EUROPEAN COMMISSION

REPORT OF THE TASK FORCE

"EDUCATIONAL SOFTWARE AND MULTIMEDIA"

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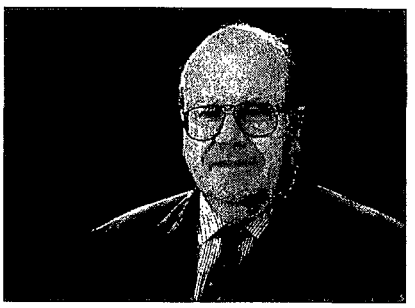
The European Union must confront the challenges of profound social changes and rapid technological innovation, without eroding the rich cultural identity of Europe in a world which is ever more open. European research has a role to play, through its vital contribution to the competitiveness of companies, and through the quality of the tools and services which it produces. But time is pressing. Other regions have already launched actions to put themselves at the forefront of the information society. European research must move without delay to ensure that its results are put at the service of Europe's citizens and companies.

This is why the European Commission decided in March 1995 to establish a Task Force, drawn from research and industry, dedicated to educational software and multimedia, whose mandate was to analyse the status of educational multimedia in Europe, its potential market, its use and to propose lines of action for the European Commission.

The Task Force produced its report in July 1996. Its work will continue on the policy basis of the Council Resolution of 6 May 1996 on educational software and multimedia, in the framework of the "Learning in the Information Society", action plan agreed by the Commission in October 1996 following a request from the European Council. The first call for proposals addressing all relevant programmes will, as a result, be launched on 17 December 1996.

This major mobilisation of the European Commission's instruments will help stimulate the market for European educational and cultural multimedia, will strengthen European industry in this sector, and will allow the citizens of Europe to benefit fully from the potential of new technologies for their education, their training, and more generally to enjoy the richness of their cultural heritage.



Martin Bangemann

Edith Cresson

Preface

The *Industry Research Task Force on Educational Software and Multimedia*, set up on the initiative of Commissioners Edith Cresson and Martin Bangemann, began its work in March 1995 (see Annex 1 for a list of the members of the Task Force).

The field covered by the Task Force concerns the whole of 'Educational Multimedia', that is, educational and cultural products and services which can be accessed via television sets or computers, whether or not connected to telematics networks, used in the home, in educational and training institutions or at work, and offering a high level of interactivity.

The Task Force is also looking into all the Community programmes which could help to strengthen the European Union's position in the educational multimedia domain. These include the Research and Development programmes (Telematics Applications, Information Technology, Targeted Socio-economic Research, International Cooperation, Training and Mobility of Researchers), the education and professional training programmes (SOCRATES and LEONARDO DA VINCI) and the programmes which support the development of multimedia content (MEDIA II and INFO 2000 in particular).

This report has been written in close cooperation with the different actors in the educational multimedia domain (see Annex 1 for the list of people consulted and Annex 12 for a synthesis of the consultations) and draws on the response to the Call for Expression of Interest launched in June 1995.

This report is in two parts. The first part analyses the situation regarding educational multimedia in the different contexts of use (family, schools and universities, and companies). The second part proposes elements for a Community action plan to encourage the development of educational multimedia in Europe.

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The availability of broadband networks at affordable prices towards the end of the century will promote the growth of new top-end educational multimedia services, provided European industry ensures the availability of user-friendly and affordable telematics applications to individual learners in the home environment.

STATEMENT N° 2

European commercial suppliers

European suppliers of educational multimedia are made up of a few large industrial groups and a myriad of small enterprises. Despite its strength, the European educational multimedia industry, apart from a few exceptional cases, is not succeeding in imposing itself inside or outside Europe. Production which addresses itself both to the school and the home markets, destined for the European and indeed international markets, and close cooperation between European enterprises and actors are both perceived as a necessity. From this perspective, the Community programmes which are designed to bring together different actors and to stimulate trans-European projects, have an essential role to play.

STATEMENT N° 3

Primary and secondary education: great potential

Numerous experiments have shown the educational value of multimedia. However, there are several obstacles to the widespread use of educational multimedia in schools :

- *the lack of user-friendly multimedia equipment and software for teachers and pupils,*
- *insufficient quantity of equipment, which is often technically obsolete, sometimes insufficiently used, and rarely connected to telecommunications networks,*
- *insufficient quantity and quality of educational software adapted to the needs of users,*
- *the difficulty of integrating educational multimedia into teachers' educational practice,*
- *the lack of teacher training and information.*

STATEMENT N° 4

Universities: a laboratory for new forms of education

As a general rule, universities produce internally, and for non-commercial purposes, multimedia educational products for high-level training. They are increasingly turning towards the use of broadband telecommunications networks for the distribution of courses and joint research. However, in the mid 1990's, the costs of equipment and multimedia services and associated high telecommunications tariffs still impede the spread of educational multimedia in universities.

STATEMENT N° 5

Multimedia - facilitating innovation in teaching methods

Multimedia has demonstrated its pedagogic efficacy in numerous pilot experiments. Its use in day to day teaching practice can only be achieved if innovative teaching processes receive a better reception both by educational institutions and by society at large. This is how multimedia will find its place in the context of the evolution of the systems of education.

STATEMENT N° 6

Vocational training: varied needs

Many large companies resort to educational multimedia, usually "customised", for training supervisory personnel, engineers and technicians. On the other hand, the use of the technologies is still not very widespread for training other categories of personnel or for training in SMEs - this is mainly due to reasons of high costs and the lack of usability of educational multimedia. The initial and continuing vocational training bodies are insufficiently equipped with hardware and appropriate multimedia resources.

PART TWO
RECOMMENDATIONS FOR A COMMUNITY ACTION PLAN

RECOMMENDATION N° 1

Mobilising objectives for all

Given what is at stake, Europeans should mobilise at all levels of action - local, regional, national and Community - to ensure that, by the year 2000:

- *every teacher can incorporate multimedia materials in his/her teaching practice; be entitled to easy access to the available networks; and benefit from good terms and conditions of use and especially from pre-training,*
- *every pupil has access to quality multimedia learning resources at school, a particular effort being made in favour of disabled children. This means that every primary and secondary school must have at least one multimedia microcomputer per class, connected to a local area network , which is itself connected to a national and trans-European telematics network, allowing links to be established between pupils and teachers or access to on-line learning services to be offered;*
- *every adult has access to quality multimedia resources for his/her personal and professional development;*
- *every university has access to the very high-speed networks needed for exchanging and using multimedia educational materials with high-quality images;*
- *every public library or public arts/cultural centre offers, free of charge, opportunities for access to multimedia resources, so that all citizens can benefit from information services, arts and cultural activities, and education and training facilities;*
- *every company, no matter what its size, has access to a centre for quality multimedia educational resources, thereby creating a virtual "open university for industry".*

RECOMMENDATION N° 2

Debating these mobilising objectives at all levels of action

All the partners concerned, at all levels of action, should contribute to the awareness campaign needed to achieve a consensus on these mobilising objectives, for example :

- *by applying the multimedia educational software resolution adopted by the Council of Education Ministers, 6 May 1996 (see Annex 5),*
- *by expanding the debate around the White Paper on "Teaching and Learning - towards the Cognitive Society" (December 1995),*
- *by seizing the numerous opportunities offered by the European Year of Life-Long Education and Training (1996),*
- *by promoting the use of the tools of the information society in all learning situations, in particular in the framework of the initiative "Learning in the information society", launched in April 1996 by Commissioners Cresson and Bangemann, and supported in June 1996 by the European Council in Florence.*

RECOMMENDATION N° 3

Mobilising and co-ordinating the Community instruments

The subject of educational multimedia is tackled in many different Community programmes, in particular, the RTD&D programmes (Telematics Applications, Information Technologies, Socio-economic Research, Training and Mobility of Researchers and International Co-operation), the education and training programmes (SOCRATES and LEONARDO DA VINCI) and the programmes for content development (INFO2000, MEDIA II, RAPHAEL). These programmes should identify, in the presentation of their work programmes, the aspects relevant to educational multimedia, and improve the structure and coordination of their activities in this domain. To meet to the need for simplification and transparency of the procedures, which has been expressed in particular by the SMEs, the Commission should launch a first common Call for Proposals, 15 December 1996.

RECOMMENDATION N° 4

Priorities for the Telematics Applications programme - "Education and Training" sector

a) New applications, *which are both easy to use and affordable, would need to be developed to assist teachers and trainers in the use and management of high quality, open educational multimedia, accessible either locally or via network connections (including broadband networks).*

b) Technically and pedagogically innovative, advanced educational multimedia applications *- should be validated in real life situations to meet the needs of teachers, trainers and learners.*

RECOMMENDATION N° 5

Priorities for the "Information Technologies" programme

The following priorities, whose impact on educational multimedia is direct, should be considered in the context of the "Information Technologies" programme:

(a) Technological development of low-cost platforms for education and the public at large, top-end platforms for simulation, software platforms for the production and distribution of advanced development tools.

(b) Quality control: methods and procedures evaluating the technical quality of the educational software; institutions and infrastructure for checking and certifying quality procedures.

(c) Infrastructure: recourse to the "Multimedia Support Centres" and to the World Wide Web as advice structure for the production of educational software and to stimulate its dissemination throughout Europe.

RECOMMENDATION N° 6

Priorities for the "Targeted socio-economic research" programme

The "Targeted socio-economic research" programme should conduct research into the cognitive aspects of new technologies, to enable production of tools well suited to learning, and also research on the socio-economic factors which will influence the deployment of multimedia educational software.

RECOMMENDATION N° 7

Priorities for the International Cooperation programme

RTD&D projects in the multimedia education and training area, addressing the education and training needs of developing countries, should be launched in the area of "Scientific and Technical Cooperation with Developing Countries".

RECOMMENDATION N° 8

Priorities for the "Training and mobility of researchers programme"

The programme should pursue, according to its "bottom-up" strategy, the financing of proposals, which meet the programme criteria, in the educational multimedia domain, and also should study possible accompanying measures which exploit telematic and multimedia means for distance training, in particular for the less favoured regions of the European Union.

RECOMMENDATION N° 9

Priorities for the SOCRATES programme

Over and above the activities pursued within the general framework of SOCRATES, the following additional activities are suggested:

- *carry out a comparative analysis and extract best practice from pilot experiments with educational multimedia in Europe and around the world, disseminating the results to the Member States;*
- *identifying and stimulating services which can be developed at the European level to synergise the results of these experiments so as to reinforce the European dimension of education and diffusion of information (for example by the development of an information network which will give users easy access to a catalogue of producers of educational multimedia software and services available in Europe), and supporting initiatives leading to the exchange of best practice;*
- *support for the exploitation of the opportunities educational multimedia offers, particularly in the areas of language teaching, science and technology, Europe's cultural heritage, and other areas which contribute to the development of European citizenship;*
- *develop cooperation centred on existing or developing "multimedia reference centres" at the primary and secondary level so that the impact on student and teacher of improved access to multimedia and use of new teaching methods can be assessed;*
- *support experimental projects to network multimedia support centres and educational establishments in Europe, and for mutual recognition of qualifications acquired outside the conventional educational framework;*

RECOMMENDATION N° 10

Priorities for the LEONARDO DA VINCI programme

The LEONARDO DA VINCI programme could, in particular, undertake specific activities concerning the exchange and dissemination of information relating to multimedia training software and services, and promote association between users, producers and service providers with the objective of improving the quality of the products. It could also encourage support training activities aimed at software creators and trainers to ensure that the various needs are better taken into account and the software is properly integrated into the educational environment. Finally, it could promote the development, evaluation and deployment of types of innovative software within the contexts of teleworking, teletraining and new types of support to disabled people or people with particular learning difficulties.

RECOMMENDATION N° 11

Priorities for the MEDIA II programme

The MEDIA II Programme should support training initiatives aimed at creators and publishers of audio-visual materials enabling them to exploit new multimedia technologies and to carry out the cultural adaptation of existing titles.

This programme should also support the development of co-productions, which could include multimedia professional, educational and cultural programmes, and the networking of firms presenting common development projects of international importance in the multimedia sector for the European and international markets.

RECOMMENDATION N° 12

Priorities for the INFO 2000 programme

The INFO 2000 programme should support projects aimed at:

- *encouraging production of multimedia content, which will be used to develop educational multimedia software,*
- *mobilising users by easing access to multimedia content,*
- *optimising the framework for negotiating multimedia IPR,*
- *improving use of public information by constructing and connecting directories.*

RECOMMENDATION N° 13

Structural Funds and Trans-European Telecommunications Networks

A more significant proportion of the Structural Funds' resources could be allocated to setting up infrastructures (telecommunications networks, equipment of education and training centres) needed to make use of educational multimedia products, and to training activities making use of educational multimedia products. Similarly, some of the funds dedicated to the Trans-European Telecommunications Networks (TTN) could support the deployment of applications which have proven their teaching effectiveness and economic viability.

RECOMMENDATION N° 14

Cooperation with Third countries

A significant proportion of the resources available on the international cooperation budgetary lines could be directed towards actions to make multimedia educational materials available to the populations in question.

RECOMMENDATION N° 15

The legal protection of IPR should develop in a way that ensures that authors of multimedia titles are not faced with time consuming and expensive procedures in order to protect their work. Owners and publishers of multimedia works should be motivated to construct "one stop shops" to facilitate access to multimedia titles.

Introduction

In order to prepare Europeans to meet the challenge of the Information Society, educational and training systems have to set ambitious objectives: to offer quality lifelong education and to meet the ever growing and diversifying needs[1]. Against a background of budgetary constraints and increasing competition, education and teaching institutions as well as companies have to meet these challenges cost-effectively. Such a constraint compels them to seek out new educational tools and to use new and adapted learning methods.

Educational multimedia can help in the response to this double challenge by facilitating the individualisation and flexibility of learning. A wealth of past experience has shown this, in primary and secondary education, at university or in vocational training. From now on, it is a question of encouraging and developing products and services which are easier to use, at affordable prices, and meet the needs of users.

Companies involved in Educational Multimedia have to pursue a similarly ambitious objective, to re-reinforce their competitiveness both in European and international markets. This objective is even more difficult to reach as the market is particularly fragmented. On the demand side, the market is made up of a heterogeneous assortment of consumers: individuals, companies and public institutions. On the supply side, the market is characterised by a variety of sectors: information and communication technologies, publishing and audio-visual.

The stakes are high. They include, in the first instance, the employment of Europeans. Educational multimedia, thanks to the improvement in education and training it helps to bring about, facilitates a better match between professional profiles and employment and helps to reinforce the competitiveness of the European economy. It also constitutes a new source of high quality employment, notably in the sector concerned with the creation and production of multimedia content (see Annex 2).

The diffusion of European culture is also at stake. Multimedia technology allows the production of content which can be adapted to different cultures and languages. It allows the exploitation and sharing of European cultural heritage. In sectors such as education, training and culture, which play a key role in determining the outlook of European citizens, it is this European identity which is at stake. Only a strong educational multimedia industry, exploiting the most advanced technologies, can contribute to affirming this European identity and to diffusing European culture throughout the world.

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[1] These include such diversified needs as those of children in very different social and cultural contexts, those of adults with very different backgrounds who need re-training, but also those of disabled people, pupils and students living in rural areas or the employees of small companies.

PART ONE

SITUATION AND PROSPECTS IN THE MID-1990's

Chapter 1

The Emergence of Educational Multimedia in the Home

Carried along by the growth of multimedia in the field of leisure, "edutainment"[2] and games, educational multimedia is spreading rapidly among the public at large, especially families with children.

1.1. HARDWARE IN THE HOME

The first home microcomputers appeared in the late 1970's. They were usually mutually incompatible, but enabled a whole generation to familiarise itself with micro computing and programming.[3] From 1985 onwards, the so-called "proprietary" systems - systems confined to running the manufacturer's own software - gradually lost ground to the *PC-MS/DOS* standard established by the North American pairing of *IBM* and *Microsoft*, which has since dominated the home microcomputer market. In the early 1990's, the microcomputer market found its second wind with the appearance of *CD-ROM*, offering sufficient storage capacity to make multimedia use a possibility.[4]

At the same time, various manufacturers decided to focus their efforts on intermediate products, between the games console and the microcomputer. The best known of these is the *CD-i* from *Philips* which, at a significantly lower price than microcomputers of equivalent capacity, aims at the home education, culture and leisure market.

In 1995, the average number of families owning a microcomputer in Europe was 19%, ranking second behind the United States (35%) but ahead of Japan (10%). In this market, the number of owners of multimedia hardware increased very rapidly from 1994 onwards: in Europe, the number of *CD-ROM* drives rose from 2.7 million to 9 million between 1994 and 1995[5], and is expected to reach 25% of homes or 35 million units by 1998.

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2 A neologism coined by combining the English words "education" and "entertainment", and used to describe products which combine these qualities.

3 The best known of these computers, the ZX81, launched by C. Sinclair in the United Kingdom, was to be enormously successful and helped to train a generation of British programmers.

4 The storage capacity of a CD-ROM is equivalent to 14 minutes of video or 250,000 pages of text.

5 INTECO Report, "*Multimedia in the home*", 1995

However, although prices for multimedia hardware are falling, they are still high enough to deter many households, whereas high-income families are beginning to acquire second PCs[6]. In addition, technical incompatibility between the hardware products available on the market means that using multimedia products is still a difficult task for the uninitiated consumer.

The number of households with a modem enabling them to connect their microcomputers to telematics networks is still low (1% in France and Italy, 3% in Germany, 4% in the United Kingdom) but is increasing rapidly, especially in the United States, where the number of homes with a modem doubled to 15% between 1994 and 1995.[7] The high cost of telecommunications in Europe is doing nothing to encourage family use of on-line services.

USES IN THE HOME

In the 1980's, the microcomputer was mainly a machine for playing games and learning to program, used mainly by adolescents and especially by boys. Today, in the 1990's, it has become the machine for all the family, used as much for professional and school work as for cultural enrichment and gaming. The interest shown by families in educational and cultural multimedia reflects the new concerns of parents. On the one hand, parents are conscious that these products offer an alternative to the passive consumption of television programmes. On the other hand, many of them are anxious about their children's futures, and invest in educational products and services in the hope of providing their children with optimum opportunities for professional and social integration.

The best-selling software in Europe comprises encyclopaedias and cultural works of European or North American origin (*Encarta* from *Microsoft* or *Le Louvre*, produced in France by the *Réunion des Musées Nationaux*) or works of discovery for young children (*The Way Things Work* from the British company *Dorling Kindersley, Math Blaster* from the American company *Davidson* or *ADI* from the French company *Coktel-Vision*). These are top-end software packages from a technical viewpoint, combining a rich multimedia content - text, images and video sequences - with a high level of interactivity.

Private individuals are also taking an interest in on-line services - services which can be accessed via the telematics networks, usually for a cost of around ECU 15 per month. The number of subscribers in the United States[8] increased by 87% in 1995[9], and a number of similar services were launched in Europe during 1995: *America On Line Europe (Bertelsmann-AOL), Grolier Interactive (Matra-Hachette), Europe On Line (Burda-AT&T), Infonie (Infogrames), T-On Line (Deutsche Telekom), Italia or UK On - Line (Olivetti).* Finally, a wide range of educational services are also offered free of charge on the *World Wide Web*. By the mid-1990's, these services are still rudimentary and usually confined to text, without images or sound. Moreover, access to educational

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6 The average price of the multimedia PC in 1995 is about ECU 2000, to which must be added ECU 50-80 to purchase a CD-ROM.

7 Source : *European Information Technology Observatory*, 1995.

8 Each major network offers home support services for pupils: Homework Helper on Prodigy and Academic Assistance Center on America Online.

9 Information Market Observatory (IMO), European Commission, February 1995. Rentals of basic on-line services by individuals rose 87% in the US in 1995, according to an Electronic Information Report.

multimedia available notably on the Internet, is still too complicated and onerous for the majority of potential users.

In any case, the availability towards the end of the century of high bandwidth networks at affordable prices, together with progress in research and development of user-friendly and affordable telematics applications, ought to encourage the development of genuine multimedia services.

STATEMENT N° 1

The emergence of educational multimedia in the home
Stimulated by the steady fall in multimedia equipment prices, the mass market for educational multimedia - both products recorded on optical disks (CD-ROM and CD-i) and services which can be accessed by the telematics networks - cannot fail to grow rapidly in the mid 90's.

The availability of broadband networks at affordable prices towards the end of the century will promote the growth of new top-end educational multimedia services, provided European industry ensures the availability of user-friendly and affordable telematics applications to individual learners in the home environment.

1.2. COMMERCIAL SUPPLIERS IN EUROPE : A FEW MAJOR GROUPS AND NUMEROUS SMALL BUSINESSES

To meet the demand for educational multimedia products and services, Europe can call upon a few major industrial groups and a great many very small businesses. The big companies are to be found in five sectors of industry: information technology, consumer electronics, communications, publishing and audio-visual.

The big **IT and consumer electronics** companies are not very active, apart from the Italian company *Olivetti*, which is developing new terminals for the general public[10], and the Dutch company *Philips*, which is a prominent publisher and distributor of multimedia products.

The **telecommunication** operators, *France Télécom, British Telecom* and *Deutsche Telekom* in particular, and the **cable network** operators too, are becoming more and more interested in the education and training sector: telecommunication tools such as video conferencing are being used in vocational training, while primary and secondary educational institutions are beginning to equip themselves for network access. Cable network operators in the UK are undertaking to link 18,000 schools before the end of the century[11] at no extra cost, while telecommunications operators in France and Germany also participate in national schools networking projects[12]. These operators are exploring new

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10 "Envision" terminal launched in 1995. Olivetti is also developing, with Acorn, a "network computer", a simplified terminal which makes it possible to "navigate" on the networks and is to be marketed in mid-1996 at a price of around ECU 400.

11 From the framework plan for "Cable in the Classroom" launched by the *Cable Communications Association* in February 1995. By the end of 1995, 500 schools were already connected to local area networks.

12 *Deutsche Telekom* is contributing to the "Schools on the Net" initiative launched at the beginning of 1996 and *France Telecom* will connect the teaching centres of 13 academies to

services aimed at families: pilot experiments were launched in England in 1995 (Colchester and Ipswich), France (Multicâble in Paris) and Germany (Stuttgart).

Eager to penetrate the market for the products put out on their networks, some of them are buying production or broadcasting companies.[13] Operators of proprietary networks such as *America Online, Compuserve, Europe Online* and *The Microsoft Network*, and suppliers of *Internet* access such as *EUnet*, are also looking for alliances with software providers.

Among software producers are major **publishing and printed media** groups such as *Matra-Hachette* in France, with a high profile in academic publishing, *Bertelsmann* in Germany, *Pearson* in England, the *Egmont Group* in Denmark and *Giunti* in Italy. Operators in the **audio-visual** sector, such as the *BBC* in Britain, *RAI* in Italy and *La Cinquième* in France, are also trying to establish a position in the educational multimedia market[14].

However, the majority of European production of multimedia educational software comes from a very large number of micro-enterprises[15], offshoots of the IT and publishing industries or sometimes also of the education sector. They are distributed throughout the territory of Europe, and largely dependent on the local market. Many of them are specialised publishers or developers operating in the educational institutional market or various niches in the vocational training market. Others specialise in the linguistic and cultural adaptation of multimedia products, most of which are still of American origin, to the various national markets. It often happens that these small producers are bought up by large groups - not only European but also American - looking to establish a foothold in the marketplace or to strengthen their market positions[16].

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the *Renater* research network (Inter ministerial Committee on Information Highways and services, October 1995).

13 In 1994 and 1995 France Télécom bought *Media-Concept, Tribun, Stud-I* and *Computer-Channel*, all four of which produce or broadcast vocational training resources.

14 Sacis International, an affiliate of RAI, is publishing CD-ROMs for the mass market and *La Cinquième* intends to co-publish CD-ROM for schools.

15 For example, the 39 enterprises which are active in the Norwegian multimedia sector employ an average of 4 people each.

16 This happened, for example, with the German company *Heureka*, which was bought by the educational publisher *Ernst Klett*, or the French *Arborescence* which was merged into the *Havas* communication group. There are also cases of successful small companies being acquired by non-European companies: recent examples include the French *Coktel Vision* being bought out by the American *Sierra*, or large numbers of small British developers specialising in video games that were bought up by the American and Japanese majors *Nintendo*, *Sega* and *Electronic Arts*.

1.3. EUROPEAN COMMERCIAL SUPPLIERS: STRENGTHS AND WEAKNESSES

European Commercial suppliers of educational multimedia have fallen behind those in the United States. A number of factors helped to bring about this situation: European demand is limited by the small number of households and teaching institutions which have their own computer equipment. It is further fragmented for cultural, linguistic and institutional reasons - with different curricula in each Member State. Producing multimedia software is costly in terms of time and investment[17], and to this must be added the high cost of acquiring copyright, which is even more difficult for small businesses as the purchase procedures are lengthy and complex.

European SMEs (Small and Medium sized Enterprises) are also handicapped by having to operate within a less favourable financial environment than their American counterparts. In the United States, where what is literally a risk capital culture has grown up, they have greater facilities for access to capital, especially in the specialised NASDAQ[18] market. In Europe, on the other hand, investors are still not very aware of the prospects for educational multimedia or the benefits of financing lightweight structures creating products which, through their intrinsic quality (educational products develop less quickly than video games), would have a sufficiently long period available to become profitable.

The American industry, which can draw on a large market, clearly has a substantial economic advantage in tackling the European market, where it is actively seeking out new opportunities[19]. European manufacturers first perceived the fragmentation of the European area as an advantage, enabling them to be best placed to make allowance for specific local cultural features; later they have seen it as a disadvantage, the markets proving too narrow to enable them to recoup high production costs. European industry, then, needs to be able to maintain the advantages of being close to its users without cutting itself off from bigger markets in Europe, Japan and the United States.

To withstand the impetus of American competition, Europe has to rely on a network of small creative enterprises, well established locally, and a few large industrial groups in publishing, audio-visual services, information technology and telecommunications. Cooperation between European producers, whatever their size and whether they are operating in the mass market or the educational or training sectors, is generally perceived as a successful approach[20]. It will enable them to acquire the technical or business skills they lack and to extend their market. Small companies, in particular. feel the need to associate themselves with publishers or distributors in order to spread their products beyond their local markets. Thus, for example, the Dutch company Philips has joined in partnerships with over 300 European SMEs.

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17 The average cost of manufacturing multimedia educational software is between ECU 100 and 300,000. It can exceed ECU 700,000 for prestige products. thus coming close to a top-end video game. In this case, and given the distribution costs, the sales volume would have to exceed 40,000 copies at an average unit price of ECU 50 before the enterprise would be able to make a profit.

18 National Association of Securities Dealers Automatic Quotation.

19 American companies are less deeply involved in this sector than in the gaming sector, although they are beginning to implement more European strategies (see annex 13).

20 This analysis is confirmed by the producers consulted during the Task Force hearings.

The Community programmes for supporting research and development or the preparation of content seem to be suitable instruments for stimulating this cooperation. Simplifying procedures would enable companies, especially SMEs, to benefit more extensively from this support.

1.4. EUROPEAN COMMERCIAL SUPPLIERS : PERSPECTIVES

In 1996, European industry produced primarily for the general public and investment in the institutional sector was not regarded as especially worthwhile mainly because of its primitive equipment and its fragmented nature. Nevertheless, this sector ought to attract the attention of many European companies thanks to new initiatives from the public and private sectors, in most Member States, to equip schools with multimedia tools, to connect them to networks and to educate and raise awareness among teachers. Market growth can only be brought about by continuity of use.

BROADENING THE MARKET GROWTH THROUGH CONTINUITY OF USE

As far as software content is concerned, nothing should restrict multimedia products and services from being developed for broad re-usability, with adaptation and adequate distribution systems, both for home and school use. Nor is there any reason why products used in professional training environments, should not be used in basic vocational training[21]. Indeed, in a society which promotes lifelong learning and training, such re-usability ought to be commonplace.

Targeting the European home market using flexible high-quality teaching products and services will help European industry to better position itself to address the needs of the institutional market as and when its development requires. This was a strategy adopted by the leading US educational multimedia content-providers (*The Learning Company*[22], *Broderbund* or *Davidson* most notably) so that catalogues of titles could be used in the home as well as in the schools market. Eventually, this development could have a positive effect on the whole market thanks to the exemplary power which educational institutions exert over families[23].

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21 Thus, in the framework of its *Schools 2000* project, *Philips* is distributing its commercial products with supporting user manuals to UK, Belgian and Dutch schools.

22 The attempts at software re-sale by *The Learning Company* have made it the premier content-provider in the US schools market. *Broderbund*, after its acquisition by *Sofkey*, prompted interest in the industry which was hitherto fore focused on the general commercial market to concentrate more on institutional markets. *Sofkey* is also a partner of *TCI*, a top US cable network operator developing on-line educational material.

23 *Acorn* and *Apple* decided to seize this opportunity and, in 1996, entered into a joint venture to develop diverse tools for the UK education market. With regard to the provision of services, the opportunity has been seized by UK cable operators who, in February 1995, launched an initiative to connect most schools to networks at no cost.

The enlargement of the market can be achieved by aiming production directly at the European, and indeed international customers. This strategy is the one adopted by the principal European content-providers[24]. Products and services with a universal and multi-disciplinary character and European interest are potentially of interest to all Europeans[25]. Questions of linguistic and cultural adaptability should therefore be taken into account from the time of the design of the products and services.

CO-OPERATION FOR WIDESPREAD AND HIGHER QUALITY MULTIMEDIA

Co-operation between producers, large companies and small specialised enterprises will allow advantage to be taken of Europe's cultural and linguistic heritage and to propagate it beyond Europe's borders, thanks to the strength of Europe's major publishing and communication companies. European producers can co-publish, adapt and distribute their products and services using the networks developed at European and international level. This co-operation will contribute to taking advantage of the assets of SMEs (close to the user and adaptable to the evolution of the market), in market niches, in particular the professional training sector

This partnership between large and small companies should accompany a private-public sector partnership involving teachers and trainers. One effect of this co-operation would be that it would allow advantage to be taken of the creativity and experience of teachers and trainers already involved in multimedia educational production for their own needs. On the other hand, it would also allow the development of products for the general public which would also answer the needs of the education and training institutions.

This co-operation should also encourage, alongside the usual distribution mechanisms for the consumer market, putting in place networks adapted to the specific needs of the institutional sector. Such co-operation should be based on local dynamics and gradually develop on the broader European level.

STATEMENT N° 2

European commercial suppliers

European suppliers of educational multimedia are made up of a few large industrial groups and a myriad of small enterprises. Despite its strength, the European educational multimedia industry, apart from a few exceptional cases, is not succeeding in imposing itself inside or outside Europe. Production which addresses itself both to the school and the home markets, destined for the European and indeed international markets, and close cooperation between European enterprises and actors are both perceived as a necessity. From this perspective, the Community programmes which are designed to bring together different actors and to stimulate trans-European projects, have an essential role to play.

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24 UK Publisher *Dorling Kindersley* is distributing its products in Europe with the help of other European publishers but also in the US under its own brand name.

25 The acquisition of living languages, reading, sciences, history, geography, economics, culture and music etc.

Chapter 2

From School to University : Multimedia Education for All

Today, multimedia technologies are available in most European universities. However, there are still numerous obstacles to prevent their use becoming widespread in primary and secondary educational establishments, although pilot projects have already shown the pedagogical effectiveness of multimedia resources.

2.1. PRIMARY AND SECONDARY EDUCATION : GREAT POTENTIAL

In our societies, educational institutions occupy a central position. Their function is to promote equality of opportunity, to propagate democratic values and to strengthen the sense of belonging to a group and to a culture - whether local, regional, national or European. This function of socialisation and cultural identification is becoming particularly important in a society where family ties are becoming weaker, traditional socialisation networks are losing their influence and national frontiers are falling before the globalisation of the economy.

In the Information Society, the risks of isolation and failure to adapt on the part of individuals could, paradoxically, be increased if schools were to fail to adapt their mission to their new environment. For economic reasons, many families cannot spare the ECU 2,000 or so which it now takes to purchase a multimedia terminal. It thus becomes important, to prevent the risk of social exclusion, for schools to be able to make educational multimedia accessible to all. In order to achieve this objective, it is necessary to provide the educational institutions with equipment, to improve familiarity with the use of multimedia resources, to put in place the necessary learning environment and to ensure that teachers are provided with training and information on how to integrate these new tools into their teaching methods.

PROMISING PILOT TESTS

Studies and experiments have been carried out both in Europe and in the United States for more than 15 years. The available analyses clearly emphasise the potential of educational multimedia. In the United Kingdom, for example, the *National Council for Educational Technology* summarised[26] these areas of potential, drawing on numerous studies and assessments: motivation of pupils who can make no progress with traditional methods, reduction of the overall risk of failure, stimulation of thought processes and a taste for reading and writing, allowance for individual needs and capabilities, etc. The studies have also identified the conditions under which the teaching potential of educational multimedia can be realised: long-term access to multimedia resources for pupils and teachers, reorganisation of space and timetable, teacher training, etc.

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26 NCET, *Information Technology: stimulate to educate*, 1994 See Annex 3 for a full list.

In the United States, a study undertaken at 59 schools in 23 different states[27] identified the quantitative and qualitative effects obtained by introducing computers into teaching practice, in terms of both pupil performance and teacher satisfaction. In a sample of 153 schools in Kentucky, it was found that introducing computers into classes had made it possible to halve, between 1981 and 1989, the number of pupils unable to progress.

Nevertheless, progressing from the stage of successful experiment to that of generalisation is one of the major challenges confronting European educational systems at the end of this century. The extent of the task is illustrated by the following data: There are in the European Union, 67 million pupils, 4.5 million teachers and 350,000 schools.

THE NEED TO IMPROVE THE EQUIPMENT LEVELS IN INSTITUTIONS

Educational institutions began to be equipped with computer hardware as a result of the stimulus provided by the national policies launched in most European countries in the mid-1980's.[28] These major equipment policies gave way, in the early 1990's, to supplementary schemes, most of them run on a decentralised basis by municipal or regional authorities. During this second wave, the PC became the general standard in school microcomputer equipment[29]. The number of computers per pupil has increased steadily, especially in secondary education.

Despite these efforts, the average provision of computer terminals in educational establishments is still low: in 1994 the average number of computers per 100 pupils was 2 in Germany, 3 in France and the Netherlands, 5 in Denmark, as compared with 10 in Sweden, 11 in the United Kingdom and the US and only 2 in Japan[30]. Furthermore, numbers of machines in place have already been technically surpassed. In the US in particular, a large number of micro-computers in schools are *Apple II* which are of limited use for multimedia applications. Similarly, in Europe, some schools are still using first generation machines, in use since 1985. This equipment is often under-exploited, primarily because of technical problems but also because of insufficient backup support.

Unlike the US, where 49% of secondary schools and 30% of primary schools have Internet access, although only 3% of classes are connected[31], the connection rate among European educational institutions today is comparatively low, except in a few countries such as Iceland and Norway.

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27 "Celebrating Success", Lud Braun and Talbot Bielefeldt, International Society for Technology in Education, April 1995.

28 In France, the *Informatique pour tous* [IT for all] plan envisaged equipping all primary and secondary educational establishments with one or more microcomputers. At the same time, other programmes - *Microelectronics* in the United Kingdom, *Minerva* in Portugal, *Atenea* in Spain and *Plano informatico nazionale* [National Information Technology Plan] in Italy - were pursuing similar objectives.

29 The situation is very different in the United States. *Apple*, first with *Apple II* and then with *Macintosh*, has always occupied a dominant position in school equipment

30 Japan should rapidly catch up with Europe following a national equipment policy in 1990

31 1995 Study by the National Centre for Education Statistics.

In the mid-1990's, however, most Member States initiated policies to stimulate the introduction of educational multimedia in schools. In 1994 and 1995, the *Department for Education* in the United Kingdom allocated an annual budget of MECU 6 for the purchase of multimedia PC stations and CD-ROMs for teaching purposes[32]; about twenty pilot projects for the networking of educational institutions were announced[33]. In April 1996, Germany announced a programme to connect schools. The programme will last three years and is co-financed by the Federal State and *Deutsche Telekom* to the sum of MECU 31. This programme will grant free access for 10,000 schools to certain commercial on-line services and Internet facilities in order to further student education.

Similarly, the Italian Ministry for Public Education announced a plan in 1995 for equipping schools with multimedia stations. Finland, for its part, has set itself the objective of connecting all its educational institutions to the national network and to the Internet (see annex 4).

The funding required for improving institutional equipment levels is very substantial. The necessary investment for equipping every classroom in the entire European Union with a multimedia station would amount to a total expenditure of the order of ECU 4,000 million, while providing one terminal for five pupils would involve an expenditure of ECU 20,000 million[34]. These figures have to be seen in the context of an annual expenditure on education which was estimated at ECU 360,000 million for the year 1994.

Apart from these problems of finance, the rapid evolution of technology makes the decision-makers' task more difficult. 1996 will see the market launch of terminals which, though less sophisticated than PCs, are adequate for navigating the networks and gaining access to on-line educational multimedia. These "network computers"[35] (NC), announced by the North American companies *Sun, Microsystems*, *Oracle, IBM* and *Apple* and the British *Acorn*, (*Olivetti Telemedia*) should cost only about a quarter of the price of a stand-alone multimedia PC. They should be of particular interest to schools, though it is unlikely that they will replace PCs in the short term.

In order to overcome these obstacles, different paths are being explored in Europe, as in the US:

- Leasing of equipment with service contracts for the maintenance of equipment and user-support.
- Tax incentives for equipment providers and multimedia service-providers who arrange special rates for educational institutions.

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32 The CD-ROM initiative in Primary Schools - National Council for Educational Technology, 1995.

33 Superhighways for Education. The way forward. Department for Education and Employment, 1995.

34 According to the March 1995 report by the US *Office for Technology Assessment* (Report of the Secretary's Conference on Educational Technology) the total investment necessary to acquire multimedia terminals in a proportion of one computer for every five pupils would probably amount to 11% of the annual education budget. This sum also includes the network connection fees and all associated operating expenditure (installation, maintenance, training and software).

35 'Network computers', or 'Internet terminals', are simplified terminals which allow you to access, via Internet, software or information stored on networks without needing hard disks which are normally indispensable on PCs for storing the required data.

- Free equipment provision for schools in exchange for after school hours use of the school premises by the providers for their employees' training.
- Relocation of unused equipment from public administrations to schools, similar to that which took place in the US following the *Executive Order* issued by President Clinton on April 17, 1996.
- The creation of a fund to enable partnerships to develop between the public authorities and the private sector (as in the US where a fund of MECU 1.6 was created under the framework of *America's Technology Literacy Challenge* launched in February 1996 for 5 years).
- Special rates for educational institutions (as exemplified by the American *Telecommunications Act,* February 1996).

EDUCATIONAL SOFTWARE STILL IN SHORT SUPPLY

Policies of purchasing, or supporting the production of, educational software represents, together with the training of teachers, the second principal back-up measure in support of the policies of providing equipment for teaching institutions. This was reflected by what were sometimes very voluntary policies of purchasing and supporting the production of teaching software under the equipment plans of the 1980's[36]. They have subsequently taken other forms as the market developed and grew away from "proprietary" technologies. The major countries of the Union tend to leave it to private supply and market forces, while setting up machinery to provide indirect support to national production[37]. This approach, however, has favoured the purchase of office software, especially word processing and management tools, at the expense of purely educational products. Smaller countries do not have sufficient software adapted to their linguistic, cultural and learning needs as their markets are too small for profitable commercial offerings. It was therefore necessary for more direct intervention, for example, in the Netherlands and the Nordic countries[38].

Today, in primary education, the most widely used applications include *Logo*[39], software designed to teach reading, writing and arithmetic, and various reference products such as electronic encyclopaedias and dictionaries. In secondary schools, specialised software is used to teach scientific disciplines, such as curve plotters in mathematics and graphics software for showing molecules in chemistry. Other packages exploit the possibilities of processing sounds and words as a way of teaching languages and music. In pre-vocational classes, hardware is used to train pupils in the actual technological tools[40].

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36 The public authorities issued invitations to tender either for software projects (Atenea in Spain, Minerva in Portugal, Poco in Holland) or for finished products (Informatique Pour Tous in France).

37 In France, for example, there has since 1988 been what is known as a mixed licence system. Every year, the Ministry for National Education selects about fifty vocational and teaching software packages. An agreement is signed with the publishers whereby the educational institutions can acquire the products at a very low price. The Ministry pays lump-sum compensation to the publisher. In Portugal, the government organises educational software competitions and the Ministry of Education guarantees to buy a certain number of the best products.

38 In the Netherlands, the *POCO* project (1987-1991) enabled private publishers to be directly financed to produce and distribute educational software in primary and secondary education.

39 Programming language for children, created by Seymour Papert, a disciple of the psychologist Jean Piaget.

40 See in particular the data collected by the *Eurydice* network and the studies carried out by the *International Association for the Evaluation of Educational Achievements.*

Finally, more and more use is being made of generic creative tools not directly associated with particular disciplines, such as word processors and spreadsheets.

In addition, educational institutions also resort - for lack of anything better - to commercial products primarily designed for family use, the mass market today being the only one to hold out any hope of profit. These products receive a sceptical welcome from teachers, who often find them technically interesting but unsuited to their teaching approach and to their pupils' needs[41]. Moreover, the use of these products in the school context can be problematic because of the need to clear the Intellectual Property Rights.

Alongside the commercial offer of private publishers, there is a non-commercial offer. The source of this is usually the teachers themselves, who participate as authors, script-writers or advisers in the design and production of multimedia educational products within mixed groups supported by the public authorities. Such structures exist especially in the Nordic countries, where producers, who themselves originated in educational circles in each of those countries, co-operate with teachers to design and exchange educational products which can be used in classroom[42]. This network has valuable experience in taking into consideration linguistic, cultural and educational differences, pooling resources and co-operative production.

THE CHALLENGE OF TRAINING AND INFORMING TEACHERS

The initial equipment policies of the mid-1980's provided the opportunity for many teachers to familiarise themselves with the new computer tools. In most European countries, the initial teacher training curricula has since included initiation into information and communication technologies. The continuing training needs of teachers today relate to the use of the available hardware and software but also, and more particularly, to methods of integrating them into teaching practice. This continuing training should encompass a permanent information service on the research results in this domain, the new experiences, the products available, and current practice.

This effort to provide training and information to teachers is a pre-condition for the development of pedagogic uses for multimedia. It would allow them to be involved in the evolution of products and services and it would contribute towards the creation of a core group of teachers and trainers ready to advise and support colleagues, on the ground, in the use of multimedia technologies.

In order to be able to train him/herself during working hours, the teacher has to abandon his/her pupils and possibly be replaced. This constraint has often led the national authorities to encourage training courses during the school holidays, but only the most motivated teachers agree to attend such courses, which restricts their effectiveness. In order to limit the expenditure and increase the flexibility of the services offered, multimedia - as a subject of continuing training for teachers - could also be used as a tool for more flexible, less expensive training. Evaluations of this type of teacher training are underway in certain Member States such as the UK.

STATEMENT N° 3

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41 The interviews conducted by the Task Force confirm this finding.

42 All these initiatives are designed and implemented by the "Nordic Council of Ministers" Committee on Educational Software and Technology

Primary and secondary education: great potential

Numerous experiments have shown the educational value of multimedia. However, there are several obstacles to the widespread use of educational multimedia in schools :

- *the lack of user-friendly multimedia equipment and software for teachers and pupils,*
- *insufficient quantity of equipment, which is often technically obsolete, sometimes insufficiently used, and rarely connected to telecommunications networks,*
- *insufficient quantity and quality of educational software adapted to the needs of users,*
- *the difficulty of integrating educational multimedia into teachers' educational practice,*
- *the lack of teacher training and information.*

2.2. UNIVERSITIES : A LABORATORY FOR NEW FORMS OF EDUCATION

Universities have a dual mission: education and research. Multimedia products are used there both as a means for facilitating access to university studies - especially through distance learning - and as a research tool for bringing together inter-university projects and teams.

NEW METHODS OF ACCESS TO EDUCATION AND RESEARCH

Distance learning institutions, and especially open universities, have for several years been playing a pioneering role both in the use of educational software and telecommunications networks and in innovative teaching, technological experimentation or cross-border cooperation. The *Open University* in England, the *Centre National d'Enseignement à Distance* in France, the *Open Universiteit* in the Netherlands and the *Universidad Nacional de Educacion a Distancia* in Spain produce a mass of educational materials - printed matter and video films for the most part, but also multimedia educational software.

Most European universities have access to the *Internet* and to *ISDN* (Integrated Services Digital Network), and several European countries are planning to connect all their universities to broadband networks from 1996, allowing easier and faster on-line access to educational multimedia products. Even now, broadband networks such as *Super Janet* in the United Kingdom, *Renater* in France or *DFN* in Germany provide a fibre-optic link between universities and research establishments which use them in various fields of activity: distance training in surgery, distribution or retrieval of satellite images, group work or visualisation of supercomputer calculations for educational purposes, etc. The high costs of telecommunications remain for many universities a barrier to the use of on-line multimedia facilities.

Furthermore, university laboratories are exploring simulation techniques or virtual reality in fields as diverse as physics, biology, medicine and algebra. Thanks to the technical and financial support of computer manufacturers, for example, universities and engineering

schools[43] are working together to develop teaching modules, especially scientific simulation modules, intended for all their students.

UNIVERSITIES : BETWEEN SUPPLY AND DEMAND

In higher education, the high degree of fragmentation of needs and their rapid evolution is blocking the development of a commercial market for multimedia software. This is why many universities are setting up software production structures specifically designed for their students and, in some cases, for other universities, most frequently on a non-commercial basis.

Even today, many universities appear as suppliers of services on the *World Wide Web*. They make available on it free of charge - so far, at least - educational multimedia servers. It is true that in most cases these are courses which are not very interactive. While German universities and polytechnics are active in the field of biology and British ones in commercial sciences, it is the North American universities that are offering the most sophisticated services, especially in the field of medicine. Among the best known are: *Virtual Hospital* (multimedia medical manuals from the University of Iowa), *Oncolink* (multimedia training in cancerology from the University of Pennsylvania), *Nuclear Medicine* (University of Harvard) and *Slice of Life* (multimedia educational materials on the human body from the University of Utah). In any case, the more literary disciplines (literature, social sciences etc.) are still poorly represented in both the production and the use of multimedia tools and services.

STATEMENT N° 4

Universities: a laboratory for new forms of education
As a general rule, universities produce internally, and for non-commercial purposes, multimedia educational products for high-level training. They are increasingly turning towards the use of broadband telecommunications networks for the distribution of courses and joint research. However, in the mid 1990's, the costs of equipment and multimedia services and associated high telecommunications tariffs still impede the spread of educational multimedia in universities.

2.3. MULTIMEDIA - FACILITATING INNOVATION IN TEACHING METHODS

Multimedia is becoming the focus of a debate about innovation in teaching methods. Designed in the last century for mass education, they have evolved today to include individual learning, active learning, and the aptitude for self-learning.

Multimedia accompanies and facilitates this evolution. It creates for the pupil, the student or the adult learner, an "interactive" environment which offers an immediate assessment of his/her actions and provides a context for the information which can be accessed locally or at a distance. It therefore stimulates the pleasure of learning and creativity. It multiplies, thanks to telematics networks, the possibilities for interpersonal communications. It brings about a new dimension, a window on the world, and especially

[43] *Hewlett Packard* is supporting the *COLOS* project which brings together universities and schools of engineering. *Apple* is networking universities under the auspices of the "*Wings for the mind*" project.

on Europe. Multimedia offers the prospect of the generalisation of innovative teaching, for the benefit of the greatest number of learners.

In order for this kind of integration into teaching practice to become possible, the needs of users should be taken into account from the inception of the tools, services and applications. User-friendliness and ease of use of equipment, flexibility and 'openness'[44] of software, are the main qualities demanded by the teaching world. New approaches should be defined for the organisation of learning, its environment and its different constituents: face-to-face learning, distance learning, individual and group learning, with the help of traditional or multimedia resources. Multimedia therefore reinforces the teacher in his/her function as the initiator of the learning process and in the role of mediator - indispensable to the learning process. By placing itself at the service of the learning process, multimedia will contribute to the evolution of the education and training systems.

STATEMENT N° 5

Multimedia - facilitating innovation in teaching methods
Multimedia has demonstrated its pedagogic efficacy in numerous pilot experiments. Its use in day to day teaching practice can only be achieved if innovative teaching processes receive a better reception both by educational institutions and by society at large. This is how multimedia will find its place in the context of the evolution of the systems of education.

[44] "Open" learning software, allows for student input, for example of data and texts in the software.

Chapter 3

Vocational Training : Diverse Needs

Initial and continuing vocational training is perceived as an efficient means of combating unemployment and making enterprises more competitive. For this reason, both public authorities and enterprises attach increasing importance to it. In the European Community in 1993, expenditure on vocational training was estimated at 0.5% of the GDP for the public contribution, or ECU 30,000 million, and 1.5% of the total company wage bill for the private contribution, a total of about ECU 50,000 million[45]. Today, both companies and the public authorities are trying to obtain greater control of the increase in this expenditure and to improve its efficiency by exploiting multimedia.

EDUCATIONAL MULTIMEDIA IN LARGE COMPANIES

Since the 1960's, large companies which are active in the information technology field have been using computer-assisted training to provide continuing training for their staff[46]. Other large companies in the service sector, especially in banking and insurance, have followed suit. From the mid-1980's, the spread of microcomputer technology throughout all kinds of companies has created a general demand for training in the use of office tools, spreadsheets, word processors, etc., which can be satisfied by self-learning software.

Despite undeniable success, the vocational training software industry has not developed at the anticipated pace. Some sectors, such as banking and insurance, actually saw a gradual withdrawal in the early 1990's. This situation is partly caused by the varied needs of companies, which are often highly specific and can rarely be satisfied by standard products, (with a few exceptions such as language teaching, marketing and management, and partly by the high cost of developing customised software).

With advances in telematics and a relative fall in the cost of telecommunications, major companies have been prompted, in the 1990's, to make greater use of distance learning in order to reduce - considerably, in some cases - the cost of training their personnel internally. For example, by making intensive use of telematics tools, *Hewlett Packard* in 1994 successfully reduced the daily cost of training a junior executive from ECU 2260 to 1500. *Olivetti*, for its part, in 1995 was able to shift all the training of its 12,000 maintenance technicians away from the training centres to the workplace and the home.

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45 Source - IRDAC "Quality and Relevance - The Challenge to European Education - Unlocking Europe's Human Potential", 1994.

46 The American company *Control Data* is the inventor of the concept of Computer-Based Training (CBT), and of *Plato*, one of the first and largest commercial systems for computer-based instruction.

In other leading-edge sectors, large companies are making use of "customised" products, the most technically sophisticated of which are simulators and virtual reality tools. Simulation is particularly useful for training in high-risk activities: nuclear power station maintenance, salvage operations, surgery[47], train driving or flying, transportation of hazardous materials, space operations, etc. To develop these customised applications, the companies generally bring in service companies, or set up specialist in-house departments.

Overall, however, the use made by large companies of educational multimedia, whether distributed on-line or used off-line, is generally confined to the training of supervisory staff, engineers and technicians.

THE SPECIAL PROBLEM OF SMEs

As yet, little use is made of educational multimedia for the vocational training of staff of small and medium-sized enterprises. Limited by their financial constraints and also because of their particular organisational structures, SMEs allocate relatively less resources to training in general, and even less to educational multimedia, than do large companies. Educational multimedia, both off-line and on-line, because of the flexibility of use which it offers, should enable them to deal more effectively with their training needs. This represents a major industrial and commercial issue for suppliers of educational multimedia, since 2/3 of Europe's employees work for an SME.

VOCATIONAL TRAINING BODIES, PUBLIC LIBRARIES AND ARTS/CULTURAL CENTRES

The vocational training bodies meet the training needs of company personnel but also of individuals, especially job-seekers. Thus, the *Open College* in the United Kingdom provides distance vocational training courses for 165,000 students; in France, the APPs (*Ateliers Pédagogiques Personnalisés*) meet local vocational training needs. Such structures are sometimes called upon to work directly with producers[48]. These bodies, whether privately or publicly funded, are resorting, more and more, to educational multimedia. In Denmark, for example, a network of 130 centres set up by the Ministry of Labour devote ECU 6.6 million each year to developing multimedia courses for vocational training. Overall, however, the initial and continuing vocational training bodies are still inadequately equipped with hardware and suitable multimedia resources. Furthermore, these bodies are suffering from the lack of personnel specialising in advising companies on the use of educational multimedia.

Public libraries and arts/cultural centres can also be used by persons in search of supplementary training. In the United Kingdom, for example, after a trial period in 11 libraries during 1992, a plan to generalise this service was set up by the *British Association for Open Learning*: in 1995, 90% of British public libraries were equipped with a multimedia station and a set of training products, primarily aimed at job-seekers.

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47 For example, Thomson-CSF has developed a simulator for teaching the surgical manipulations in gynaecological endoscopy.

48 For example FIMMBO (the Fund for Interactive Multimedia Production for Vocational Training), set up in the Netherlands in 1993, which brings together manufacturers such as Philips and basic training schools.

Moreover, science and technology museums can play a key role in teacher and trainer training - this is already being practised by the *Exploratorium* in San Francisco.

STATEMENT N° 6

Vocational training: varied needs

Many large companies resort to educational multimedia, usually "customised", for training supervisory personnel, engineers and technicians. On the other hand, the use of the technologies is still not very widespread for training other categories of personnel or for training in SMEs - this is mainly due to reasons of high costs and the lack of usability of educational multimedia. The initial and continuing vocational training bodies are insufficiently equipped with hardware and appropriate multimedia resources.

PART TWO

RECOMMENDATIONS FOR A COMMUNITY ACTION PLAN

Chapter 4

Mobilisation and Coordination

To strengthen its position in the educational multimedia market, the European Union can draw on the expert knowledge of its teachers, its many designers, publishers, graphics artists, its audio-visual producers, telecommunications operators, informatics equipment suppliers as well as service providers.

However, numerous obstacles remain: the lack of familiarity of the majority of teachers and trainers with the new technologies; a learning environment which is not very open to the integration of multimedia; the lack of good quality educational software; all contribute to the barriers to the spread of local experience and innovation. Only a concerted effort at regional level, at Member State level and on the European level will facilitate the overcoming of these obstacles.

On the European level, respecting the principle of subsidiarity, a vigorous effort to support research activities and the deployment of educational multimedia is necessary to turn European aspirations into concrete reality. It must focus, in particular, on better coordination of the Community programmes, whether they be research and development programmes, programmes which support the production of multimedia content, or educational and training programmes. It must also strengthen their complementary with the national initiatives.

4.1. MOBILISING OBJECTIVES FOR ALL LEVELS OF ACTION

The mobilisation of all the partners concerned, at regional, national and Community level, should be centred on a consensus regarding precise objectives. At the time of the Task Force hearings, the objectives set out below were the subject of broad agreement.

RECOMMENDATION N° 1

Mobilising objectives for all

Given what is at stake, Europeans should mobilise at all levels of action - local, regional, national and Community - to ensure that, by the year 2000:

- *every teacher can incorporate multimedia materials in his/her teaching practice; be entitled to easy access to the available networks; and benefit from good terms and conditions of use and especially from pre-training,*
- *every pupil has access to quality multimedia learning resources at school, a particular effort being made in favour of disabled children. This means that every primary and secondary school must have at least one multimedia microcomputer per class, connected to a local area network , which is itself connected to a national and trans-European telematics network, allowing links to be established between pupils and teachers or access to on-line learning services to be offered;*
- *every adult has access to quality multimedia resources for his/her personal and professional development;*
- *every university has access to the very high-speed networks needed for exchanging and using multimedia educational materials with high-quality images;*
- *every public library or public arts/cultural centre offers, free of charge, opportunities for access to multimedia resources, so that all citizens can benefit from information services, arts and cultural activities, and education and training facilities;*
- *every company, no matter what its size, has access to a centre for quality multimedia educational resources, thereby creating a virtual "open university for industry".*

RECOMMENDATION N° 2

Debating these mobilising objectives at all levels of action

All the partners concerned, at all levels of action, should contribute to the awareness campaign needed to achieve a consensus on these mobilising objectives, for example :

- *by applying the multimedia educational software resolution adopted by the Council of Education Ministers, 6 May 1996 (see Annex 5),*
- *by expanding the debate around the White Paper on "Teaching and Learning - towards the Cognitive Society" (December 1995),*
- *by seizing the numerous opportunities offered by the European Year of Life-Long Education and Training (1996),*
- *by promoting the use of the tools of the information society in all learning situations, in particular in the framework of the initiative "Learning in the information society", launched in April 1996 by Commissioners Cresson and Bangemann and supported in June 1996 by the European Council in Florence.*

4.2. MOBILISING AND CO-ORDINATING THE COMMUNITY INSTRUMENTS

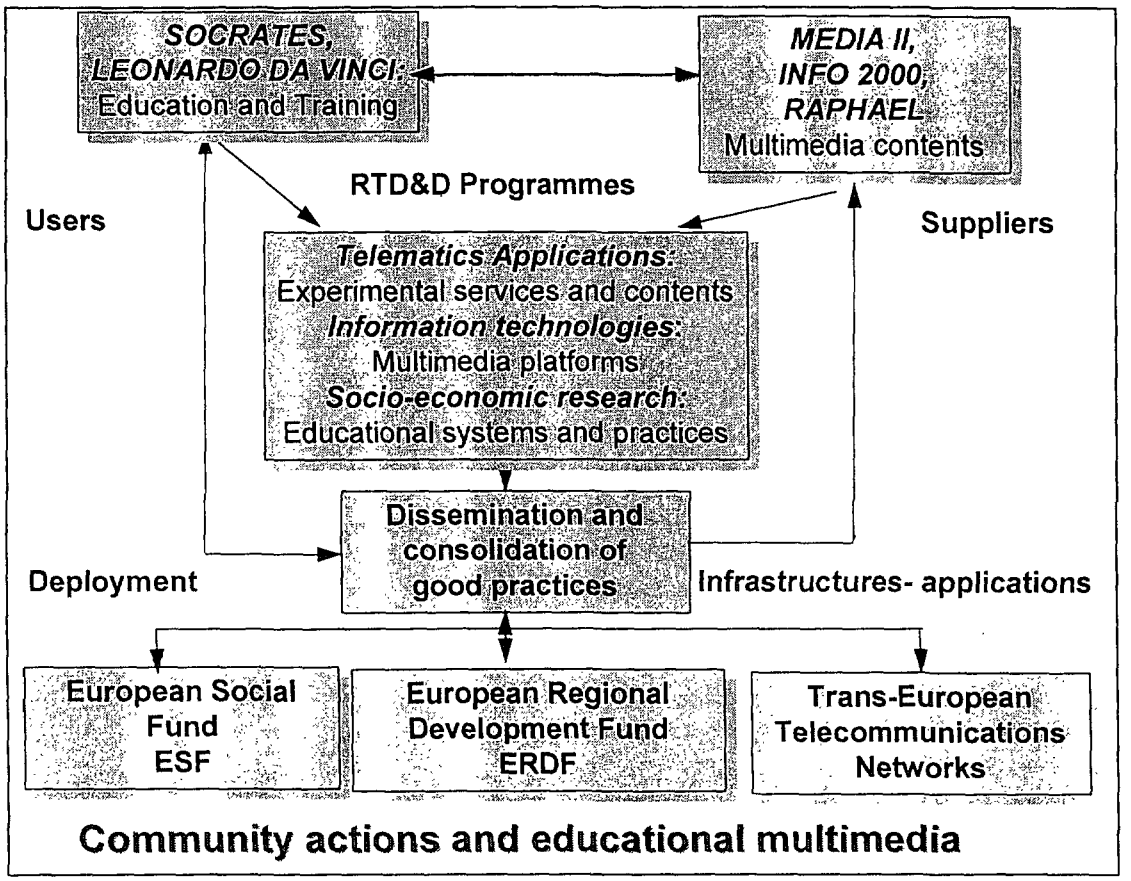
The European Union, in compliance with the principle of subsidiarity, and in close consultation with the Member States, has a specific part to play in stimulating the development and use of educational multimedia throughout the Member States and regions of the Union. To do so, it will need to mobilise, in a co-ordinated manner, the many instruments available to it in the field of educational multimedia (see Annex 6).

The core of the Community machinery is based on the Research, Technological Development and Demonstration (RTD&D) activities of programmes such as "Telematics Applications" and "Information Technologies" which are preparing the platforms and the experimental multimedia services of the next generation.

The education and training programmes SOCRATES and LEONARDO DA VINCI are helping to integrate multimedia products and services in education and training, by both exchanging experience and by elaborating policies and strategies in this field.

The MEDIA II, INFO 2000 or RAPHAEL[49] programmes, for their part, are stimulating the creation of multimedia programmes which can be used for educational and cultural purposes.

Finally, the deployment of educational multimedia can be facilitated by recourse to the Structural Funds (ERDF and ESF) or with financial aid from the Trans-European Telecommunications Networks.



Community actions and educational multimedia

Each of these Community financial instruments and programmes can make a significant contribution to promoting educational multimedia in Europe. Two series of adaptations are, however, necessary in order to improve the existing mechanisms. Firstly, during 1996, it will be necessary to adapt the work programmes of the specific RTD&D programmes adopted by the Commission in the autumn of 1994. Secondly, in order to

[49] The RAPHAEL Programme is under discussion by the Council and the European Parliament, mid 1996

respond to the wish expressed, in particular by SMEs, for simplification and transparency, co-ordinated or even joint Calls for Proposals should involve both the RTD&D programmes and the educational and training programmes or content development programmes. To allow such common calls to happen, the specific RTD&D programmes, like the other programmes, need to clearly identify those aspects related to educational multimedia contained in their work programmes.

A first common Call for Proposals should be launched 15 December 1996. It will be based on a common information pack covering all the programmes concerned, and on a simplification of information and consultation procedures of the programme committees concerned. For proposers, there will be one single approach resulting in one point of entry (one-stop-shop).

RECOMMENDATION N° 3

Mobilising and co-ordinating the Community instruments

The subject of educational multimedia is tackled in many different Community programmes, in particular, the RTD&D programmes (Telematics Applications, Information Technologies, Socio-economic Research, Training and Mobility of Researchers and International Co-operation), the education and training programmes (SOCRATES and LEONARDO DA VINCI) and the programmes for content development (INFO2000, MEDIA II, RAPHAEL). These programmes should identify, in the presentation of their work programmes, the aspects relevant to educational multimedia, and improve the structure and coordination of their activities in this domain. To meet to the need for simplification and transparency of the procedures, which has been expressed in particular by the SMEs, the Commission should launch a first common Call for Proposals, 15 December 1996.

4.3. ENSURE THE FOLLOW-UP AND EVALUATION OF THE DIFFUSION OF THE USE OF MULTIMEDIA IN EDUCATION AND TRAINING.

By its resolution of 6 May 1996, the Council of Education Ministers invites the Member States to develop their activities of research, experimentation, evaluation and use of new technologies, in order to bring about the adaptation of pedagogic methods in a way which takes full account of the role of teachers and supports team learning and working. Member States are also invited to research the means of financing which are best suited to the needs and constraints of education and training institutions, as well as those measures which favour synergy with multimedia developed for the general public. Furthermore, the Council requested the European Commission to identify support activities which could be developed at a European level, notably information on leading edge experiences, multimedia products and services currently available, and on evaluations which may have been made at local level.

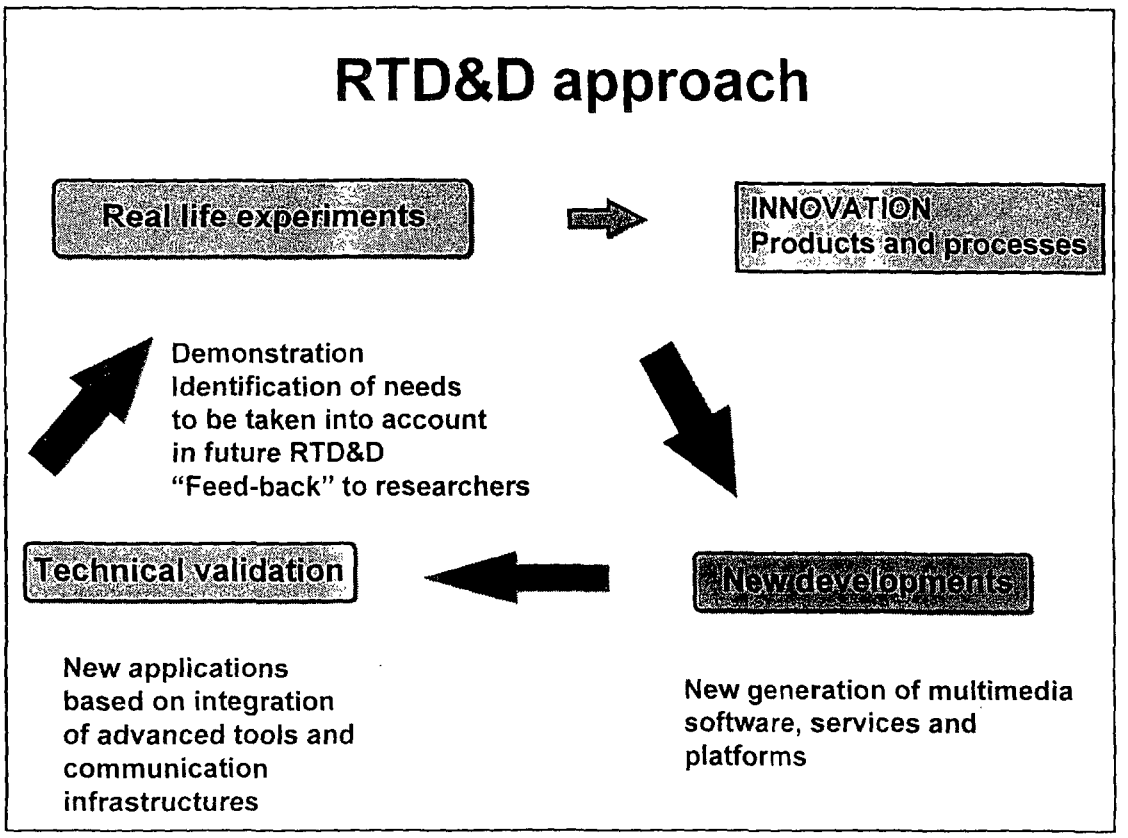
Acting on this request, the Commission will put before the Council, before 31 December 1997, a report which describes the progress to date, the obstacles encountered and the complementary actions necessary in order to encourage the diffusion of multimedia.

Chapter 5

Research, Technological Development and Demonstration Activities

Research and technological development play a key role in the innovation process. However, many innovative developments fail to reach the market. A major cause of this failure is a lack of understanding of user needs, particularly when new applications would imply substantial changes to the surrounding environment, as is the case in the education and training domain.

To overcome this obstacle the traditional linear approach (research-development-innovation) must be replaced by a more iterative approach, as illustrated by the following diagram.



These three steps are still often inadequately identified and taken into account. The Community action promoting educational multimedia should support research projects which adopt this approach already within the IV Framework Programme for RTD&D (1994-1998) (see annex 8).

5.1. "TELEMATICS APPLICATIONS" PROGRAMME

The "Telematics Applications" programme is designed to promote research and development on applications of information and/or communication technologies in areas of common interest to society. The "Telematics Applications for Education and Training" sector, with a budget of ECU 66 million, plays a central role in educational multimedia matters (see Annex 7).

This field of applied research is arousing the interest of a great many companies and universities in all countries of the European Union, as is revealed by the analysis of the results of the first call for proposals which closed on 15 March 1995. The request for Community financing was 20 times greater than the available funds, and a number of proposals of excellent quality could not be selected. These results show that European universities and companies have clearly grasped the importance of applied research activities in the field of multimedia educational products and that they are ready to make substantial investments, together with the European Union, in this area.

The objective of the programme is to assist the development of a competitive supply of multimedia products and services which meet the needs of users. To achieve this objective, the activities envisaged in the December 1994 Work Programme would need to be strengthened and broadened: research and development of easy to use, affordable applications, made possible by the rapid development of multimedia and communication technologies; validation and demonstration of advanced multimedia educational applications covering a broad spectrum of learning situations (see annex 8).

RESEARCH AND DEVELOPMENT OF NEW APPLICATIONS

To enable a better response to meet the need of teachers and trainers for easy to use, affordable applications, it will be necessary to promote research and development work on support tools exploiting recent developments in intelligent agents, making it possible to administer, adapt and enrich teaching resources which are accessible on site or via the networks.

In addition, to enable a better response to the needs of persons undergoing training, the programme would have to support research and development work on educational applications which make increased student participation in training possible and which enable self assessment by simple means. These applications will be able to take advantage of the potential offered by intelligent agents, by multimedia simulation techniques and by the new forms of man-machine interaction made possible by virtual reality.

Finally, it will be necessary to stimulate the development of applications which exploit the potential offered by the emergence of broadband networks which, around the end of the century, will provide easy universal access to top-end multimedia products and services. Thus, interactive television or ATM networks would need to allow experimentation with more interactive and user-friendly distance learning services, the remote loading of multimedia courses and co-operative learning.

EXPERIMENTATION OF ADVANCED MULTIMEDIA EDUCATIONAL APPLICATIONS IN REAL LIFE SITUATIONS

Experimental and validation activities involving advanced multimedia educational software should address the main areas of use: training teachers and trainers, education of pupils in primary and secondary schools, vocational training - in institutions, at the workplace and at home - and education and training to meet the specific needs of less favoured groups. Public libraries and arts/cultural centres, because of their proximity to potential users, would need to be closely associated with this validation work.

It would also be necessary to utilise advanced telematics networks for co-production of multimedia software, bringing together publishers, libraries, museums and other cultural institutions, together with the networks of teachers and trainers, whether organised between institutions or by discipline.

RECOMMENDATION N° 4

Priorities for the Telematics Applications programme - "Education and Training" sector

a) New applications, *which are both easy to use and affordable, would need to be developed to assist teachers and trainers in the use and management of high quality, open educational multimedia, accessible either locally or via network connections (including broadband networks).*

b) Technically and pedagogically innovative, advanced educational multimedia applications *- should be validated in real life situations to meet the needs of teachers, trainers and learners.*

5.2. THE "INFORMATION TECHNOLOGIES" PROGRAMME

The "Information Technologies" programme has three spheres of action which could help, by providing generic solutions, to improve the quality and therefore the performance of multimedia educational software:

- "Multimedia Systems" (ECU 153 million), activities under which focus on tools, standards for basic multimedia processing, copyright management,.
- "Software technologies" (ECU 268 million), the objective of which is to stimulate the spread of software best practice and software quality;
- "High-Performance computing and networking" (ECU 244 million), contributing in particular to advanced simulation educational software applications.

RECOMMENDATION N° 5

Priorities for the "Information Technologies" programme

The following priorities, whose impact on educational multimedia is direct, should be considered in the context of the "Information Technologies" programme:

(a) Technological development of low-cost platforms for education and the public at large, top-end platforms for simulation, software platforms for the production and distribution of advanced development tools.

(b) Quality control: methods and procedures evaluating the technical quality of the educational software; institutions and infrastructure for checking and certifying quality procedures.

(c) Infrastructure: recourse to the "Multimedia Support Centres" and to the World Wide Web as advice structure for the production of educational software and to stimulate its dissemination throughout Europe.

5.3. "TARGETED SOCIO-ECONOMIC RESEARCH" PROGRAMME

This programme includes a budget line of ECU 25 million for research on education and training. Two of the ten activity themes are involved with new technologies in education and the dissemination of innovative teaching.

It includes research into the cognitive impact of multimedia systems in education and training, and the socio-economic impact of the deployment of these systems. In particular, studies will examine their impact on disadvantaged social groups, the changing role of the educator, and the necessary conditions for the successful adoption of multimedia in education, including cost-benefit analysis and problems of ensuring quality of service and content.

RECOMMENDATION N° 6

Priorities for the "Targeted socio-economic research" programme

The "Targeted socio-economic research" programme should conduct research into the cognitive aspects of new technologies, to enable production of tools well suited to learning, and also research on the socio-economic factors which will influence the deployment of multimedia educational software.

5.4. INTERNATIONAL COOPERATION PROGRAMME (INCO)

Educational multimedia should not be restricted to developed countries. Given the flexibility it offers, it can also meet the education and training needs of developing countries.

The specific International Cooperation programme has reserved ECU 15 million to support research in information and communication technologies involving European Union members and developing countries (Latin America, Mediterranean rim, Asia and Africa).

RECOMMENDATION N° 7

Priorities for the International Cooperation programme
RTD&D projects in the multimedia education and training area, addressing the education and training needs of developing countries, should be launched in the area of "Scientific and Technical Cooperation with Developing Countries".

5.5. THE "TRAINING AND MOBILITY OF RESEARCHERS" PROGRAMME

In order to encourage creativity and innovation in its activities, the "Training and mobility of researchers" programme supports projects for "training and trans-national co-operation" which are spontaneously proposed by researchers (a "bottom-up" approach). In the framework of its four activities: organisation of European research institutions networks; improving the access of researchers to large research installations; granting research training grants; and accompanying measures, the programme could support multimedia research and use.

With regard to the first activity, the text of the Council decision adopting the programme states that "every time it is considered desirable, the resources and possibilities offered by modern telematics will be used". In the framework of the third activity, the programme finances grants at a doctoral level, to undertake research with educational multimedia software aspects, in the information sciences and in the economic, social and human sciences. Among the activities foreseen under "accompanying measures", is a "study on the possibility of organising distance training activities, accessible to less favoured regions in the Community, in close coordination with the other Community programmes".

RECOMMENDATION N° 8

Priorities for the "Training and mobility of researchers programme"
The programme should pursue, according to its "bottom-up" strategy, the financing of proposals, which meet the programme criteria, in the educational multimedia domain, and also should study possible accompanying measures which exploit telematic and multimedia means for distance training, in particular for the less favoured regions of the European Union.

5.6. IMPLICATIONS FOR THE IVTH AND VTH RTD&D FRAMEWORK PROGRAMMES

Starting in 1996, the IV Framework Programme should extend activities in educational multimedia RTD&D. This will only be effective if it is accompanied by an increase in the credits available commensurate with the willingness of the actors involved in educational multimedia to invest in European collaboration. The Call for Expressions of Interest launched in June 1995 confirmed that universities and companies were very interested in participation in European educational multimedia research; nearly half of the 5,000 ideas submitted were relevant to RTD&D. The credits available in mid 1996 are insufficient to act on these ideas. For example, the Telematics Applications programme has only ECU 7 million available for the first common call envisaged for 15 December 1996. For this reason, the European Commission proposed supplementary funding of ECU 125 million for educational multimedia in its communication COM(96)12 on the

supplementary funding for the fourth framework programme (see Annex 8 - RTD&D activities to be supported in the framework of the supplementary budget).

On the basis of current evidence, multimedia applied to education, training and culture should be a principal theme for the V Framework Programme (1998-2002).

Chapter 6

Other Community activities

The Community programmes relating to education and training or supporting the production of multimedia content should also play a key role in the activities of the European Union. Moreover, the Community funds designed to implement regional policies for economic and social cohesion or to foster cooperation with Third countries should contribute as appropriate to the dissemination of educational multimedia.

6.1. EDUCATION AND TRAINING ACTIVITIES

A. THE SOCRATES PROGRAMME (1995-1999)

This programme covers cooperation in education from pre-primary schooling to lifelong education for adults. It integrates the activities previously covered by ERASMUS, LINGUA and the numerous pilot schemes undertaken in the various areas of cooperation since 1976. It also includes new areas of cooperation in the fields of school education (COMENIUS), open and distance education and adult education, and studies and analyses of quality in teaching.

The SOCRATES programme can assist the development of methodological frameworks, of pedagogical methods, and of educational environments which can exploit and integrate multimedia education software within the curriculum. SOCRATES can also assist teachers to improve their expertise in this domain, and facilitate mutual recognition of qualifications. These actions are covered by the relevant sections of the activity promoting open and distance education, and by other actions referred to above, which have projects whose objectives address open and distance education. However, the programme is not in a position to support directly the development of either tools or multimedia content.

The general objectives of the *"open and distance education"* section are as follows :

- facilitating cooperation between users and producers;
- improving the skills of teachers, trainers and administrators in the use of the techniques involved;
- improving the quality and user-friendliness of products;
- encouraging recognition of qualifications acquired through open and distance learning;
- identifying and facilitating the transfer of innovative practices for integrating educational software into teaching.

The proposed actions will be partnerships (at least 3 organisations in 3 countries) or, alternatively, observer projects at European level.

With a view to greater attention being paid to the question of multimedia educational software, aspects relating to "open learning" and "the use of multimedia software in traditional teaching" could be priority areas. Clearly, the other sections of the

programme, too, can pay particular attention to the development and dissemination of multimedia educational software.

In connection with the ERASMUS-SOCRATES scheme, and given the driving role of the universities in the design and development of multimedia educational software, the human networks already set up in connection with inter-university co-operative projects are an important trump card for any activity in this field.

As regards the LINGUA-SOCRATES scheme, priority could be attached to showcase operations in the field of modern languages. This field benefits from joint contributions from the software development activities which will have been financed and the extensive research carried out for many years in the field of languages.

As regards the new SOCRATES-COMENIUS scheme (primary and secondary education), a priority could again be given to the design of multimedia areas in or out of school which would, for example, involve pupils, teachers, parents and enterprises and could be stimulated by partnerships between schools at Community level. The school partnerships could also provide a driving force behind the development of joint contents on the theme of Europe (Europe and Science, Europe and the Environment, etc.).

Horizontally, across the various activities, and in conjunction with the LEONARDO DA VINCI programme, special attention could be paid to ways of validating the qualifications acquired by non-traditional methods (including multimedia) and validating the quality of multimedia services and products.

SOCRATES will thus play an important role from 1996 onward in promoting cooperation between users, producers and designers of multimedia educational software. In particular, its strong rooting in the world of education will allow it to launch actions which require extensive user participation, such as the creation of specific networks, cataloguing and evaluating available educational multimedia resources, demonstration projects, and the diffusion of results.

Evidently, any new direction must conform to the general approach of the programme. In accordance with the decision making process of the SOCRATES programme, the Commission plans to obtain the formal opinion of the SOCRATES committee on the priorities and general orientations of the programme, on the financial allocations, and on the selection criteria.

RECOMMENDATION N° 9

Priorities for the SOCRATES programme

Over and above the activities pursued within the general framework of SOCRATES, the following additional activities are suggested:

- *carry out a comparative analysis and extract best practice from pilot experiments with educational multimedia in Europe and around the world, disseminating the results to the Member States;*
- *identifying and stimulating services which can be developed at the European level to synergise the results of these experiments so as to reinforce the European dimension of education and diffusion of information (for example by the development of an information network which will give users easy access to a catalogue of producers of educational multimedia software and services available in Europe), and supporting initiatives leading to the exchange of best practice;*
- *support for the exploitation of the opportunities educational multimedia offers, particularly in the areas of language teaching, science and technology, Europe's cultural heritage, and other areas which contribute to the development of European citizenship;*
- *develop cooperation centred on existing or developing "multimedia reference centres" at the primary and secondary level so that the impact on student and teacher of improved access to multimedia and use of new teaching methods can be assessed;*
- *support experimental projects to network multimedia support centres and educational establishments in Europe, and for mutual recognition of qualifications acquired outside the conventional educational framework;*

B. THE LEONARDO DA VINCI PROGRAMME (1995-1999)

The LEONARDO DA VINCI programme (see Annex 9) could, within the framework of its activities in favour of vocational training, stimulate the creation and use of educational multimedia products through the following activities, designed to :

- facilitate the development of a European network providing the dissemination among users of information on available resources in terms of training software and allowing an exchange of information and experience in this field. This network could present the results of assessments of training software;
- foster associations between users, producers and service providers in order to facilitate the production and use of software which is well suited to users' needs and enable multimedia software to be integrated more effectively into training methods;
- encourage software producers to supply, with each of their products, information in common "format", addressed to teachers and trainers and covering the nature of the software, its specific objectives, the teaching support required to use it, ways of using it in a teaching context, etc.;
- encourage the setting-up of a European database of multimedia educational software intended for vocational training, a European library network (which would steer demand towards multimedia software by providing the best response), and the creation of a cataloguing system. Such support would, of course, have to avoid finishing by establishing rigid institutional structures, and would take full account

of legal questions associated with the protection of intellectual property. These activities could be pursued in collaboration with the SOCRATES programme;

- encourage the development, assessment and use of new types of software enabling disabled persons to overcome the difficulties they may encounter in training;
- support training activities aimed at software creators, so that educational software takes into account the psychological profiles or disabilities of those undergoing training, the various teaching strategies, the various test systems and programmes and the various organisational contexts;
- support training activities aimed at teachers and trainers in the field of multimedia training software in order to enable them to assess these resources and integrate them into their working environment effectively and, if need be, help to design and adapt this software in specific teaching environments;
- study the possibilities of software creation in the context of "on the job" training, distance learning and distance work (including "tele-placements");
- encourage the recognition of qualifications acquired through the use of multimedia educational software and open and distance learning.

These activities would be integrated into the framework of the programme's specific financing rules (ceiling of ECU 100,000 per year and per project, for a maximum period of 2 or 3 years depending on the type of project) and could take the form of trans-national partnerships, pilot projects, support for European networks, placements and exchanges, enquiries and analysis.

The LEONARDO DA VINCI programme has already begun to take into account the work of the Task Force in the fifth priority of the call for proposals launched on 29 February 1996, on the theme of "Generalising access to knowledge using Information Society tools in the context of lifelong learning". The projects supported in this context should enhance the ability of teachers and trainers to use open and distance learning tools, including multimedia educational software, as well as aiding authors to produce appropriate material. They should also encourage the use of such material in professional training. More precisely, this call has paid particular attention to projects focused on :

- establishing methods and titles aimed at training teachers and trainers in the exploitation of educational multimedia, and for training the creators of educational software,
- disseminating best practice relating to production, use and distribution of educational multimedia material, and the implementation of a European information network,
- promoting initiatives in the sphere of "virtual mobility" (for example, teleworking, or teleplacements) as well as other forms of work organisation.

RECOMMENDATION N° 10

Priorities for the LEONARDO DA VINCI programme

The LEONARDO DA VINCI programme could, in particular, undertake specific activities concerning the exchange and dissemination of information relating to multimedia training software and services, and promote association between users, producers and service providers with the objective of improving the quality of the products. It could also encourage support training activities aimed at software creators and trainers to ensure that the various needs are better taken into account and the software is properly integrated into the educational environment. Finally, it could promote the development, evaluation and deployment of types of innovative software within the contexts of teleworking, teletraining and new types of support to disabled people or people with particular learning difficulties.

6.2. ACTIVITIES TO DEVELOP THE MULTIMEDIA CONTENT

A. MEDIA II PROGRAMME (1996-2000)

The MEDIA II programme (see Annex 10) has two main parts, one focusing on training and the other on development and distribution, under which multimedia educational projects could be supported, primarily in the fields of cinematography and audio-visual culture.

Under *the MEDIA II Training Programme*, the aim will be firstly to improve the skills of audio-visual creators and producers as regards economic and commercial management of audio-visual projects and enterprises, and secondly to improve the ability of professionals to use advance creation techniques, especially in the fields of computer graphics, multimedia and interactivity, which should have a significant impact on the quality of the multimedia educational products developed in Europe. Special attention will be given to new professions to which these techniques are giving rise: virtual image designers, multimedia and interactive programme designers, new technology project leaders, etc.

The proposed actions are :

- promoting the design and updating of training modules on new audio-visual technologies, complementary to national and regional initiatives;
- encouraging the integration of these training modules into the existing syllabuses;
- putting training initiatives on a network and facilitating exchanges of trainers and students as well as professionals (study grants, work-experience placements in companies, teacher training).

The MEDIA II Programme - Development/Distribution will aim, by means of technical and financial assistance, to promote, in particular, the development of production projects that make use of new creative techniques and to support companies capable of developing these projects and encourage them to set up networks. Action undertaken in this context will directly affect pilot production of multimedia programmes and interactive television applications with an educational purpose.

RECOMMENDATION N° 11

Priorities for the MEDIA II programme

The MEDIA II Programme should support training initiatives aimed at creators and publishers of audio-visual materials enabling them to exploit new multimedia technologies and to carry out the cultural adaptation of existing titles.

This programme should also support the development of co-productions, which could include multimedia professional, educational and cultural programmes, and the networking of firms presenting common development projects of international importance in the multimedia sector for the European and international markets.

B. INFO 2000 PROGRAMME (1996-1999)

The INFO 2000 Programme (see Annex 11), has a budget of ECU 65 million over four years and covers four objectives :

- promoting favourable conditions for the development of the European multimedia content industry,
- stimulating demand for and use of multimedia contents,
- contributing to the professional, social and cultural development of Europe's citizens,
- stimulate exchange of "best practice" between users and suppliers of multimedia products and intelligent infrastructures.

To achieve these objectives, four action lines have been established, to stimulate :

- the setting up of pan-European user networks,
- new market creation through awareness raising in targeted special interest groups,
- definition of policy on access to and use of public sector information,
- interconnection of public information directory services in Europe,
- use of public sector content/information,
- European production of quality multimedia content,
- promotion of a pragmatic approach to exchange of multimedia intellectual property rights,
- development and exchange of best practice,
- multimedia content market watch and analysis,
- promotion of European competence, in synergy with the SOCRATES, LEONARDO DA VINCI and MEDIA II programmes.

RECOMMENDATION N° 12

Priorities for the INFO 2000 programme

The INFO 2000 programme should support projects aimed at:

- *encouraging production of multimedia content, which will be used to develop educational multimedia software,*
- *mobilising users by easing access to multimedia content,*
- *optimising the framework for negotiating multimedia IPR,*
- *improving use of public information by constructing and connecting directories.*

6.3. EDUCATIONAL MULTIMEDIA DEPLOYMENT ACTIVITIES AND ACCOMPANYING MEASURES

A. STRUCTURAL FUNDS, TRANS-EUROPEAN TELECOMMUNICATIONS NETWORKS

As shown in Annex 6, the European Social Fund (ESF), the European Regional Development Fund (ERDF) and the Trans-European Telecommunication Networks (TTN) have considerable potential to stimulate the dissemination of educational multimedia in Europe. These investments will also benefit small and medium-sized local enterprises, whether they be users or producers of educational software, which would strengthen the competitiveness of these regions and increase local employment.

RECOMMENDATION N° 13

Structural Funds and Trans-European Telecommunications Networks
A more significant proportion of the Structural Funds' resources could be allocated to setting up infrastructures (telecommunications networks, equipment of education and training centres) needed to make use of educational multimedia products, and to training activities making use of educational multimedia products. Similarly, some of the funds dedicated to the Trans-European Telecommunications Networks (TTN) could support the deployment of applications which have proven their teaching effectiveness and economic viability.

B. PROGRAMMES OF COOPERATION WITH THIRD COUNTRIES

As Annex 6 also shows, the European Union is supporting training and education activities in the Third countries with which it has concluded cooperation agreements: the countries of the Mediterranean Basin, signatories of the Lomé Convention, countries of Central and Eastern Europe, etc. A special effort to encourage the use of multimedia educational materials would enable these countries to benefit straightaway from the potential they offer.

RECOMMENDATION N° 14

Cooperation with Third countries
A significant proportion of the resources available on the international cooperation budgetary lines could be directed towards actions to make multimedia educational materials available to the populations in question.

C. MEASURES TO IMPROVE THE PROTECTION OF INTELLECTUAL PROPERTY RIGHTS

Intellectual property rights (IPR) play an important role in stimulating the creation of multimedia titles. The creative effort needed to stimulate investment in new multimedia products and services will only be forthcoming if the economies of scale and the opportunities afforded by the single market can be exploited. The harmonisation needed for the establishment of a favourable regulatory environment, which takes account of the rights and aspirations of all involved, is thus a priority. It is particularly important to reconcile the cultural and educational objectives of institutions such as libraries and

universities, whose aim is to maximise the dissemination of knowledge, with the legitimate desire of authors to profit from their work[50].

The European Union already has a legal basis for the protection of IPR, established by the adoption of five directives relating to copyright and associated rights. These directives, in particular that relating to legal protection of data bases[51], identify the key questions to be addressed, and map the way for the definition of an IPR policy which properly addresses multimedia products.

The Commission Green Paper "The copyright and the related rights in the Information Society"[52] addresses the possible implications of new technological developments in the multimedia area on existing legal structures for the protection of author's and related rights. It is the result of an extensive consultation exercise in order to plan the Commission's work programme in this area. Interested parties have been invited to give their opinions on these questions, particularly in relation to the commercial development of multimedia with special emphasis on the need to adapt or modify existing legal structures in order to facilitate the development of the Information Society. The consultation process should culminate in a communication from the Commission to the other Community Institutions, which is expected to be adopted in 1996, and will set out imminent initiatives of the Commission in this area.

RECOMMENDATION N° 15

The legal protection of IPR should develop in a way that ensures that creators of multimedia titles are not faced with time consuming and expensive copyright procedures. Owners and publishers of multimedia works should be motivated to construct "one stop shops" to facilitate access to multimedia titles.

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50 In the education domain, it has happened that some authors renounce their rights, and do not demand profit from the income resulting from the exploitation of their work or envisage special tariffs and conditions (for example, in the case of "shareware"). These kinds of favourable conditions usually apply to multimedia works which do not have a high economic value, are outside the normal market, or are at the early stages of market introduction.

51 This directive will introduce a new economic right protecting the investment of producers of, for example, CD-ROM and CD-i. It was adopted by the European Parliament and the Council, 11 March 1996 (OJ No. L77/20, 27.3.96).

52 COM(95)382 final, 19.7.95.

Conclusions

The work of the Educational Software and Multimedia Task Force has already contributed to putting in place some concrete actions.

The Council of Education Ministers adopted a resolution (see Annex 5) on 6 May 1996, inviting the Member States to develop their activities of research, experimentation, evaluation and use of new technologies, in order to improve the training of teachers and trainers, as well as to encourage partnerships with the private sector. Moreover, the Council has asked the European Commission to conduct a comparative study of advanced pilot project experiments and to diffuse "best practice". This resolution gives a clear political signal to all the actors in the educational multimedia domain, by demonstrating the strong wish of the public authorities to, in partnership with the industrialists, address the challenge of the spread of educational multimedia.

The Commission, on its side, announced its "Learning in the Information Society" initiative, during the Summit in Florence, 21-22 June 1996. This was launched to stimulate the use of new technology for educational purposes and to develop European multimedia content. It is furthermore planned during 1997, to extensively re-examine the scope, level, quality and affordability of universal services, while considering, in particular, the needs of educational establishments. In a parallel activity, the European Commission will launch, on 15 December 1996, a common Call for Proposals of the RTD&D and other programmes concerned with educational multimedia.

With the strong support of the Member States, the European Parliament, and society representatives brought together in a Information Society Forum, the Commission can set about mobilising all the actors in the educational multimedia domain for the service of education, training and culture for all European citizens.

Educational Software and Multimedia

Annexes

ANNEX 1A
Task Force Members

	Tel.	Fax	E-Mail
Director			
Mr Michel Richonnier (DG XIII-C)	2950973	2968362	michel.richonnier@bxl.dg13.cec.be
Rapporteurs			
Mrs Marielle Riché-Magnier (DG XIII-C-3)	2968856	2968362	marielle.riché-magnier@bxl.dg13.cec.be
Mr Serge Pouts-Lajus (mars/déc 95) (DGXIII-C-3)			
Mrs Martine Cauvin (jv-juin 96) (DG XIII-C-3)	2963428	2962392	martine.cauvin@bxl.dg13.cec.be
Programmes representatives			
Telematics Applications:			
Mr Luis Rodríguez-Roselló (DG XIII-C-3)	2963406	2962392	luis.rodriguez-rosello@bxl.dg.13.cec.be
Information Technology:			
Mr Andrew Folkmanis (DG III-F-4)	2968092	2968364	andrew.folkmanis@bxl.dg3.cec.be
Targeted Socio-economic Research:			
Mrs Lieve Van Den Brande (DG XII-H-2)	2963425	2964299	lieve.vandenbrande@bxl.dg12.cec.be
International Cooperation:			
Mr J.-F. Soupizet (DG XIII-A-6)	2968964	2968970	francois.soupizet@bxl.dg13.cec.be
Training and Mobility of Researchers			
Mr Conor O'Carroll (DG XII-G-1)	2959322	2962133	conor.ocarroll@bxl.dg12.cec.be
Media II:			
Mr Thierry Leclercq (DG X)	2994849	2999214	thierry.leclercq@bxl.dg10.cec.be
Info 2000:	352-430134226	352-430132847	
Mr Claude Poliart (DG XIII-E-3)			claude.poliart@bxl.dg13.cec.be
Socrates:			
Mrs Corinne Hermant (DG XXII-A-4)	2963455	2964258	corinne.hermant@bxl.dg22.cec.be
Leonardo da Vinci:			
Mr David Morgan (DG XXII-B-4)	2993020	2955723	david.morgan@bxl.dg22.cec.be
Other Members			
Miss Valérie Lamy (DG III-A-5)	2968930	2968867	valérie.lamy@bxl.dg13.cec.be
Mrs Agnès Bradier (DG III-F-5)	2968084	2961692	agnès.bradier@bxl.dg13.cec.be
Mr Ronan O'Brien (DG XII-H-1)	2968956	2962137	ronan.obrien@bxl.dg12.cec.be
Mr Michel André (DG XII-INI)	2960781	2994207	michel.andre@bxl.dg12.cec.be.
Mr Giuseppe Mancini (DG XII-JRC)	39-332-785827	39-332-789394	giuseppe.mancini@jrc.it
Mr Wim Jansen (DG XIII-C-3)	2954073	2962392	wim.jansen@bxl.dg13.cec.be
Mr Guy Weets (DG XIII-C-3)	2963505	2962392	guy.weets@bxl.dg13.cec.be
Mr Søren Nipper (DG XIII-C-3)	2963432	2962392	søren.nipper@bxl.dg13.cec.be
Mr Rogelio Segovia (DG XIII-C-3)	2963432	2962392	rogelio.segovia@bxl.dg13.cec.be
Mr Alain Dumort (DG XXII-DG-New technologies in the field of Education & Training)	2966418	2966297	alain.dumort@bxl.dg22.cec.be
Correspondants :			
Mrs Judith Neisse (DG I)	2990977	2991045	judith.neisse@bxl.dg.cec.be
Miss Amaya Guijarro (DG V-B-5)	2951658	2969771	maria.guijarro@bxl.dg5.cec.be
Mr Bartolome Amat Armengol (DG VIII-G-2)	2993211	2992875	
Mr Mark Leysen (DG VIII-5)	2993060	2992525	mark.leysen@bxl.dg8.cec.be
Mrs Birgit Weise-Montag (DG XV-E-4)	2966063	2950992	birgit.weise-montag@bxl.dg15.cec.be
Mr Guy Durand (DG XVI-A-2)	2956020	2962473	guy.durand@bxl.dg16.cec.be
Mr Giorgio Chiarion-Casoni (DG XVIII-A-4)	352-430136404	352-430136599	giorgio.chiarron@lux.dg18.cec.lu

ANNEX 1B
List of people consulted.

Member States representatives	Ministers of Education representatives	Users representatives	Producers representatives	Information & Communication Technologies representatives
Austria				
Mrs Irene Hyna Mr A. Kleinsasser (Austrian Ministry)	Mr Boris Marte Dr H. Bodenseher (Bundesministerium)	Dr P. Skalicky (Osterreichische Rektoren)		
Belgium				
Mr Ph. Bueckens (Ministry Flemish Com) Mr C. Lenain (Education & Recherche) Mr M. Meert (Affaires scient., techn., cultur.) Mr R. Reynders (Ministry of Education) Mrs Jane Massy (Bureau assistance technique)	Mrs Claire Lobet-Maris (Ministère Education Nat.) Mr G. Verloove (Min. Enseign. Sup & Rech.) Prof D. Leclerq (Univ. de Liège) Mr René Bauwens (Vlaamse Minister Onderwijs) Mr Ph. Bueckens (Ministry Flemish Com)	Mr Jos Bellefroid Mr T. Jacobs (Belgian Banking Assoc.) Mr A. Libotton (VUB) Mr Vanherweghem (Conseil Communauté Franç) Dr Jacques Willems (Vlaamse Interuniversitaire)		Mrs Laurence Abraham (Belgacom)
Denmark				
Mrs Lilla Voss (Ministry of Education)	Mr Niels Hummeluhr Mr Stefen Jensen (Undervisningsministereit)	Dr H.P. Jensen (Rektorkollegiet)	Mr Hoejsholt-Poulsen (Orfeus) Mr P.O. Looms (Denmarks Radio Drive)	
Finland				
Mrs Ilkka Larjomaa (Helsinky Univ. of Technology) Mrs H. Savolainen (Ministry of Education)	Mr Markku Linna Mrs H. Savolainen (Ministry of Education)	Mr O. Lindqvist (Finnish Council)	Dr Olli Martikainen (Telecom Finland) Prof Yrjö Neuvo (Nokia Mobilphones)	Mr J. Kuusi (Nokia) Mr. Seppo Noppari (Telecom Finland)

Member States representatives	Ministers of Education representatives	Users representatives	Producers representatives	Information & Communication Technologies representatives
France				
Mrs Claudine Bachy Mr Antoine Bousquet Mrs Maryse Quere (Min Education Nationale) Mrs Gaëlle Bequet (Ministère Culture) Mr P. Schouller (Ministère Industrie)	Mr Guy Pouzard Mr Pierre Maurel (Education Nationale)	Mr Gilles Braun Mrs Franck (Ministère Education) Mrs E. Clifit Minot (AFPA-DEI) Mr R. Sève (CNRS-AFPA) Mrs Toporkoff (Université Paris VIII) Mrs Vidal (CNED) Mr Noël Belin (SNCF) Prof J.-M. Monteil (Conf. Présidents d'Univ.)	Mr Michel Bera (Lagardère) Mr Jacques Bombal (Spring-Courcelles) Mr Michel Bussac (Edusoft) Mr Olivier Goulay (Infogrames) Mr Denis Fortier (Infonie) Mr J. Querzola (Quadrix) Mr F. Sergent (Matra Hachette)	Mr J. Ernest (Alcatel Alsthom) Mr C. Boulle Mr H. Felix (Bull) Mr Ph. Goossens (Alcatel) Mr. Daniel Purlich (Media Concept)
Germany				
Mr F. Diessner (Forschungsanstalt) Mr P. Strutz (Ministry of Culture)	Dr Werner Boppel (Bundesministerium) Mr Georg Eder (Bayerisches Staatsminist.)	Dr H. Juergen-Bangen (Daimler-Benz Aerospace) Mr H. Mispelkamp (Daimler-Benz) Mr W. Reichelt (GIP-IMBSE) Mr P. Schenkel (Bundesinstitut Berufsbildung) Dr Walter Schüsser (Siemens) Prof H.U. Erichsen (German Rector's Conference)	Mr J. Buerstenbinder (Pixelpark) Dr H. Klinger (Festo Didactic) Dr Ingo Stein Mr M. Van Swaaij (Bertelsmann)	Mr W. Doster Mr E. Lehfeldt Mr H. Soboll (Daimler-Benz) Mr Alfred Hoffmann Mr J. Moritz (Siemens) Mr J. Vanhumbeeck (Siemens AG) Mrs Isabelle Dremeau Mr. Ludwig Bauer Mrs G. Böckermann (Deutsche Telekom)

Member States representatives	Ministers of Education representatives	Users representatives	Producers representatives	Information & Communication Technologies representatives
Greece				
Mr G. Karayannis (Institute Language & Speech) Mr Ch. Chamzas (Demokritos Univ. of Thrace)	Mr John Panaretos (Ministry of Education) Mr Kostas Karagiannis (Pedagogical Institute)	Dr J. Pavlossoglou (Ministry of Education) Prof Y. Phillis (Technical Univ. of Crete)	Mr Y. Cobopoulos Mr Vretto (Integrated Information System) Mr Nikos Damianakis (Epsilon Software) Mr K. Drakas (Pliroforiki Technognosia) Mr M.F. Galouzidis Mr S. Kotsis (Intrasoft) Mr N. Kastis (Lambrakis) Mr Ch. Krokos (Info Partners) Mr Markatatos (Epsilon Group)	Mr. N. Constantakakis (OTE)
Island				
Mr G. Arnasson Mr A. Ingthorson (University of Iceland) Mr M. Larusdotlin (Commercial College Iceland)	Ms A.H. Bragadottir (Ministry of Education)			
Ireland				
Mr Michael Foley (Univ. College Dublin) Mr N. McDermott (Library Council of Ireland)	Mr Alex Corcoran (Schools Inspector's Office)	Mr E. Carey (Loughlinston Training) Dr M. Mortell (Heads of Irish Univ.)	Mr P. Durrant (Multimedia Techno. Ireland) Dr A. Gibbons (Multimedia Centre for Arts)	

Member States representatives	Ministers of Education representatives	Users representatives	Producers representatives	Information & Communication Technologies representatives
Italy				
Mr Alessandro d'Atri (Univ. di l'Aquila) Mr B. Rivetti (Univ. e Ricerca) Mr Mario Fierci (Ministero Pubblica Istruzione)	Dr M. Pandolfelli D.ssa Cristina Loglio (Ministero Pubblica Istruzione) Prof Valerio Grementieri (UETP Toscana)	Mrs M. Semararo (Ministry of Education) Prof P. Blasi (Rettori delle Università)	Dr Marco Bergometti (Giunti Multimedia) Mr E. Pentiraro (EPEE) Mr M. Bianchi (Teseo) Mr C. Dondi (Scienter)	Mr G. Ciardiello (Olivetti) Mr A. de Flammineis Mr G. Cordaro (STET) Mr A. Bertanii Mrs F. Scotti Mr. Zilioli (Finsiel) Mr. A. Camanzi (Olivetti)
Luxemburg				
Mr Alexis Werne (Ministère Education Nat.)	Mr Gérard Gretsch (Ministère Education Nationale)	Prof P. Seck (Centre Univ. Luxembourg)	Mr J.P. Bouillot (SEFI Consulting)	
Norway				
Mr Tron Espeli (Research Council of Norway) Mr M.S. Hernes (Ministry of Education)	Mr Fred Odegaard (Ministry Research&Education)			Mr Erik Bergersen Mr Lars Helljsen Mr Kjell Johnsen (Telenor Research)
Portugal				
Mrs Judith Nozes (Univ Aberta) Mr J. Vieira da Luz (Ministerio da Educaçao)	Mr Paisana (Représentation Perm. Portugal) Mrs Eduarda Bual (Ministère Education)	Mr Joaquim Azevedo (Ass. Industrial Portuense) Dr Machado Santos (Universidade do Minho)	Mr R. Pacheco (Porto Editora)	

Member States representatives	Ministers of Education representatives	Users representatives	Producers representatives	Information & Communication Technologies representatives
Spain				
Mr Luis Del Blanco Mr Fernando Gomez (Ministerio del Educacion)	Mrs Elena Veiguela (NTIC) Mrs Pilar Marin (Coop. Internacional)	Mr C. San Jose (Ministry of Education) Prof Medina Precioso (Universidades Españolas)	Mr M. Coderch Collell (Grupo Anaya) Mr G. Meiro (Micronet)	Mrs Begoña Iturbe (Fundesco) Mr Juan Jimenez Mr A. Martinez Ovejero Telefonica)
Sweden				
Mr Hans Ahrens (Nat. Board Ind. & Tech. Dev.) Mr B. Thomas (Sweden National Council) Mr Ulf Lundin (Ministry of Education)	Mr Ulf Lundin (Ministry of Education) Mr Hans Strandell Mr Kent Waltersson (Ministry Education & Science)	Prof S. Strömholm (Swedish Higher Education)	Mr L. Hellquist (VM Data Education) Mrs Kristina Lystad (Multimedia AB)	Mr J. Borg (LM Ericsson - DT) Mr P.O. Akerberg (LM Ericsson) Mr Gunnar Ahlbom (TELIA)
Switzerland			Mr R. Cailliau (SERN) Mr R. Morel (Centre Informatique Pedago.)	
The Netherlands				
Mr A. Ijzerman Mr P. Van Den Dool (Ministry of Education) Mr Patrick Polman (Ministry Economic Affairs)	Mr F.J.H. Mertens (Onderwijsen Wetenschappen)	Mr C.W. Van Seventer (EADTU) Prof Meijerink (Nederlandse Universiteiten)	Mr H. Bellaart Mr Budy Naeyaert (Philips Media Benelux) Mr Henk Sligte Mr J. Versteeg (SPC Vision) Mrs C. Van den Graaf (CIBB)	Mr N. Hazewindus Mr J.L. Goethals (Philips International)

Member States representatives	Ministers of Education representatives	Users representatives	Producers representatives	Information & Communication Technologies representatives
UK				
Mr Christopher Dee Mrs Jane Evans Mr Keith Holder Mr David Noble (Education & Employment) Mr Brian Jones (Trade & Industry)	Mr Robin Ritzema Mr David Noble (Education & Employment) Mr Gabriel Goldstein (Office for Standard Education) Mr Walter Beveridge (Scottish Office)	Mr M. Brady (Dominican College) Mr F. Daly (NCET) Mr John Daniel (Open University) Mr J. Gibb (Shell) Mr Ph. Strange (Scottish Council) Mr Chris Yapp (ICL) Prof G. Roberts (Committee Vice-Chancellor)	Mrs Jane Drabble (BBC Education) Mrs E. England (ATSF) Mrs L. Jones (BBC) Mr Martyn Lowry (Apple Europe)	Mr A.S. Philip Mr I. Davies (GPT) Mr Chris Fowler (BTRL / MLB)
Europe				
European Parliament: - Committee on Research, Technological Development and Energy - Committee on Culture Youth, Education and the Media		Mr A. Barblan (Assoc. European Universities) Mrs I. Knudsen (Liaison Com.of Rectors Conf.) Mr R. Koper (EADTU) Mr U. Vasstrom (Nordic Council of Ministers)	M A. Bensoussan (INRIA - WWW Europe)	Mr W. Wagner (EITIRT)

ANNEX 2
Multimedia Education and Employment

Multimedia is a sector undergoing strong growth. Turnover is expected to triple in both Europe and the USA, between 1994 and 1999[53].

Forecasting job creation in this sector is, however, not simple. Employment does not evolve in an analogue fashion in the different areas of activity, as a result of the differing productivity gains and the differing exposures to international competition.

The Information Technology, consumer electronics and telecommunication industries in Europe are undergoing a phase of restructuring under the pressure of technological progress which allow increases in productivity (digitalisation of information) and increasing economic competition (loss of market share, relocation to third countries). The number of jobs in these sectors is declining.

On the other hand, the development of multimedia is giving rise to **rapid job creation in the area of content provision**, which requires significant investment in human resources. The potential productivity gains in the development of multimedia content, work essentially of an intellectual nature, is more limited than in hardware production. In the United States, the film industry created more jobs since 1990 than the automobile industry, pharmaceutical companies and hotels combined[54]. The content industry in the broad sense[55] has also experienced strong growth worldwide (nearly 10% in 1992); in the United States, this has been shown by strong relative growth in employment: 4.8% of total employment in 1991 as against 3.3% in 1977.

A similar trend is evident in Europe, where employment is being rapidly created by enterprises working in multimedia content production. For example, the multimedia department of the European publisher Dorling Kindersley (UK), formed in 1991, presently employs more than 300 people. At the same time, the French company Infogrames, composed of 2 people in 1983, now has a staff of over 300. It is however difficult to determine what proportion of the job creation constitutes net job creation, and what proportion results from the transfer of jobs from one sector to another.

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[53] Estimation based on Frost & Sullivan, 1994.

[54] *Fortune*, 18 September 1995, p. 39.

[55] Including computer software, themotion picture, television and video, the music and recording. Cf the OCDE, *Technology, Productivity and Job Creation*, 1996.

Number of Employees	1994	Change 1998/1994
Information Technology (data processing and components)	389 000	- 4%
Software and Information Services	732 000	+ 11%
Consumer electronics	110 000	- 16%
Telecommunications (equipment and services)	1 361 000	- 6%
Content Industries (printing and publishing, audiovisual, electronic publishing)	2 000 000	n.a.

Sources: Bipe Conseil, IMO

It is estimated that the educational multimedia market in Europe will grow by 40% per year for the next 10 years[56]. This high rate, which result from the small initial base of the market, represents significant employment creation in this sector. This growth in the market could generate an annual **growth rate in employment of about 5%**, provided that European actors in the field improve their competitive positions. These figures can be compared with projected figures for growth in overall European employment of 0.5% per year from 1994 to 1997[57].

At the same time, educational multimedia is responsible for **important indirect job creation**. In order to participate fully in the information society, it is necessary for people to continually improve their training and qualifications. In a rapidly evolving service based economy, well-educated people are a key factor for companies' competitiveness, and therefore for employment.

Multimedia tools and services allow for improvement in the efficiency of education and training, and the opening of access for all, in educational institutions, at work, at home, in public places as well as in remote regions.

For companies, multimedia makes it possible to reduce training costs in a number of ways (e.g. by reducing travel costs, simulation of costly or dangerous activities). It can facilitate training in SMEs, which account for two-thirds of the working population in Europe. This assumes however a restructuring in the nature of traditional training which have to refocus on consultancy and brokerage between clients and multimedia training service providers.

[56] "Multimedia Training and Education - the next ten years" Datamonitor 1995.
[57] Economic Budget 1996-97 - European Commission, DG II, 1996.

ANNEX 3

IT Works.

Main results of the NCET study, UK
(National Council for Educational Technology), 1994

1. Children who use a computer at home are more enthusiastic and confident when using one in school.
2. Video games can be educational if they are well managed.
3. IT can provide a safe and non-threatening environment for learning.
4. IT has the flexibility to meet the individual needs and abilities of each student.
5. Students who have not enjoyed learning can be encouraged by the use of IT.
6. Computers gives students the chance to achieve where they have previously failed.
7. Computers can reduce the risk of failure at school.
8. IT allows students to reflect on what they have written and to change it easily.
9. Using a computer to produce a successful piece of writing can motivate students to acquire basic literacy skills.
10. IT gives students immediate access to richer source materials.
11. IT can present information in new ways which help students to understand, assimilate and use it more readily.
12. IT removes the chore of processing data manually and frees students to concentrate on its interpretation and use.
13. Difficult ideas are made more understandable when information technology makes them visible.
14. Interactive technology motivates and stimulates learning.
15. Computing programs which use digitised speech can help students to read and spell.
16. IT gives students the power to try out different ideas and to take risks.
17. Computer simulations encourage analytical and divergent thinking.
18. IT is particularly successful in holding the attention of pupils with emotional and behavioural difficulties.
19. IT can often compensate for the communication and learning difficulties of students with physical and sensory impairments.
20. Pupils with profound and multiple learning difficulties can be encouraged to purposeful activity and self-awareness by IT.
21. Using IT makes teachers take a fresh look at how they teach and the ways in which students learn.
22. Computers help students to learn when used in well-designed, meaningful tasks and activities.
23. Students make more effective us of computers teachers know how and when to intervene.
24. IT offers potential for effective group working.
25. Giving teachers easy access to computers encourages and improves the use of IT in the curriculum.
26. Head teachers who use computers raise the profile of IT in their schools.
27. Management Information Systems can help save money and time in schools.

ANNEX 4

Recently Launched National Public Initiatives for Educational Multimedia in Schools (Europe-USA-Japan).

1.Europe

- **Germany**

In April 1996, the Ministry for Education, Science and Technology, supported by the telecommunications operator *Deutsche Telecom,* launched a three-year initiative called "Schools on the Network", which aims to connect 10,000 out of the 52,000 schools to on-line information services.

Within the framework of this initiative, a server for educational matters will be installed, supplementary finances will be allocated to the pilot projects supported by the Länder, training will be organised for the teachers, and the connection of schools to the ISDN for free or at preferential rates will be provided through the commercial providers such as T-Online or America Online-Bertelsmann. Schools will be selected by the Länder beginning in the Summer of 1996, on the basis of pedagogical projects which they have submitted, so that the project can begin at the start of the 1996-1997 school year.

This initiative will be financed by the organisation "Schools on the Net" supported by the federal government (at a cost of 12 Mecus) and by Deutsche Telecom (19 Mecus), joined by hardware and software providers Bertelsmann, Cornelsen, Klett, AVM, ORACLE, Sun Microsystems... It will be orchestrated by the Länder.

- **Denmark**

Within the framework of its 1994 general action plan ("*INFO 2000 IT&T Action Plan*"), the government intends to connect all primary and secondary schools to the national and international networks by the year 2000, and to equip them with PCs at a ratio of 1 to every 10 students (compared to the present ratio of 1 to 40). A training program for all teachers ("*Learn IT*") has been put into place under new legislation on the organisation of teaching in primary and secondary schools. This initiative will be financed in the framework of the upcoming negotiations between the government and the local authorities. Other activies are also under preparation.

A center for education and technology ("*Center for technology-supported Education*"), budgeted at 2.7 Mecus per year, was established in 1994 by the Minister for Education for a three year period. It will support pilots, awareness raising and diffusion of information. The Education Ministry will establish a committee to study methods for preparing children for intelligent use and management of information.

- **Finland**

In 1995 the Minister for Education launched a 5-year plan titled "*Education, Training and Research in the Information Society : A National Strategy*" which includes the objective of connecting all schools and training institutions to the information network by the year 2000. The budget for this plan of 39 Mecus in 1996 should allow for the supply of equipment and the connection of educational establishments, from primary school to universities, including libraries, the training of teachers and librarians, the stimulation of content production and pedagogical resources and the development of new pedagogical methods.

- **France**

As the result of the call for proposals launched at the beginning of 1995, the French government identified 244 of the 635 projects as being of public interest, some of which addressed education and culture. 121 of these projects will receive research and development funding totalling 33 Mecus in 95/96. A information highway technology watch will monitor these project, and the whole market. Additionally, in 1995 ANVAR (the National Agency for the Validation of Research) launched a 15 MECUs call for proposals to support SMEs aiming to provide more user-friendly multimedia access. Finally, loans to support publication of multimedia titles on optical media, have been available since 1989, managed by the National Cinema Centre under the framework of a fund in operation; this is now being extended to on-line products.

The Ministry for National Education will produce an inventory of multimedia education resources by mid-1997, and will collaborate with on-line content and service providers to produce a range of on-line services. The Ministry, together with local authorities, aims to provide in secondary schools one computer for every 20 pupils in *collèges* (it is now 1 to 30) and to replace 10% of the personal computers now used by *Lycées* (1 to 12 pupils at present) with multimedia computers. By the end of 1996, France Telecom will set up RENATER II, a new generation of national network connecting the research centers, universities and enterprises. Connexion of primary and secondary schools from 13 *Académies* to the RENATER research network is planned for 1996 (700 establishments will be involved by the end of 96). Finally, France Telecom will offer low cost access for secondary schools at rates equivalent to telephone services.

- Italy

In October 1995, the Minister for Public Education set up a Task Force to improve the use of technology in the educational system and launched a plan of action to provide multimedia hardware and software by 2005 to 20% of primary schools and 30% of secondary schools. The Plan aims to provide for the production and distribution of high quality software and networking of schools. It also aims to provide a laboratory to test equipment and software and to diffuse this information to schools. An observatory to monitor these experiences in Italy and throughout the world will also be created.

Finally, teacher-training programs will be established at the regional level. 150 Mecus a year will be set aside for this plan. In 1996, the preparatory phase will cost more than 7.5 Mecus and will include experimental activities in 140 schools and the training of teachers. The plan will be realised in partnership with the private sector (telecommunications operators, broadcasters, hardware manufacturers and publishers).

- **The United Kingdom**

In November 1995, the British government launched the "*Superhighways in Education - The Way Forward*" initiative to connect schools and colleges to information networks. This initiative results from a large scale consultation involving over 400 organisations, institutions and individuals. Within this framework, 23 pilot projects will receive 12 MECUs. They will be financed by partnerships between the public and private sectors and evaluated by the UK education departments. The government is creating a framework to facilitate the uptake of multimedia in educational institutions (through financing, consultancy, dissemination of information about pilot projects and training activities) and to stimulate the establishment of partnerships to meet to the demand for educational services where the need is felt most strongly, and to create a market where producers can benefit from their investment.

2. The United States

In February 1996, President Clinton launched the national initiative "*The Technology Literacy Challenge*" to connect all American schools to the information highway by the year 2000. This initiative is built on 4 pillars: to help and train teachers in the use of technology; to develop and integrate multimedia resources into the curriculum; to provide access to modern equipment for students and teachers; and to connect classrooms to the information highway.

A 1.6 BECUs *Technology Literacy Challenge Fund* over a 5 year period will stimulate partnerships on an equal basis between the states and the private sector. A 39 MECUs per year local Innovation Fund will finance local initiatives under the same conditions.

Furthermore, Congress adopted in February 1996 the *Telecommunications Act of 1996* which reforms the regulatory framework for telecommunications and broadcast operators. This legislation requires that telecommunications operators provide preferential rates to primary and secondary schools and to public libraries for services which are focused on education. A not for profit organisation, The *National Education Technology Funding Corporation*, composed of representatives from the institutional sector, the federal government and the private sector has also been set up. It will encourage partnerships between the public and private sectors for the diffusion of new educational technologies. It will also provide funding to *State Educational Agencies* and will contribute to the diffusion of best practices.

Finally, an Executive Order from President Clinton, "*Educational Technology: Ensuring opportunity for all children in the next century*", published on the 17th of April 1996 allows federal administrations to donate unused equipment to schools, and encourages federal employees with expertise in information technology and communication to offer their assistance to teachers on a voluntary basis.

3. Japan

The Minister for Education launched a 9-year Plan of Action in 1990 built on 4 action lines; familiarisation of students from primary level upwards in the use of multimedia in education; equiping of all schools with multimedia hardware and software and the establishment of resource centres in the Prefectures to distribute the most up to date software; the training of teachers to integrate multimedia into their work; support for the use of advanced technology (high bandwidth networks, especially through satellite) in education (schools and universities).

The goal is to reach a ratio of 1 PC for every 16 students, and to have all teachers trained by 1999.

In 1996, 375 Mecus will be committed to the Action Plan; this excludes the cost of hardware and software for schools, which will be met by local taxes.

At the same time, MITI has launched in 1994, the *Program for a Communications Infrastructure*, with particular emphasis on the development of multimedia applications in education. One project in particular, "100 Schools Network" supported by MITI and the Ministry of Education, will introduce teachers and students to innovative learning methods based on interactive information search and on the animation of distributed working groups, particularly through the internet. A call for proposals launched in summer 1994 resulted in the selection of 111 schools. The costs of communication will be covered by the Ministry of Education. The experimental phase of the project should be completed by March 1997.

ANNEX 5

COUNCIL RESOLUTION OF 6 MAY 1996 RELATING TO EDUCATIONAL SOFTWARE AND MULTIMEDIA, IN THE FIELDS OF EDUCATION & TRAINING.

THE COUNCIL OF THE EUROPEAN UNION :

Having regard to the Treaty establishing the European Community,
Having regard to the draft Resolution submitted by the Commission with the contribution of the Italian Presidency,
Having regard to action to support the development of high quality education through cooperation between the Member States, while respecting their responsibilities in this area,
Having regard to Decision No 819/95/EC of the European Parliament and of the Council of 14 March 1995 establishing the Community action programme (SOCRATES)[58],
Having regard to Council Decision 94/819/EC of 6 December 1994 establishing an action programme for the implementation of a European Community vocational training policy (LEONARDO DA VINCI)[59],
Having regard to Decision No 818/95/EC of the European Parliament and of the Council of 14 March 1995 adopting the third phase of the (YOUTH FOR EUROPE) programme[60].

Whereas Decision No 1110/94/EC of the European Parliament and of the Council of 26 April 1994 concerning the fourth framework programme of the European Community activities in the field of research and technological development and demonstration (1994 to 1998)[61], also makes provision for research in the area of the application of information and communication technologies in responding to common social needs.

Whereas Commission communication COM (96) 12 Final concerning the draft Decision of the European Parliament and of the Council regarding the second amendment to Decision 1110/94/EC makes provision for an increase in the global amount of the Community's financial contribution to the fourth framework programme and the allocation of financial resources to activities relating to educational multimedia software.

Having regard to Council Decision 94/802/EC of 23 November 1994 adopting a specific programme for research and technological development, including demonstration, in the field of information technologies (1994 to 1998)[62],
Having regard to Council Decision 94/801/EC of 23 November 1994 adopting a specific programme for research and technological development, including demonstration, in the field of telematics applications of common interest (1994 to 1998)[63],

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[58]OJ No L 87, 20.04.1995, p.10
[59]OJ No L 340, 29.12.1994, p.8
[60]OJ No L 87, 20.04.1995, p.1
[61]OJ No L 126, 18.05.1994, p.1
[62]OJ No L 334, 22.12.1994, p.24
[63]OJ No L 334, 22.12.1994, p.1

Having regard to Council Decision 94/915/EC of 15 December 1994 adopting a specific programme of research and technological development, including demonstration, in the field of target socio-economic research (1994 to 1998)[64],
Having regard to the Commission proposal of 30 June 1995 for a Council Decision adopting a multiannual Community programme to stimulate the development of a European multimedia content industry and to encourage the use of multimedia content in the emerging information society (INFO 2000)[65],
Having regard to Council Decision 95/563/EC of 10 July 1995 on the implementation of a programme encouraging the development and distribution of European audio-visual works (MEDIA II - Development and distribution) (1996 to 2000)[66] and Council Decision 95/564/EC of 22 December 1995 on the implementation of a training programme for professionals in the European audiovisual industry (MEDIA II - Training)[67],
Having regard to the Council Resolution of 4 April 1995 on "culture and the multimedia", which recognized the urgency of taking action to support the establishment and development of a market in cultural multimedia whilst respecting Europe's linguistic and cultural diversity[68],
Having regard to the Commission's White Paper "Growth, competitiveness, employment : the challenges and ways forward into the 21st century", which stresses the importance of education and training as catalysts in a changing society,
Having regard to the Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions "Towards the information society in Europe: a plan of action".

Taking note of the outcome of the G7 meeting in Brussels on 25 and 26 February 1995 on the information society and particularly the recommendations on pilot projects in the area of transcultural education and training,
Having regard to the potential offered by the use of educational multimedia for third countries in the interest of international cooperation and in particular the countries of central and eastern Europe, the countries of the Mediterranean basin and developing countries.

Taking note of the two Reports of June and December 1995 from the Advisory Group on Competitiveness forwarded to the President of the Commission and to the Heads of State and Government on the improvement of European competitiveness,
Taking note, as contribution to the discussion, of the report of the Task Force "Multimedia educational software", which took stock of the situation as regards such software in Europe and proposed a plan of action in this area,
Having regard to the Commission White Paper "Teaching and learning: towards the learning society", which recommended inter alia measures to encourage the development of multimedia instruments conducive to the acquisition of new knowledge,
Having regard to the Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions on a methodology for the use of Community resources in implementing

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[64]OJ No L 361, 31.12.1994, p.77
[65]OJ No C 250, 29.09.1995, p.4
[66]OJ No L 321, 30.12.1995, p.25
[67]OJ No L 321, 30.12.1995, p.33
[68]OJ No L 247, 23.09.1995, p.1

information society applications and on the need for effective coordination between research and educational programmes,
Having regard to the advantages of coordinated action for the use of educational multimedia software in services in schools and training establishments in order to :

- improve the quality and effectiveness of education and training systems, inter alia by introducing new patterns of teaching,
- strengthen social cohesion ensuring equal opportunities of access to users, particularly to those of the less-favoured regions and the small and medium size enterprises, allowing them to play an active role in the information society,
- give teachers, students and apprentices access to the information society by making them aware of the use of these new tools and of the training about it,
- encourage a solid partnership between educational establishments and the suppliers of hardware, software and services with a view to creating a big market in multimedia applications and services truly adapted to teaching needs.

Whereas the use of software and multimedia educational services requires the active participation of local authorities, schools and training establishments, teachers, trainers and the business sector so that the best teaching methods can be tested and used,
Having regard to the contribution of multimedia telematics networks in linking up education and training establishments, teachers, pupils and the outside world in order to provide access to information and to exchange and compare ideas and teaching experience,
Taking note of the results obtained within Community programmes and of the richness and diversity of actions in progress and of experience acquired by the Member States in the development and exchange of methods relating to the use of information and communication technology for educational and training systems.

CALLS UPON THE MEMBER STATES :

Within the framework and the limits of their respective political, legal, budgeting, educational and training systems to :

- develop or follow up their actions in the fields of research, experimentation, evaluation and use of the new information and communication technologies in education and training systems as part of an enhanced approach to pedagogical needs and methods which take full account of the teacher's role, give the pupils and students a more active and participative role, customize learning, encourage a cross-curricular slant and secure cooperation between teachers in defining teaching projects and in responding to specific needs,
- intensify the initial and in-service training of teachers and trainers in using multimedia software and on-line services and their use as tools to better prepare their teaching activities. Special attention should be paid to the analysis and understanding of the role of teachers and trainers, to providing teachers with the results of research on the introduction of multimedia into teaching, awareness actions showing the potential benefits of multimedia and the conditions of its correct use, to support and promotion of teachers' initiatives and to cooperation between educational and training institutions and the business sector on experiments in new teaching practices,

- encourage research activity on products and learning processes, including distance learning, the creation and design of multimedia educational software, particularly in partnerships between the educational world, editors and multimedia companies, in order to comply with pedagogical and educational guidelines of the Member States, with reference to the European dimension of education for :

    - the development of methods for the design of multimedia teaching material taking into account the variety of languages and cultures in collaboration with teachers or trainers,
    - methods to support the development and adaptation of educational multimedia software, involving teachers and trainers in the design of these products,
    - reflection on the appropriate conditions of use, on financing schemes and on new ways to share resources,
    - ways of opening up access to multimedia libraries and to educational software for schools and training establishments,
    - the definition of quality criteria for educational software where they deem appropriate and the study of measures in order to encourage synergy with multimedia intended for the home market and a satisfactory level of consumer information.

- promote actions to develop and if necessary set up infrastructures in order gradually to allow, to the greatest possible number of users in educational and training systems, access to appropriate hardware, software and on-line multimedia services of good quality, as well as to the appropriate training and backup. This could be achieved by installing this equipment at the places concerned e.g. schools, vocational training centres, universities, public libraries, resource centres, socio-educational centres for young people and families, associations, etc. Special attention should be paid to developing where appropriate multimedia support centres within the Member States and to communication between teachers and education partners, and to training in its broadest sense,
- take steps to :

    - experiment, in the context of working out and encouraging flexible patterns of school or university organization, their integration with the information and communication technologies, in order to increase their effectiveness and dissemination,
    - ensure equal opportunities in access to the benefits of multimedia technologies for personal and professional development and favour their use in rural areas or those suffering from industrial decline,
    - experiment with the use of these new tools to fight against social exclusion and scholastic failure.

- encourage the evaluation and dissemination of best teaching practices based on experiments and on the use of multimedia educational software and services, spread the information on products and services and consider locally the establishment or consolidation of demonstration and promotion fora on this basis,
- seek out the most efficient management methods for coordinated actions between cultural, educational and training programmes and research programmes, taking account of the opportunities offered by the appropriate Community instruments.

CALLS UPON THE COMMISSION TO:

- undertake, with the collaboration of the Member States, a comparative study and follow up of the most advanced pilot experiments on the use of multimedia educational products and services in Europe and in the world and disseminate the results of this analysis to the Member States,
- take account of the fields of education and training in the context of its overall initiatives on the information society,
- use all the potential offered by multimedia software and services in implementing relevant Commission-driven actions in the areas of education, training, languages and culture, including international cooperation,
- identify and encourage support activities which could be developed at European level, including information on products and services and on the locally performed evaluation of these, as well as on the procedure used, the dissemination of information inside and outside the Community about European products and services in the field of multimedia educational software, the establishment of links between producers, users and managers of education and training systems in order to promote quality in products and services and their use,
- encourage, in the framework of community programmes, pilot projects using among other things national networks in order to link educational and training institutions in different Member States which are interested in using new multimedia technologies to promote virtual mobility, exchange of information and experience, plurilinguistic practices and different themes of interest,
- establish a coordinated approach for its own actions in the field of multimedia educational software under the different Community programmes and instruments concerned and initiatives to develop trans-European telecommunications networks, around converging objectives, while respecting the decisions and the procedures applicable and paying special attention to external visibility,
- encourage dissemination and exploitation at European level of best teaching practices based on the use of multimedia software and services, making as much use as possible of existing structures, at all levels,
- submit no later than 31 December 1997 a report on progress achieved, obstacles encountered and additional action needed for the implementation of these actions looking ahead to the year 2000.

ANNEX 6: MULTIMEDIA EDUCATIONAL MATERIALS AND EUROPEAN PROGRAMMES

Area	Programme	Period	Allocation	Main objectives	Impact on multimedia educational materials
Research	- Telematics applications	94-98	898 MEcus	- To develop computer and telecommunications applications which meet the economic and social requirements of users	- The "Education and training" sector (ECU 66 million) is devoted exclusively to multimedia educational materials (Computer-assisted education and distance learning or training). Other sectors ("Urban and rural areas" and "Healthcare") also have projects for multimedia educational materials (see Annex 7)
	- Information technologies		2 067 MEcus	- To develop new technologies and disseminate their uses to increase the competitiveness of European industry	- Research on advanced platforms and multimedia software engineering
	- Targeted socio-economic research		112 MEcus	- To develop a knowledge base from research work on the assessment of policy options in the fields of science and technology, education and training, social integration and social exclusion	- Pedagogical research and the acceptability of multimedia educational materials
	- Training and mobility of researchers		792 MEcus	- To establish networks of researchers, promote training through research, enable the acces to young researchers, to large European scientific infrastructure, to European conferences, to summer courses and to modern RDT techniques and methods.	- Finance networks of researchers, study grants and conferences including in the area of educational software
	- Cooperation with third countries		575 MEcus	- To increase by targeted RTD cooperation the value added of Community RTD activities, to improve the Union's scientific and technological bases and to support the implementation of other Community policies	- Multimedia educational materials are of prime interest to third countries also
	- Dissemination and optimization		330 MEcus	- To disseminate and optimize the results of Community research	- Multimedia educational materials could be one of the priorities of this action

Education and training	- Socrates	95-99	850MEcus	- To improve the quality of teaching, cooperation between institutions, to encourage teacher and student mobility, the recognition of diplomas and flexible and distance-learning	The setting-up of human and technical networks of producers, users and service providers; support for the production of educational software; actions to boost the use of multimedia educational materials; exchange of information and experiences; studies and research projects; setting up of training and information networks.
	- Leonardo da Vinci	95-99	620MEcus	- To promote the development of vocational training at European level; to support and supplement national programmes for improving training policies and practices, European cooperation exercises and the capacity for innovation	
Content and information market	- MEDIA II	1996-2000	310MEcus	- To develop a competitive industry of audiovisual programmes by training professionals and supporting the creation and distribution of programmes	- 45 million ECUs are allocated to the training of creators and producers, economic and commercial management and the use of multimedia technologies. - 50 to 70 million are allotted to support preproduction projects of audiovisual programmes including multimedia educational and cultural software.
	- RAPHAEL (proposal)	1996-2000	67MEcus (proposed)	- To optimize Europe's cultural heritage	- To support pilot projects which use multimedia materials aimed at making the cultural heritage more accessible both to the public and to professionals
	- INFO 2000	1996-1999	65 MEcus	- To boost the content component of European industry and the market for new multimedia products and services. The programme focuses on the transfer from printed works to electronic publishing and on multimedia services under development	- To increase awareness of and train users. Promote access to public sector information Optimalize the potential of the European multimedia industry and encourage the exchange of "good practices". Identify training needs and qualifications requirements and devise pilot training courses.
Trans-European networks	TEN-TELECOM	1995-99	278MEcus (proposed)	- Guidelines to develop trans-European networks by giving prominence to the institution of telematics applications	The call for proposals launched in April will be evaluated in July 1996. Among the areas which could be financed are distance-learning, university networks, urban information highways, services for access to libraries and to cultural heritage resources

Structural funds	- European Social Fund (ESF)	1994-99	47 BEcus	- Aimed at building up human resources, the ESF helps people to get into the labour market, especially young people and the long-term unemployed, and promotes equal opportunities by means of training programmes, aid in creating jobs, vocational counselling and technical assistance	- The Community initiatives EMPLOI and ADAPT, each allocated ECU 1 400 million, contain chapters on the development of innovatory educational materials, support for the implementation of flexible and distance-learning and support for training programmes to acquire new qualifications or aimed at trainers. The second phase of the initiative ADAPT (ADAPT BIS) starting in 1997 and allocated ECU 170 million, will be entirely devoted to information society projects.
	- European Regional Development Fund (ERDF)	1994-99	93 .8BEcus (Community support frameworks) + 12 .7BEcus (Community initiatives)	- To contribute to the economic and social cohesion of the Union by supporting progress in undeveloped regions and the conversion of declining industrial regions	- Multimedia educational materials is one of the areas covered by the call for proposals of September 1995 to promote integration of information society dimension in European regional development policies (Budget of ECU 20 million; Article 10 ERDF and Art. 6 ESF). Distance-learning and ongoing training are one of the fields of action. This call is composed of two parts : a consideration of the implications of the Information society at the regional level (projects launched before Summer '96); proposals for pilot actions which could, in some cases, concern the Educational multimedia (evaluation of projects at the end of Mai '96).

	- Mediterranean countries	1995-99	5 .5BEcus	- Socio-economic development of the Mediterranean regions. Priorities include vocational training (ECU 300 million) and education (ECU 400 million)	- The MED-CAMPUS programme (92-98) of ECU 10 million in 95-96 relies on university networks and higher educational establishments in the European Union and the Mediterranean countries to devise training courses for managers and officials, university students and postgraduates. Pilot training scheme on multimedia vehicles envisaged for the 96/97 school year.
	- Latin America/Asia	1991-95	3.0 BEcus	- Financial, technical and economic cooperation with the countries of Latin America and south-east Asia (Philippines, Indonesia, Brunei, Singapore, Thailand, Vietnam)	- Cooperation programme between European and ALFA Latin American universities (ECU 32 million) -Training of young European and Asian university level professionals for the period 1996-1996 (15M ECUs)
Internatio-nal cooperation	- Central and Eastern Europe (PHARE)	1990-94 1995 (95-99)	4 .2BEcus 1 .108BEcus (5.0 BEcus)	- Financial and technical cooperation with central and eastern Europe countries to assist them during the transition phase of their economy in the perspective of future adhesion to the Union. Education and training is one of the key elements of the programme.	- Under TEMPUS a cooperation programme between European universities and those of Central and Eastern Europe (1990-98) managed by DG XXII with PHARE/TACIS appropriations (ECU 130 million in 1995), several projects for distance-learning, computer equipment and development of educational media including computerized media were launched.
	- African, Caribbean and Pacific countries (ECP)	1990-95 1996-2000	10.8BEcus (LOME IV, first instalment) 13,3 BEcus (LOME IV, second instalment)	- Financial and technical cooperation with African, Caribbean and Pacific countries-	- Under LOME IV first instalment, ECU 250 million of appropriations allocated to programmable aid, i.e. 4%, go to education and training projects; ECU 237 million under the adjustment programmes go to actions supporting these areas. - Under LOME IV,second instalment, between 8 and 10% of the appropriations under the European Development Fund (EDF) should be allotted to education and training - Multimedia educational materials, particularly distance-learning and training would enable these countries to benefit from improvements made to teaching and vocational training practices in recent years.

ANNEX 7
Examples of educational multimedia RTD&D projects - "Telematics applications" Programme (1994-1998).

1."Telematics applications for education and training"

In 1995, 230 proposals were submitted concerning education and training under the Telematics Applications programme. They all concerned multimedia educational systems and one hundred or so of them were evaluated as being excellent or very good. Only 23 could be selected. The following proposals are given by way of examples :

Example of project for teachers' training: TRENDS (Training Educators Through Networks And Distributed Systems)

Coordinator: Lambrakis research foundation (Greece)

This project aims at the in-service, distance training of 2 400 school teachers in Secondary Education from Greece, Italy, Spain, Portugal France and United Kingdom, on the use of Information Technology and telematics in the learning process .The training is based on multimedia telematics and technologies such as e-mail, access to multimedia information, fora for debates, tele-training. A network of interconnected sites (training centres, shools and teachers in each country) will provide distance training services and will act as a service provider to the schools and the teachers, not only from the six participating countries, but also from other European regions.

Total duration: 30 months

Example of project for SMEs: IDEALS (Integration of Dedicated Experimental Services for Advanced Training Linked to Small and Medium-Sized Enterprises)

Coordinator:Zentrum für Graphische Datenverarbeitung (Germany)

The purpose of this project is to develop and validate experimental training services mainly for SMEs in the field of tourism, textiles, leather and footwear, by making use of existing terrestrial informatics infrastructures (Integrated Services Digital Network - ISDN) and small-aperture satellites (when ISDN is not available) for remote regions. The validation activities will be carried out from five training centres situated in five countries (D, GR, P, NL, SF) offering jointly prepared courses adapted to local needs in areas such as computer-assisted manufacturing, management and marketing.

Total duration: 36 months

Example of project for the training of specialists: EUROMET (European Programme for Meteorological Education and Training)

Coordinator : Météo - France (France)

The purpose of this project is to validate and develop an experimental computer-assisted training service for meteorology specialists. Four multimedia learning materials servers will be established by most of the meteorological institutes in Europe and made accessible by the Internet to meteorology instructors in 14 European countries. Enhanced WWW servers will ensure high-level interactivity and image simulation and processing services. 40 hours of courses for 200 students will be offered as part of the demonstration. Ultimately, 320 training modules should be accessible via telematics networks.

Total duration: 36 months

Example of project for the training of young children: TOPILOT (To Optimize the Individual Learning Process of Occupational Travellers)

Coordinator : European Federation for the Children of Occupational Travellers - Belgium

The purpose of this project is to develop and validate an experimental distance training service for the children of migrant workers. It will be based on a network of 16 centres in four countries (B, D, NL, UK) responsible for the joint preparation of courses and exchanges of multimedia learning materials adapted to this mobile population category which accounts for a total of 2.2 million people in the European Union. The training institutes, which operate mainly during the winter months, will be turned into providers of multimedia educational services operating throughout the year. The GSM network connected to multimedia PCs will be used for the monitoring of pupils, the downloading of correction exercises and the provision of advice. As an experiment, four multimedia course modules on CD-ROM or CDI will be developed. The experiment, which is intended first of all for the children of migrant workers, will subsequently be extended to cover adult education.

Total duration: 48 months

Example of home learning project: DOMITEL (Domestic Interactive Telematics Education and Learning)

Coordinator: Hogeschool van Amsterdam - Netherlands

The purpose of this project is to develop and consolidate home learning services using interactive cable television networks (CATV) and integrated services digital networks (ISDN). The demonstration will be carried out in towns and cities in Ireland, the Netherlands, Portugal, the United Kingdom and Finland. The target population is mainly people with limited access to training, e.g. the unemployed, women returning to employment, the disabled, the elderly, and migrant workers.

Total duration: 36 months

Example of project for the publication of multimedia learning materials: POLLEN (Publishers on Information Highways)

Coordinator: Ernst Klett Verlag für Wissen und Bildung GmbH, Germany

This project brings together a group of six private publishers interested in the production of interactive multimedia educational systems for the teaching of science, in particular physics, biology and chemistry, in secondary schools. A cooperative approach using telematics networks will be developed and validated through the production of three prototypes, providing an embryonic multilingual living science encyclopedia. Two types of commercial outlets will be explored in the project : off line (CD-ROM) and on line. On-line dissemination to the general public will be validated at two experimental sites in France (100 homes in Saint Quentin) and Germany (300 homes in Stuttgart) in the context of regional "information highways" experiments. The applications developed will be used at home by pupils in the age range concerned (13-18 years).

Total duration : 48 months

CL4K (Cyberspace Learning for Kids)

Coordinator: TOUCAN Europe, United Kingdom

The purpose of this project is to develop and validate experimental services for young children in 14 rural areas in ten countries (D, E, F, GR, IRL, NL, SW, SF, UK). The network addresses the needs of yound handicaped children, disadvantaged or living in rural areas remote from schools. Children will be involved in the design of tele-services that will be set up by schools, libraries and local associations concerned with education and leisure. The network will gather similar groups in Europe.

Total duration: 36 months

2."Telematics applications for health care"

Two projects concern multimedia educational systems:

ENN (European Neurological Network)

Coordinator : Instituto do Sona, Chronobiologia e Telemedecine (ISTEL) - Portugal

The purpose of this project is to develop and validate a multimedia expert telematics network (Internet) for the most common chronic neurological diseases (insomnia, headaches, epilepsy) which affect over 5% of the working population. This project consists of a module for the validation of experimental multilingual training services for general practitioners and specialists using reference data bases developed in eight specialist centres in six European Union countries (A, D, DK, F, P, SF).

Total duration: 48 months

EDUCTRA (Information Technologies for Medical (and Nursing) Education and Training)

Coordinator: Fundesco (Telefonica) - Spain

The purpose of this accompanying measure is to develop and validate training programmes for health professionals (doctors, nurses, paramedics) using informatics and medical telematics. This training will be accessible either locally via three CD-ROMs or through existing multimedia telematics networks (World Wide Web or satellites). These programmes will be tested in the languages of the nine countries involved (UK, D, F, I, E, P, NL, DK, SF) with 6 000 health professionals at 17 demonstration sites (11 courses and 12 seminars per site).

Total duration: 36 months

ANNEX 8

MAIN RTD & D ACTIVITIES TO BE CARRIED OUT IN EDUCATIONAL MULTIMEDIA

As part of the supplementary funding proposed by the Commission in January 1996 [COM (96) 12 final] the following work should be carried out :

1. Research and innovative developments.

- Tools for the design and production/adaptation of low cost multimedia education document for *teachers and trainers* allowing automatic conversion and re-use of multimedia information, (including co-operative production and pooling of multimedia resources over the World Wide Web). This will also cover advanced research on "intelligent agent" and personal software assistant helping teachers and trainers to navigate through the network and assist them in the identification and collection of Educational resources appropriate to their needs.
- Tools for *tutors and learners* working through telematics network within an integrated learning environment including: diagnosis support system for tutors, decision support systems for learner's guidance by tutors, self-assessment tools for learners studying with computer based training, research on tutoring issues involving a learner needing access through telematics network to distributed competencies. This will also cover research on applications supporting both tutors and learners having to deal with cooperative problem solving and advance computer simulation.
- Tools for *producers* of multimedia courseware independant of the delivery infrastructure (CD-ROM, WWW, Interactive TV, etc...) easily adaptable to the language, culture and curricula of different target population.
- Tools for *learners of foreign languages*, encompassing among others voice recognition, voice mail, automatic translation systems.

2.System integration and Technical validation.

- Development of applications integrating advanced user-friendly and intuitive interfaces such as virtual reality and easily adaptable to specialised training as well as to the diversity of *learners* such as disabled people.
- Development of applications adapted to the needs of teachers and learners based on the integration of multimedia storage and retrieval tools supporting navigation, browsing, pre-viewing including intelligent agents and personal software assistants.
- Development of advanced computer simulation allowing *teachers* to design realistic practicals (virtual laboratories) supporting the *learners* in building their knowledge while experimenting with the computer model.
- Development of applications integrating advanced systems for *producers* designing and producing multimedia courseware, and based on functionality including quality control and copyright enforcement tools and billing provisions.
- Developmement of *experimental learning services based on broadband communication* like Asynchronous Transmission Mode (ATM), interactive cable television and existing research networks and focusing on the interoperability of the various application and on on-line learning delivery services.

3.Real life experimental services.

The use of multimedia in Education and Training opens a new road that will require both important research and validation work in the above mentioned areas. Above all however, important complementary efforts have to be carried over to get a clear understanding of user needs that are particularly complex to understand by the industry and the researchers. Real life experiments will also provide feed back to the enginers and the researchers, allowing them to develop tools and applications that will really find a usage and therefore hit later on the market. The different areas of experimentations should be the following :

- Education and training delivery services for :
  - Primary and secondary schools and universities,
  - Vocational and dual mode education institutions,
  - Special needs users including 2d chance schools,
  - Teacher, trainers training,
  - Specialised professionals in the media and in the electronic publishing industry.

- Experimental cooperative design and production of education material base on :
  - Telematics network linking school teachers and educational publishers,
  - Telematics network linking educational publisher of different Members States,
  - Pooling of educational and training resources.

- Other support services addressing copyright / intellectual property rights issues, quality control methods, and extending the multimedia technology support centres to the needs of educational publishers:

4.Targeted socio-economic research on education and training.

This activity will address the socio-economic consequences of deploying educational technologies in schools and training institutions. It will be carried out through specific research tasks in the framework of an experimental service or through independent research projects aiming at the consolidation of the findings throughout the multimedia research projects in domains like :

- cost-effectiveness,
- the quality of educational multimedia and its use,
- impact of multimedia on disadvantaged groups,
- the changing role of the teacher,
- the other preconditions of an appropriate introduction of educational multimedia into the practices of education and training.

5.International cooperation

Educational multimedia represent a strategic ingredient to support the development of third world countries in particular those which are suffering from a lack of skilled workforce. It is therefore important to offer to those countries the possibility to participate to the research activities of the Task Force.

ANNEX 9
Examples of projects developed under the COMETT II programme (1990-1994).

(SECOND PHASE OF THE COMMUNITY ACTION PROGRAMME FOR EDUCATION & TRAINING FOR TECHNOLOGY, 1990-1994)

COMETT II (which had a budget of approximately 230 million ECU, and under which some 3000 projects were selected following five calls for applications between 1990 and 1994) led, amongst its other achievements, to the development of more than 4500 training materials, of which over one third are software or video based. These projects covered training needs in virtually all technologies and related areas.

Title	Country	Description
BIT - Biotechnology in Training	UK	This project aims at developing and harmonising education and training in the field of biotechnology, through laboratory-based short courses and complementary multi-media distance learning.
IN#TEL#EC - Integrated Telecommunications training for the European Community	P	The goal of this project is to meet skill and training deficits for telecommunication technicians through multimedia training modules, and devise and publish a European syllabus for the establishment of common standards for training.
APECE - advanced production Engineering Continued Education	N	The objective is to develop and disseminate a continuing education programme for distance learning in production engineering for the mechanical and electrotechnical industry, using modular courses.
ESAVS - European school for postgraduate veterinary training and continuing education	D	The main objective of this project is to create postgraduate courses, including distance learning systems, leading to Europe-wide accredited diplomas in all fields of advanced veterinary science.
EMBA - Management of technology in a European environment	NL	The goal of this project is to establish a European network for the production, distribution and delivery of distance learning course modules dealing with the management of technology in a European environment.
EUROHOT - Design, development, evaluation and dissemination of an open, flexible, distance learning scheme of advanced technical training for the European highway construction and maintenance industry	IRL	The objective of this project is to economically deliver, through self-extension, an open, flexible multimedia scheme of advanced technical training for the European highway construction and maintenance industry.
EMOT - European masters programme in management of technology	UK	This project is concerned with the development, marketing and dissemination of post-graduate distance learning modules in technology. The modules are part of a masters degree for students, managers and qualified trainers.
COSTEL - Course System for Telecommunication training and innovation management	DK	The aim of this project is to develop and market a course system for training of trainers and computer supported cooperative work with on-line support, concerning the use of computer and telecommunication based solutions for training.

EUROMOTOR - Training modules - Innovation in motor vehicle design and manufacture	UK	To improve the knowledge base of the European motor industry, this project will develop high level collaborative training programmes, using modules and multimedia techniques, in motor vehicle design and manufacture.
EUROCHEMOMETRICS Chemometrics and qualimetrics for the chemical, pharmaceutical and agroalimentary industry	B	This project concerns industry-oriented training and transfer of knowledge of chemometrics and qualimetrics techniques, using introduction and integration courses and distance learning and multimedia techniques.
ECATA - European Consortium in Advanced Training for Aeronautics	F	This project is concerned with the creation of a structure for advanced education for engineers, to improve cooperation and training abilities and formation skills in management and technical integration in aerospace programmes.
PALIO - European standard qualification in the design, delivery, marketing and evaluation of multimedia open learning	I	By using open learning techniques, the PALIO project will implement training actions for professionals involved in the design, management and evaluation of open and distance learning schemes and support systems.

Other products (computer-assisted language learning products) were developed within the framework of the LINGUA programme (Community Action Programme to promote foreign language competence in the European Community) between 1991-1996.

ANNEX 10
Examples of projects supported by the MEDIA Investment Club (1991-1995).

From 1991, the Media Investment Club, created by the European Union (MEDIA Programme), INA (F), BBC (UK), Canal+ (F), France Télévision (F), LBO SA (F), Matra Hachette Multimédia (F), NOB (NL), Philips (NL), RAI (I), RCS Editori (I), T1 NMGA (G), Telac (NL) and Thomson multimédia (F) has supported projects of creation of multimedia products. Since he was created, the Club has supported 201 projects for a total investment sum of 21,3 MEcus. This investment resulted in a volume of activity amounting to 187 MEcus. Most of the Club activity is devoted to the production of titles published on CD-I or CD-ROM in the domain of education, training and culture. The following chart presents a selection of such titles.

Title	Publisher	C.	Support	Description - Public
Astronomie	Flammarion	F	CD-I	Discovery of the sky and celestial objects. General public.
Dictionary Hachette Multimédia	Hachette	F	CD-I	General knowwledge Encyclopédia. General public.
The time machine	Bayard	F	CD-I	Journey through time to discover evolution of mankind. Children 7-13 ans.
Peter in the country of numbers	Arborescence	F	CD-ROM	Game to acquire elementary notions of figures and numbers. Children 5-7 ans.
Body Interact	Primal Pictures	UK	CD-ROM	3D exploration of human body. General public.
The French Experience	New Media	UK	CD-I	French language learning. General public.
I was there	Line TV	UK	CD-I	Series of subjects on major historical periods (Vikings, C.Colombus, etc). Adolescents.
Quattro grandi maestri della pittura Europea	Giunti	I	CD-ROM	Discovery of great European painters (Titien, Rembrandt, Goya, Gauguin). General public
Animalia	Coktel Vision	F	CD-ROM	Interactive animal discovery game. General public
Treasure hunters	Cryo	F	CD-ROM	Exploration of wrecks below the sea throughout the world. General public
Enciclopedia delle ricerche	Armando Curcio Editore	I	CD-I	Encyclopaedia of natural science, social science and art. Adolescents.
Europe facing its past	Pact	B	CD-I	Visits of great archeological sites of Europe. General public.
Geography - Physic and Chemestry	Alberto Peruzzo Editore	I	CD-I	First volumes of a thematic encyclopaedia. General public
Golden Symetries	Artware	DK	CD-ROM	Visualization in art, architecture, mathematics, music. General public.
Historical Atlas of the world	Maris	UK	CD-ROM	Historical Atlas made up of satellites photos of the Earth. General public
Interactive Mathématics	Quai Nord	F	CD-I & CD-ROM	Non scholastic initiation to algebra. General public.

ANNEX 11
Examples of projects supported within the IMPACT programme (1992-1995).

From 1992, the Commission (DGXIII/E) supported within the IMPACT programme the development of interactive multimedia titles. 57 projects have been selected to be supported during a first definition phase and 22 have been finaly selected to be co-financed during the second development phase. The total community support reched 7MEcus. Most of the the titles are dedicated to education, training and culture. The following chart presents a selection of such titles:

Title	Country	Support	Description - Public
BABY	BE, FR	CD-I	Expecting and growing a baby.
GOTHIC CATHEDRALS OF EUROPE	FR UK ES	CD-I	Discovery of major gothic cathedrals in Europe.
Eurotown Adventure	FR UK	CD-ROM	Game to develop language skills
EC Floklore	FR UK IT	CD-ROM	Folk music and dance images, descriptions, data, instructions.
Mount Olympos	UK GR	CD-I	Discovery of Mount Olympos and its natural environment.
Hans Christian Andersen	DK IT	CD-ROM	Discovery of 19th century through life and works of HCA
Safeway to school by foot and bike	DK NL	CD-ROM	Practical advices for going to school by foot and byke.
Europa Quest	FR DE UK	CD-ROM	Discovery of European social life through demography, daily life and economy.
Edusex	IT ES	CD-ROM	Sexual education for teenagers.
Genesis of the European art, the Flemish connection	FR BE	CD-ROM	Collection of 5 CD-ROMs on discovery of the Flemish painting.
Back injuries prevention	IR UK DK	CD-ROM	Educational program to prevent back injuries for workers.
Total productive maintenance	GB FR GR, UK	CD-ROM	Interactive training package.
Operations and maintenance view	BE IT	CD-ROM	Training course for senior manager.
Heath and safety in the workplace	BE DE - UK	CD-ROM	Training course.
Museum of London	UK - NL	CD-ROM	Travel through London and its history.
Multimedia dictionary of modern & contempory art	FR UK - ES	CD-ROM	Multimedia dictionary of modern art.
All about everything	NL - ES DE - UK	CD-ROM	Interactive encyclopedia for children
Vialucis	PT IT	CD-I	Discovery of Baroque Art in Lisboa and South America.
Enviducation	DK GR IRL	CD-ROM	Geographical data base on environmental issues based on a GIS system
CD-PLASTIC	ES UK FR	CD-ROM	Training on handling of plastic materials
Callanetics	NL DK - BE	CD-I	Fitness training course.

Annex 12
General recommendations resulting from the consultations with users and producers.

During the hearings and consultations held with producers and users from May 1995 to February 1996, a series of general recommendations touching upon all levels of action were formulated. They relate to three objectives aiming at stimulating the use of multimedia tools in education and training systems, improving the quality of products and services, as well as strengthening the European educational multimedia industry.

GENERAL RECOMMENDATIONS FOR ACTION

A. DEVELOPING THE USE OF MULTIMEDIA IN EDUCATIONAL SYSTEMS

R1 Renovate the pedagogical methods and environment in educational institutions
R2 Increase the awareness of teachers, educational institutions' personnel and families to the benefits of educational multimedia
R3 Stimulate the dissemination of information on products and practices
R4 Optimise expenses in hardware, software and telecommunications

B. IMPROVING THE QUALITY OF PRODUCTS AND SERVICES

R5 Stimulate research on software creation and use, and train educational multimedia designers
R6 Stimulate cooperation between producers and users for the creation and use of multimedia educational products and services adapted to the needs.

C. STRENGTHENING THE EUROPEAN INDUSTRY

R7 Expand the market
R8 Stimulate the export of European educational multimedia
R9 Create a favourable financial and legal environment

A. DEVELOPING THE USE OF MULTIMEDIA IN EDUCATIONAL SYSTEMS

The dissemination of multimedia in educational systems is only possible in the framework of adapted teaching methods with which teachers, families and educational institutions' personnel have been previously familiarised. For this purpose, it is necessary to ensure an adequate dissemination of information on existing products and best practices, as well a rigorous evaluation of the expected expenses and pedagogical benefits.

Recommendation 1 :	Renovate the pedagogical methods and environment in institutions

Multimedia technologies should be integrated in a favorable educational framework: the role of teachers, the organisation of courses and workplaces, as well as learning control modalities should be adapted in order to take fully advantage of the potentials offered by new pedagogical tools.

A first step towards achieving this renovation consist in **providing schools with multimedia equipment,** thus allowing for the local exploitation of pedagogical multimedia programmes and access to telecommunication networks.

A second step consists in the **reorganisation of the physical environment** according to the practical and pedagogical constraints and potentialities of multimedia. High attention should be devoted to the location and connection of work stations, as they condition the very nature of their use.

A third priority would be to **train teachers** to integrate innovative pedagogy which exploit the didactic potential of multimedia tools. The qualifications obtained through multimedia learning should be recognised as professional qualifications which could be valorised in a teacher's career.

Another priority would be the **reorganisation of timetables**, which would give teachers the opportunity to dedicate more time to their training, to team work and to the setting up of pedagogical projects.

Recommendation 2 :	Increase the awareness of teachers, educational institutions' personnel and families to the benefits of educational multimedia

Multimedia has to meet the expectations of teachers, parents and students to be optimally used. The various actors in education and training should therefore be aware of the pedagogical potential of these new tools. Research and demonstration have a leading role to play in raising awareness.

Research results should be widely disseminated at national and European level. In addition to the use specialised magazines, this dissemination could be achieved through seminars, exhibitions, public debates: education and training are themes that are of interest to the general public, whether it be parents, teachers or researchers. Public audiovisual broadcasters could largely contribute to this awareness building.

Demonstration, for instance through the **implementation of pilot projects**, should contribute to supporting and explaining research. Pilot experiments, which are often conducted in exceptionally favourable conditions, are difficult to generalise, both for practical and financial reasons. They could therefore lead to frustrations and inequalities. Nevertheless, if properly advertised, these pilot experiments could be an efficient tool to raise awareness amongst teachers, trainers and families.

Recommendation 3 :	Stimulate the diffusion of information on products and practices

The heterogeneity of pedagogical practices[69] renders impossible any attempt to "standardise" the use of educational multimedia. There are no "miracle receipts" in this field. Only the dissemination of information on individual experiments allow for the local adaptation of experiments that were conducted somewhere else in a similar pedagogical environment. A better knowledge of current practices should help lift the reluctance of some teachers, prescriptors and parents to endorse new educational technologies

Information dissemination must involve **users, producers and researchers**. Such a collaboration would help improving evaluation methods of the products. This evaluation could rely on the technical and practical data of the products, their prices and ways of acquisition, as well as on their specific pedagogical objectives and their use modes. This information should be accessible to families, for which it could constitute valuable advise for the purchase of software or the subscription to an on-line educational service.

Information on products and practices could be disseminated through paper or electronic **catalogues** issued by ministries in cooperation with software publishers, or through human or telematic users' networks. They could rely on **demonstration or products evaluation workshops,** on **multimedia libraries** where new products and services can be consulted, or on **specialised resource centres.**

Recommendation 4 :	Optimise expenses in hardware, software and telecommunications

Investments of educational institutions must be considered on a long-term basis. They must take into account the necessary **upgrading of equipment** and anticipate the evolution of needs, personnel and technologies. This evaluation work could be carried out through comparative studies and surveys at national and European level. These studies would take into account previous experiments, the chosen equipment, its location (in the class room or in dedicated premises...), as well as the pedagogical consequences of this location from the point of view of students, teachers and managers.

The issue of **software** prices, still high compared to traditional pedagogical supports, could be tackled by using **license systems** as they already exist in some countries[70]. Another path to explore could be the creation of **"public" cooperative educational software databases,** developed by teachers and trainers and usable without paying copyrights[71].

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[69]In most European countries, teachers are free to chose the pedagogy they apply.

[70]Several years ago, Canada established the principle of on-site licenses according to the number of pupils. France has institutionalised relations with publishers throught a so-called mixt license system (see page 00). As for Austria, it negociated the global purchase of licenses for schools and universities.

[71]Some disciplinary associations (for instance of chemistry teachers) have started to put into place such databases.

Partnerships between industrialists and educational and training institutions should be encouraged as they foster tariff decreases on equipment and software purchases, their maintenance and on telecommunication costs.

B. IMPROVING THE QUALITY OF PRODUCTS AND SERVICES

The quality of multimedia products and services relies on their adaptation to the context in which they are used. In order to improve this quality, new creation methodologies and approaches will have to be developed as well as cooperation between users and producers promoted.

Recommendation 5	**Stimulate research on software creation and use, and train multimedia educational designers**

Multimedia is a new mean of expression. Due to its interactive features, it represents for authors a tool of personal expression as well as of dialogue with users. During the product design phase, user's representations and reactions must therefore be anticipated. This raises difficult problems for designers, still few explored. **Research actions on design** are necessary to ensure knowledge's progress on these processes.

Research must particularly put emphasis on **quality**-related issues, both from a software engineering and a pedagogical efficiency corner.

Research actions on uses will enable to better understand the role of the human operator in the whole knowledge acquisition process, concerning either the teacher or the learner, alone or in group, as well as the role played by multimedia technologies in this process.

Research will have to generate new **training methods for educational software designers**. Teaching needs and contents, including psychological and pedagogical issues, will have to be analysed in collaboration with companies. Training could also be devoted to users, in order to diffuse a sound creation and innovation culture in the field of multimedia.

Recommendation 6:	**Stimulate the co-operation between producers and users for the creation and use of multimedia educational products and services**

The cultural and pedagogical nature of educational multimedia products and services makes cooperation between producers and users, a key quality factor. **Cooperation networks between users, software producers and broadcasters** must be promoted, involving hardware producers, iconographic content owners (museum, images agency), publishers and software producers, telecommunications and cable operators, as well as teachers, trainers, education and training institution's managers, representatives in charge of professional training within companies and administrations, political representatives.

Several of these networks already exist[72], established on the basis of local dynamics. The European dimension could be taken into account within a **Educational Software Forum**, acting as an exchange platform between producers and users, and as a promotion tool for products and services available in Europe.

C. STRENGTHENING OUR INDUSTRY

Because of the different market sizes, the European educational multimedia industry cannot count on the same effects of scale as the equivalent American industry. This situation is aggravated by the fact that European innovative SMEs lack the access to finance that their American cousins enjoy. The expansion of the internal market, export stimulation and improving the legal and financial environment of the producing enterprises are the priorities for reinforcing our educational multimedia industry.

Recommendation 7: Expanding the market

One of the means of expanding the market to children of school age consists of orienting production towards the resources adapted to the needs of the public at large as well as to the needs of schools.

The other way is to target a European market. Translation possibilities must be foreseen from the very conception of products and services. The subjects dealt with may bear on themes of European interest (history, geography, culture) but may equally concern multidisciplinary themes or universal subjects, in particular in the scientific domain. In general, the traditional practice of inter-cultural exchanges in Europe provides a basis for supposing that any cultural or educational product will be of interest across Europe, so long as it is handled independently from local curricula or teaching methods.

Recommendation 8: Stimulating exports of educational multimedia

Multimedia communications and activities are developing on a global scale, particularly in the cultural domain. Europeans must actively seek export markets. Penetrating foreign markets requires international industrial alliances.

Public sector cooperation policies have a role to play, whether they are bilateral or at the level of the European Union. Educational multimedia is one of the ways of reinforcing political and cultural links with its foreign partners, while favouring the export of its expertise and its technologies.

Recommendation 9: Creating a favourable legal and financial environment

The question of intellectual property is central to the multimedia industry. Dealing with works that are in essence composite, it is necessary to reconcile the interests of users, the role of educational and cultural institutions such as libraries and universities in

[72] FIMMBO (Fund for the production of interactive multimedia for professional training), created in 1993 in the Netherlands is gathering private producers like Philips and vocational training institutions. ARDEMI in France is federating means from different enterprises in the Rhones-Alpes region for the production of training multimedia.

disseminating knowledge, the protection of the European heritage and the right of the creators and owners of the works to make a profit from their enterprise.

Currently the administration of intellectual property rights varies from one sector to another and in function of the type of entitled person, on occasion difficult to identify. The creation of clearing houses for the administration of royalties could increase efficiency and transparency in this domain[73].

The creation of a favourable financial environment for the development of multimedia activities is equally crucial for European enterprises. Financial support is essential for starting up an industrial activity, particularly when new markets are addressed and when very small enterprises are concerned.

It is necessary to raise investors' awareness to the prospects of educational multimedia, so that they may be encouraged to finance light structures for the production of products that by their intrinsic quality will remain active for sufficiently long to become profitable.

An analysis of the actions that could meet SMEs' financing needs in educational multimedia should be launched in collaboration with companies and operators. Different financing possibilities must be envisaged, such as **facilitated entry into the stock exchange** or the creation of a specific **Guarantee Fund** combining both public and private money. They will have to be based on financial and commercial criteria.

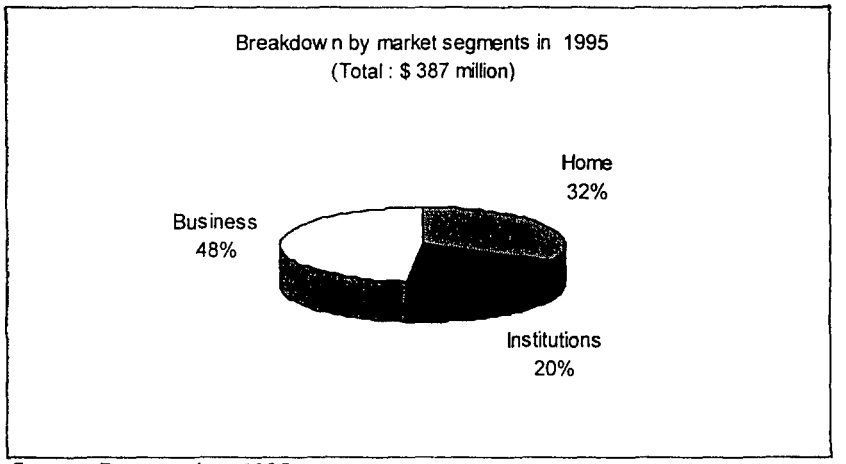
[73]Numbering systems of protected works such as ISBN could facilitate the collection and distribution of royalties

Annex 13
Data and Statistics

I. THE THREE MARKET SEGMENTS

The Global European educational multimedia market -1995

Software and services·



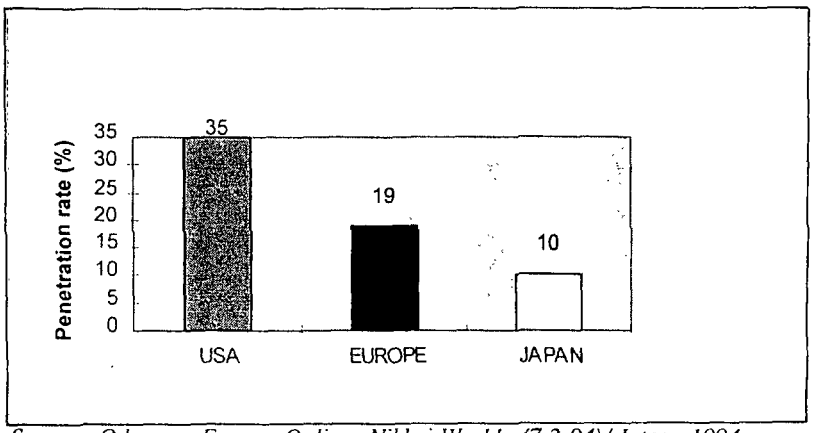
Source: Datamonitor, 1995

Upon Datamonitor expectations, the educational multimedia market could expand at a 45% annual growth rate on the next decade. The business market, still the largest segment in 95, as well as the rapidly developing home segment are boosting this market growth.

A.The Home market

1.Equipment of households with PCs

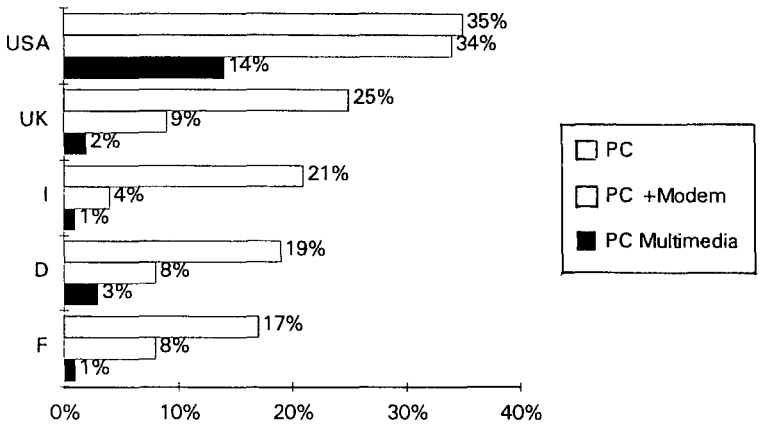
Percentage of the total number of households in 1994



Source: Odyssey, Europe Online, Nikkei Weekly (7.2.94)/ Inteco 1994

The sector of households knows a rapid growth in Europe. Upon the Wall Street Journal and Link Resources, these equipment penetration rates in the home have reached in 95 respectively 39 % in the USA, 30% in Germany, 25 % in UK and France 22%. In a year, Japan has dramatically caught up with about 21% of Japanese households being equipped of a PC. By 2000, equipment rate of European households could reach 33 to 50%.

2.Equipment rates for households (through platforms)



Source : Inteco, 1994

On-line platforms :

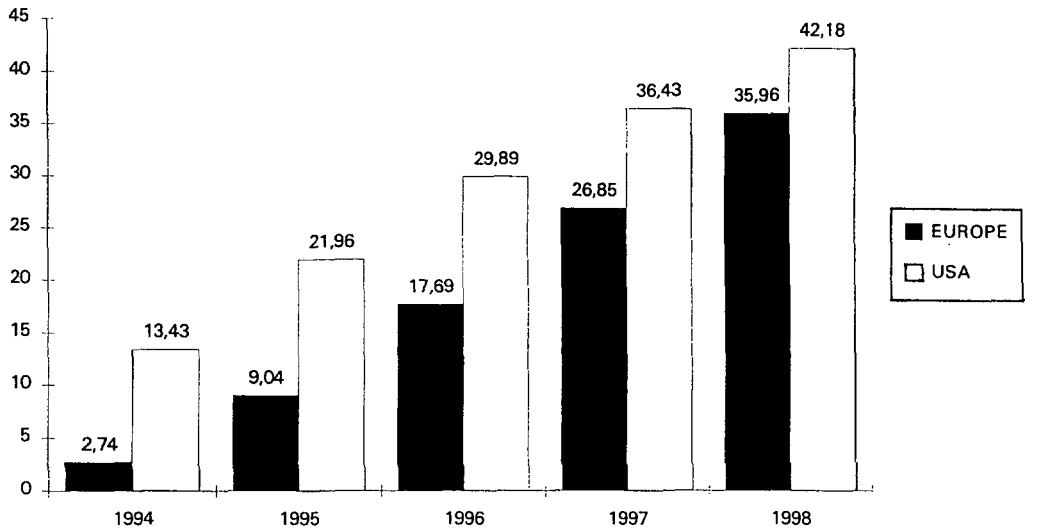
In US, most of the PCs are equipped with an on-line connection. This trend only begins in Europe, namely in UK thanks to the decrease of prices of Modem and tele-communication services.

Off-line platforms :

Equipment of PCs with CD-ROM players knows a strong progression in US and in Europe. In Europe, the most developed parks of multimedia PCs are in Germany and United-Kingdom.

3.CD-ROM players in households

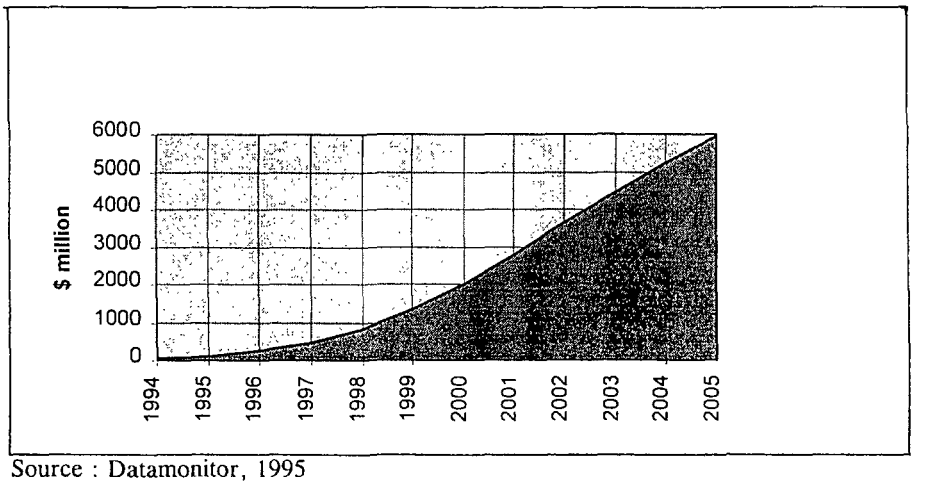
Millions of units



Source: Inteco, 1994

Still very few present within European households in 94, CD-ROM platforms are massively penetrating in the European homes. European equipment rate is converging towards the US.

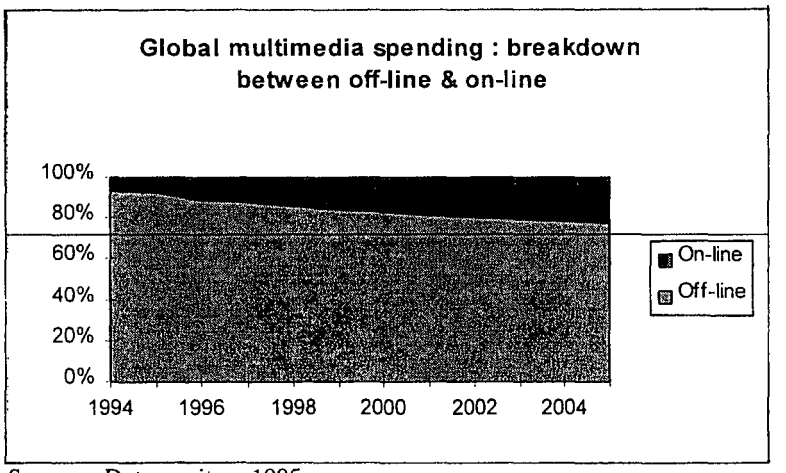
4.European multimedia spending in the home: trends



Source : Datamonitor, 1995

Germany is pulling the European home market's development which has already more than doubled in 94 to reach 125 $ million in 95 upon Datamonitor. It is predicted to grow sharply (+74% annual growth) by the end of the decade and could amount up to $ 6 billion in 2005.

5.Uptake of on-line in the European home market

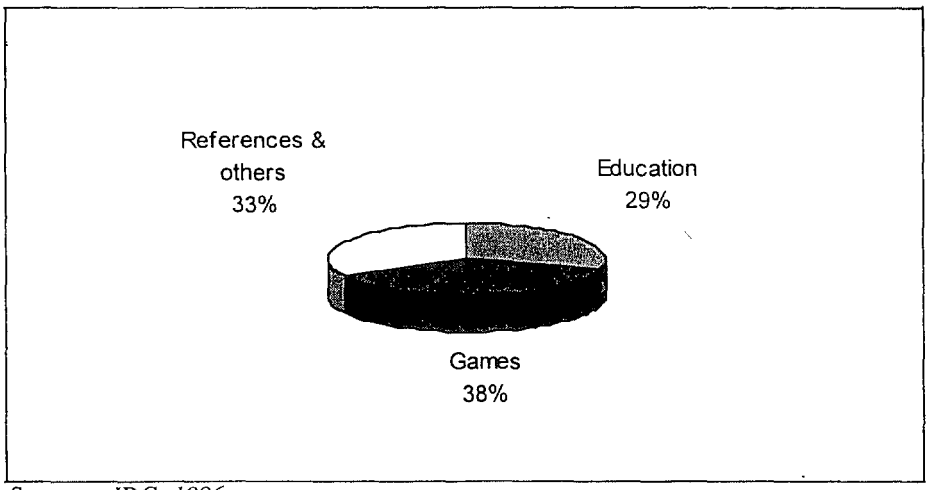


Source : Datamonitor, 1995

On-line services are rapidly developping within the home segment : they could represent up to 25 % of the home multimedia market within 10 years.

6.Categories of CD-ROM titles for large audience in 1995

Consumer market sales breakdown in 95

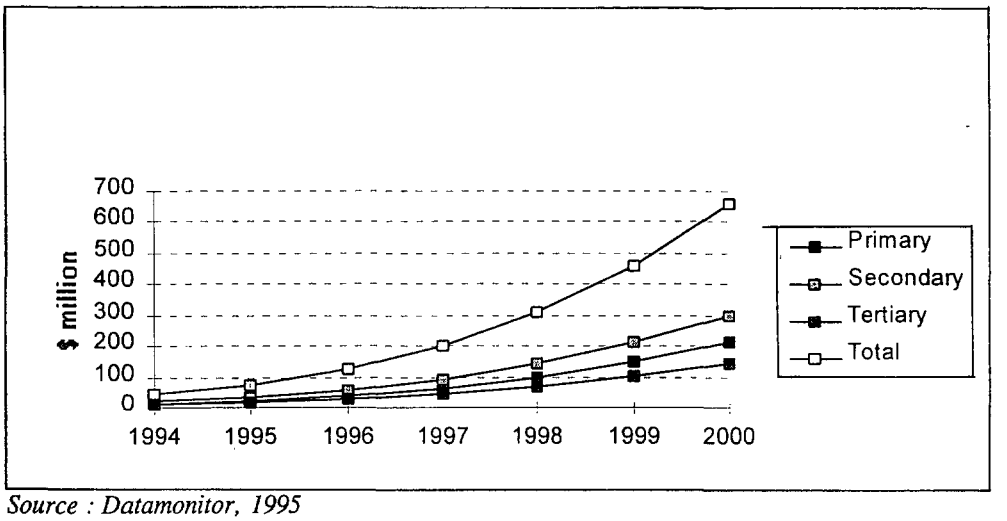


Source : IDC, 1996

Although the consumer market was still dominated in 94 with game titles (51%), the share of educational titles keeps growing dramatically. The educational segment could represent 29% of the consumer market in 95 upon IDC and be in contention for the leadership position by 97.

B.The institutional market

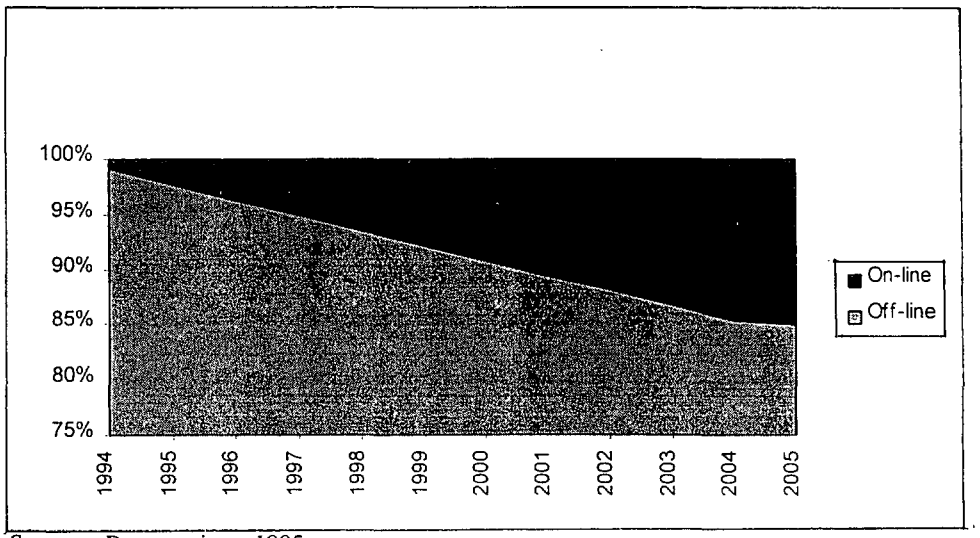
1.Evolution of global multimedia spending in European educational institutions



Source : Datamonitor, 1995

Though currently representing an insignificant part of books/equipment spending within educational institutions, multimedia investment levels should more than tenfold by the end of the decade. From a starting point of 43 $ million in 94, Datamonitor expects it to amount 460 $ million throughout Europe by the end of 99.

2.European Multimedia spending within educational institutions : breakdown between off-line & on-line

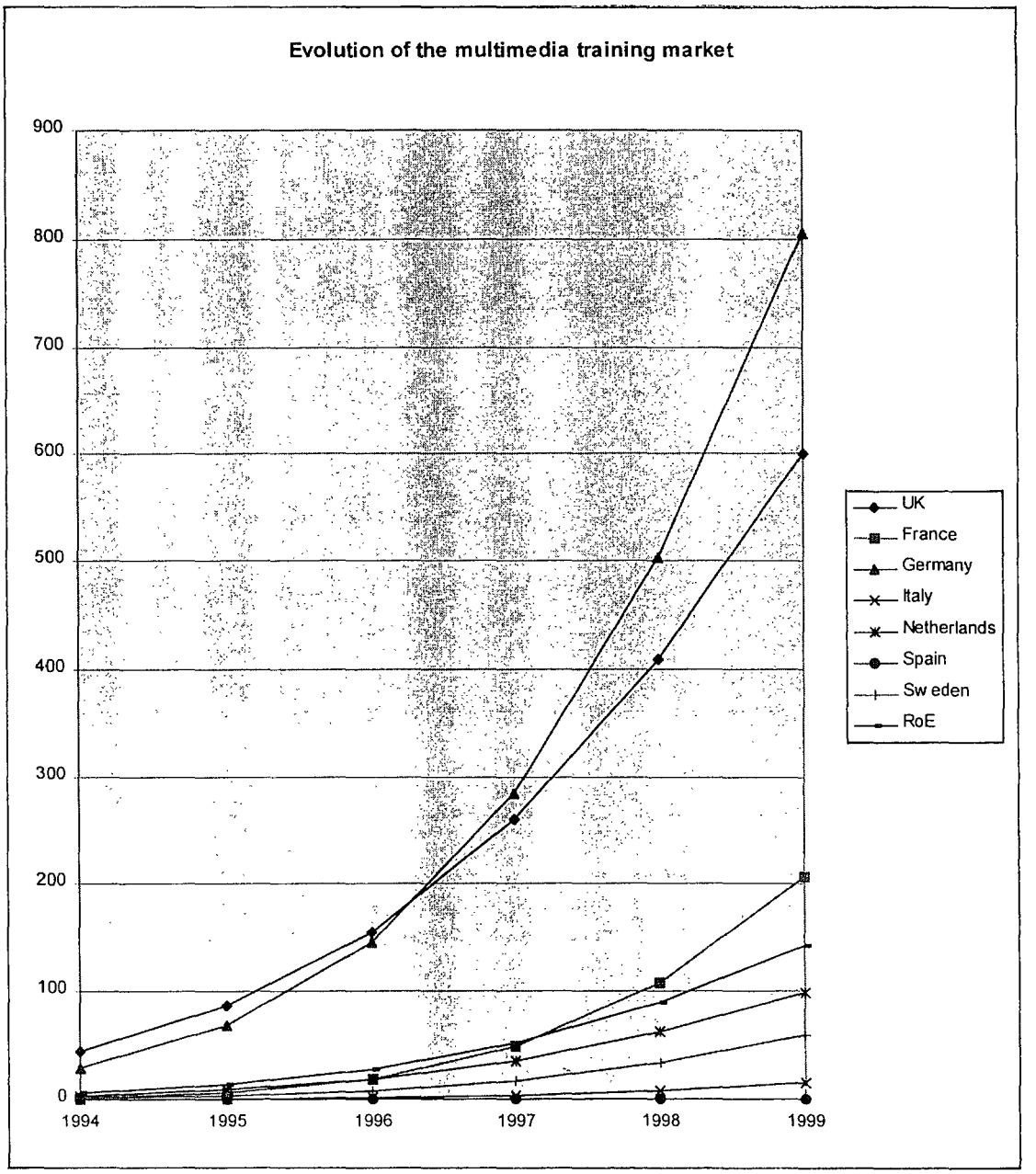


Source : Datamonitor, 1995

Greater investment will be dedicated to on-line multimedia within educational institutions. Starting from scratch, on-line services are get to soar to 16 % of the institutional multimedia market over the decade.

C. The professional market

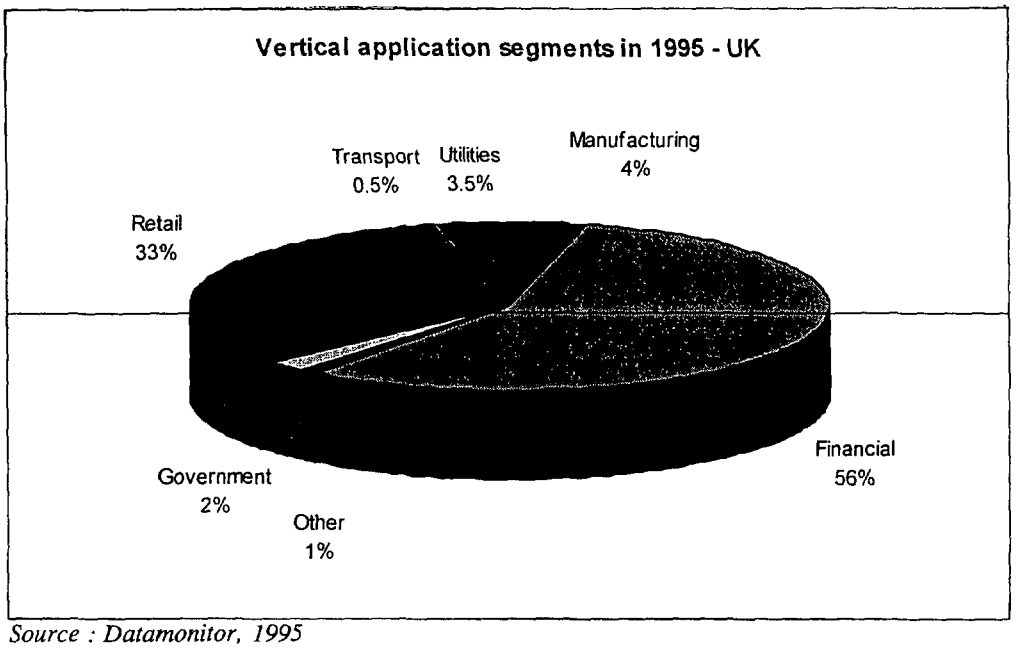
1.Multimedia training : global spending trends in the European business segment



Source : 1995 Datamonitor

Although little used at the moment, multimedia training tools will become more commonplace throughout Europe in the coming years. Germany and UK are the present European leading countries in terms of utilization of multimedia training products.

2.Multimedia training market: breakdown by professional applications



Source : Datamonitor, 1995

Despite a progressive disengagement, the financial services segment still represented the largest application market in 95. This share should slow down with the uptake of multimedia training tools in the manufacturing and retail application segments.

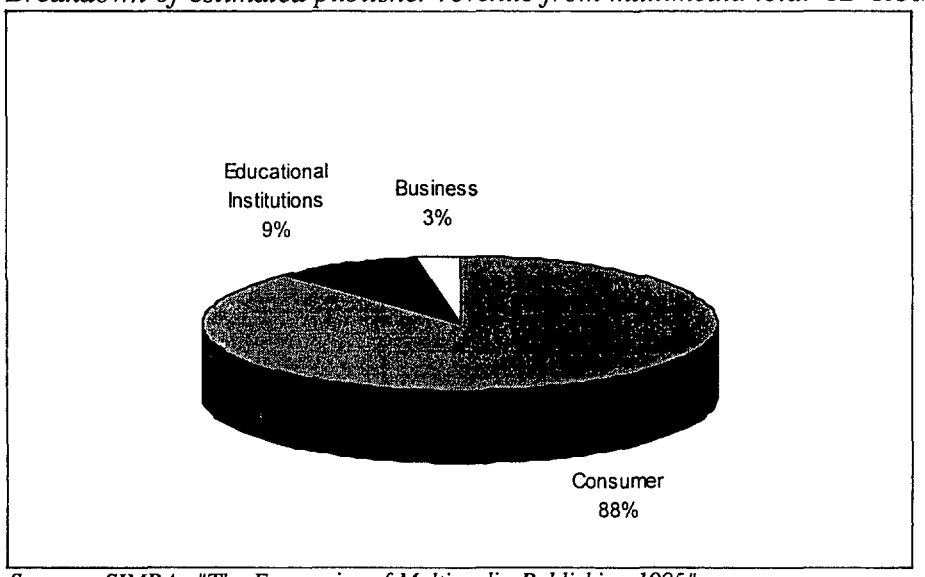
Definitions of the segmentation used

- **Manufacturing**: inc. metal goods, engineering, food, textiles, vehicles
- **Financial**: inc. banking, finance, insurance
- **Utilities**: inc. energy and mineral extraction
- **Retail**: inc. wholesale, distribution, hotels and catering, repairs
- **Government**: both central and local inc. sanitary services, education, research and development, recreation and culture
- **Transport**: inc. transport and communication
- **Other**: including construction, personal services, self employed.

II. THE CD-ROM SUPPLY

A.The CD-ROM market in 1995

Breakdown of estimated publisher revenue from multimedia total CD-ROM title sales



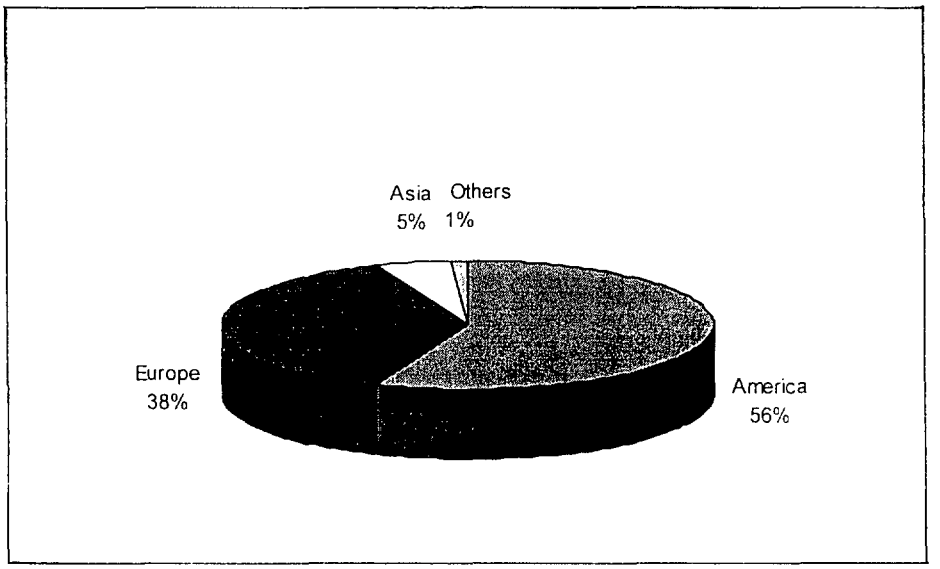
Source : SIMBA, "The Economics of Multimedia Publishing 1995"

NB : Business segment = sales of packaged multimedia software only, customised applications being excluded.

The consumer market represents the largest portion and the fastest growth (+88%) of multimedia CD-ROM sales in 1995. CD-ROM's foothold in schools is also rapidly increasing (+59% in 95).

B.Worldwide production of CD-ROM titles in 1995

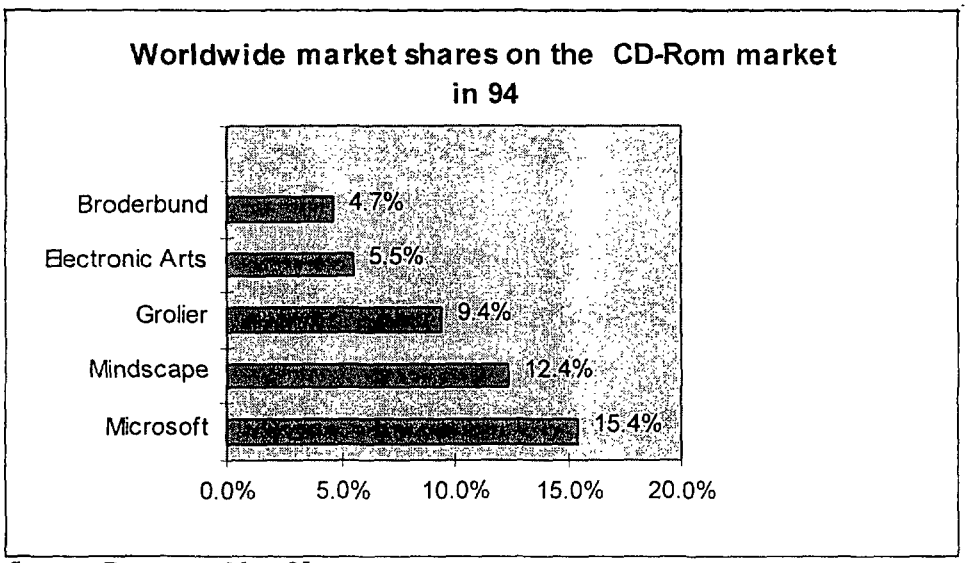
Breakdown by geographical areas



Source : TFPL Publishing, "Facts & Figures 95"

In 94, Europe only represented 29% of the worldwide CD-ROM production and half of the North American production. 95 reveals to be a booming year for the European production, reaching 38% worldwide .

C.US publishers leading the Worldwide market of CD-ROMs



Source : Dataquest, Mars 95

The five leading CD-ROM publishers on the worldwide market are American. Their global market shares reach almost half of the world market.

III. SOME SIGNIFICANT ACTORS OF EDUCATIONAL MULTIMEDIA

A. USA

1. The most important players

Companies	Remarks	US educational multimedia market shares in 1995	Titles
Learning Co.	Leader on the school and consumer market for language learning products. Bought by Softkey*. Cursus-based titles	16%	Reading and writing learning titles with Reader Rabbit, Treasure Mountain,... "Hyperglot" language learning for adults
Davidson & Associates	Company created by a group of teachers. Primary & secondary cursus-based titles for the school market.	9,4 %	Math Blaster, Word Attack. New range of titles to be launched with Fisher Price "Fisher Price Ready for School" (3-6 years)
Disney Multimedia	Multimedia subsidiary of the Disney Communication Group	8.5 %	Strong market penetration from 94 with early years and children series (3 to 12)
Broderbund Software	Bought by Softkey in 95 (606 M$). Titles dedicated to the consumer, school and SME segments 77 new titles released in 94-95	8 %	Where in the world is Carmen San Diego? "Best Early Education Programme" "Active Mind" early years titles
MECC	Pedagogical tools system developper, first software distributor in schools. Educational curriculum - based products for children (5-18) & consumer products. Purchase offer from Softkey*.	6 %	The Oregon Trail, Word Munchers, Number Munchers, Sotrybook Weaver, Mathkeys
Microsoft Multimedia Microsoft Home	Department specialized for home and school market.	5,2 %	Encarta -Dinosaurs Fine Artist - Creative Writer
Living Books	Bought by Broderbund and the publisher Random House	5 %	"Grandma and Me"-400.000 copies sold
Edmark	School publisher, targeting the consumer market since 92. Cursus-based titles	3.5%	Thinkin'Things", "Imagination Express" & "Early Learning" Series (Sammy's Science House, Millie'Math House)

Mindscape	Consumer software publisher with an edutainment line for children and adults.	3 %	"Peter rabbit's math garden", "global maths", "Global english reading", global language series, "Mavis Beacon teaches typing", "world atlas"
Knowledge Adventure	Educational softwares for the family market S.Spielberg has got interest in the company.	2.5%	Adventure Series (Dinosaur Adventure, Underseas Adventure), School curriculum-based products (Jumpstart pre-school, Kindergarten (4-6), First Grade (5-7), Children's encyclopedia
Sierra-On-Line	Consumer title publisher Distribute the products of the french Coktel Vision (ADI)	2,4%	Jeux vidéo. ADI Series, Berlitz for Business in Japanese
Maxis	This a one-product company.	1,2%	Simulation softwares SimCity Series : Sim Earth, Town, Building, Farm
OTHER SIGNIFICANT ACTORS			
Compton's Newmedia	Leader on the encyclopaedia segment.Bought by Softkey*	n.a.	Interactive Encyclopaedia
Jostens Learning Corp.	Integrated learning system & software developper for educational institutions/ Educational products and services for schools	n.a.	Cursus-based titles "A+dvantage", "Learning First"
Scholastic	Leader school publisher in 95 (11000 schools and colleges). Agreement with Microsoft for children's softwares development	n.a.	Pedagogical and cursus-based products, on-line service for schools : The Scholastic Network
Voyager	One of the most creative and innovative US publishers.	n.a.	Expanded books - Paws - Films, musique, etc.

Source : Quadrix 1996/ TF

*Softkey, the consumer multimedia publisher, is implementing an aggressive acquisition strategy on educational multimedia producers: through its acquisition of Compton and Learning Co, Softkey has been building a leading position on both the institutional and consumer market. Its current 17% share of the US educational multimedia market could raise up to 24 % if on-going negotiations with MECC come through.

2.Implantation in Europe of American actors

The following tables present the position of the major american players in this sector in Europe.

Educational Multimedia publishers

Compton's New Media	No presence. International strategy now led by Softkey.
Davidson &Associates	A few localised titles in France and Germany.
Edmark Corp.	No presence.
Jostens Learning Corp.	No presence.
Knowledge Adventure	A few titles localised by Edusoft in France.
Mathsoft, Inc.	No presence.
MECC	No presence.
Scholastic Corp.	No presence.
Softkey	Acquisition of Personal Soft in France and Tewi Verlag in Germany.
The Learning Company	Localised titles. Strategy now led by Softkey

General multimedia publishers

Broderbund Softw., Inc	Marketing office in the UK. Titles localised in France by Ubisoft.
Electronic Arts, Inc.	Employs 250 persons in Europe, following the acquisition of several development and distribution companies.
Maxis Inc.	Localised titles in most of European countries .
Sierra on Line, Inc.	Strong position in Germany and in France following the acquisition of 100 % of CoktelVision.

Subsidiaries of Information and Communication Technology groups

Discovery Communication	Localisation in France by UbiSoft. Will to develop its european implantation.
Disney Multimedia	Strong ability to develop its European implantation.
Microsoft Home	Strong implantation everywhere in Europe.
Viacom New Media Simon & Schuster Interactive	Weak presence.

Source : QUADRIX, 96

B.EUROPE

Companies	Remarks	Titles
Dorling Kindersley (UK)	Book publisher for youth. Leader in Europe on the cultural and educational CD-ROMs market.	References titles: "Musical Instruments", "How the things work", "The Ultimate Body", Eyewitness Encyclopedia of Nature
BBC Worldwide Multimedia (UK)	Consumer market	Language learning titles , reference titles, natural history, entertainment, children
Marshall Cavendish LTD (UK)	Book, music and multimedia publisher (consumer market).	"Images of War", "Great Artists", "Science Lab"
Eurotalk (UK)	90% of sales for export to 30 countries Collaboration with Berlitz . Walt Disney licence	Multi-lingual support (17)language course "Astérix le Gaulois" and children's tales "Story World"
CRT-Group PLC (UK)	Training service provider-professional multimedia publisher- technical and pedagogical support services for schools (LINK's school initiative)	Professional tutorial CD-ROM "Easy Tutor"
Bertelsmann[74] (G)	First European publishing group. Partnership with America-On-Line (Bordas encyclopedia)	Edutainment software and references.
Heureka-Klett (G)	Subsidiary of the German book publisher Ernst Klett.	Products for schools. Leader on the German market.
Burda (G)	Publisher. Owns Navigo and New-world Vision (culture and edutainment). Majority Shareholder in Europe-On-Line (with AT&T) providing among others a language learning service	edutainment ("A brief history of time", "Goethe in Weimar", "Jerusalem") and learning programmes for children (Interaktive Lernsspiele mit Mario)
Cocktel Vision (F)	Bought by Sierra-On-Line(US). Subs. in F, RU, E, All	"Adi" educational titles-edutainment titles
Edusoft (F)	Publisher distributing Nathan software titles. Adaptation of titles from Knowledge Adventure, Broderbund and Softkey	Edutainment (PC Human Body, PC Baby, PC Health) and education (Magic Desk)
Matra-Hachette (F) - Grolier (US)	Development of titles with Voyager and Herisson Fox (US) - strategy of on-line distribution.	Sports; Edutainment; Grolier encyclopaedia.
Arborescence (F)	Bought by Havas (F)	Early years children "Peter", and cursus-based titles. Edutainment, cultural, travel and reference titles (collections "Carnets de voyages", "Hommes de légendes", "L'Essentiel du savoir", "Grandes Expositions", "triptyque" (F, E, G)

[74] Three companies have been created by Bertelsmann to deal with entertainment market (BMG Interactive Entertainment), edutainment (Telemedia Interactive Entertainment) and references (Electronic Publishing Telemedia).

Infogrames (F)	European leader of video game. Creator of the on-line service *Infonie* dedicated to the family market.	Edutainment (languages, music, etc). References titles ("Napoléon", musical encyclopaedia), "Virtual Book"
Giunti Multimedia (I)	Titles CD-i, CDTV, CD-ROM Multimedia subsidiary of the Giunti publishing Group	Karaoké CD-I large audience - CD-I for language learning (6-12), science & nature
Dida'el (I)	Educational software developper & publisher for schools, universities and organisations	"Technical Drawing", "Welcome CAD", "Ancient Rome & Empire"
Opera (I)	Multimedia subsidiary from Olivetti	Education and culture for large audience - History of Europa (U. Ecco)
Micronet (S)	Publisher	Encyclopedia
Anaya (S)	Main publisher in Spain for schools	Education and entertainment for schools and consumer market.
Philips Interactive Media (NL)	Creator of the CD-i. Operates also as a publisher and a distributor.	Distribution of titles for educational, entertainment professional training, languages, etc.
Orfeus (DK)	Public Fundation from the danish Ministry of Education.	Andersen. Danish curiculum "on & off-line", training of trainers.

MAIN COMMERCIAL ON LINE SERVICES

USA				EUROPE			
Entreprises	Date of launch	Subscriptions (million)	Available services	Entreprises	Date of launch	Subscription (million)	Available services
The three biggest entreprises share 80 % of the market.[75]:				***Compuserve**	1990	0,5	3000
				***Microsoft Network**	9/95	ND	
				***America On-line Europe** (Joint venture between	12/95		
*America On-line (AOL)	1985	4,5	ND	AOL et Bertelsmann).			
*Compuserve (bought by International	1979	3,5	3000				
Wireless inc. à H&R BlockInc.).				*Europe Online (EOL): (Burda et AT&T, available	12/95	0,004	
*Prodigy (Sears et IBM)	1984	1,4	900	in D in 95, in UK and F in 96).			
The rest of the market is divided among others, notably :				*Italia On-Line (Olivetti Telemedia)	3/95	0,13	
				*UK on line (Olivetti)	été 95		
*GEnie (General Electric),	1985	0,2	ND				
*Delphi (mis en vente par NewsCorp.)	1984	0.1	ND	*T-On-Line (Deutsche Telekom).	9/95	1	
*Microsoft Network (MSN) is directly	8/95	0,5	ND	*Infonie (France)	10/95	0,002	
accessible from the Windows'95 exploitation system .				*Wanadoo (France Telecom et Havas)	été 96		
				(p.m.: Télétel (France)[76]	*1984*	*7,1*[77]	*25 000)*

1995 was marked by the launching of a large number of commercial on-line networks in Europe. In parallel, the Internet continues to develop : around 5 million machines are connected to this network which involves over 40 million users and an average of 250 000 new subscriptions each month. Most of Internet services are free but the addition of security on the network will soon allow the growth of on-line commercial transactions. Due to this fact, strategies of commercial services (MSN, EOL, Compuserve, etc.) will move towards an opening of their networks on Internet.

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[75] AOL, Compuserve and Prodigy have grown by 200, 100 % and 16,7 % respectively in subscriptions in 1995, and individual subscriptions to on-line services have increased in the United-States by 87 % in the same year (11,4 million subscriptions). This growth was more moderate for the professional services (*Electronic Information Report* 1996).

[76] Teletel, unlike other on-line services, does not operate on a subscription basis, but on the principle of billing for the connection time.

[77] Terminals (Minitels and computers equipped with cards for this purpose).