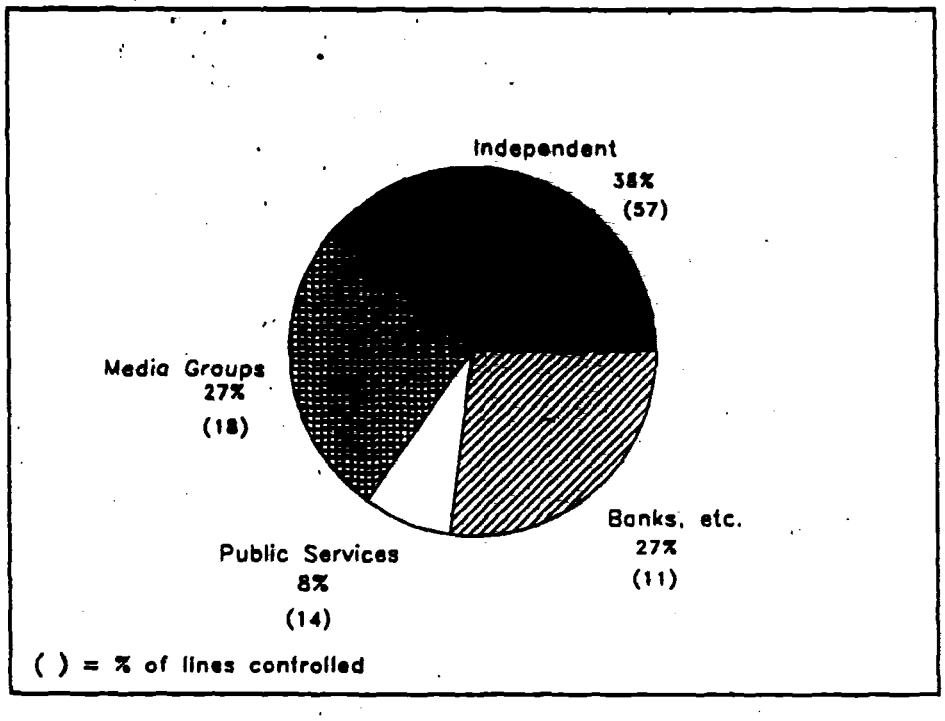
A study by Geste called *Panorama de l'Edition Audiotel* provides a detailed picture of the range of services available in France and the nature of the organisations offering them. Informal indicators suggest that the European audiotex industry has a large number of small operators. The Geste report provides a detailed case study which appears to confirm that this is the case. Around 60 per cent of French service providers were found to have only one line, controlling 10 per cent of the total number of lines, whereas only 3 per cent of service providers had more than 20 lines, but together controlled 40 per cent of the total. The type of organisations offering audiotex services are broken down in Table 7.15.

Table 7.14 Breakdown of European Premium Rate Markets, Launch Dates and DTMF Penetration

	Market Size (MECU)			Year of Launch	DTMF Line Penetrat. 1992 (%)
	1992	1993	1995		
Belgium	10.789	15.413	23.712	1989	55
Denmark	24.773	25.500	30.600	1990	95
Germany	11.712	53.678	487.981	1992	10
Spain	54.062	117.000	139.018	1992	40
France	279.990	348.355	435.443	1986	62
Greece	-	10.100	20.200	1993	10
Ireland	6.503	8.750	14.000	1986	60
Italy	0.741	144.000	290.223	1993	35
Luxembourg	-	1.000	1.600	1993	77
Netherlands	99.587	105.000	127.731	1990	40
Portugal	1.756	15.600	41.600	1991	10
UK	346.707	367.934	424.540	1986	33

Source: *Overview of the Audiotex PRS Service Market*, IMO Working Paper 93/3, *EPJournal*

Table 7.15 Breakdown of Organisations in France Offering Premium Rate Services and Percentage of Lines Controlled



Source: *Panorama de l'Edition Audiotel*, Geste

The more mature European audiotex markets, such as the UK and France, seem to be stabilising and becoming more established. However, in countries where audiotex has been introduced relatively recently, it is unfortunate that the same problems relating to adult and chatline services, and concern over premium rate bills, are still occurring. In Italy, national audiotex services were launched for the first time during 1993, but by the end of the year there had been so much public outrage over bills generated through use of Audiotel services that the Italian PTO decided to ban chatlines and live services until July 1994, from which date an opt-out facility for Audiotel 144 services will be available nationally.

Spain, which had suffered similar problems in the early days of its audiotex industry and had all of its services closed down by the Spanish government in December 1992, re-opened audiotex lines to all service providers in December of 1993, but with the proviso that audiotex services are opt-in only, so that customers have to apply to the PTO, Telefonica for this facility. In addition to the 903 lines originally used for premium rate services, a new 906 prefix has been introduced for services which are non-profit making, including weather and stock market services. These are available to all telephone subscribers without an opt-in requirement. The Belgian market grew by over 180 per cent between 1991 and 1992, mainly as a result of adult services and chatlines, but there has now be a harsh regulatory clamp-down and growth has slowed considerably.

Audiotex markets in Europe are almost entirely national, although bilateral talks between European PTOs have been taking place in order to establish mechanisms for cross-border activity. It has therefore been necessary to establish a Code of Practice for the provision of audiotex services across boundaries, and work has been carried out by the EIIA on this front. (See also section 6.)

7.6 Fax-Based Information Services

Fax-based information services represent a niche sector and, whilst the number of information services delivered by fax has grown substantially over the past few years, it is still a small and specialist market. The most promising applications for fax as an information medium are those which offer access to specified sets of information on demand (fax on demand).

Fax on demand services are often operated over premium rate telephone lines, allowing users to select the documents they require using the touch tone keys on a telephone or fax machine. Typical applications are detailed weather information, share prices and currency rates, business summaries and company information. Another application which has proved very successful in the US and which is becoming common in Europe is on-demand access to reader enquiry information. A premium rate or free phone number is published along side an advertisement, which the reader can dial in order to receive by fax further details of the product or company advertised. This allows publishers to offer an additional service to advertisers, and to generate revenue through charging readers per call or by charging advertisers for storage and delivery of promotional information.

One of the reasons why fax-based publishing has remained a fairly small concern is the inflexibility of the premium rate tariff structure. Tariffs vary from country to country, but even

in Member States where service providers are allowed to charge per call (rather than per minute), the rates are often too low to make the provision of high-value business information worthwhile. Consequently, some fax operators have turned to other methods of service delivery. An interesting example of fax on demand innovation is I-Fax, a service offered by a company of the same name originating in Nova Scotia, which opened a UK office during 1993. The company acts as a service developer and bureau, and uses technology based on pattern recognition. Users fill in a form by shading boxes corresponding to letters and numbers, thus specifying the information they require, then fax the request to I-Fax. When the request is received by the I-Fax computer, it is automatically converted into a database search and the results faxed back in a matter of minutes.

So far, the I-Fax system is being used by HPI, (the UK's motor vehicle registration database holder) for access to vehicle ownership and information, and by Infocheck for company reports and credit rating. In both cases, users are pre-registered and are provided with account and identification numbers, which they fill in on their information request forms. This type of system has the advantage of allowing information providers to choose their own pricing structure, and of allowing the user to specify requirements much more closely than is possible through touch tone or voice recognition. And, of course, it allows remote database searching without a computer and without formal searching skills.

Fax on demand methods such as this one are likely to represent a greater opportunity for business information providers than premium rate, which requires significant call volumes before it becomes profitable. Fax on demand still makes up a small proportion of the total premium rate market (it is unlikely to represent more than 10 per cent, even in well established markets), although it is difficult to get an accurate picture of the fax-based information market as distinct from other service revenues.

Fax delivery of paid-for information is likely to increase substantially as new forms of document delivery and Inter-Library Loans services become established. The number of electronic document delivery and CASIAS (Current Awareness Services with Individual Article Supply) services available on the networks is growing rapidly, and many of these offer fax as a delivery option. This is likely to be an area of substantial growth in terms of volume of traffic and number of transactions, although the long-term financial benefits to providers of these services are not yet clear.

A report by Ovum entitled *VANs Markets Europe* suggests that value-added fax services will grow twelvefold by 1997, although the definition of value-added fax includes enhanced communications and messaging networks as well as information services. It also predicts that the Spanish market, where value-added fax suppliers have their own networks and can significantly undercut international PSTN rates, the market will be worth ECU 67m by 1997. The UK was said to have the most developed value-added fax market, accounting for 70 per cent of the total European market in 1992, followed by France, Italy, Germany and Switzerland.

7.7 Electronic Information Services in the Home

It became evident in 1993 that the use of electronic entertainment and consumer information services in the home was becoming a fact of life in most European countries. However, a number of indicators also suggest that Europe is beginning to mirror the US in the trend towards work-related information access in the home. The single biggest factor in this development has been the growing base of computer technology in the home, resulting largely from the fall in price of office equipment and the marketing efforts of the equipment manufacturers, anxious to establish themselves in new markets before the growth of the office market slows too dramatically. In particular, growth has been significant in home PC and fax ownership (especially in low-cost combined telephone/fax machines) and modems. As on-board modems drop in price and become standard on PCs, growth in the installed base of fax machines may be somewhat reduced. But either way, the ability of home users to communicate electronically is becoming an important consideration in information service delivery.

It has proved very difficult to produce reliable figures on the installed base of technology in homes, but Table 7.16 provides an overview of the comparative position in the EU and US as regards the penetration of three indicator technologies: CD-ROM drives, video recorders and cellular telephones.

Table 7.16 Penetration of Technology into European and US Homes, 1992

	Percentage Population		Percentage Households	
	EU	US	EU	US
CD-ROM Drives	0.2	1.2	0.5	3.1
Video Recorders	20.5	25.1	54.9	68.3
Cellular Phones*	1.2	4.0	3.2	10.7
Source: IDATE	* Relates to subscriptions rather than handsets.			

OMSYC's figures on the penetration of fax machines, modems, pagers and mobile telephones per thousand inhabitants also provide an interesting view of technololgy take-up in EU countries, the US and Japan (see Table 7.17 below). Whilst they do not refer solely to technology in homes, they do appear to confirm the impression given by IDATE's figures that Europe is still lagging behind, especially on mobile telephone penetration.

Table 7.17 Penetration of Technology per Thousand Inhabitants, 1993

	Fax Machines	Modems	Pagers	Mobile Phones
Germany	17.4	9.2	6.4	17.3
Canada	20.6	28.0	17.8	42.9
Spain	20.5	9.7	3.9	6.9
US	48.6	76.0	61.9	52.8
France	20.6	19.9	5.9	7.8
Italy	27.2	10.0	4.1	17.3
Japan	55.3	n.a.	59.4	18.3
UK	19.7	13.0	12.2	27.7
Source: *Les Chiffres Clés des Télécommunications Mondiales*, OMSYC				

Figures on the penetration of personal computers into homes have tended to be unreliable and misleading. However, there is a growing consensus that in the most advanced regions of Europe, between 20 and 25 per cent of homes in 1994 have personal computers.

The widespread availability of technology in US homes has helped to stimulate a consumer market for electronic information services. In the US, consumer on-line is already well established, with Prodigy and CompuServe the biggest providers of on-line services to the general public and home-based workers. At the end of 1993, Prodigy had 2.1 million subscribers - a growth of just 5 per cent since the previous year - whilst CompuServe experienced growth of 41.6 per cent, bringing its total number of subscribers up to 1.6 million. America Online is much smaller than these two, although its subscriptions grew by 165 per cent during 1993 to 0.53 million. US consumer on-line is likely to grow substantially in the area of specialist computer information services. A number of on-line computer magazines already exist and Apple looks set to make a serious entry into this market with its own consumer service, eWorld. This will be launched during 1994 and, according to Apple, will attract millions of users over the next five years. At the end of 1993, Ziff Davis also announced that it would launch its own on-line service targeted at its 3.5 million computer magazine subscribers. Ziff Davis Interactive will be launched in the last quarter of 1994 and is expected to attract 185,000 subscribers in its first 12 to 18 months of operation.

Until recently, consumer use of on-line services in Europe has been low, but CompuServe has begun to make in-roads into the European market, with 130,000 subscribers as at June 1994. CompuServe says that the number of European subscribers has doubled in each of the last three years and is expected to double again to over 250,000 during 1994/5. However, growing awareness and use of the Internet in Europe may make it harder for consumer on-line operators to establish themselves at this stage. CompuServe has addressed this problem by developing a full Internet connection, which it will make available during 1994.

7.8 Emerging Media and Markets

7.8.1 The Networks

During 1993 and 1994, access to international data networks such as the Internet and national equivalents grew significantly, with huge increases in the number of users and services, and in the amount of information available over these networks.

The background to the Internet has already been discussed in Chapter 1 of this report, but it is worth looking in a little more detail at recent Internet growth. In a report published in 1994, Infonortics gave the following indicators of Internet growth:

- between July 1992 and July 1993, the number of networks linked into the Internet rose from 5,739 to 13,293, with new networks connecting to the Internet at an estimated rate of one every 10 minutes;

- between July 1993 and October 1993, the number of Internet hosts rose from approximately 1.8 million to just over 2 million;

- between February 1993 and December 1993, the number of articles posted on USENET rose from 35,000 to 43,000.

It has become almost impossible to make accurate calculations of the number of Internet end-users, but figures from the beginning of 1994 suggested a total of 25 million end-users in 137 countries, using some 2.2 million host computers. The Internet Society's figures for June 1994 suggested that the number of hosts had now risen to just over 3.3 million, (representing an 81 per cent increase since the previous year), and that the number of users had grown to 30 million. One million new hosts were added in the first six months of 1994 alone, with much of this growth attributable to countries outside the US (see table 7.18 below). SMEs and freelance individuals are thought to make up a growing proportion of users, although large companies are also heavily represented on the Internet. Digital Equipment Corp, for example, has over 31,000 computers linked to the Internet.

Table 7.18 Internet Hosts Worldwide

Country	Number of Hosts	Percentage of Total	Percentage Change Since Jan 1994
US - educational	856,234	27	41
US - commercial	774,735	24	36
US - government	169,248	5	31
US - defense	130,176	4	26
US - non profit org.	66,459	2	31
US - net operator	30,993	1	146
US - local	16,556	1	153
US - total	2,044,401	63	38
UK	155,706	5	37
Germany	149,193	5	51
Canada	127,516	4	48
Australia	127,514	4	42
Japan	72,409	2	69
France	71,899	2	117
Netherlands	59,729	2	43
Sweden	53,294	2	40
Finland	49,598	2	n.a.
Switzerland	47,401	1	24
Norway	38,759	1	22
Italy	23,616	1	38
Spain	21,147	1	79
Austria	20,130	1	30
South Africa	15,595	<1	42
New Zealand	14,830	<1	157
Denmark	12,107	<1	175
Belgium	12,107	<1	147
Poland	7,392	<1	55
Portugal	4,518	<1	25
Ireland	3,308	<1	103
Greece	2,958	<1	249
Luxembourg	420	<1	37

Source: Internet Society, July 1994

According the Internet Society, if the number of users continues to grow at the same pace as that experienced during 1993, by 1995 there will be 38 million Internet users and 5 million Internet hosts. Other estimates suggest that by 1999, 100 million users a day will be logging onto the Internet to send E-mail messages.

A huge variety of information services exists on the networks, ranging from obscure bulletin boards run by individuals in their backrooms, to business and academic databases made available by commercial publishers and information providers. In the US alone, there were thought to be over 50,000 `cottage-industry bulletin boards' at the end of 1993, with new ones being added at the rate of a few hundred a week (source: *The Economist*, December 1993). However, not all bulletin boards are amateur services made available free to users - and neither are they all in the business of disseminating reference material or providing a forum for serious

discussion. The US' biggest bulletin board, Event Horizons, has over 35,000 subscribers and an estimated turnover of US$ 3.5m (ECU 3.01m) per year. It offers hardcore pornography in the form of a catalogue of still and moving images which can be downloaded and viewed on a Windows PC.

A growing number of European information companies are making their services available over the Internet and over national networks. Many more, however, are waiting until workable copyright and payment mechanisms are available, or are still confused about what the Internet actually is and what commercial opportunities it can offer.

Those European companies which have ventured into network publishing have tended to be those offering academic and research information, or information aimed at librarians and information scientists. This is largely because national research networks are better established in the academic and library community, and in some cases because universities have joined together to negotiate flat-rate deals for database access. This has been the case in the UK, where Bath University has co-ordinated deals with information providers such as ISI and the British Library, whereby universities pay a flat fee and students and staff can access the databases, which are 'free at the point of use'. Many more information companies are starting to use the Internet to promote their services and support users (SilverPlatter, for example, offers the SPIN-L bulletin board for this purpose), and for providing advance information on forthcoming articles and publications. This type of activity allows information companies to experiment with the medium and offers new marketing opportunities.

In Europe, Elsevier and Springer Verlag have both taken active roles in developing services for the Internet, as have many smaller publishers and academic societies, such as the Institute of Physics Publishing and Imperial Cancer Research Fund in the UK. Elsevier's Tulip project has brought 60 electronic journals to the Internet. Bibliographic databases, current awareness services (such as Springer's Journal Preview) and document delivery services (such as Blackwell's UnCover) are also making an impact in the European academic community.

Although most of the media attention has been focused on the Internet, a great deal of development work has taken place at a regional and national level in Europe to create academic and research networks, which have later been extended to the commercial community (see Table 7.19). The French network, Renater (Réseau national de télécommunications pour la technologie, l'enseignement et la recherche) began as a connection between several regional networks and then expanded nationwide. It has recently been opened to the commercial world. National networks in Europe are connected by means of EuropaNET, and an agreement was signed by six network operators at the end of 1992 for the development of pilot ATM research network. Meanwhile, ATM and broadband network experiments continue to take place at a regional and national level. These networks are interconnected with the Internet, although access to some may be restricted to the academic community.

Table 7.19 Research Networks in Europe

First Generation National Networks	
GARR	Italy
JANET	UK
RCCN	Portugal
RedIRIS	Spain
RENATER	France
Regional ATM Network Experiments	
BBA	Belgium
BREHAT	Paris, Rennes and Lannion
EXPLOIT	Basle
RECIBA	Madrid
RIA	Aveiro
SGN	Stockholm
SURFnet	Netherlands
National Broadband Networks	
BAT MAN	Denmark
DPN	Germany
SUPERJanet	UK
Supernet	Norway
Cross-Border Networks	
EuropaNET	Europe
BETEL	Greece/France/Switzerland
HPC-Vision	France/Germany
ISABEL	Spain/Portugal
TIRONET	Northern/Southern Ireland
Source: *Les réseaux à large-bande en Europe: quel futur?* J.P Euzen, EC Brussels	

7.8.2 Handheld Reference Products and Personal Communicators

Since the introduction of the first calculator-like electronic dictionaries by the likes of Franklin and Selectronics in the 1980's, the handheld reference and communicator industry has mushroomed. Whilst a number of reference-only handheld products still play an important role in this market, they now have to compete with a new generation of handheld products which also offer data entry and communication facilities. Of these, the product which really broke new ground in 1993 in terms of media coverage and general awareness was Apple's Newton, the first of a new range of pen-based products which allow the user to handwrite messages on screen, convert these into ASCII text, and transmit them by way of fax modem, as well as offering diary and address book facilities and, of course, published data sets for reference and annotation. Portable, pen-based computing is not new (early pioneers of such technology were GO Corporation and EO Inc.), but this was the first serious attempt by a manufacturer to make an impact on the consumer market.

A number of European manufacturers have become involved in the personal communicator market, although they have tended to do this through alliance with US-based companies rather than striking out on their own. Siemens, for instance, has an alliance with Apple and is

supporting Newton technology, whilst Philips has taken a stake in General Magic and Olivetti has bought a minor stake in EO Inc. AT&T meanwhile acquired a 51 per cent stake in EO, which itself had recently merged with the UK-based Active Book Company.

The personal communicator and handheld reference market must be one of the most over-hyped in the consumer electronics industry, with forecasts for the handheld computers and communicators market as high as US$ 7.4bn (ECU 6.7bn) worldwide in 1997 (source: Technologic Partners, New York). Olivetti predicts that in Europe alone, 40 million units will be in use by the end of 2000. Estimates released by Dataquest in March 1993 seem rather more reasonable, however, suggesting 11.5 million users by 1997. Dataquest suggests two possible scenarios for the development of the handheld computer/ communicator market. The first indicates that initial growth in Europe will be small, with take-off not occurring until 1996. Critical factors in this scenario are:

- The point at which products reach an acceptable price level in Europe (around US$ 350/ECU 301 or under).
- Further development of handwriting recognition.
- Adoption of standards in mobile data communications technologies generally.
- Accustomisation by the market to the new technology.

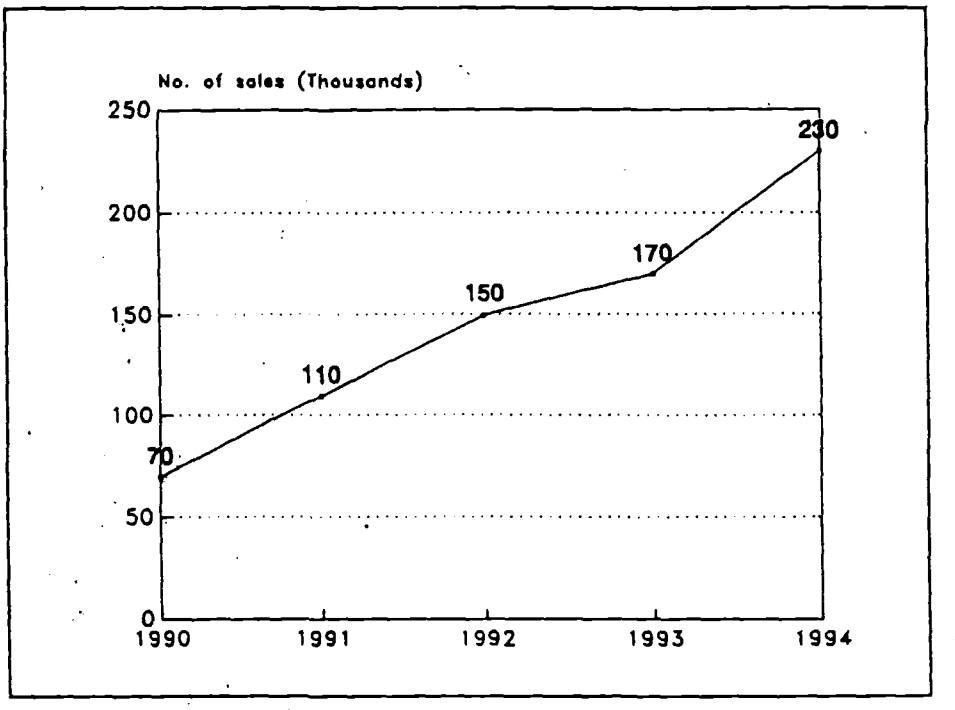
In Dataquest's second scenario, the take-off point occurs in 1994/5 and is followed by rapid growth. The vital factor here will be the establishment of de-facto standards across all personal communicators, allowing the market to develop more coherently. In addition to the points made by Dataquest, however, the issue of pan-European mobile communications networks and the availability of GSM is crucial in Europe. So far, progress has been slow and Dataquest's early take-off scenario therefore appears unlikely. Having said that, a great deal of emphasis has been placed on interconnection, deregulation and tariff reduction for pan-European mobile networks by the Bangemann report and the Commission's Action Plan which followed. The combination of government action and new market opportunity is likely to stimulate intense activity in the mobile communications sector in the next couple of years. (See section 2.2.2 on telecommunications for a fuller discussion of mobile communications.)

Since its launch in Japan in 1990, the proprietary Sony Electronic Book (EB) has been through a number of modifications in order to improve its functionality and make the platform more accessible to software producers and users. Towards the end of 1993, Sony announced that the caddy surrounding the EB disc would become removable and that users would now be able to play EBs on a CD-ROM drive attached to a PC. The EB is an 20cm CD-ROM which has a capacity of 200 MB, in other words around 100,000 pages of text, 32,000 graphics or 5.6 hours of digital sound.

Since the launch of the EB, Sony claims that over 300 software titles have been produced in eight languages, and that sales have expanded into 17 countries, with Panasonic, Sanyo and Sharp all having introduced their own EB players. European hardware companies have been less active in the EB market than their Japanese counterparts, although a few European

publishers (such as Langenscheidt) have produced EB titles. The total number of EB players sold worldwide, according to Sony, was around 500,000 by the end of 1993, and sales during 1994 are expected to reach between 200,000 and 300,000 (see Table 7.20).

Table 7.20 Sales of EB Players Worldwide



Source: Sony

The bulk of these sales, however, are still taking place in Japan, with Japanese sales accounting for 65 per cent of the total in 1993 and expected to make up the same proportion in 1994.

7.8.3 Video on Demand and Interactive TV

Video on Demand (VOD) is likely to be one of the major applications for high capacity networks, or information super highways. In this sense, it is useful to examine Video on Demand within the context of emerging information markets, although it will also represent a significant development for the wider audio-visual sector discussed in section 7.9.

The idea behind Video on Demand is that a film or video archive is made available over a network via the service provider's server, which can then be searched by users via their television sets and intelligent set-top boxes. A selection is then made and an electronic transaction carried out using a credit card or smart account card. De-encryption and decompression devices in the set-top box will then allow the user to download the film for viewing. In the future, it may also be possible to make a video CD recording of the film for an

additional payment. The speed of development of Video on Demand will depend to a large extent on the availability of high-bandwidth telecommunications networks, and on the level of success achieved by US companies currently experimenting with simple interactive services. Full Video on Demand over ATM-switched, broadband networks is probably several years and a few billion ECUs of investment away.

In spite of the excitement in the media industries, the potential market for Video on Demand is still an unknown quantity. For this reason, operators are experimenting with applications which can run on existing infrastructure. Satellite broadcasters, for example, are working on Near-Video on Demand, which will allow access to existing programme resources using infrastructure currently available. A number of films are broadcast continuously, so that the user makes his or her selection and then waits for the next broadcast of the film. Depending on the number of broadcast channels used and the number of films offered, this could be anything from every 10 minutes to every half hour. In this respect, it is similar to teletext broadcasting.

Fully interactive television is a more distant prospect, partly because of the two-way communications requirement and partly because developing content for interactive searching as part of a film or television programme will be costly and time consuming. In the meantime, a certain amount of interactivity can be offered by linking a telephone set to a television via audiotex and teletext services. This technology is currently being used for applications such as tele-voting, games and shopping.

Some of the companies already involved in providing services, initiating trials and carrying out development work are indicated in Table 7.21.

The range and prominence of companies involved in Interactive TV and Video on Demand projects reflects the fact that this is expected to be a very lucrative market, both for the network providers and for the content owners. There is already strong competition for the supply of set-top boxes and the consumer electronics manufacturers look set to engage in a battle for market domination in this area.

Beyond the hype, however, very little reliable data is available which puts a value on the interactive TV market or provides forecasts for the future. A 1993 report by Quadrature entitled *Interactive TV in Europe and the USA* suggests that the US market was already worth some US$ 1bn (ECU 0.86bn) in mid-1993. It also claims that more people in Europe have access to interactive TV services than in the US, mainly because European companies like Radio Television Luxembourg (RTL), Canal+ and News Corporation have begun experimenting by offering fairly simple interactive services, such as simple gaming and survey applications. Additional impetus for interactive service development is expected to come from US companies with European cable interests.

Table 7.21 Selection of Companies Working on Video on Demand and Interactive TV

Company	Main Activity	Origin	Key Partners
AT&T	Telecoms	USA	News Corp, ComStream
GTE	Telecoms	USA	Philips, Discovery Chnl.
Bell Atlantic	Telecoms	USA	
Nynex	Telecoms	USA	Liberty Cable
Ameritech	Telecoms	USA	
Microsoft	Software	USA	Intel, Gen. Instruments
TCI	Cable TV	USA	
TV Answer	Radio Wave TV	USA	Hewlett-Packard
Viacom	Satellite TV	USA	
Liberty Media	Cable	USA	Prodigy, X*Press
Time Warner	Cable TV	USA	AT&T, Gen. Instruments
QVC	Cable TV	USA	BSkyB
BT	Telecoms	UK	IBM
France Telecom	Telecoms	France	Lyonnaise Comms.
CLT	Satellite TV	Lux	
Canal+	TV	France	News Corp
France 2/3	TV	France	Hachette, Virgin Megastore, 3 Suisses
Source: Quadrature / Delphic, 1993			

7.9 Audio-Visual

The world audio-visual market, including hardware and software, was valued at US$ 289bn (ECU 248bn) in 1992 and, according to the International Observatory for Communication Systems (OMSYC) in Paris, limited growth will occur in 1993/4 to bring the market up to US$ 295bn (ECU 254bn) at the end of this year. Within this timescale, equipment revenues are expected to rise 1.7 per cent, whilst income for services will grow as little as 0.5 per cent. This continues the trend of low growth experienced in the early 1990s (overall growth was 0.6 per cent in the period 1990-1992) and marks a sharp contrast to the average annual growth rate of 6.3 per cent calculated for the years 1985 to 1990.

According to OMSYC's report *Les Chiffres-Clés de l'Audiovisuel Mondial*, published at the end of 1993, the market is broken down as follows in Table 7.22:

Table 7.22 World Audio-visual Spending, 1992

	ECU bn	Percentage	Av. An. Growth Since 1987
AV Hardware*	114.3	45.9	5.4
TV Revenues**	85.8	34.5	4.2
Radio Advertising	10.7	4.3	0.5
Cinema Box Office	11.5	4.6	-1.5
Pre-rec. Video Tapes	26.5	10.7	6.1
Total	248.8	100.0	4.4

Source: OMSYC / *Television Business International*, January 1994
* includes professional and consumer equipment
** includes broadcast and cable TV

The same report indicates that the US represents the biggest audio-visual share, accounting for 38.4 per cent of world spending, with Europe accounting for 26.4 per cent and Japan 16.8 per cent. However, Table 7.23 shows that there is a concentration of audio-visual giants in Europe, with 34.4 per cent of top audio-visual companies' revenues being generated in the in the EU in 1992. This represents a slight drop since the previous year, but a significant improvement on the position in 1988.

Table 7.23 Revenues of Top 50 Audio-visual Groups by Area of Origin

Region	Percentage of Revenues Generated by Top 50		
	1988	1991	1992
US	41.5	36.8	32.6
EU	29.4	36.4	34.4
Japan	22.5	23.2	27.8
Other	6.7	3.6	5.2

Source: IDATE

A 1994 analysis of the *Top Fifty European Media Owners* by Zenith indicates that the top three rankings for 1992 remain the same as the previous year, with Reed/Elsevier, Fininvest and Bertelsmann at the top in terms of media revenues. Advertising on television, radio, newspapers, magazines, cinema and outdoor media are included in the definition of media revenues, but publishing and production activities unrelated to advertising (such as printing, book publishing and programme production) are excluded.

In putting together their Top 50, Zenith concluded that commercial television was continuing to experience high growth, and that state-owned, terrestrial television was often suffering in direct proportion. Zenith also concluded that media companies had reacted to recession by cost-cutting, and that the disappointing performance of press titles in Europe (especially in France and Germany), had led many press owners to diversify further into broadcast media.

The effects of convergence and the emergence of multimedia markets were not discernible in Zenith's analysis, as these two phenomena had made little practical impact on the media industries during the period in question. Table 7.24 below shows an extract of the top 10 media owners, their media revenues and their total revenues.

Table 7.24 Top Fifteen European Media Owners Ranked by Media Revenues

Ranking	Company	1992 Media Revenues (MECU)	1992 Total Revenues (MECU)
1	Reed/Elsevier	3,198.3	9,453.1
2	Fininvest	2,629.9	3,739.5
3	Bertelsmann	2,067.4	9,453.1
4	Axel Springer	1,711.1	1,963.4
5	CLT	1,606.3	1,680.3
6	Havas	1,569.5	4,578.3
7	Heinrich Bauer	1,483.5	1,584.9
8	Matra/Hachette	1,429.5	8,950.9
9	Hersant	1,397.1	1,397.1
10	RCS Editori	1,330.9	2,039.1
11	United Newspapers	1,170.8	1,263.4
12	Canal Plus	1,112.4	1,289.3
13	TF1	1,028.3	1,207.6
14	News International	1,016.8	1,057.8
15	Daily Mail and General Trust	975.5	1,008.4

Source: *Top 50 European Media Owners 1994*, Zenith Media Worldwide

7.9.1 Television, Cinema and Video

In terms of the EU's competitive position, it is clear from figures relating to 1990-1992 that there is a significant deficit in EU/US audio-visual trade. In 1990, US revenues in the EU for TV cinema and video were ECU 3,198m (ECU 3,150m in 1992), whereas EU revenues in the US amounted to only ECU 212m (ECU 248m in 1992). Whilst this reflects a very slight narrowing of the gap, the EU deficit in 1992 was still ECU 2,902m (see Table 7.25).

Table 7.25 EC Audio-visual Trade Deficit with the US, 1990-1992

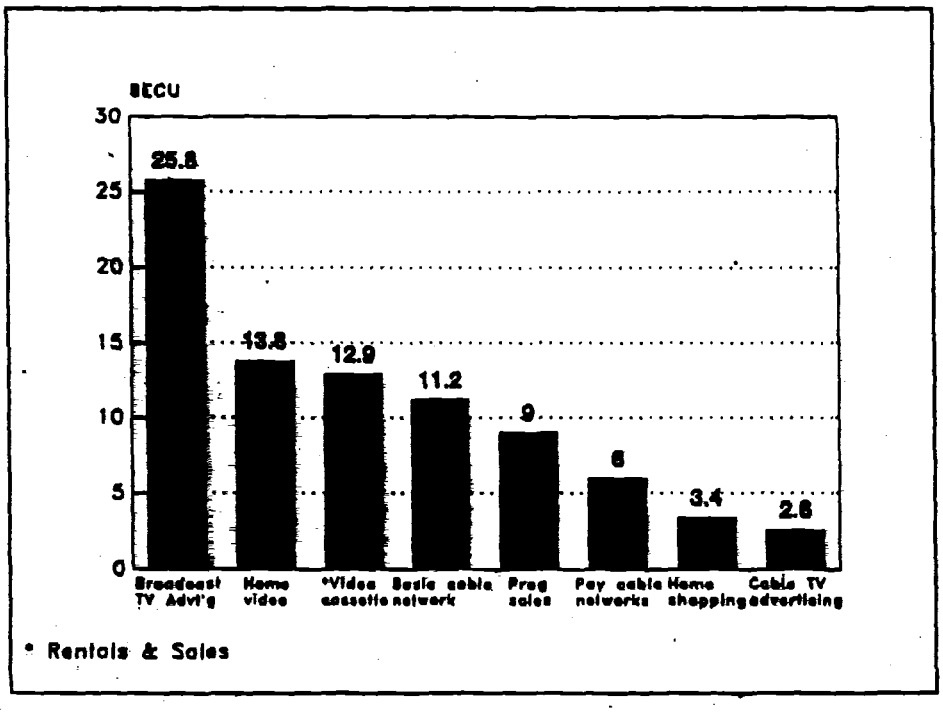
	US Receipts in the EU (MECU)		EU Receipts in the US (MECU)	
	1990	1992	1990	1992
Cinema	975.2	733.6	43	63.6
Television	1,099.1	1,417.3	80.8	81.7
Video	1,124.0	999.3	88.6	102.3
Total	3,198.3	3,150.2	212.4	247.6
EC Deficit			2,985.9	2,902.9

Source: IDATE

The European Commission has recognised that the European film and television industries will need a radical overhaul if they are to compete on international markets, but disagreements amongst Member States over proposed measures during the GATT negotiations have made it difficult to reach a position of consensus on audio-visual policy. In April 1994, a Green Paper on *Strategy Options to Strengthen the European Programme Industry in the Context of Audio-visual Policy of the European Union* was presented by the Commission. This was later discussed at the European Audio-visual Conference in Brussels in June/July 1994 and adopted by the EU. Further action in the audio-visual sector was recommended by the Bangemann report and subsequently by the Commission's Action Plan. The latter indicated that a revised Directive on Television without Frontiers should be adopted by the Commission during 1994, and that follow up to the Green Paper on Media Pluralism was currently underway.

According to Frost & Sullivan, the world television programming market was worth US$ 80bn in 1993 (ECU 69bn), and is rising at a rate of 10 per cent a year. Meanwhile, ownership of television sets looks set to continue rising at 5 per cent a year until the year 2000; in spite of a saturated market, continued growth in television sales is largely thanks to replacement and second-set purchasing. The figures in Table 7.26, compiled by *The Economist* from Morgan Stanley and Frost & Sullivan, indicate that the US accounts for nearly 40 per cent of the programming market, and that pay-TV and home shopping services are now generating significant revenues.

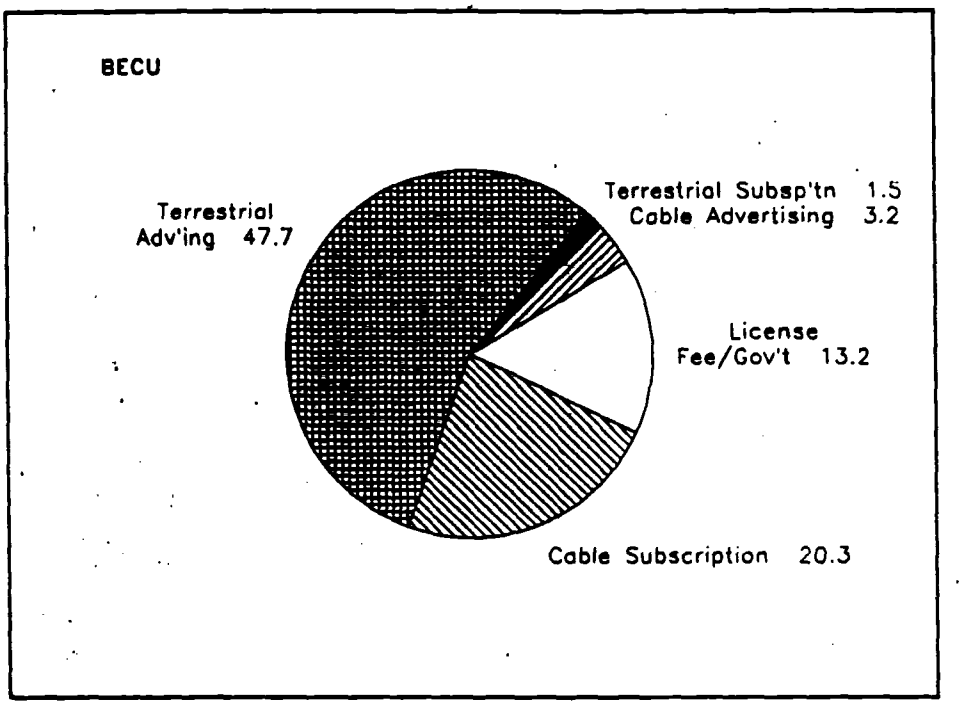
Table 7.26 US Television Programming Market Estimates, 1992



Source: Morgan Stanley, Frost & Sullivan / *The Economist*, February 1994

The proportion of television revenues sourced from advertising seems to be increasing steadily, with cable advertising revenues growing particularly quickly. Table 7.27 below indicates that terrestrial advertising accounted for almost half of world television revenues in 1992.

Table 7.27 Breakdown of World Television Revenues, 1992



Source: OMSYC / *Television Business International*, January 1994

Home video has continued to show higher rates of growth than either television or cinema, with annual growth of around 6.1 per cent since 1987, bringing worldwide revenues for rentals to ECU 14.4bn in 1992 and ECU 6.96bn for sell-through in the same year. The sell-through market is growing particularly quickly, (at an annual rate of 26 per cent according to OMSYC), mainly thanks to falling retail prices. In Europe, retail sales of videos amounted to over US$ 6bn (ECU 5.16bn), according to a report entitled *Video Entertainment Europe* published by Dodona Research. The same report indicates that in three years' time the market will be worth over 12 per cent more in real terms than it was in 1993, partly thanks to new forms of delivery such as Video on Demand.

7.9.2 Audio

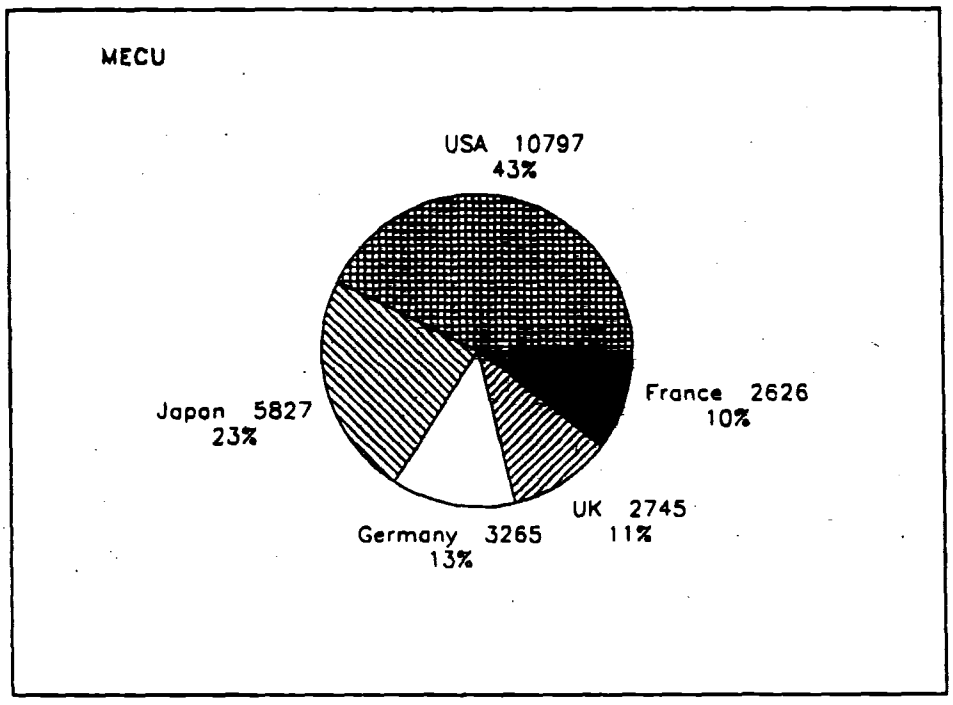
An MBI World Report for 1994 suggests that the world market for music sales will reach US$ 31.65bn (ECU 27.2bn) in 1994. This is an increase of 5 per cent since 1993, when the figure was US$ 31.14bn (ECU 26.8bn), and the market is expected to grow at between five and seven per cent a year to reach US$ 44.2bn (ECU 38bn) by 2000 (see Table 7.28).

Table 7.28 World Music Market - Global Sales and Forecasts 1991-2000

	Music Sales (MECU)	Percentage Annual Growth
1992	24,686	8.0
1993	25,920	5.0
1994	27,216	5.0
1995	28,850	6.0
1996	30,292	5.0
1997	32,412	6.5
1998	34,681	7.0
1999	36,054	4.5
2000	38,015	5.5
Source: MBI World Report, 1994		

The US is expected to remain well ahead in terms of the biggest share of the market, although Germany, the UK and France will continue to feature in the top five. Table 7.29 provides forecasts of geographical market shares in the year 2000.

Table 7.29 Top Five Markets for Music Sales, 2000



Source: MBI World Report, 1994

Compact disc sales have now exceeded those of cassettes and vinyl records in almost every national market.

Across Europe, the British Phonographic Industry estimates that 230,000 people were employed in the music industry in 1992, with a high proportion of these employed in retailing. In the UK alone, 48,600 were employed in the music industry, some 30 per cent of which are involved in retail, 16 per cent as professional musicians and 8 per cent in record company administration and marketing.

7.10 Print Publishing

In February 1993, a report entitled *New Opportunities or Publishers in the Information Services Market* was published by the Information Market Observatory. The report was welcomed by print and electronic publishers alike as one of the first published studies to address systematically the impact of electronic information services upon the traditional publishing industry and to set out new opportunities as they relate to the print publishing sector. The report also provided useful background to the print publishing market itself and, although it has been summarised in an IMO Working Paper (93/4) and well publicised at the Frankfurt Bookfair, its findings are worth summarising here as they form a useful reference point.

EU-based publishers were estimated to have generated revenues of 75.5 BECU in 1991 from newspapers (25 BECU), magazines (22 BECU), books (18.5 BECU) and corporate publishing (10 BECU). In the same year, production in the US was worth 39 per cent more than that of Europe, according to INTERGRAF and nearly double that of Japan. Whilst the volume of trade between the US and Europe remained low, the EU's export trade balance has remained positive since 1982, although according to Eurostat, the actual value of trade surplus fell slightly in 1991 to 2,104 MECU from 2,136 MECU the previous year.

Europe continues to be a dominant force in world print publishing markets, especially in books and scholarly publishing. A ranking by Kagan World Media of the world's top 20 publishers by revenue included 10 EU-based publishing and media conglomerates, whose combined turnover in 1991 was 24.1 BECU. Table 7.30 shows the EU's top ranking publishers by 1992 turnover their ranking alongside a general Top 500 by turnover.

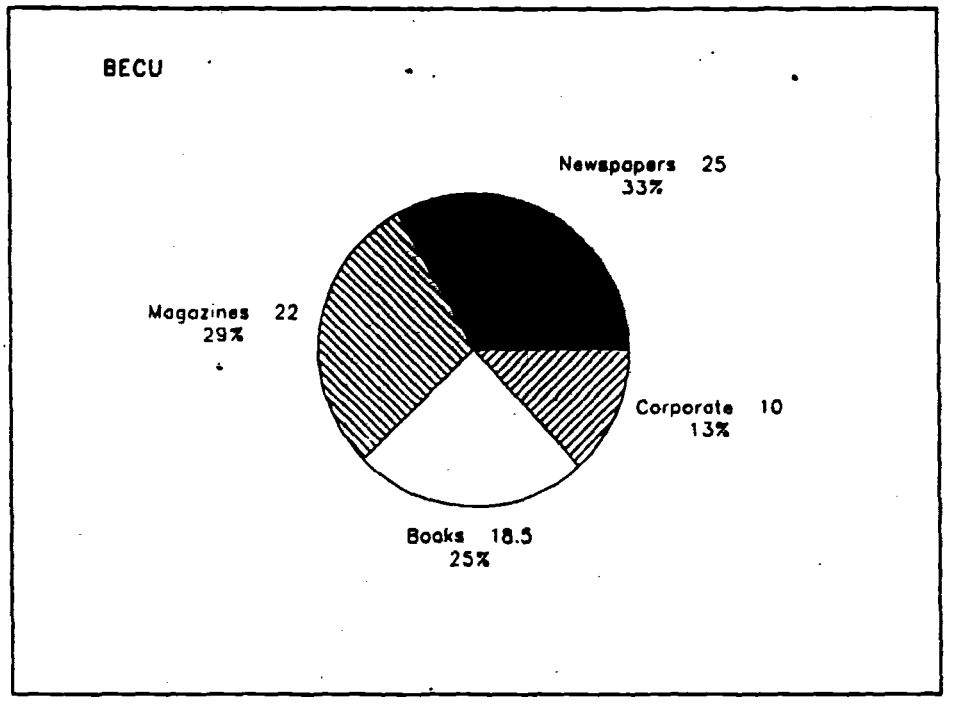
Table 7.30 EC's Top Ranking Publishers by 1992 Turnover

Ranking	Company	Location of HQ	Sales (MECU)
89	Bertelsmann	Germany	7,042
151	Hachette	France	4,360
252	Reed Int.	UK	2,319
256	Pearson	UK	2,284
309	Axel Springer*	Germany	1,795
417	VNU	Netherlands	1,182
422	United Newspapers*	UK	1,160
450	Wolters Kluwer*	Netherlands	1,030
464	Elsevier*	Netherlands	982
469	Mondadori*	Italy	958
473	Groupe de la Cité	France	951
489	Dly Mail/Gen Trust	UK	920

Source: International Management, 1993
* Includes printing operation

Growth rates in EU publishing industry have slowed in the last couple of years from around 3.8 per cent to 2 per cent. The market breakdown in Table 7.31 shows that newspapers have the largest share of the print publishing market, followed by magazines.

Table 7.31 EU Publishing Market, 1992



Source: Consulting Trust, 1993

The publishing industry is highly concentrated across Europe and in many countries the top ten publishing conglomerates control 50-70 per cent of the market. Altogether, there are estimated to be some 60,000 publishing companies in Europe, the majority of which are book publishers. By the year 2000, EU-based publishers are forecast by Consulting Trust to reach sales and advertising revenues of ECU 123.8bn, of which electronic publishing activities will contribute around ECU 12.1bn.

8 CONCLUSIONS

1. The information society is on its way. Throughout the reference period of this report, the 'digital revolution' has been a major topic of discussion. But one could argue that the digital revolution actually began in the information sector 25 years ago, with the emergence of electronic information services. Dramatic changes are now taking place in the telecommunications sector, with the uptake of ISDN and broadband networks in the European Union. On the other hand, with the exception of CD-Audio, digitisation is only just making an impact on the audio-visual sector.

   Although digitisation has enhanced many professional processes, it has not yet changed professional and private life dramatically. The full impact of the digital revolution is still to be felt and the pace of change will be difficult to predict.

   The digital revolution will be more or less complete when the following scenarios have become a practical reality:

   - open, direct and easy access to all publicly available information held anywhere in the world, (including text, sound, still and moving pictures), regardless of time and location, in the mother tongue, customised if necessary, and affordable by everyone;

   - affordable oral and visual telecommunications worldwide, available regardless of time, location and language;

   - easy to use transactional services available via electronic media from any location.

   We are already moving towards an environment where scenarios such as these are a possibility, thanks to technical developments and the activities of major information industry players. Several European Commission research and pilot projects are underway in support of these developments. The prospect of an information society has also captured the attention of political and entrepreneurial decision makers.

2. Many countries are now laying the foundations for future development. Initiatives already undertaken in the major industrialised countries such as the USA, Japan, Canada and the European Union will pave the way towards an information society, and further initiatives will follow. A G7 conference will be organised early in 1995 in Brussels to discuss the development of an open, competitive and integrated worldwide information infrastructure.

   The European Union, which has lagged behind the USA and Japan in the digitisation process, is now trying to make up lost ground with a bundle of initiatives including the Common European Information Area, the White Paper on Growth Competitiveness and

Employment, the Bangemann Report and the Action Plan on Europe's Way to the Information Society. These initiatives are important for Europe: they will help the Union to take its place amongst those countries setting the ground rules for the global information society.

3. However, the Bangemann report and the European Council response which followed emphasise the need for the private sector to take the initiative in addressing new markets and adopting new technologies. Having said that, there are a number of questions which still need to be answered:

   - How can the private and public sectors co-operate in building basic infrastructure, especially in those countries of the Union which are less advanced?
   - Once the infrastructure is in place, what kind of services and applications will be delivered?
   - What forces will drive the market for such services?
   - Who will dominate the European information society - is there a danger that non-European media conglomerates will dominate?

   Equally, the likely socio-economic impact of the information society is as yet unclear:

   - What will be the impact on employment?
   - How will it affect regional development?
   - How will the social, societal and cultural environment be affected?

4. The increasing availability of high quality infrastructure will necessitate a mass market for information products and services as a means of generating return on investment and long-term cost effectiveness. The importance and value of the content industry (including print and electronic publishing, films, video, audio and television programme production) is likely to grow as a result. The current repositioning of the information industry, (evidence of which can be seen in the growing number of mergers and acquisitions), supports this view.

   Technology convergence, characterised by multifunctional equipment for users and multimedia products, has led to a re-grouping of IT, software, basic infrastructure and content industries, which are now coming together to exploit the new opportunities. This has helped to create headline news in the form of dramatic take-overs in the media industries and exciting announcements in areas such as Video on Demand. Widespread media coverage of such developments has helped to raise overall awareness of electronic information services within governments and companies and amongst consumers.

The content industry now has a great deal to live up to. The expectations of users have been raised and they are demanding increasingly high standards of information content and presentation. ICT industries look to the information and entertainment services sectors to provide content for running on the computers, consumer electronics goods and networks which are now being developed. Governments across the world are looking to the information industries as a whole to generate employment and stimulate economic growth.

The biggest challenge to the content industry in meeting these expectations will be its ability to invest time, labour and financial resources in the development of innovative information products and services. Such investment will be essential if European content companies are to compete with their counterparts in the USA and Japan, and share the rewards of industry growth with ICT industries.

5. There is still uncertainty over future consumer behaviour and the level of market demand for electronic information services and a clear and stable regulatory framework is still lacking to a great extent. Under these circumstances, it is not surprising to find that content companies have been reluctant to invest heavily in developing electronic superhighway applications.

   The European content industry is faced with particular challenges in that it is made up of a greater number of smaller, less vertically integrated, and more nationally focused companies that its US counterpart. To take advantage of the opportunities which lie ahead, European content companies will often need to enter joint ventures and alliances with companies in other regions. At the same time, policies at a national and European level will be required in order to guarantee the continued availability of diverse, multi-cultural information content, and to strengthen the competitiveness of small European companies.

   Building on the results of the IMPACT programme, the European Commission will reflect on ways to stimulate the creation of favourable conditions for information providers to adapt their skills and products to the changing environment and to stimulate increased usage.

6. The electronic information services industry has high added-value and strong growth potential, but the European market is still fragmented. In the financial and academic sectors, a pan-European market exists to an extent. Elsewhere, a number of barriers still exist to the creation of a European market for information services, not least of which is language. The penetration of information technology and infrastructure varies from region to region and a combination of legal and political barriers exists to the development of pan-European videotex and audiotex interconnections. The overall legal and regulatory framework for the information services industry also varies considerably.

   A certain amount of progress has been made in eliminating these barriers. Efforts continue to seek a technological solution to language barriers, and the European Commission's Language Engineering programme will contribute to this work. There has been greater

communication and collaboration between European network operators. New efforts have been made to create links between European research networks and bi-lateral interconnections between national audiotex and videotex systems. IT equipment prices are falling rapidly and new media and products (like handheld reference devices, multimedia products and Video on Demand) are emerging. The process of trying to reach a European consensus on major legal issues such as the legal protection of databases is underway. All this may facilitate and encourage a greater number of individuals and organisations to participate actively in the emerging information society.

ANNEX A

GLOSSARY AND DEFINITION OF TERMS

ATM (Asynchronous Transfer Mode):
A system for organising a digital signal in such a way as to allow very high speed transmission of the signal while making optimum use of the network's transmission capacity. A standard agreed for B-ISDN networks (see *ISDN*).

AUDIOTEX:
Audiotex is the term for telephone-based voice information services with applications both in consumer (home user) and business markets. Audiotex services are automated and are directly accessible by means of a suitable (Dual Tone Multi-Frequency or DTMF) telephone handset or voice recognition.

BROADCAST SERVICES:
Services where no interactivity is possible on the part of the customer in selecting what is sent by the service provider.

BUNDLING:
`Free' distribution of software as part of a hardware package. The hardware manufacturer buys the software (applications software, CD-ROM titles, games, etc.) in bulk from the producer and markets them as part of a package.

COMMON INFORMATION AREA:
Term used in the EC White Paper on Growth, Competitiveness and Employment to describe the combination of electronic information and applications, hardware and software, communications infrastructure and the user community. The combination of these elements in a Common Information Area is seen to be essential to the development of an Information Society.

COMPRESSION:
The technique of reducing the amount of data in a signal in order to reduce the amount of required transmission or storage capacity, the signal being reconstructed in its original form at the time of use. A device to do this is a `codec' (coder-decoder).

CONTENT SECTOR:
Industries supplying information or entertainment content, rather than hardware or network infrastructure, for example. The sector includes publishing and electronic information, films, music, games, TV programming, etc.

CONVERGENCE:
Term used to describe the coming together of IT, telecoms, content, and other related industries as a result of common technology developments and market aspirations.

DATA SUBJECTS:
Individuals whose names are held on file by third parties - term used in the context of Data Protection legislation.

DATABASE PRODUCER:
An organisation which holds the intellectual property rights relating to the content of electronic information products and services and which may licence host services or distributors to make

available in electronically usable form. Usually the database producers perform the editorial tasks of collection and organisation of the information contained in electronic information services.

DIGITAL TRANSMISSION:
On a digital network, the original source is transformed into and transmitted as a series of digits in binary code (i.e. 0s or 1s). Voice, text, image or data are all equally capable of being coded as a digital signal, so that a single network can handle all four forms of transmission. The string of binary digits can be abbreviated and then re-expanded on arrival, thus economising transmission capacity (see *Compression*). Different strings of binary digits can be interleaved and transmitted together, thus permitting several separate conversations on a single line. The string of digits can be encrypted prior to transmission, to ensure a high level of information security and privacy (see *Security*). Through digitalisation, even a severely degraded transmission can be reconstructed to reproduce perfectly the original source.

DISTRIBUTOR:
An organisation which performs a function similar in nature to that of a host service, but in relation to unitised electronic information products (such as magnetic tapes or disks, or CD-ROMs) rather than information services delivered via telecommunications.

ECONOMIES OF INTEGRATION, SCOPE AND SCALE:
Digitisation and compression enable different infrastructures such as wire, radio, optical fibre and satellite to inter-operate, thus allowing for economies of integration. They also enable the same set of physical infrastructure to support a wide range of services, from traditional telephony to new interactive video services for entertainment, training and business, thus allowing for economies of scope. Extending these networks and services over a larger geographical area, that is making them trans-European, fosters economies of scale as large volumes of production and service provision reduces costs.

EDI:
Electronic Data Interchange, standard format for the exchange of trading data and transactions without manual intervention.

ELECTRONIC MAIL (E-mail):
A service which allows computer users to send electronic messages to other computer users. The use of sophisticated software ensures that the sent message will find its way along different networks until it reaches the addressee.

GATEWAY SERVICE:
A gateway operator provides specialised telecommunications links to on-line information services provided by third parties. `Pure' gateway services are not hosts in their own right.

HISTORICAL DATABASE SERVICES:
On-line services which are not updated in real-time.

HOST SERVICE:
An organisation which offers its customers direct access to computer-held information via a telecommunications link. This definition includes services delivered in videotex mode.

INFORMATION SERVICES INDUSTRIES:
The term `information services industries' embraces a range of commercial and non-commercial activities relating to the creation; publication; and distribution of information goods and services. In the context of this Report, the term carries a rather more precise meaning, relating solely to a subset of those industries which deliver information services to professional (i.e. non-consumer) markets on a commercial basis across a range of information media, from print-on-paper to optical disk.

INTERCONNECTIVITY:
Devices (computers, lines, application programmes, etc.) are interconnected when they can communicate with each other, that is send and receive data. They use the same communication protocols, for example OSI (Open Systems Interconnection).

ISDN (Integrated Services Digital Network), N-ISDN, B-ISDN:
A single network capable of carrying several different types of service - based on voice, text, data, still or moving image - by means of digital transmission techniques. The ISDN currently being deployed in Europe carries a communication of up to 2 Megabits per second (Narrowband ISDN). Future networks will carry higher speed communications (Broadband ISDN).

JPEG, MPEG:
Compression standards for still (JPEG) and moving pictures (MPEG).

LOCAL LOOP:
The section of the telephone transmission network between the local telephone exchange and the subscriber's premises, which currently consists of copper wiring. In the future, optical fibre or wireless will also be used.

MAGNETIC MEDIA:
Tapes and disks of various sizes and formats (including diskettes for personal computers) which use magnetic storage technology.

MULTIMEDIA:
The concept of closely combining voice, text, data, as well as still and moving image. A multimedia database, for example, might contain textual information, images, video clips, tables of data, all equally easy to access. A multimedia telecommunications service (such as B-ISDN) would permit the user to send or receive any of these forms of information.

NETWORK, COMMUNICATIONS:
Communications networks correspond to a complete system of communications between users' terminals. Networks may be `point to point' (the transmission goes from a fixed origin to a fixed destination), `switched' (the transmission is switched so as to reach a single destination out of many) or `broadcast' ( the transmission goes simultaneously to multiple destinations). Networks may be `public' (owned by an operator and open to any member of the public who subscribes) or `private' ( owned or leased by an individual or company or group of companies exclusively for its own use). A network may be `real' (physically separate from the public network) or `virtual' (using public network facilities, which revert to public use when no longer required in the private network).

NETWORK, DATA:
A Data Network is specialised in the transmission of data rather than voice. Among such networks are Circuit Switched Data Networks (CSDN; which include the so-called X.21 networks), Packet Switched Data Networks (PSDN, X.25 networks), Frame Relay networks, Switched Multimegabit Data Services networks (SMDS).

NETWORK, INTELLIGENT:
An intelligent network (IN) includes sophisticated features superior to those of the ordinary telephone service, such as advanced software allowing the customisation of the services provided to individual customers. For example, it allows the called party to redirect calls intended to another terminal (e.g. from a home phone to an office phone during office hours). It allows calls to be billed wholly or in part to somebody other than the caller (`freephone' services). It also provides virtual private network services.

NETWORK, OPTICAL FIBRE:
Optical fibre networks are telecommunications networks based on fine glass fibres, down which signals may be sent by flashing a laser. Compared to earlier `multimode' networks, recent `monomode' networks have a much higher transmission capacity and rapidity.

NETWORK, SPEED OF:
`Speed' or `Flow rate,' when used of a digital network, refers to the number of bits per second it can carry, thus being a measure of the network's capacity. To carry voice, Europe's industry has agreed on a standard speed of 64 Kilobits per second. Still images may also be transmitted adequately at this rate. Full-colour moving images require transmission speeds of the order of 150 Megabits per second, though using various compression techniques moving images (though of less than normal TV quality) can be transmitted at 2 Megabits per second. Trunk connections, which carry many calls at once, require multiples of these speeds.

ON-LINE ASCII DATABASES:
The term `on-line' is deemed to cover all interactive information services delivered by hosts (directly or through gateways) via telecommunications links. Services delivered character by character, rather than page by page or screen-full by screen-full, are distinguished by reference to the internationally recognised ASCII convention for character coding.

ONP (Open Network Provision):
Principle of non-discriminatory opening of telecommunications networks to all telecoms operators and service providers on the basis of the harmonisation of access and usage conditions of telecommunication infrastructures with the view to develop a trans-European information market. The ONP is being applied to leased lines, packet switching transmission services and ISDN, and will be applied to voice telephony in 1998.

OPTICAL MEDIA:
Various types of disc which use optical storage technology, the most common format being CD-ROM.

ORIGINATOR:
The original creator of content materials, for instance an author, composer, artist or photographer.

PDA (Personal Digital Assistant):
A hand-held personal computer with advanced features and communications facilities, where text is introduced by handwriting on a screen (rather than conventionally via a keyboard), also referred to as `notepad' computer.

PSTN (Public Switched Telephone Network):
The everyday telephone network used for the transmission of voice conversations, fax images and for low speed data transmission. The basic voice service is also sometimes referred to as POTS (Plain Old Telephone Service).

REAL-TIME INFORMATION SERVICES:
On-line services which are updated immediately as new data becomes available.

SECURITY (of Information and Systems):
Security has three basic components: confidentiality, integrity and availability. Confidentiality refers to the protection of sensitive information from unauthorised disclosure. Integrity means safeguarding the accuracy and completeness of information and computer software. Availability relates to ensuring that information and vital services are available to users when required.

TCP-IP:
Set of protocols used on the Internet to ensure common communications standards.

TELE-WORKING:
The capability to carry out one's work at any location by means of telecommunications and computing facilities.

TRANSACTION SERVICES:
Services where the principal objective is a transaction rather than the delivery of information, such as EDI services.

VALUE ADDED SERVICE (VAS), VALUE ADDED NETWORK SERVICE (VAN):
In most countries certain basic telecommunications services have been defined and reserved as a monopoly for the national operator. This usually includes voice communication in real-time. Services other than this may be offered by other service suppliers which use the national network as the basic transmission medium but `add value' to the basic transmission facility (e.g. by storing and forwarding the transmission at a later date, by distributing it to multiple destinations, by processing the information contained in the transmission then forwarding the result, etc.). Therefore, what exactly comprise the notions of basic and value-added service depends on the regulatory situation of each country.

VIDEOTEX:
On-line services delivered page by page or screen-full by screen-full, rather than character by character.

VIRTUAL REALITY (VR):
A system whereby the user is supplied with computer-generated images and sounds giving the impression of reality. Virtual in this sense means `apparent', `seeming'. The user interacts with the artificial world by means of sensors which detect head and hand movements. Future work in VR is directed towards increasing the impression of reality, for example by means of 3D images, and transmitting VR `worlds' to users located remotely from the source computer.

WHITE PAPER:
European Commission paper on Growth, Competitiveness and Employment: the Challenges and Ways Forward into the 21st Century. The White Paper was agreed at the Brussels Summit in December 1993.

ANNEX B

ACRONYMS AND ABBREVIATIONS

ADMDs	European ADministration Management Domains
AIM	Advanced Informatics in Medicine
ASCII	American Standard Code for Information Interchange
AT&T	American Telephone & Telegraph
ATM	Asynchronous Transfer-Mode
BAT MAN	Broadband ATM Access Network (Denmark)
BBA	Belgian Broadband ATM
BBC	British Broadcasting Corporation
BREHAT	Brasseurs et REseau à Haut débit en ATM (France)
BSA	Business Software Alliance
BT	British Telecom
CAD	Computer-Aided Design
CCITT	Comité Consultatif International Télégraphique et Téléphonique
CD	Compact disc
CD-i	Compact disc - Interactive
CD-ROM	Compact disc - Read Only Memory
CD-ROM/XA	Compact disc - Read Only Memory/eXtended Architecture
CDTV	Commodore Dynamic Total Vision
CITED	Copyright in Transmitted Electronic Documents (EC Research Programme)
DELTA	Developing European Learning through Technical Advance
DG-XIII	EC Directorate-General for Information Technologies and Industries, and Telecommunications
DRIVE	Dedicated Road Infrastructure for Vehicle safety in Europe
DTMF	Dual Tone Multi-Frequency
EARN	European Academic Research Network
EB	Electronic Book
EBU	European Broadcasting Union
EC	European Commission
ECU	European Currency Unit (BECU = Billions of ECU, MECU = Millions of ECU)
EDI	Electronic Data Interchange
EDICON	EDI in Construction
EEMA	European Electronic Messaging Association
EFTA	European Free Trade Association
EIIA	European Information Industry Association
EITO	European Information Technology Observatory
E-mail	Electronic Mail
ESA/IRS	European Space Agency/Information Retrieval Service
ESPRIT	European Strategic Programme for R&D in Information Technology
EU	European Union
Eusidic	European Association of Information Services
FCC	Federal Communications Commission (USA)

GATT	General Agreement on Tariffs and Trade
GSM	Global System for Mobiles
IBM	International Business Machines
ICSTIS	Independent Committee for the Supervision of Standards of Telephone Information Services (UK)
ICT	Information and communication technologies
IDC	International Data Corporation
IE	Information Engineering
IFPI	International Federation of Phonographic Industry
IFTMR	International Forwarding and Transporting Message Framework
IIA	Information Industry Association (USA)
IMO	Information Market Observatory
IMPACT	Information Market Policy ACTions
ISDN	Integrated Services Digital Network
ISO	International Standards Organisation
IT	Information Technology
ITU	International Telecommunications Union
JANET	Joint Academic NETwork (UK)
JPEG	Joint Photographic Expert Group (ISO)
LAB	Legal Advisory Board
LAN	Local Area Network
LFR	Less Favoured Regions
M&A	Mergers and Acquisitions
MIDI	Musical Instrument Digital Interface
MMC	Monopolies and Mergers Commission (UK)
MMCD	Multimedia CD (Sony)
MPEG	Motion Picture Expert Group (ISO)
NREN	National Research and Education Network (USA)
NSF	National Science Foundation (USA)
OECD	Organisation for Economic Co-operation and Development
OMSYC	International Observatory for Communications Systems
ONP	Open Network Provision
OPIA	Optical Publishing Industry Assessment
PC	Personal Computer
PRS	Premium Rate Services
PSTN	Public Switched Telephone Network
PTO	Public Telephone Operator
RACE	Research & Development in Advanced Communications in Europe
RBOC	Regional Bell Operating Company
RENATER	Réseau National de Télécommunications pour la Technologie, l'Enseignement et la Recherche (France)
RTD	Research and Technological Development

SDI	Selective Dissemination of Information
SGML	Standard Generalised Markup Language
SGN	Stockholm Gigabit Network
SMEs	Small and Medium Enterprises
STM	Science, Technology and Medicine
TEDIS	Trade Electronic Data Interchange System
TFPL	Task Force Pro Libra
UIT	Union Internationale des Telecommunications
VADS	Value Added Data Services
VANS	Value Added Network Services
VAT	Value Added Tax
VIS	Video Information System (Tandy)
WAN	Wide Area Network

ANNEX C

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