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1. Introduction: the Form-Base project

The Form-Base project was set up by Directorate 13 of the European Commission, in the framework of the European Community's INFO 2000 report, with two objectives:

- to analyse the situation in Europe as regards multimedia training;
- to draw up an inventory of training in multimedia technologies in the countries of the European Union and EFTA, in the form of a database.

The project was carried out between March 1997 and July 1998 by a consortium of which IDATE was in charge and which comprised the British Film Institute, Danmarks Radio, FUNDESCO, Medienforschung und Beratung and the University of Milan.

This report presents the outcomes of the Form-Base project; it is divided into three parts:

- ✓ in the first part, we present the analysis of the situation of the multimedia industry in Europe;
- ✓ in the second part, we describe the firms' multimedia skill requirements;
- ✓ in the third part, we analyse multimedia education and training in Europe.

A presentation of the situation in each country is given in the annex to this report, entitled: Form-Base: Final Report/ Annex: National reports.

2. The European multimedia market and players

2.1 Multimedia - definition

Throughout this document, multimedia is defined as “a digital representation of signals perceived by humans through sight, hearing, touch, taste, smell etc.; or produced through voice, movements and tools such as a pen, violin, camera, computer, etc. Thus it includes text, graphics, images, speech, music, video, animation, virtual reality etc.. Multimedia technology allows separate information streams to be recombined, interactively and in real-time, when used (...).The Multimedia Industry consists of all organisations involved in the creation, production, trade, integration or delivery of multimedia content within computer-mediated applications.’’¹

2.2 Multimedia market segments

2.2.1 The Consumer market and Business to business

It is commonly assumed that a considerable part of the European multimedia industry works exclusively with the consumer market. This would seem to be the case for companies developing or localising CD-ROM titles, but not for the Internet.

Business-to-business contracts involve not only the production of multimedia products for sale to commerce and industry, but also those which are used by companies as part of their marketing: innovative web-sites, CD-ROM product catalogues and demos, screen savers and the like.

Although the study has no hard data to support this hypothesis, enterprise interviews indicate that business-to-business activities may well generate a similar revenue to that of the consumer market and outrank in terms of the number of multimedia professionals employed. Data to this effect was mentioned in national reports for Sweden and Norway. The demand for Internet services by business in 1996-97 lead to runaway growth among small, specialist companies offering help with the design, implementation and maintenance of corporate or public web sites.

¹ European Commission - Specific RTD programme in the field of Information Technologies 111/6528/97 page 5, February 1997. EC DG III.

2.2.2 Off-line: Games consoles, CD-ROM, CD-i, Video CD, DVD and arcade games

The consumer multimedia is usually associated with CD-ROMs, games cartridges and discs - and arcade games. Arcade games have a significant turnover and are visible examples of the interactive use of 3-D graphics animation. Some 150,000 machines are thought to generate almost the same revenue as the “interactive software” market.

Purchases of interactive software in Europe had a turnover of US\$ 3,500 million in 1996, a 58% increase compared to the previous year. Interactive software is now a bigger market than video rentals and represents almost 80 per cent of the European cinema box office. Included in “interactive software” are CD-ROMs for multimedia PCs, cartridges for 16-bit video games and CDs for advanced consoles such as the Sony PlayStation, Sega Saturn and Nintendo N64.

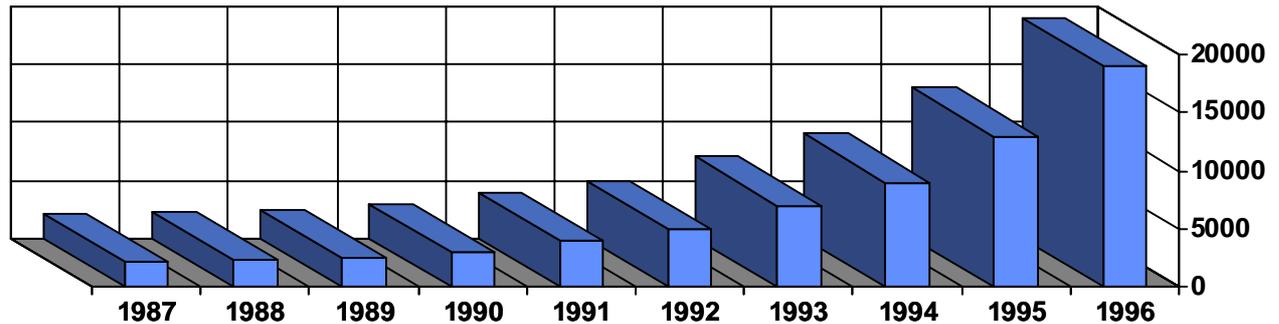
CD-ROM accounts for two-thirds of this 3.5 billion-dollar market, while two 32-bit consoles take an additional 25 per cent. CD-i and video CD have a small and declining share of the market, in marked contrast to China and India, where video CD is experiencing rapid and strong growth. In China alone, the installed base exceeded 22 million units in 1997 and is therefore of importance for European companies, such as Philips, holding the original patents.

DVD-video and DVD-ROM are to be launched in Europe in April, the delay being due to a lack of authoring and pre-mastering tools for MPEG-2 layer 2 audio for PAL titles. The developers currently working on DVD titles fall into two categories:

1. Developers of business software currently limited by the 650 MB capacity of the CD-ROM.
2. Computer game developers looking to DVD-ROM to provide quality video for inclusion in a new generation of games.

There is a consensus that DVD-ROM is set to replace CD-ROM over the next four years. Several hardware manufacturers claim that they will phase out production of CD-ROM drives from the end of 1998. Sales of DVD-ROM drives will overtake those of CD-ROM drives in the year 2000 although DVD-ROM title revenue will only account for a few percent of the total off-line market by the end of the decade due to its computer requirements: a fast processor, a new operating system and API (Windows '98 and DirectShow 2.0 or Apple System 8.1 capable of handling the micro Universal Disc Format, UDF) and a DVD-ROM drive with MPEG-2 board. CD-ROM title production will continue for some years into the next decade.

By the end of 1996 there were some 19,000 CD-ROM titles commercially available, an increase of 45% since 1995. Provisional figures for late 1997 indicate that the number of titles rose to 24,000 (23% yearly growth). Over the last 10 years, the range of titles has increased more than tenfold:



Source: TFPL 1997

The major European CD-ROM market is Germany which, in 1996, accounted for just over a third of sales by value:

PC software sales value (million US\$)

	1996
Benelux	172,4
France	209,9
Germany	1005,3
Italy	133,2
Spain	106,1
UK	305,4
Rest of Europe	377
Total Europe	2309,3
Total USA	1802,9

English language discs still dominate the world market, and account for three-quarters of all commercially available titles.

The ranking of European languages is shown in the following table:

CD-ROM by language

	1996
English	75,0%
German	3,4%
French	1,8%
Spanish	1,3%
Italian	1,0%
Dutch	0,5%
Swedish	0,2%
Danish	0,2%

Source: TFPL 1997

The content of CD-ROMs on the market has changed considerably over the last ten years.

CD-ROM titles by main data type

	1996
Full text	37%
Graphics	33%
Images	31%
Audio	26%
Multimedia	21%
Video	19%
Reference	18%
Software	13%
Bibliographic	11%
Numerical/statistical	5%

Source: TFPL 1997

A competitive title makes full and appropriate use of audio, video, and 3-D graphics reflecting the improvements in the microprocessors over this period. In terms of sales forecasts, a top games title in Germany can sell as many as 400,000 copies, as was the case with *Red Alert*. The title also sold 350,000 copies in the US and 120,000 copies in the UK. A cultural title such as Cryo Interactive's *Versailles* seems likely to sell a total of 200,000 copies in France, Germany, Spain and Italy. Screen Digest quizzed a number of distributors in Europe early in 1997 on their forecasts for specialist (B), general (A) and premium (AAA) titles for that year:

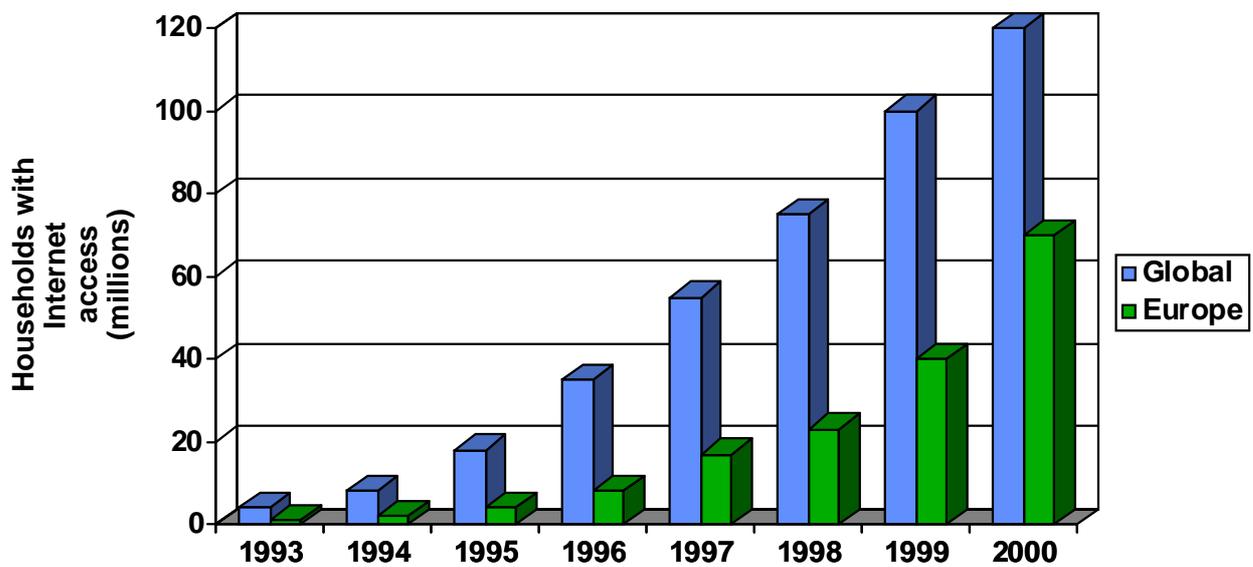
Sales expectations for CD-ROM titles in 1997

	B title	A title	AAA title
Benelux	900	3,000	15,000
Denmark	300	1,000	10,000
France	3,600	12,000	60,000
Germany	12,900	43,000	215,000
Italy	2,400	8,000	40,000
Spain	1,800	6,000	30,000
UK	5,400	18,000	90,000
Rest of Europe	2,700	9,000	40,000
Total Europe	30,000	100,000	500,000

Source: Screen Digest February 1997

Given typical development costs for blockbuster games of at least 700 KECU and between 100-400 KECU for good, general interest titles in Europe it is clear that the CD-ROM market, while reaching maturity, is a high risk area for content developers. The market seems likely to split into blockbusters dominated by international publishers along the occasional national hit such as the Swedish title “Backpacker”, and other titles which struggle to break even.

2.2.3 Internet



Source: Unitech Universal Information Technology Group (1997)

The emergence of the Internet goes hand in hand with the appearance of computers in the home. The US had an early lead whilst Europe was expected to catch up by the end of the decade. Initially, the Internet was fuelled by growth in electronic mail. The increasing use of the Web has had major consequences for telecommunication companies and Internet service providers (ISPs). Voice traffic has been overtaken by data transmission for local calls in the US.

A recent study ranks Internet penetration by country :

Top 15 Countries in Internet Usage Per Capita

<i>(no. per 1,000)</i>	<i>1997</i>
1. Finland	244.5
2. Norway	231.1
3. Iceland	227.3
4. USA	203.4
5. Australia	178
6. New Zealand	155.9
7. Canada	148.9
8. Sweden	147.3
9. Singapore	141.2
10. Denmark	125.6
11. Switzerland	107.1
12. United Kingdom	99.5
13. Netherlands	88.9
14. Hong Kong	64.9
15. Japan	63.1

Source: Internet Industry Almanac March 1998 - figures Dec. '97

There are currently 11 countries with over 100 Internet users per 1,000 people. By the year 2000 there will be another 14 countries in which over 10% of the population will be Internet users: Austria, Belgium, The Czech Republic, France, Germany, Hungary, Ireland, Israel, Italy, Japan, the Netherlands, Portugal, Spain and the UK. The rankings are based on 1997 year-end estimates.

Business models for content provision on the Internet have typically been based on advertising. Internet advertising spending for the first quarter of 1998 rose to \$351.3 million (319 MECU), setting a pace that would easily give the fledgling industry its first \$1 billion calendar year, the Internet Advertising Bureau reports.

Figures were based on data from more than 200 on-line publishers selling advertising, including Web sites, commercial on-line services and e-mail providers, which were compiled for IAB by Coopers & Lybrand's New Media Group.

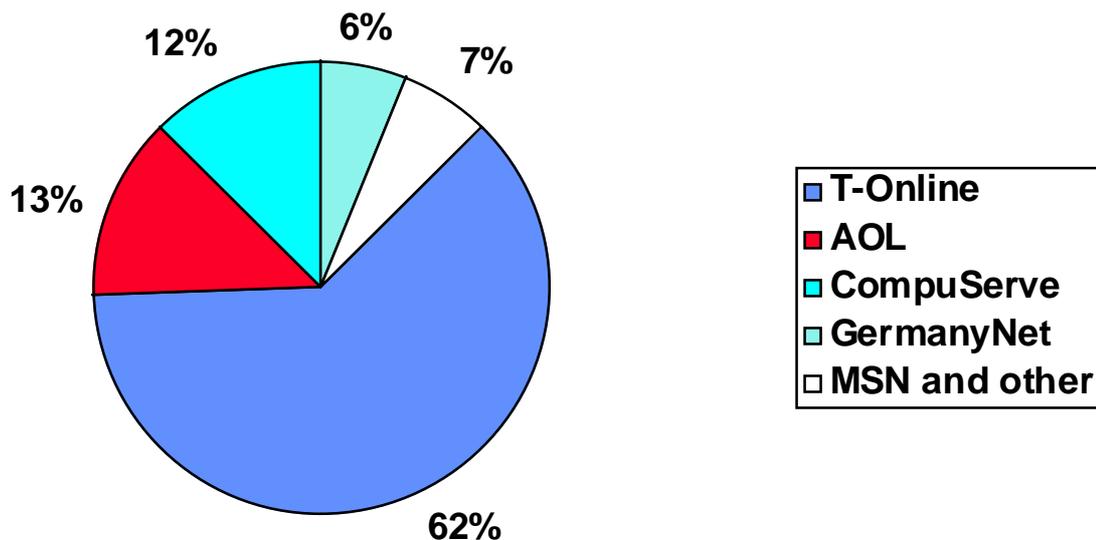
According to the IAB, computers led all advertising categories with 27 percent, followed closely by consumer-related products at 25. Other leading categories were telecommunications, 14 percent; financial services, 13 percent; and new media, 10 percent.

First-quarter spending was about 5 percent higher than the fourth quarter of 1997 and 272 percent higher than the first quarter last year. According to IAB, total on-line advertisement spending last year was \$907 million (824 MECU).

There has also been success in specific, business-to-business areas such as electronic contracting for services, the sale of computer software and business information. With the emergence of safe mechanisms for electronic commerce, the Web is being used to sell new services (previews of new releases of recorded music) or constitutes a new channel for the sale of books and CDs.

In numerical terms, the main markets are Germany and the UK, whereas the Nordic countries have the highest household penetrations. The German on-line market has more than 2.5 million subscribers and is forecast steady growth. The dominant player is currently the national telecommunications company T-On-line, followed by America On-line and CompuServe (which recently merged in the US) and GermanyNet. Microsoft's MSN was thought to have just over 2.2% of the German market at its height:

On-line market Germany 1997 total 2.5 million subscribers



Most consumers currently have dial-up access from their homes via the telephone system; in the north of Europe, ISDN access has been on the increase. There are trials in several European countries involving either Asymmetric Digital Subscriber Lines (ADSL) over copper twisted pair telephone lines or cable modems from cable TV operators to offer improved bandwidth for Internet and digital TV services.

2.2.4 Digital television (set-top boxes, interactive TV, Web-TV)

The nineties have seen a transition from communication satellites to Direct Broadcast, Digital Video Broadcast-S (Satellite) and DVB-T (terrestrial transmission). Digital Set-top Boxes (DSBs) are appearing on the market allowing the reception of as many as six PAL MPEG-2 television signals multiplexed in the same bandwidth allocation as 1 analogue channel. There is no coherent trend regarding the operating systems used in these boxes: some are proprietary based on Windows CE while others use MHEG-5 or Java. As new functions and standards emerge over the next three years (cable modems, high-speed wireless local loops within the home handling IP and ATM protocols and ADSL/VDSL over short distances from the telecoms provider), interactive services such as interactive television and Web-TV are likely to emerge, “piggy-backing” on digital television.

2.3 - The European multimedia industry

2.3.1 Size and organisation of the multimedia industry

The number of European enterprises (public and private) working in the multimedia industry, as defined above, is probably in excess of 6,000. The number of people working in this industry is almost impossible to assess. What can be said is that the work force consists of:

- ✓ a large number of freelancers and self-employed individuals working on a project-by-project basis for other individuals, small or medium-sized enterprises
- ✓ the staff of some 5,000 small companies whose core business is off-line or on-line multimedia
- ✓ the staff of a few hundred medium-sized enterprises with as many as 190 employees who are the multimedia subsidiary or department of a national or multinational company from a related sector such as publishing, broadcasting or telecommunications

The importance of size is dealt with in more detail later in this report.

In all member states of the EU, with the exception of Greece, *there is at least one professional or trade association working with multimedia*. Some of them - BIMA in the UK - are almost ten years old. The difficulty that most of these bodies face is to be representative.

Germany, for example, has the DMMV (German Multimedia Association) in Düsseldorf, which regards itself as an umbrella organisation for its 260 or so members, and ZIM (Centre of Interactive Media) in Cologne. The latter, having a membership which is just a fraction of those active in the field, reduces its authority in discussions on standards of education and training.

The same problem exists in Denmark which has two trade associations, the Multimedia Trade Association and the Danish Multimedia Publishers Association. Neither of them can be regarded as representative of the multimedia industry as a whole. Members of the former are typically small companies with between 3 to 20 employees. Some (TextWare, Courseware Scandinavia, Waves Information Technology, Visionik) have existed for more than 10 years and grew out of companies working with interactive video. The majority have emerged within the last two to three years, in particular those in the Internet and World Wide Web field.

A second problem facing such professional or trade associations is *identity*. Do multimedia producers define themselves as such? In Greece, there is no professional association for multimedia producers; software houses specialising in multimedia are members of the Federation of Hellenic Information Technology Enterprises. A number of the major multimedia players in, say, Denmark are not represented by either of the multimedia associations. In some cases they are to be found among the members of the IT Trade Association. There are also specialised entities such as *FAKDIS* (the Danish Association of Commercial Internet Sites) and *FDIH* (the Danish Association of Internet Commerce) who are in fact part of the multimedia industry but do not regard themselves as such. Other multimedia enterprises belong to no association whatsoever.

There are a number of Special Interest Groups (SIGs) in most European countries which, as a result of EC funding, have developed into professional associations. In the last two years both DGIII and DGXIII have supported the setting up of a number of Multimedia Support Networks such as MIDAS with the aim of developing various segments of the multimedia content industry, the results of which are beginning to emerge. The Portuguese Multimedia Association is a good example of such a SIG in one of the smaller member states which functions as a catalyst.

2.3.2 Major players

2.3.2.1 Publishing

Publishers of CD-ROMs have emerged from a number of related industries: book publishing, software, films and broadcasting and, to a limited extent, telecommunications. Microsoft and Disney are two of the dominant publishers world-wide.

In the USA, Dorling Kindersley (a UK publisher with a strong background in books and the audio-visual industry) was the only European publisher to be found on the top ten list of general titles in 1996. While under UK management, Virgin Interactive was a strong player in the games market - also among the front-runners in the US, and the Danish Lego company was on the top-ten list of computer games up to Christmas 1997 (although their title was developed by an American company).

In 1996, Disney held six of the ten best-selling titles in the US, and 4 in Europe. The successful players either exploit a powerful brand in their segment of the market and/or exploit the synergies of cross-marketing multiple media/cross media projects encompassing television, video, CD-ROM, off-line and merchandising. A new example of this trend is the Australian Broadcasting Corporation project, Bananas in Pyjamas, a runaway success for small children, which exploits the television brand on video and CD-ROM.

The number of CD-ROM publishers remained constant in 1996 (and may have fallen in 1997). A number of high-profile publishers have either gone under (ATTICA, New Media, Epic), withdrawn from the market (Penguin, Harper Collins, News Multimedia and Marshall Cavendish) or streamlined their operations in the face of poor results.

This was very much in evidence at the MILIA (February 1997, 1998) and Frankfurter Buchmesse (October 1997).

The buzz words were realism and consolidation. Navigo and Systema are now divisions of the same holding company run by Burda, with the former concentrating on life-style and the latter on reference titles. Ravensburger consolidated its position for children's and teenager titles, while the Bertelsmann group seems to have retrenched: BMG Music is no longer an active player in the consumer CD-ROM market having concentrated on its core book publishing business while retaining its stake in the developer PixelPark and T1.

Only a small proportion of CD-ROM publishers - probably less than 6% - make money: most are thought to have a negative cash-flow. Apart from Disney and Microsoft, the blue-chip publishers in Europe include Infogrames, Oxford University Press, Dorling Kindersley and Chadwyck-Healey.

2.3.2.2 Major players: distribution

Distribution channels for multimedia in Europe tend to have unique structures in each individual country. Denmark, for example, is characterised by book shops and consumer electronics outlets rather than, say, record and computer stores:

Main retail outlets for CD-ROM titles in Denmark (1996)

<i>Retailer</i>	<i>Category</i>	<i>No. outlets</i>	<i>Est. market share</i>
Bog og idé	Bookstore	147	5-10%
BR Legetøj	Bookstore, toys	82	less than 1%
Danexpert	Radio/Hi-Fi	81	5-10%
Telebutikkerne	Telecom	72	10-15%
FONA	Radio/Hi-Fi	52	10-15%
JYFO	Photo	50	5%
DER	Radio/Hi-Fi	36	less than 2%
Fredgaard Radio	Radio/Hi-Fi	36	5%
Merlin (=FDB)	Radio/Hi-Fi	29	10-15%
Selandia	Radio/Hi-Fi	22	less than 5%
GAD	Bookstore	16	5-10%
Alcotini	Computer	12	less than 2%
Superleg (Toys R Us)	Toy	11	less than 1%
Bilka (Danish Supermarket)	Hypermarket	11	5-10%
Others:	Computer	40	less than 21%
Total		697	92% - 127%

Source: Thomas Kleingartner, Cryo Interactive Entertainment, Paris France.

In other countries such as France, the distribution side is dominated by a limited number of players such as FNAC who hold a wider range of titles than many other distributors both in France and elsewhere in Europe.

2.3.2.3 Audio-visual (broadcasting, film, recorded music and post-production)

As mentioned under “publishing”, multinational media companies have a strong presence in the off-line multimedia market around the world, and film companies such as Disney increasingly look to exploit well-established brands through cross-media marketing. Revenue from the sales of videos, CD-ROM and merchandising for “The Lion King” or “Titanic” can offset the staggering production and advertising budgets for such films.

Broadcasters such as Canal+, the Discovery Channel, the BBC, Anglia and Yorkshire Television and small public broadcasters such as Danish Broadcasting are also players in the European multimedia market using the same cross-media approach to exploit their brands.

Over the last few years, the major players in the UK industry have expressed concern over the slow penetration of the Net into the mainstream. There has been wide-ranging debate over what the potential accelerators of the process are. A major initiative by British Interactive Broadcasting (BIB) to deliver the Net via television sets has raised hopes of massively improving access to on-line services. BIB, a joint venture between British Sky Broadcasting, British Telecom, Midland bank and Matsushita electronics, recently launched a joint-venture to offer Internet access, home shopping, banking via television sets, and therefore increasing the potential market for on-line services to all those 22 million homes with a television set.

Post-production in the audio-visual sector and in advertising increasingly involves multimedia technologies which are to be found in on-line video editing systems, digital animation and special effects systems. Analogue tape-based editing has first given way to on-line digital editing, built around Motion-JPEG or QuickTime, and recently to MPEG-2 editors and advanced multimedia servers, soon to incorporate variable bit-rate real-time encoders. Integrated production systems based on MPEG-2, MPEG-4 and MPEG-7 would seem to be a natural extension allowing improved functions, greater efficiencies and lower production costs.

2.3.2.4 Advertising

A number of advertising agencies such as BBDO and Young and Rubicam entered the multimedia market at the beginning of the decade, first in connection with the production of corporate and product presentations on CD-ROM, with digital tools for the production of film and television commercials, and then the production of advertising for the Web. Post-production companies which were associated with them also began to play a role in the development of creative skills for multimedia. A pioneering scheme was set up by the French company Mikros Image who made expensive multimedia workstations available to artists outside office hours in order to experiment with digital animation techniques. This provided the “creators” with a new tool with which to express themselves and it gave the sponsoring company insights into novel means of exploiting their equipment.

2.3.2.5 Computer and telecommunication companies

Computer hardware and software manufacturers such as IBM, Oracle and ICL and telcos such as BT, Deutsche Telekom, France Telecom, Telia, Telenord and Nokia all play an important role in providing the technical infrastructure for multimedia even though they regard themselves as part of the IT sector. This is particularly evident in the educational field where private/public initiatives both at European and national level seem to accelerate the introduction of ICT infrastructure.

2.3.2.6 Public sector

In the eighties, public sector initiatives played an important role in raising awareness as regards multimedia. National initiatives such as the Italian cultural heritage programme and the Norwegian digitisation programme for libraries, museums and archives were instrumental in kick-starting developments in digital scanners and cameras.

2.3.3 National policies and regulatory framework for the multimedia industry

The UK and Scandinavia were among the first countries to develop national policies to promote the development in this field. Multimedia was identified by the *Danish* government as an emerging industry with considerable potential in 1986. This resulted in the setting up of the National Interactive Media Centre, a three-year awareness programme to promote the development and use of interactive technologies.

In the nineties, discussions on the transformation of the economy into an information society led to national White Papers on the use of interactive technologies in education and the INFO 2000 report. The latter formed the cornerstone of the national IT Action Plan in March 1995 co-ordinating all government policy on the information and communication technology in Denmark.

Subsequently, as part of its remit to handle the government's Information Technology policy, the Ministry of Research took an active part in identifying strategic weaknesses in Danish society. A report entitled *A Danish Media Lab - "Et dansk medielab"* - published in 1995 led to the setting up of a virtual centre, *Centre for Informationsteknologi (CIT)* comprising 5 academic teams located around Denmark to act as a R&D locomotive. Work is currently in progress to set up an IT school with the aim of rectifying the shortage of high-calibre staff in the multimedia field.

In 1996, the Danish labour market - the Danish Employers Association (*DA*) and the Danish Trade Union movement (*LO*) commissioned a study on the multimedia field in 1996. The aim was to promote both changes in educational provisions and a dialogue with the Ministry of Education concerning the content and form of the existing education and training provisions. The study was published in 1997².

² Andersen, Karsten Bøjesen, Fagerberg, Maj. Nutids- of fremtidsbilleder inden for multimedier og elektronisk kommunikation - en kvalifikationsanalyse [Current issues and trends of multimedia and electronic communication - an analysis of qualifications] DTI Danish Technology Institute, Tåstrup, Denmark. Published by the Danish Ministry of Education, June 1997.

The annex of this report comprises 3 detailed case studies of multimedia companies in Denmark. By referring to one completed multimedia project from each company, the researchers described the division of tasks and responsibility for the complete production cycle.

While all three cases are broadly comparable as regards the job functions of the project teams, the individual job profiles are not: staff members with much the same job title in the three companies have considerably different ranges of job functions. This is due in part to:

- ✓ the small size of the companies concerned
- ✓ the nature of the projects being worked on
- ✓ the current status of the multimedia industry, consisting as it does of largely self-taught pioneers

Thus the term “television producer” is an useful label, implying a given range of responsibilities and skills, whereas the term “multimedia producer/editor” is not - as yet.

The report goes on to identify 11 job categories in multimedia production and suggests the various professional, organisational and personal qualities required for each one of them.

The report concludes with a number of observations concerning the education and training of multimedia staff. Existing educational provisions do not provide key organisational and personal skills required in the private sector, such as an in-depth comprehension of the production process and the contribution of each team member, the ability to plan one’s own work and keep to a tight schedule and to acquire new skills autonomously on an on-going basis.

UK

Following the Conservative government’s measures in the eighties to promote interactive multimedia, a new round of initiatives were announced in 1997. The new Labour government has fashioned itself as the party committed to a ‘Wired Britain’ and it has pledged significant resource allocation to promoting the use of the Internet. One of its major initiatives this year has been the launch of the National Grid for Learning, which promises to connect every school in the country to the Internet by the year 2002. The plan also envisages a major new network of learning resources, including on-line museum and library collections to be available to schools across the nation.

The year has featured an intense debate about the future of conventional broadcasting in the face of a digital revolution and the ever stronger presence of the Net.

In the light of this debate, a number of major broadcasters have committed significant resources to an on-line presence. The BBC pledged about 30 MECU to creating a strong on-line presence, including a sophisticated multimedia site featuring 24 hour on-line rolling news and a commercially-sponsored web site featuring some of its most popular programmes.

Belgium has seen regional initiatives such as Multimedia in Flanders, the Walloon “Du numérique au Multimedia” and “WIN” programs, but these are not part of a shared development strategy.

In November 1997, the *Irish* government undertook two national initiatives:

- ✓ a 35 MECU Technology in Education Initiative Fund to be spent on infrastructure, research and development as well as new course initiatives
- ✓ the provision of Internet access to all educational establishments by the national telco Telecom Eireann.

In a different area, *German* legislation came into force on August 1 1997 regulating commercial activities on the Internet and separating the multimedia sector from broadcasting, the latter being administered by the federal states.

Content providers are now responsible for the contents they publish on the net (with the exception of e-mail and chats). Minors are offered protection from harmful content (violence, pornography) as such content has to be protected by passwords or filter software.

The same multimedia act also provides a legal framework for safe business transactions such as home banking and contains provisions for personal electronic signatures.

In *Finland*, the Finnish multimedia industry receives support from TEKES, the government-funded Technology Development Centre which was set up to promote the competitiveness of Finnish industries through collaboration in research and development between companies and universities.

2.4 An overview of national situations³

2.4.1 Markets

In many countries, the development of the market for multimedia products has yet to take place. In **France**, 1998 has been a key year as regards multimedia PC equipment at home and the migration of interactive services from the Minitel to the Internet. Interactive services through television should also become a specific market segment, driven by the growth of digital television subscribers. The situation is similar in **Italy** or **Spain**, where the installed base of multimedia PC's should grow considerably this year.

However, in a significant number of cases, the multimedia market has already experienced a shift from CD-ROM to the Internet: In 1997 and 1998, in the **United Kingdom**, major broadcasters and established multimedia content producers have been investing in the development of Interactive television programming, as well as entertainment designed for the Internet. Meanwhile, the CD-ROM market is suffering from a glut of multimedia titles that appear lacklustre and/or are too expensive for the buying public. Consequently, multimedia companies with significant investments in CD-ROM development have been downsizing and many have folded altogether. In December 1997, Dorling Kindersley, the largest multimedia edutainment publisher has in December 1997 announced a 50% reduction in its work force. In **Ireland**, while CD-ROM was thought to be the financial winner in the new media arena, the drift has now changed in favour of the Internet, with notable cases of sector reduction.

The rapid evolution of the market can be observed in the **Netherlands**, a highly developed market by European standards as regards computers in the home or Internet access. An important driver in the development of the industry, at the beginning of 1990, was Philips with the introduction of the CD-Interactive; Developers of CD-I products moved on to the CD-ROM platform but, up to 1995, the market was not growing fast enough, and companies geared toward the Internet.

2.4.2 Players

The Multimedia industry in **Belgium** is highly concentrated in Brussels (55% of Multimedia and Internet related companies) and suffers from the lack of a Belgian-based international player, unlike **Luxembourg** where the CLT group guarantees an active role in the development of the European audio-visual and, broadly speaking, media industry. Moreover, recent development of the European Satellite Multimedia Service aims to enhance the development and satellite-based diffusion of on-line multimedia contents.

³ From the Form-Base national reports

Denmark illustrates the diversity of the Multimedia industry, with:

- ✓ a pool of free-lancers and self employed multimedia professionals;
- ✓ several hundred micro-enterprises (3-4 employees);
- ✓ 20 to 30 small companies (10 to 30 employees)
- ✓ 10 to 15 medium-sized organisations (30 to 120 employees).

Most of the players appeared in the last few years.

The other Scandinavian countries present similar patterns.

In **Germany**, the *core branch* of the new industry consists of genuine multimedia companies which were founded just a few years ago and which produce 100% multimedia products. The «*first periphery*», having its origin in mass media companies, now concentrate more and more on multimedia products as well- for instance on-line websites for newspapers or broadcasting stations. They are users and producers at the same time. The «*second periphery*» consists only of «User companies». Insurance companies, banking houses and health institutions all use multimedia technologies for their specific purposes - but they do not develop them.

In **Greece**, the players of the Multimedia market are from 4 different sectors:

- ✓ Traditional publishers which have engaged in Multimedia development;
- ✓ Software companies also engaged in Multimedia development;
- ✓ Internet access providers;
- ✓ Non-profit-making organisations.

In **Ireland**, the first wave of multimedia companies who provide for the primary market have reached a point of strategic development; the underpinning finance may not be available for expansion. It is the juncture of an industry dip (CD-ROM) with future bright prospects (Internet, games, media convergence) that is beginning to pose problems, at present, for multimedia companies. The second wave of producers are Internet orientated, new media literate and flexible in approach; altogether, it is assumed that indigenous Multimedia companies will grow in size, follow the development in export markets and invest a greater proportion in research as well as marketing.

In the Netherlands, the media sector has the largest share of the Multimedia market; **in Norway** and **Sweden**, Multimedia organisations originate from publishing and distribution, the computer industry, telecommunications, film and television, advertising and the public sector (education and culture).

In **Switzerland**, some medium-sized companies exist, together with smaller firms and free-lancers.

There are three main sources of multimedia content production activity in the **United Kingdom's** multimedia industry. Firstly, there is a large number of small companies (the

average number of employees appears to be in the region of 12) that have been set up within the last few years with multimedia production as their only/main source of income. Secondly, there are a number of companies whose main activity lies in one of the more « conventional » industries, but which have branched out into multimedia production in order to benefit from convergence trends. There is an industry populated by a vast number of generally under-invested, small to medium-sized companies which tend to have the creative edge over the larger companies, such as the BBC or B SkyB whose multimedia departments benefit from significant back-up funds.

Most multimedia companies in **Portugal** are small, have flexible and agile structures, and master the technology. However, they suffer from the reduced dimension of the market, and they need to continuously invest in technological updates. They face a lack of shelf space in stores, and a strong competition from international production companies with lower prices.

The multimedia industry in **Spain** comprises:

- ✓ small players, very active and dynamic. Most of them were established in Madrid or Barcelona, where over 50% of the activity in this field is concentrated. Initial capital investment to start up one of these companies is directed towards buying expensive equipment for digital edition of audiovisuals and videos.
- ✓ big publishing houses have finally decided to go into the electronic and digital business. Internal departments that were set up a few years ago with the aim of following the multimedia revolution that was taking place, have evolved into new companies or branches within the publishing corporations
- ✓ Old dinosaurs in communications like PTT's, TV channels and cable network operators consider multimedia as a means of easily obtaining new contents for their digital communication networks.

3. Multimedia skills requirements

3.1 Major characteristics influencing recruitment skills requirements

3.1.1 Composition and status

The situation in the UK is typical of the more developed European national markets. Despite a number of major setbacks to the industry, such as the collapse of profitability in the CD-ROM market, multimedia is very much perceived as the industry of the future there. Journalists, commentators, business leaders and policy-makers continue to use multimedia as a buzz word at every possible opportunity. The high profile that the multimedia industry has enjoyed over the last few years has meant that courses, claiming to equip graduates with the means to succeed in the industry, have been mushrooming. This applies to courses across the board: Further and Higher Education, as well as the private sector. There has been little attempt to review this growing provision of training in any comprehensive way.

The UK companies that were taken as a sample are all relatively small, with a work force ranging from 4-37 employees. As regards activity, they range from games developers, CD-ROM publishers, and Internet developers. They have all been set up from scratch within the last 4 years, or are an off-spring of an established company (e.g. a print design consultancy). Most have been set up by former colleagues and university friends. Entrepreneurs who have set up the companies tend to have a number of years experience in a related activity: design, art, IT, corporate AV products. They tend to be highly driven individuals with a number of skills and a self taught specialisation either in programming or design and are normally able to participate at most stages of the production process.

3.1.2 The significance of size

It is striking that, according to national studies on which this report was based, the size of a multimedia enterprise is a key factor that affects the way in which it is organised and run. The European multimedia industry can be broken down into at least three main categories:

1. *a large pool of creative individuals* (e.g. graphics artists, multimedia producers/editors, animators, web developers and programmers) who are either freelancers or self-employed.
2. *several thousand small enterprises* with an average staff of 12 working on multimedia (off-line and increasingly on-line) for the local or national business-to-business market.
3. *a limited number of medium-sized companies* or the multimedia divisions, subsidiaries or special projects of publishing, film and broadcasting, advertising, computer, and telecommunications companies or organisations which work nationally or internationally. These companies have as many as 190 permanent employees.

It is important to note that small and medium-sized enterprises have a mix of permanent and temporary staff (either freelancers or sub-contractors). Small companies have an informal network of freelancers who are hired on a project basis whereas medium-sized enterprises tend to have a bigger proportion of full-time, permanent staff with key skills. Regardless of size, companies commonly put teams together on a project by project basis, so as the Finnish report mentions “someone can be the designer in charge of one project and then work with production in the next”.

3.1.3 Company age

The average age of the companies surveyed is less than 4 years. Small companies working on the Internet are rarely more than one or two years old, whereas those working with a background in computer-based training, interactive video or point-of-information systems may well be more than 10 years old. The oldest companies are invariably multimedia companies associated with publishing houses and broadcasters.

3.1.4 Turnover

Those polled were often reluctant to discuss their turnover. It ranges from 250 KECU to 50 MECU for a CD-ROM publisher. Growth is reported to be steady but low in small, well-established companies and higher in medium-sized enterprises in Denmark, Finland and Germany.

One company has been doubling in size every year and plans to have a staff of 160 at the end of its second year.

Other countries have experienced stagnation or even decline among small enterprises who work with CD-ROM production and not moving quickly enough into on-line.

3.1.5 Staff turnover

Staff turnover (the proportion of staff joining or leaving over the previous year) is highest in medium-sized enterprises such as CD-ROM publishers and broadcasting and telecommunications companies with a multimedia department or division. The reasons given are:

- ✓ staff leaving as the result of restructuring or privatisation (new competencies are required)
- ✓ staff leaving as the result of the outsourcing of testing or localisation
- ✓ rapid growth in new multimedia subsidiaries

One specific area identified in four countries concerns localisation - the adaptation of the content of a product originally produced in one country so as it can be used in another. Major CD-ROM title publishers under pressure to cut costs in response to falling retail prices have begun to re-establish the technical part of their localisation in countries with either lower labour costs, higher productivity or both. Editorial and business control remains with the publisher.

The UK and Ireland were, until recently, among the beneficiaries of this trend and companies such as SDL (UK) were handling localisation for publishers both within Europe and overseas.

In 1997, new competitors in countries such as Singapore and Poland, offering attractive rates, skilled labour and good quality control, began to earn contracts which had previously gone to the UK and Ireland. There were different net growth patterns in the various countries.

3.1.6 Uneven regional distribution

Reports from many of the countries surveyed indicate that multimedia enterprises are unevenly distributed:

- ✓ Multimedia companies in Belgium are concentrated in Brussels and the Flemish-speaking regions whereas the Walloon region houses between half and one third of the multimedia companies
- ✓ Multimedia enterprises in the UK are concentrated in the south-east
- ✓ Multimedia enterprises in Finland are concentrated in the metropolitan area of Helsinki.

3.1.7 Intense competition - creativity and capital

The multimedia industry is intensely competitive: for many individuals and small companies, chances of medium to long-term survival, let alone success, are still slim and depend on their having a competitive edge over their larger, better-capitalised competitors.

Established multimedia content producers have been gearing up for the potential future demand for their products and have been investing in the development of interactive programmes, as well as entertainment designed for the Internet. Some of these companies see themselves at the cutting edge of a new revolution: just as the advent of independent television production companies in the 1980s infused broadcasting with a new lease of life, so they see themselves at the forefront of a new digital interactive television age. These small companies earn their living by working on lucrative commercial intranets and web sites, while they also pursue innovative programming. Some of these companies are said to be following in the footsteps of their older sisters, the independent television production companies, as the world's most innovative companies of their kind.

There is little forthcoming investment for small companies from national financial institutions as multimedia production is still largely - and often correctly - perceived as a high-risk, low-return activity.

3.2 Recruitment and skills required

3.2.1 Occupations - the kind of staff recruited

The future of the multimedia industry continues to be extremely unpredictable. Bitter lessons have been learnt following the over-eager and often misguided expansion fuelled by CD-ROM technology. Companies in the UK are increasingly cautious in their recruitment policy at junior level. They feel they cannot commit themselves to the long term investment required in order to transform inexperienced (though often talented) junior entrants to the industry into productive team members.

It has been quite difficult to ascertain what kind of staff is being recruited by the multimedia industry. Three factors are at stake here:

1. these days, as regards recruitment, there is a very wide range of occupations being recruited ;
2. there is a lack of direct relationship between the job title on a business card and the job functions that it involves. It is true to state that in companies of 3-4 people, a given person is probably doing the same “jobs” as three or four staff members in medium-sized enterprises where there is room for specialisation ;
3. the title on a business card reflects a taxonomy of occupations which was inherited from mature industries such as broadcasting, publishing or computing.

In France, the study revealed that “core professions” (multimedia editor/producer, multimedia designer, multimedia project manager and multimedia programmer) account for two-thirds of the work force recruited, i.e. employed on a permanent basis.

In Germany, the most common categories are also multimedia editors/producers, multimedia designers, and multimedia programmers.

In the Netherlands, the common occupation categories are again multimedia managers/directors and producers, multimedia designers, programmers and animators.

Although this is not clearly highlighted in the other reports, the trend seems to be largely the same elsewhere.

3.2.2 Job functions

The interview questionnaire listed 36 job functions which had been identified with staff in multimedia enterprises. These were found in nearly all those companies surveyed. Exceptions included marketing and market analysis, distribution, customer contact, copyright clearance and technical support (companies which are subsidiaries and where these functions are dealt with elsewhere).

Multimedia specialists also have to be generalists, i.e. have an in-depth comprehension of the multimedia production process from beginning (idea) to end (finished product/service) and their role in that cycle.

Multimedia designers, authors, editors/producers, project managers and marketing specialists may be responsible for or carry out as many as 33 of the functions listed. Staff in medium-sized companies are often more specialised but even so, multimedia editors/producers and project managers often cover the same number of functions.

Freelancers usually have job functions which are not part of the core functions of the organisation. Desk top graphics artists and video and audio technicians as well as translators and actors are good examples of this.

3.2.3 Skills and competence

Given the rapid rate of development of the multimedia industry, it is very difficult to identify and quantify the skills that are required in order to work in the industry. There is no formal system of accreditation that is recognised by both employers and employees. Therefore jobs are often given on the basis of personal acquaintance or to somebody that is known to be reliable. This pattern is most prevalent in small companies, less so in, say, French multimedia subsidiaries which are medium-sized enterprises. Therefore, in all but the largest companies, individuals who are not 'on the scene' (e.g. in the UK, people living outside the south-east of England - the main hub of multimedia activity in the country) may come across barriers when trying to enter the industry.

3.2.4 Recruitment methods

Most of the small enterprises surveyed shun formal channels of recruitment. They rely on contacts and acquaintances. Some often recruit graduates who have previously gained work experience in the company during the course of their studies. Small enterprises also tend to be inundated by CVs and work samples and expect potential employees to use their initiative and approach them. They claim that using contacts enables them to recruit reliable and qualified people, as they cannot afford to take on someone whose skills are not guaranteed.

It is a different picture as regards medium-sized enterprises, especially for departments and subsidiaries of telcos and publishers where word-of-mouth is less common. Their recruitment methods include:

- ✓ internal recruitment from elsewhere in the organisation
- ✓ job advertisements in national newspapers (and sometimes on the web)
- ✓ management consultants who headhunt (project managers, marketing managers and other hard-to-find specialists on the world market)

3.2.5 Skills required - priorities and bottlenecks

The organisations interviewed named skills which they rate highly but which they say are difficult to find in people, in particular, specialist functions. There is a consensus on the need for a *mix* of abilities in creative, technical, professional and organisational areas.

Due to very different requirements from one company to the next, it is difficult to establish patterns across countries in the interview sample.

In some cases the skills required are available in the employment market but those who possess them are too few in number and therefore ask for salaries that are too high for most companies apart from the medium-sized ones. In other cases, there are simply too few people with the skills in question.

Job categories that are mentioned in at least two national reports include:

3.2.5.1 'Hard core', highly skilled code programmers

They are very expensive and almost impossible to recruit permanently, as it is in their interest to work freelance. Typically they specialise in the use of tools such as Macromedia Director and Shockwave, and other Internet tools such as Java and Flash. This shortage is most certainly the spill-over effect from the wider IT skills shortage that has existed in the UK and other Northern European countries for some time. Medium-sized companies offering high salaries and/or other attractive working conditions do not seem to have this problem.

3.2.5.2 Those with a good command of cutting edge technologies

The few specialists who possess these skills are very highly paid. At the time of going to press, the shortage applies to specialists in the fields of real-time 3-D design (VRML), 3-D modelling and animation, Dynamic HTML, Java-based technologies and to those who possess skills in MPEG-2 based systems for post-production and special effects.

3.2.5.3 New media marketing staff

It is now widely recognised that marketing - both nationally and internationally - is essential for the survival and growth of most multimedia companies. Most, however, find it difficult to recruit marketing personnel who have a thorough understanding of the new media. Only one of the companies in the sample managed to recruit someone with a qualification in new media marketing. Here again, the pattern is dependent on size. Enterprises which are a department or subsidiary of a media company do not handle their own marketing.

3.2.5.4 Experienced project managers

A number of the interviewees have reported difficulties in recruiting highly-skilled managers with a number of years experience in the industry. Normally, although not always, they specialise in either programming or design and have a thorough understanding of all aspects of the production process.

There are two different schools of thought. Some enterprises look for those with proven skills in general project management who could adapt to multimedia production. Others find that it is extremely difficult to engender this feel for multimedia production and therefore prefer to help the best of their editors/producers develop into multimedia project managers.

3.2.5.5 Highly skilled multimedia designers

Enterprises have also reported problems in finding individuals who are first and foremost highly innovative designers, and to whom the technology is a tool for executing their concept. A number of interviewees complained that many designers, especially those who have been introduced to design through multimedia oriented courses, have been 'seduced by the technology' and often produce rather cryptic designs. Others are simply not innovative enough and produce lacklustre work.

Others still, are not aware of the limitations of the technology and do not have sufficient understanding of the capabilities of programming and therefore produce designs that are technically impossible to execute.

3.2.5.6 Other specialists (copyright clearance, quality control and usability testing)

Copyright clearance as well as other kinds of legal and commercial expertise have been mentioned several times (notably in Greece) as has quality assurance and multimedia research.

3.2.5.7 "Soft skills"

Some of the skills and competencies sought among all such highly-qualified staff could be termed "soft skills". They are rarely technical, but more organisational or personal, relating to creativity and motivation:

- ✓ Flexibility
- ✓ Empathy
- ✓ Enthusiasm and commitment
- ✓ Self-reliance and self-motivation.
- ✓ Ability to work in a team & social skills
- ✓ Ability to work creatively in a team
- ✓ Ability to understand one's contribution to the multimedia production process.

Perhaps these soft skills are even more relevant in multimedia than in most other industries as the production process is inevitably team-based, and often conducted to very tight deadlines. Most companies, even the larger ones, cannot be certain of the future and live a relatively precarious existence. On the other hand, the industry offers a great deal of novelty and excitement.

3.2.6 Skills requirements towards 2000

“More of everything, especially project management skills” was a typical response here. Although interviewees were willing to talk in general terms, talking in too much detail about their plans would pose strategic problems for them and they felt that, in any case, it would be unfruitful to talk about developments more than 24 months ahead.

However, skills that are generally required include knowledge of the Internet, the web and emerging technologies to do with virtual reality and virtual communities, developing and integrating commercial digital television services, knowledge of electronic commerce, on-line learning and collaborative working.

3.3 The multimedia industry and the training offer

3.3.1 Awareness of existing education/training provisions

A common feature, regardless of the size of the country, was a general lack of awareness, among those interviewed, of existing educational and training provisions in their own country, let alone elsewhere in Europe. The situation was very different in some of the medium-sized enterprises where recruiting world-quality staff is a critical factor. Companies find it extremely difficult to keep track of developments in education; this situation is compounded when they feel that there is not much worthwhile to be found.

3.3.2 Attitudes towards initial education and training provisions

The term “initial education and training” is used here to cover all post-compulsory education and training - public and private - which are equivalent to at least 6 weeks full-time teaching and which lead to qualifications and/or skills applicable to the multimedia industry.

It includes:

- ✓ courses for teenagers who have left school (out-of-school courses run in several EC countries)
- ✓ courses at secondary or vocational level (e.g. technical *gymnasium* in Sweden, *tekniske skoler/handelsskoler* in Denmark)
- ✓ short diploma or degree courses in tertiary/higher education or their equivalents in the private sector
- ✓ bachelor, master, and PhD degree courses in tertiary/higher education or their equivalents in the private sector

The companies interviewed were generally aware of a small proportion of the courses in their own country but rarely of such courses elsewhere in Europe. The exceptions were:

- ✓ major players (medium-sized companies) with a well-defined recruitment policy
- ✓ companies in Belgium who are often critical of what they can find in the way of 3-D courses at home and who refer to initial education and training courses in France or the Netherlands

3.3.3 Criticism of existing initial education/training

3.3.3.1 Irrelevance

The majority of companies profiled which did not employ people with initial education/training, i.e. did not recruit staff direct from a college or university, cited irrelevance of existing education/training provisions as the main reason for not doing so.

Many practitioners said that they were striving to be at the cutting edge of technology and design and that their requirements were therefore ‘unteachable’.

Others considered courses out of date; by the time a course has been set up, things have already moved on.

One of the Danish interviewees felt that a number of junior posts could be filled with graduates from Danish institutions, especially from courses which offered a mix of theoretical and practical training of which production in real-world conditions was an important part (Space Invaders being one of them). The main reason for the cited “irrelevance” of many public education/training courses was the inability of the staff to keep up with the changes in the industry, the lack of first-hand experience of working in multimedia production and the lack of external lecturers or those on short-term contracts from the industry with the necessary “cultural” and organisational insights.

As the Finnish report pointed out, one of the issues here is the problem that educational institutions have to establish and maintain high-end production facilities in, say, 3-D animation.

One could ask: If staff do not acquire the skills and abilities they need to hold down a multimedia job through initial education and training, how do they acquire them? The answer seems to be on-the-job or by learning on their own.

3.3.4 Attitudes towards in-service education and training

In-service education and training covers both formal and non-formal activities leading to the acquisition of skills *among those who work in the multimedia industry*.

If such people have no formal initial education or training in multimedia, they will either have to acquire it *on-the-job* through *formal* in-house training or *non-formal* learning by doing or *off-the-job* by taking part in *external* courses, seminars and conferences.

For those with an initial education/training in multimedia, in-service training is a means to maintain existing skills.

Regardless of the size of their company, all those interviewed emphasised that on-the-job acquisition of skills and abilities as being central to their manpower development.

Some enterprises focus on non-formal learning (e.g. using the Internet, learning by doing, watching colleagues, “go-home” sessions during which the staff teach each other how to use various tools and upgrades). The Danish study, mentioned earlier, highlighted the fact that multimedia professionals have to be good autonomous learners to keep abreast of relevant developments in their field and that learning is part of the culture of competitive enterprises. A pioneering example of non-formal learning in the UK is Backspace, a workshop-like space connected to the Net where subscribing members - both novices and multimedia professionals - can work on their individual projects and get the opportunity to use the most up-to-date facilities and tools.

A few small enterprises and many of the medium-sized companies have some kind of formalised in-service training, both internal and external. Short seminars (invariably privately run), courses and conferences are also found to be of use, not only as a means of learning but also as a means of creating and expanding informal networks of contacts with other multimedia professionals and promoting the company image. The range of short seminars, courses and conferences is considerable. Private courses of a few days’ duration (and occasionally similar courses in the public sector) arise in response to perceived needs - and disappear again when the demand has been met.

Medium-sized companies are the only ones that consider formal training as a key and integral part of their development and future growth. In such companies, not only is there a budget for seminars, courses and conferences but also for staff participation in MBA and open education degree courses in marketing and management.

3.3.5 Attitudes towards upskilling and reskilling

Upskilling in this context covers education and training provisions which are aimed at those with a post-compulsory qualification, not necessarily in multimedia, and who need to upgrade their existing skills. Examples include courses for architects wishing to move into interactive communication through the use of multimedia, modular courses run by Graphics Art schools on the use of new software, or a considerable number of courses for those with a background in tourism wishing to learn about multimedia in order to work on multimedia in tourism (a Europe-wide course funded by the European Social Fund started in March 1998).

Reskilling covers education and training for those with a set of skills which are no longer much in demand. They are offered a course covering a new set of skills which are required in multimedia production. Examples include 14-week work placements in Denmark for skilled and semi-skilled workers - and the Unemployed and Social Fund training which exists in various disadvantaged regions in Europe.

3.4 National views

Companies from **Belgium and Luxembourg** seek both creators and computer specialists. Creativity-related skills are considered to be available in the work force; a technically skilled work force also exists but these countries suffer from a serious quantitative shortage in IT skills. Furthermore, when talking about multimedia competence, companies claim that it is a more complex case: the job necessitates the match of two opposite types of abilities: creativity drive and technological rigour.

Companies' explicit requests could be summarised as follows:

<i>Basic orientations</i>	<i>Quoted skills</i>	<i>Quoted constraints</i>
Creative orientation	Creative sense of aesthetics Innovative Sense of project co-ordination Integrated into the Internet culture Basic knowledge of multimedia software	Little prepared for technological processes and their specific constraints
IT orientation	In-depth knowledge of multimedia software, ability to learn by oneself, strong interest in multimedia, flexibility	Little prepared for creative processes Skill shortage creates harsh competition as regards recruitment
General capacities	Bilingual, teamwork experience, sense of commercial business, customer driven, flexibility, resourceful	Young work force rarely experienced in such areas

The companies' skills requirements in **Denmark** can be summarised as follows:

- ✓ Medium-sized companies mention the lack of skilled art directors, project managers and producers/editors, rendering specialists, Virtual Reality specialists, Java programmers, systems engineers (UNIX and NT), and various categories to do with Web production. This group invested considerable sums of money in attracting the right staff by either offering them good salaries or an unique working environment and argued that in doing so they could reduce outlays on upskilling staff to meet their exacting requirements. Some of them consider getting students to do research or to do work experience as a means to select useful staff, but rarely for the most exacting tasks.
- ✓ Small companies and micro enterprises often found it difficult to compete with better-capitalised competitors in offering attractive salaries to attract top-class staff. Most were working on business-to-business projects and chose to use a combination of freelancers, recruited informally through existing networks, and diploma and degree course students who were gaining work experience instead.

- ✓ Generally speaking, all companies reported current weaknesses in project management (trouble-shooting and corrective action in connection with deadlines, quality, costs, forecasts, milestones, agreements) and in cross-media design skills. In most cases priority was given to general project management skills coupled with an in-depth comprehension of the multimedia production process rather than having to focus exclusively on multimedia production management.

Multimedia companies in **Finland** reported that good designers, programmers, graphics professionals and copywriters were difficult to find. People with skills in multimedia marketing and management are also rare.

In **France**, « core professions » (Multimedia Designer, Multimedia Project Manager and Multimedia Programmer) account for about 2/3 of the total multimedia workers recruitment. It is difficult to find competent multimedia designers, Web masters and On-line journalists; additionally, documentalists and lawyers appear difficult to recruit.

Companies from **Germany and Austria** also reported a shortage of a series of competent workers in a series of fields: Law, Instructional Design, Multimedia Programming, Multimedia Design, 3D Graphics, System Engineering and Sales & Marketing. In the long term, the following requirements are envisaged:

- ✓ more HTML, more World Wide Web
- ✓ integration of TV in multimedia (business TV, teletext, video)
- ✓ Internet telephone
- ✓ storyboarding, interactive potential of multimedia
- ✓ all kinds of marketing (especially media planning)
- ✓ electronic commerce
- ✓ optical fibre backbones
- ✓ access to knowledge (intuitive access to necessary information)
- ✓ on-line learning (as products and in-house training)
- ✓ working together in virtual teams, integration of working and learning

In **Greece**, the following skills have been quoted: multimedia design, 2D & 3D graphics, multimedia programming, documentation of production, process and legal administration, marketing and sales planning and multimedia copyright clearance. They required in-house staff such as graphic designers, market and sales planners and copyright managers; all other requirements would be sought from free-lancers or subcontractors.

Firms surveyed in **Ireland** have expressed requirements for staff in the following fields, listed in order of greatest necessity: market research and planning, legal, copyright and contract, network maintenance, quality control and testing, technical environment, research methodologies, establishment of administrative systems, production of 3-D graphics, animation and text.

Italian companies reported that they found it difficult to find multimedia authors and concept designers, multimedia managers and, finally multimedia lawyers. They also expressed their

concern that many courses are dedicated to « multimedia operating » or « multimedia editing » which cover all the aspects of multimedia without training students in a specific field.

Multimedia companies from the **Netherlands** report an extensive need for graphic designers, and an enormous need for good, flexible and communicative programmers.

In **Norway**, firms have expressed a limited number of skills that are difficult to find; reported deficiencies in the short term focused mainly on the business and legal aspects of multimedia (marketing, contracts, copyright clearance) but also on the management issues involved in setting up and maintaining a Web site. Future training requirements reflected some of the problems mentioned above - and included, in addition, abilities regarding electronic commerce and middle band on-line systems as well as hands-on skills to do with the Internet and handling 3-D graphics and animation.

A shortage of a large number of professions have been reported by the multimedia companies in **Portugal**: multimedia editors, project managers, multimedia authors, lawyers/multimedia copyright experts, instructional designers, documentalists, multimedia database managers. Other occupations such as sound technician, video technician, programmer and sales and marketing personnel are considered by companies to be easier to recruit because they come from well-established trades/professions and then they apply their knowledge to the multimedia industry.

Spanish companies differ in their analysis; some of the firms mention skilled « Electronic » journalists as the most difficult to find. More generally speaking, 'complete professionals', specifically workers endowed with artistic skills for graphic and sound edition and processing are difficult to recruit. However, some firms mentioned that artistically endowed people abound while there is a shortage of consistent technical skills.

In Switzerland, recruitment of staff seems to be quite difficult for all companies:

<i>Mutimedia Disciplines</i>	<i>Diffiulty of recruitment</i>
Multimedia Design	difficult
Multimedia Research	difficult
Multimedia Production Management	difficult
Multimedia Sales and Marketing	difficult
Multimedia Production-Systems	difficult
Other non-production related categories	medium
2-D, 3-D Graphic Artists	medium
Programming	medium

Finally, in the **United Kingdom**, the following shortages were identified:

- **‘Hard core’, highly skilled code programmers.**

They are very expensive and almost impossible to recruit permanently, as it is in their interest to work freelance. This shortage is most certainly the spill-over effect from the wider IT skills shortage that has existed in the UK for several decades.

- people with a good command of **cutting edge technologies** before they become mainstream. The few specialists who possess these skills are very highly paid. At the time of going to press, the shortage applies to specialists in technologies such as real time 3-D design and Dynamic HTML.

- new media **marketing**

It is now widely recognised that marketing is essential for the survival and growth of most multimedia companies. Most, however, find it difficult to recruit marketing personnel with a thorough understanding of the new media. Only one of the companies in the sample managed to recruit someone with a qualification in new media marketing.

- **management skills** for new media environments

Managing creative talent takes a very different approach, and traditional corporate management models are not appropriate for the multimedia industry⁴.

- **experienced project managers**

Highly skilled individuals with a number of years experience in the industry. Normally they specialise in either programming or design and have a thorough understanding of all aspects of the production process.

- **highly skilled designers**

Individuals that are first and foremost highly innovative designers, and to whom the technology is a tool for executing their concept. A number of interviewees complained that many designers, especially those who have been introduced to design through multimedia oriented courses, have been ‘seduced by the technology’ and often produce rather cryptic designs. Others are simply not innovative enough designers and produce lacklustre work.

Others still, are not aware of the limitations of the technology and do not have sufficient understanding of the capabilities of programming and therefore produce designs that are simply impossible to execute technically.

⁴ For a discussion on the need for a new breed of creative managers, see *Skills for the Missing Industry*, as above, and Matthew Stibbe: *Is Managing Creativity a Contradiction in Terms?* WWW.igl.co.uk/t001.htm

Summary: Reported specific shortage of skills by multimedia companies

<i>Country</i>	<i>Reported specific shortage of skills by multimedia companies</i>
Belgium, Luxembourg	General lack of computer-oriented skills
Denmark	Project managers, cross media designers, production planners General lack of Internet-related technical skills 3D worlds specialists
Finland	Designers, programmers, graphics professionals and copywriters. Multimedia marketing and management
France	Multimedia editors, Web masters and on-line journalists Additionally, Researchers and legal experts
Germany, Austria	Lawyers, instructional designers, multimedia programmers, multimedia designers, 3D graphics artist, system engineers, sales & marketing expert
Greece	Multimedia designers, 2D & 3D graphics specialists, Multimedia programmers, lawyers, marketing and sales managers
Ireland	Market research and planning, legal aspects, maintenance, quality control and testing, technical environment, research methodologies, 3D graphics production
Italy	Multimedia authors, multimedia managers, multimedia lawyers
The Netherlands	Multimedia programmers, graphic designers
Norway	Marketing and sales management, Web masters
Portugal	Multimedia editors, project managers, multimedia authors, lawyer, instructional designers, multimedia planners, documentalists, multimedia database managers.
Spain	On-line journalists, lawyers
Switzerland	Multimedia designers, Multimedia documentalists, Multimedia production managers, Multimedia sales and marketing managers, multimedia production - systems managers, 2-D, 3-D graphic artists multimedia programmers.
United Kingdom	Highly skilled multimedia programmers, multimedia marketing managers, multimedia managers, highly skilled designers.

3.5 Multimedia skills requirements: key issues

3.5.1 The terms “multimedia” and “multimedia industry” should be used with caution

The terms “multimedia” and “multimedia industry” do not have the same connotations for practitioners. Many of those working with multimedia in the computer industry and on the Internet do not always regard themselves as part of the multimedia industry. This is clearly in evidence when one looks at the plethora of professional and trade associations in Europe.

If European policy in this area aims to promote the development of enterprises falling within the definitions used by the European Commission, it may well be necessary to use a number of synonyms or more specific terms in order to reach these objectives.

3.5.2 There is no stable taxonomy of multimedia occupations

Due largely to the small size of most European multimedia enterprises and the fact that the few medium-sized enterprises that exist are typically subsidiaries or divisions of organisations in publishing, broadcasting and IT, there is no stable taxonomy to describe multimedia occupations. Those working in core professions in this field tend to have a wide range of responsibilities and functions. Comparisons of skills and abilities from one person to another will require more detailed information about the subjects’ job specifications.

3.5.3 A casual labour market

It is crucial to emphasise that in the UK, the labour market in the multimedia industry has, from the offset, been a highly flexible and casual one.

Most employees tend to work on short term contracts, some doing so out of choice, benefiting from shortages, while others comply with the norms of the system. Programmers chose to work on a freelance basis as they are almost always guaranteed work and secure very good salaries. Designers and production staff working at junior level, on the other hand, ask for significantly lower salaries and tend to be much more disposable.

Designers, programmers and producers/production managers are the most likely to work freelance, while project managers and editorial staff (CD-ROM) tend to be employed on a permanent basis, as they are perceived as the key ‘ideas’ people.

There are a number of positive, as well as negative implications for the transfer of training and skills that occurs within such a highly flexible labour market.

3.5.4 Freelancers do not benefit from company training provisions

The large proportion of freelancers that are working in the industry, do not benefit from training provided by companies. This applies to formal external and in-house training, as well as informal on-the-job training that the permanently employed enjoy during off-peak periods when freelancers are not employed. Freelancers must ensure that they allocate a proportion of their time/income to training. A number of interviewees have expressed doubt that they actually do so in practice.

3.5.5 Informal recruitment of staff in all but medium-size multimedia companies

Word-of-mouth recruitment is very widespread among small companies, whereas formal methods predominate in medium-sized enterprises.

3.5.6 The size and youth of multimedia enterprises lead to a focus on proven skills rather than formal qualifications

The small size (less than 10 employees) and youthfulness (less than 4 years of age) of the average multimedia enterprise working in a technologically-volatile field, in which part of its work force are freelancers, leads to a focus on proven job skills rather than formal qualifications. Whereas medium-sized companies generally have formalised recruitment and human resource development, small enterprises use informal recruitment procedures to ensure that those hired have the skills required. This, in turn, means that such enterprises are often critical of those leaving existing multimedia education and training courses.

3.5.7 The industry benefits from a fast skills transfer

As regards skills, freelancers benefit from stimulation by a variety of different working environments. Companies also benefit from the continuous supply of ‘fresh blood’ and ideas that freelancers provide.

3.5.8 A glut of under-qualified job-seekers

Most practitioners interviewed said that there is a large number of individuals wishing to work in the industry who do not possess the appropriate set of skills to do so. They can be grouped as the following:

3.5.8.1 Graduates of multimedia courses who are not aware of the demands of the industry.

Their work is too theoretically-based and user-unfriendly. There is a concern in the industry that multimedia has been used by Universities as a buzz word to attract the much needed students while not really creating industry-relevant courses.

3.5.8.2 People with unrealistic expectations of the industry

The industry practitioners sense that many people aspiring to work in multimedia have an overly glamorous perception of the industry and are therefore not prepared to engage in the meticulous and often repetitive operations that are involved at the junior level.

3.5.8.3 ‘Jack of all trades - master of none’

Graduates of multimedia courses who do not really specialise in anything; no exceptional design skills, no in-depth programming skills and no first-hand experience of the real-world demands of multimedia production.

3.5.8.4 Technically proficient programmers who lack the creative flair

There is a lack of high calibre programmers suited to work in the multimedia industry. Many have been too moulded by the corporate environment. ‘Pigeon-holed’, complained one company director.

3.5.8.5 Designers are relatively easy to recruit - especially people working at the basic level

Those who can handle basic tasks e.g. digitising images. However, the recruitment of highly skilled designers is much more difficult.

3.5.8.6 A glut of designers/programmers who have worked in the CD-ROM industry and who have no on-line skills

Many of these could be hired if they had on-line skills, but they have not yet retrained for on-line activities.

The strength of multimedia products lies in the synergy of a number of creative talents, which have resulted from a continuing convergence of production processes originating in a number of different industries. There is great concern in the industry, however, that multimedia products are not reaching the full potential of synergies of cutting edge technology, design and editorial excellence. The findings of this report point strongly to a lack of convergence of the production process as one of the reasons for this situation.

3.5.8.7 Specialisation with a holistic outlook

The multimedia industry is the result of a convergence process of a number of diverse activities, ranging from IT to publishing. It is therefore essential that training providers understand what lies at the heart of this convergence process. It is not adequate to train individuals in the 'contributing' activities, such as design and programming. It is essential that people understand that convergence has led to a situation where 'the whole is greater than the sum of the parts'. Individuals need to understand the production process as a whole. The answer to this is for them to gain a profound outlook which surpasses the programming/design divide.

Nor is it adequate to assume that a single individual can be trained to contribute to all aspects of the production process, and label them 'multimedia' graduates. It is crucial that every individual is equipped with a specialisation.

3.5.9 A number of both “soft” and “hard” skill “bottlenecks” are emerging

Several skill “bottle-necks” have been identified by interviewees. These include a lack of “hard-core” programmers, those with a clear understanding of, and skills in, cutting-edge technologies, new media marketing staff, experienced project managers and skilled multimedia designers. Bottlenecks in specialist areas such as multimedia copyright clearance were also reported, although only in some member states.

While some are “hard”, volatile skills which relate to the technologies and tools currently being used, other “soft” skills regarding inter-personal skills are of a more general, long-term nature. Mechanisms already exist to ensure that the latter can be developed within multimedia education and training.

3.5.10 Some of these bottlenecks are a subset of the existing deficiencies of the Information and Communication Technology sector

Some of the reported deficiencies are subsets of those already recognised in the Information and Communication Technology sector. Others - the “soft” skills - are largely associated with multimedia. As there are marked differences as to the extent of these bottlenecks within the European Union, the Commission would do well to act as a catalyst by bringing together those addressing these issues at national level to improve their awareness of current approaches and their outcomes.

4. Multimedia education and training in Europe

4.1 General issues

4.1.1 Formal education/training or informal learning?

Given the existing structure of the European multimedia industry, consisting as it does of many small enterprises and a small proportion of medium-sized companies, both of which call on the services of a pool of freelancers and self-employed people, skill and competence acquisition in both creative and technical areas has, to date, been largely informal. Exceptions include management, financial, marketing and legal skills where formal qualifications are required.

Formal multimedia education and training provisions are not currently well-known nor very highly thought of by the industry for the reasons quoted in the previous chapter. It will be important to assess the extent to which this will change as the industry matures.

- ✓ Will the rate of technological change continue as it has over the last few years?
- ✓ Will small enterprises continue to dominate - or will a proportion of them mature into medium-sized companies?
- ✓ If so, will the proportion of creative and technical staff recruited with an initial education/training in multimedia increase?
- ✓ Will increased professionalism imply more formal education/training?

On balance, whereas technological change seems likely to continue unabated, the average size of enterprises could well increase in response to increased demands for specialisation. Coupled with the need to introduce quality assurance and usability testing for business-to-business products and services it seems likely that the balance will swing in favour of formal education and training over a ten-year period.

Public courses, which still predominate when it comes to initial education and training, will thus have to address the criticisms raised by the industry. An equilibrium between theory and practice, “soft” and “hard” skills will have to be found and regularly adjusted in line with the continual changes affecting the industry.

4.1.2 On-the-job/external courses?

In-service training for those already in the industry is currently met by in-house training on the job which is supplemented by external training ranging from a one-day course or seminar to a fully-fledged MBA or diploma course in marketing, project management and the like. The public sector plays a minor role here, with the exception of upskilling and reskilling provisions for the unemployed.

4.1.3 The importance of networking

Skills and competency development in the multimedia industry is both a question of *what* you know and *who* you know. Having a good informal network of multimedia professionals is critical to survival and success - especially for those in small enterprises.

4.1.4 Public or private education/training provisions?

The lists of education and training provisions to be found in the various member states (with the exception of Iceland, where none has been identified to date) indicate that whereas initial education and training provisions are still primarily to be found within the public sector, there is also a number of private providers operating successfully in this field. In some cases these providers are highly regarded by the industry.

Private sector provisions predominate when it comes to in-service training: seminars, courses and conferences.

4.1.5 Long or short term?

For the purposes of the database, this FORM-BASE study has concentrated on all public and private provisions for multimedia education and training with a duration equivalent to or more than a six-week full-time course leading to qualifications and/or skills which are of use in the multimedia industry.

In spite of the disappointing response rate to the questionnaires sent out, we have identified the existence of several hundred public and private courses which meet these requirements. Were we to take short courses into account, the number would run into the thousands.

4.1.6 Fees?

The existence and amount of fees depend on the nature and duration of the course in question. Fees are high for many in-service training courses in small companies and for the many freelancers for whom paid training is not open to them. The permanent staff of medium-sized enterprises often have access to quite expensive courses which are paid for by their employers.

There may well be a need to discuss the possibility of making training bursaries available for multimedia start-ups in much the same way as funding has been available to help innovators start up their own enterprises in many EC member states.

4.2 Public education/training provisions

4.2.1 Initial education and training

Historically, multimedia courses have been the offspring of existing graphic design courses and more recently, have also been offered by computer science faculties. The fact that these two educational sectors stand so far apart on the science-art spectrum has meant a certain cultural distance has existed between designers and programmers. However, there are courses emerging at undergraduate and especially postgraduate levels, that attempt to bridge the deeply rooted divide between art and sciences.

Currently, the various member states offer between 20 and over 100 vocational, tertiary, degree or diploma courses. Over 50% of the courses are in interactive design, about a third are multimedia courses with an emphasis on programming.

There is also a number of specialised courses, such as first degrees in games development, MBAs with a multimedia component, an MA in Electronic Publishing as well as degree courses in related fields (IT, media, communications, architecture) incorporating multimedia modules.

4.2.2 In-service

There are various in-service education and training provisions available in Europe, which are basically the same courses as in the initial provision but which are offered as part of an Open Education programme on a part-time basis (i.e. in the evenings and at weekends). In addition, public providers offer various modular courses in areas such as programming and the use of new graphics tools.

In-service (life-long) education and training is an area in which both DG X (MEDIA II) and the European Social Fund have been active; the first caters for the needs of the audio-visual industry and the provision of various postgraduate courses as well as shorter courses in multimedia management, design, script-writing and storyboarding.

4.2.3 Upskilling and Reskilling

While examples of such courses were found in northern Europe (such as the pioneering work of reskilling those with physical disabilities to working in multimedia content digitisation by the AMU HADAR centre in South Sweden and the Mouse House/AMU project for multimedia assistants in Denmark) they do not play a dominant role in the European labour market.

4.3 Private sector education/training provisions

4.3.1 Initial Provisions

The study revealed the existence of a number of important, privately-run or joint-venture courses around Europe. The number of courses reported was high in Sweden and Germany; significantly smaller numbers were found elsewhere.

4.3.2 In-service, upskilling and reskilling

In-service training as explained in the previous chapter covers both formal and non-formal training, on and off-the-job.

Formal provisions comprise:

- ✓ Short and bespoke professional courses aimed at the industry lasting between a day and a week (primarily external but sometimes in-house).
- ✓ Seminars and conferences on the multimedia industry, covering subjects such as convergence, IPR Electronic Commerce and the Net. These are presented by and attended by a combination of multimedia industry practitioners, commentators and strategists.
- ✓ Conferences promoting new products and new releases of development tools.
- ✓ One or two-year diploma courses with a very production-oriented structure often operating with some degree of public funding (Mouse House, Space Invaders in Denmark).

Innovative *non-formal* provisions include private initiatives such as the CyberSkills Association, set up by ICL to promote the use and understanding of multimedia internationally. In Britain they have set up a number of Cybercentres which provide basic training for the unemployed as well as workshops for those working in the industry to update their skills, from basic IT training to producing multimedia products/ services. The Centres are co-funded by Local and Training Enterprise Councils and the State Department for Education and Employment.

4.4 Other training environments

4.4.1 Non-profit-making workshops sponsored by companies

Non-profit-making workshops are usually sponsored by companies which benefit from innovative ideas generated by talented individuals who develop and exhibit their skills in an informal environment.

Backspace is a pioneering example in the UK. It is a London-based workshop-style 'space' connected to the Net which members can use as often as they like (as opposed to a cybercafé where fees are time-based). A wide range of users benefit from the facilities: practitioners already working in the multimedia industry working on their own private projects, people wanting to acquire relatively basic Web site production skills, local business people, film makers and musicians.

Such workshops are fertile networking environments. Moreover, people wishing to gain entry into the industry are given the opportunity to use the most up to date facilities in order to brush up their skills, work on their portfolios and market their skills by displaying their work on a relatively high profile web site.

4.4.2 Commercial production facilities used informally

In the UK, the commercial and independent film-making sectors have, for decades, benefited from a symbiotic relationship. There is an informal exchange of resources and ideas between the two sectors.

The multimedia industry appears to be following a similar model. Commercial players are especially keen to support independent artists for prestige and idea generation purposes. Moreover, there are a number of people working in the industry who are keen to pursue their own independent 'art' projects.

Commercial facilities therefore often benefit the non-profit-making arts sector. On the other hand/equally the ideas generated by the arts community fertilise ideas that are the very lifeblood of the industry.

The same approach is to be found elsewhere (e.g. the Mikros Image internship scheme for artists working on creative expression and 3-D modelling at their award-winning post-production company).

4.5 National views

Fundamentally there are three different types of multimedia-education and training in **Austria**:

The public tertiary-sector is represented by **6 public high-schools** which offer 8 different studies as regards multimedia. Austrian **university studies** thereby are less oriented towards multimedia subjects: The Viennese Technical University and the Department of Journalism and Communication Research in Vienna and Salzburg offer a few - especially theoretical based lectures in the context of new media and new information and communication technologies. **Postgraduate courses** can be studied at the University of Krems in Lower Austria.

At secondary level, the **higher school** for graphic vocation offer alternative 2 yrs full-time multimedia education. The main topics and training cover «multimedia design and production».

Training structures and courses in the Austrian private business sector are less various. We could only identify **4 courses** – that lasted between 4 weeks and 12 month –in 1997.

The multimedia training structures in **Belgium and Luxembourg** are recent, and quite heterogeneous. They are characterised by an important implication of public educational institutions but nevertheless, private structures are also quite active in the sector.

The following grid gives a broad classification of the observed training offer, listing some examples per region and type of institution:

- ✓ University programmes (Mons-Hainaut, St Louis, VUB, KUL, LUC...)
- ✓ Non-University higher education (CRP HT, IST, Hornu, St-Luc-Tournai, IAD, La Cambre, Paul Lambin, Roger Guibery, IEPSCF Evere, ERG, IWT, YLECKO, Groep T, VIZO, KH Kempen, Gent Hogeschool)
- ✓ Academy programmes (Tounai, Gent, Antwerpen)
- ✓ Adult education (IPSMA, STE Liège, Technotèque Forem, CEFORA, INFAC, Bruxelles Formation...)
- ✓ Short-term programmes (CEDITI, EAVE, DOMATEC...)

At least 28 institutions provide Multimedia courses in **Denmark**. As regards *initial education*, technical and business schools provide vocational education in multimedia production. 7 public schools and universities provide short tertiary degree or diploma courses; Tertiary courses leading to a Master's degree are provided by 6 universities. Only a few private organisations provide initial education in multimedia. As regards *further education*, most of the public organisations providing initial education are also open to those already working in

the multimedia sector; at least 30 private organisations provide in excess of a 100 short courses, but most of them last less than 2 weeks.

In **Finland**, Universities propose several programmes dedicated to multimedia, but most of them are short courses. However, the Espoo - Vantaa Institute of Technology (higher vocational education) - offers a 4 year programme dedicated to Media Technology, and the Vaasa Vocational Adult Education Centre offers two extensive vocational upgrading courses (Creative Multimedia and Internet and Multimedia). Numerous short courses with a variety of contents are offered to the working age population by further education centres (at universities), vocational adult education centres and private education providers.

Most multimedia courses in **France** are post-secondary courses. The « Instituts Universitaires de Technologie » provide short-term tertiary diplomas (- Marne La Vallée, Reims, Toulon, Vélizy...). Tertiary courses leading to a Master's degree are provided by Universities (Avignon, Franche-Comté, Metz, Paris 7 - Paris 6, Paris 8, Paris X Nanterre etc.) and a few private organisations. Further education is also proposed by most of the Universities, public organisation (e.g.« Institut National de l'Audiovisuel ») and a series of privately-owned organisations.

In **Germany**, there is no particular «Multimedia» studies course in the *Public Highschools* up to now (end 1997) apart from the «Diplomingenieur für Multimedia» (Engineering for multimedia) at the «Fachhochschule Lippe» in Lemgo and the «European Media Master» (multimedia designer) at the «merz akademie» in Stuttgart, which is a government-approved private high school. Any multimedia training is integrated into studies like design, arts, information studies, media management (Hanover) or even medicine (Magdeburg).

The landscape of *private training structures* shows a large variety. Most of the companies offer one or several courses as a full-time qualification lasting from anything between five months to two years. Unfortunately, there are no common standards for courses qualifying for similar occupations, but the «dmmv» (Deutscher Multimedia Verband) and the University of Giessen are working on a concept for common quality standards for all multimedia training structures.

The most well-known training providers in **Greece** are Eurocom and the Vocational Training Centre Initiative of the Greek Ministry of Labour. Other training centres include IIS and the Athens University of Economics and Business.

In **Ireland** there are three established education and training sites for multimedia production: DIT, Trinity College Dublin and Arthouse. The Dun Laoghaire College of Art and Design in Interactive Media has been recently established. Across the country it is certain that educational establishments are seeking accreditation for multimedia specific provisions, a process which could take up to two years to achieve.

Secondary generators of training are the private and public sectors. In the publicly funded education system many courses may contain computer related design or digital media

components but may not be entirely dedicated to multimedia. These are not as widely known as the specialist courses to key multimedia managers in the industry. Private training provisions geared towards the company sector appear to be emerging.

There are four different types of formative organisations in **Italy**:

- ✓ High Schools
- ✓ Universities
- ✓ Professional training centres (state-owned and private)
- ✓ Private companies or private schools

A large range of final qualifications are proposed, comprising « Professional qualifications or specialisation certificates », diplomas and University degrees.

Initial education in multimedia in **The Netherlands** can be divided into three categories:

- ✓ Higher Vocational Education (4 years), fully focused on interactive multimedia development;
- ✓ Postgraduate education (1-2 years), mainly focused on interactive multimedia development;
- ✓ Specialisation during final year (0.5 - 1.5 years) focusing on interactive multimedia development but within another educational field such as communication or graphic design.

Further education, mostly provided by the private sector, can be divided into two groups:

- ✓ Basic multimedia education (course duration varies from a week to 6 months);
- ✓ Intermediate and advanced level training (these courses last up to months).

In **Norway**, initial multimedia education is provided by the Gjøvik college, and the National School of Crafts and Industrial Design. Course modules dealing with some aspects of multimedia can also be found in programmes to do with Culture and Media, and Engineering and Architecture at Universities and Natural Science Colleges. Further education, especially in-service training, is proposed by private companies such as *Designskolen A or Aktiv Opplæring AS*.

In **Portugal**, there is only a small supply of multimedia courses as multimedia in itself is an emerging industry and education and training structures need time to adapt to new demands. There is also a lack of specialised teachers in this field which hampers the creation of courses to match the rate of change of the market. As multimedia is made up of a convergence of multiple techniques (audio-visual, information sciences, telecommunications), the teaching/training institutions need to invest a huge amount of capital in order to acquire the adequate

facilities and equipment. Many Portuguese universities are unable to invest in such a way and private schools charge high fees.

The courses currently available tend to concentrate either on the aspect of communication using multimedia or on the more technical side of multimedia production itself. Sometimes certain related multimedia courses are introduced in the curricula. Nevertheless, multimedia is too wide an activity to be encircled by a single course. Besides short training courses on specific multimedia activities, there also exists a number of initial teaching, graduate, postgraduate and specialisation courses in Portugal. New courses appear regularly, demonstrating the interest in this line of teaching.

There is a significant offer of multimedia training in **Spain**, taking into account the number and variety of courses.

In Spanish *universities*, public and private alike, multimedia training is integrated in the lists of subjects concerning careers such as journalism, graphic arts, audio-visual communication, sound and image, or computer science. In a few institutions, especially private ones, there are more specific diplomas such as Multimedia Engineering. However specific « stand alone » courses such as postgraduate or specialisation courses abound.

Vocational training centres offer courses in multimedia, but in many cases the contents are out of date and present serious defects.

Private institutions represent the most dynamic part of the supply of training. In a first phase, a lot of private centres appeared in Spain which were trying to make profit out of the multimedia fashion. Market rules established a natural selection process that has only allowed those centres that provide quality training and that are adapted to the market's needs to survive. However, due to the high cost of the necessary equipment as well as the lack of good training professionals, the price of this type of training is high.

About 60 Upper secondary institutions in **Sweden** run some modules involving Internet multimedia, usually in connection with Information and Advertising, Graphics or Design, but only one school has a specific course in multimedia. At tertiary level there are approximately 20 universities and higher education colleges offering degree courses of which multimedia forms a part. In addition to upper secondary education and tertiary education, other adult education provisions should be mentioned such as *KomVux* (adult education) and folk high schools, 16 of which offer courses containing modules to do with multimedia.

At least 10 private schools provide further training which is, primarily, in-service training.

In **Switzerland**, *public organisations* providing multimedia training include

- ✓ Public Schools specialising in art and graphical art (Ecole d'art appliqué, Ecole Romande d'art graphique (ERAG))
- ✓ University courses open to university students (Université de Genève: faculté d'informatique, TECFA)
- ✓ University continuous training open to anyone (Université de Genève, EPFL, etc)
- ✓ Public companies (Cours Commerciaux de Genève, Cours Industriels de Genève, etc) open to anyone

Mostly, *private training centres* either imply individuals giving private lessons or private schools. There are schools that run some multimedia courses. Other schools teach only the different disciplines of computer science but again among these you can find some modules relevant to multimedia. You can also find schools which teach only multimedia disciplines, but these are rarer and more difficult to find.

Historically, multimedia courses in the **United-Kingdom** have been the offspring of existing graphic design courses and more recently, have also been offered by computer science faculties. The fact that these two educational sectors stand so far apart on the science-art spectrum has meant a certain cultural distance has existed between designers and programmers. However, there are courses emerging at undergraduate and especially postgraduate levels, that are attempting to bridge the deeply rooted divide between art and sciences.

Currently, there are about a 100 institutions providing courses at the *Higher Education* level in the UK. Over 50% of the courses are in interactive design and about a third are multimedia courses with an emphasis on programming. There are also a number of specialised courses, such as a BSc in games development and courses of which multimedia is one of the core subjects, such as an MBA with a multimedia component and an MA in Electronic Publishing.

The *commercial sector* provides mostly short (lasting between a day and a week) and bespoke professional courses aimed at the industry.

Finally, certain aspects of multimedia can best be learnt in an *informal environment*, such as non-profit making workshops sponsored by companies or commercial facilities used for non-commercial purposes

4.6 The Multiform data base

The MULTIFORM database of the multimedia training structures in Europe is available online at the following address: <http://www.idate.fr/multiform>.

The data included in the database have been collected by the partners of the Form-Base consortium between September 1997 and February 1998. Questionnaires have been sent to about 600 training structures in Europe, and completed by the training structures themselves; additionally, some information has been directly collected by the consortium members from various sources.

MULTIFORM presents 234 courses, from 17 different countries.

All the information available in the database is given in English except for some specific data which are given both in English and in the national language.

The database can be searched with a series of criteria:

- ▶ Name of the institution
- ▶ Country
- ▶ Course title
- ▶ Profession
- ▶ Final level
- ▶ Nature of the course
- ▶ Course language

4.7 Multimedia education and training in Europe: recommendations

4.7.1 Developing a common understanding of multimedia skills and companies' requirements

4.7.1.1 Support a skill analysis initiative

A skill analysis should be performed every two to three years, based on a sample of large and small companies in the multimedia field, to establish a taxonomy and description of jobs in the multimedia sector.

4.7.1.2 Promote one umbrella association for European multimedia training organisations

The launch of a European association of multimedia training organisations should be encouraged.

4.7.1.3 Promote the dialogue between companies and teaching/training institutions

At the Regional level, the organisation of workshops dedicated to the skills requirements of multimedia companies should open the way to permanent cooperation between companies and training organisations in the framework of professional associations.

4.7.2 Addressing the shortage of key skills

4.7.2.1 At the European level, support further training courses for CD-ROM programmers

The Multimedia Industry has already experienced a shift from the CD-ROM market to the Internet market, where there is a lack of programmers. The retraining of off-line programmers to the on-line multimedia market would help the redeployment of the work force.

4.7.2.2 Support a European Programme of advanced training sessions for multimedia project managers

Training sessions, with seminars organised in different European towns, would enable the participants to master the financial, marketing and commercial aspects of multimedia production.

4.7.2.3 Support the development of additional further training courses to solve specific shortages in the short term

Further education courses are necessary to solve specific shortages in the following countries:

	<i>Multimedia Programming</i>	<i>Multimedia Design</i>	<i>Multimedia Project Management</i>
Austria	✓	✓	✓
Belgium	✓		
Denmark			✓
Finland	✓	✓	✓
Germany	✓	✓	✓
Greece	✓	✓	✓
Ireland			✓
Italy			✓
Luxembourg	✓		
The Netherlands	✓		
Norway			✓
Portugal	✓	✓	✓
Spain			✓
Switzerland			✓
United Kingdom	✓		✓

4.7.3 Improvement of the quality of multimedia training

4.7.3.1 Study the opportunity to support the creation of an international resource centre for multimedia training

Based on the model of the Media Business School, a resource centre would monitor the trends of the multimedia industry, analyse the needs of the companies, establish models of training programmes and organise training sessions and seminars.

4.7.3.2 Support the development of traineeships

An on-line desk should be set up to provide information on jobs and traineeship opportunities proposed by companies. Closer cooperation between companies and training organisations should also include the development of traineeships.

4.7.3.3 Stimulate companies to provide in-house training

The unit-credit approach coupled with relatively short, modular courses would allow those already in the multimedia industry, who have not completed formal education, to gain qualifications. Open education would allow them to combine qualifications from modules in new disciplines with merit for skills gained on the job.

4.7.4 Access to training provisions

4.7.4.1 Support human resource consultancies for SME's

SMEs' access to specialised expertise that can analyse job occupations within the company and the need for training should be encouraged.

4.7.4.2 Financially support the access of SME's to multimedia training

Any mechanism lowering the cost of SME's access to multimedia training would have a strong leverage on the level of qualifications of the industry's workers.

4.7.4.3 Support the access of freelance workers to training provisions

European scholarships, involving training in at least two different countries, should be proposed to freelance workers.

4.7.5 International training

4.7.5.1 Stimulate and support international traineeships of short duration in other multimedia companies abroad

Scholarships should be attributed to multimedia professionals to fund traineeships in other countries.

4.7.5.2 Stimulate networking between training organisations in order to facilitate international curriculum

Students should be given the opportunity to follow part of their curriculum in a foreign organisation.

4.7.6 Awareness of training provisions

4.7.6.1 Disseminate the inventory of courses both to the multimedia companies, and the students

The MIDAS Network should be used to promote the MULTIFORM database in the multimedia companies, schools and universities (see chapter 5.3).

5. Synthesis: conclusions and recommendations

5.1 - Main conclusions

5.1.1 The terms “multimedia” and “multimedia industry” should be used with caution

The terms “multimedia” and “multimedia industry” do not have the same connotations for practitioners. Many of those working with multimedia in the computer industry and on the Internet do not always regard themselves as part of the multimedia industry. This is clearly in evidence when one looks at the plethora of professional and trade associations in Europe.

If European policy in this area aims to promote the development of enterprises falling within the definitions used by the European Commission, it may well be necessary to use a number of synonyms or more specific terms in order to reach these objectives.

5.1.2 There is no stable taxonomy of multimedia occupations

Due largely to the small size of most European multimedia enterprises and the fact that the few medium-sized enterprises that exist are typically subsidiaries or divisions of organisations in publishing, broadcasting and IT, there is no stable taxonomy to describe multimedia occupations. Those working in core professions in this field tend to have a wide range of responsibilities and functions. Comparisons of skills and abilities from one person to another will require more detailed information about the subjects’ job specifications.

5.1.3 A casual labour market

It is crucial to emphasise that in the UK, the labour market in the multimedia industry has, from the offset, been a highly flexible and casual one.

Most employees tend to work on short term contracts, some doing so out of choice, benefiting from shortages, while others comply with the norms of the system. Programmers chose to work on a freelance basis as they are almost always guaranteed work and secure very good salaries. Designers and production staff working at junior level, on the other hand, ask for significantly lower salaries and tend to be much more disposable.

Designers, programmers and producers/production managers are the most likely to work freelance, while project managers and editorial staff (CD-ROM) tend to be employed on a permanent basis, as they are perceived as the key 'ideas' people.

There are a number of positive, as well as negative implications for the transfer of training and skills that occurs within such a highly flexible labour market.

5.1.4 Freelancers do not benefit from company training provisions

The large proportion of freelancers that are working in the industry, do not benefit from training provided by companies. This applies to formal external and in-house training, as well as informal on-the-job training that the permanently employed enjoy during off-peak periods when freelancers are not employed. Freelancers must ensure that they allocate a proportion of their time/income to training. A number of interviewees have expressed doubt that they actually do so in practice.

5.1.5 Informal recruitment of staff in all but medium-size multimedia companies

Word-of-mouth recruitment is very widespread among small companies, whereas formal methods predominate in medium-sized enterprises.

5.1.6 The size and youth of multimedia enterprises lead to a focus on proven skills rather than formal qualifications

The small size (less than 10 employees) and youthfulness (less than 4 years of age) of the average multimedia enterprise working in a technologically-volatile field, in which part of its work force are freelancers, leads to a focus on proven job skills rather than formal qualifications. Whereas medium-sized companies generally have formalised recruitment and human resource development, small enterprises use informal recruitment procedures to ensure that those hired have the skills required. This, in turn, means that such enterprises are often critical of those leaving existing multimedia education and training courses.

5.1.7 The industry benefits from a fast skills transfer

As regards skills, freelancers benefit from stimulation by a variety of different working environments. Companies also benefit from the continuous supply of ‘fresh blood’ and ideas that freelancers provide.

5.1.8 A glut of under-qualified job-seekers

Most practitioners interviewed said that there is a large number of individuals wishing to work in the industry who do not possess the appropriate set of skills to do so. They can be grouped as the following:

5.1.8.1 Graduates of multimedia courses who are not aware of the demands of the industry.

Their work is too theoretically-based and user-unfriendly. There is a concern in the industry that multimedia has been used by Universities as a buzz word to attract the much needed students while not really creating industry-relevant courses.

5.1.8.2 People with unrealistic expectations of the industry

The industry practitioners sense that many people aspiring to work in multimedia have an overly glamorous perception of the industry and are therefore not prepared to engage in the meticulous and often repetitive operations that are involved at the junior level.

5.1.8.3 ‘Jack of all trades - master of none’

Graduates of multimedia courses who do not really specialise in anything; no exceptional design skills, no in-depth programming skills and no first-hand experience of the real-world demands of multimedia production.

5.1.8.4 Technically proficient programmers who lack the creative flair

There is a lack of high calibre programmers suited to work in the multimedia industry. Many have been too moulded by the corporate environment. ‘Pigeon-holed’, complained one company director.

5.1.8.5 Designers are relatively easy to recruit - especially people working at the basic level

Those who can handle basic tasks e.g. digitising images. However, the recruitment of highly skilled designers is much more difficult.

5.1.8.6 A glut of designers/programmers who have worked in the CD-ROM industry and who have no on-line skills

Many of these could be hired if they had on-line skills, but they have not yet retrained for on-line activities.

The strength of multimedia products lies in the synergy of a number of creative talents, which have resulted from a continuing convergence of production processes originating in a number of different industries. There is great concern in the industry, however, that multimedia products are not reaching the full potential of synergies of cutting edge technology, design and editorial excellence. The findings of this report point strongly to a lack of convergence of the production process as one of the reasons for this situation.

5.1.8.7 Specialisation with a holistic outlook

The multimedia industry is the result of a convergence process of a number of diverse activities, ranging from IT to publishing. It is therefore essential that training providers understand what lies at the heart of this convergence process. It is not adequate to train individuals in the 'contributing' activities, such as design and programming. It is essential that people understand that convergence has led to a situation where 'the whole is greater than the sum of the parts'. Individuals need to understand the production process as a whole. The answer to this is for them to gain a profound outlook which surpasses the programming/design divide.

Nor is it adequate to assume that a single individual can be trained to contribute to all aspects of the production process, and label them 'multimedia' graduates. It is crucial that every individual is equipped with a specialisation.

5.1.9 Skills requirements

► Firms have identified the following **priorities** as regards competence:

- ✓ Highly skilled code programmers;
- ✓ Specialists of cutting edge technologies;
- ✓ New media marketing staff;
- ✓ Experienced project managers;
- ✓ Multimedia designers.

► They report the following shortages:

<i>Country</i>	<i>Reported specific shortage of skills by multimedia companies</i>
Belgium, Luxembourg	General lack of computer-oriented skills
Denmark	Project management, cross media design, production planning General lack of Internet-related technical skills 3D world specialisation
Finland	Design, programming, graphics and copyright skills. Multimedia marketing and management
France	Multimedia editing, Web masters and on-line journalism Additionally, research and legal expertise.
Germany, Austria	Law, instructional design, multimedia programming, multimedia design, multimedia editing, 3D graphic art, system engineering, sales & marketing expertise
Greece	Multimedia design, 2D & 3D graphics specialisation, multimedia programming, law, marketing and sales management
Ireland	Market research and planning, legal aspects, maintenance, quality control and testing, technical environment, research methodologies, 3D graphics production
Italy	Multimedia authorship, multimedia management, multimedia law
The Netherlands	Multimedia programming
Norway	Marketing and sales management, Web masters
Portugal	Multimedia editing, project management, multimedia authorship, law, instructional design, multimedia planning, research, multimedia database management.
Spain	On-line journalism, law
Switzerland	Project management, creative management, HTML specialisation, system engineering
United Kingdom	High-skill multimedia programming, multimedia marketing management, multimedia management, high-skill design.

5.1.10 The training offer

- ▶ **A large number of organisations have implemented between 1 and 2 courses to multimedia, necessarily too general to match the increasing complexity of the multimedia products and markets.**
- ▶ **Six professions** have been mainly quoted by the training structures as being prepared to by their courses:
 - ✓ Multimedia designer
 - ✓ Multimedia project manager
 - ✓ Multimedia editor
 - ✓ 2D/3D graphics artist
 - ✓ Multimedia Author
 - ✓ Web master
- ▶ Results by countries (where the sample is large enough) are to some extent comparable:

<i>Country</i>	<i>4/5 more quoted professions by training structures</i>
All Countries	Multimedia Designer Multimedia Project Manager Multimedia Editor 2D/3D graphics artist
Austria	Multimedia Editor Multimedia Designer 2D/3D Graphics artist Audio technician
Belgium	Multimedia Designer 2D/3D Graphics artist Multimedia Project Manager System Designer
Denmark	Multimedia Designer Multimedia Project Manager 2D/3D Graphics artist Multimedia Author

<i>Country</i>	<i>4/5 more quoted professions by training structures</i>
Finland	Multimedia Designer Multimedia Editor Multimedia Programmer Multimedia Author
France	Multimedia Project Manager Multimedia Designer Multimedia planner/manager Multimedia Author
Germany	Multimedia Designer Multimedia Editor 2D/3D graphics artist Audio technician
Greece	Multimedia Designer Multimedia Project Manager Web Master Multimedia Programmer
Italy	Multimedia planner/manager Multimedia Author Multimedia Editor Multimedia Project Manager Web Master
Ireland	Multimedia Designer Multimedia Project manager 2D/3D graphics artist Multimedia Author Researcher
Luxembourg	Multimedia Project Manager
Netherlands	Multimedia Designer Multimedia Author Web master Multimedia Programmer
Portugal	Web Master Multimedia Designer Multimedia Project Manager 2D/3D graphics artist
Spain	Multimedia Project Manager Multimedia Designer 2D/3D graphics artist Multimedia Editor
Sweden	Multimedia Designer 2D/3D graphics artist Multimedia Author Multimedia Programmer Multimedia Planner/manager
Switzerland	2D/3D graphics artist Multimedia Author
United Kingdom	Multimedia Designer Multimedia Project manager Multimedia Editor 2D/3D graphics artist

5.2 Recommendations as regards multimedia education and training in Europe

5.2.1 Developing a common understanding of multimedia skills and companies' requirements

5.2.1.1 Support a skill analysis initiative

A skill analysis should be performed every two to three years, based on a sample of large and small companies in the multimedia field, to establish a taxonomy and description of jobs in the multimedia sector.

5.2.1.2 Promote one umbrella association for European multimedia training organisations

The launch of a European association of multimedia training organisations should be encouraged.

5.2.1.3 Promote the dialogue between companies and teaching/training institutions

At the Regional level, the organisation of workshops dedicated to the skills requirements of multimedia companies should open the way to permanent cooperation between companies and training organisations in the framework of professional associations.

5.2.2 Addressing the shortage of key skills

5.2.2.1 At the European level, support further training courses for CD-ROM programmers

The Multimedia Industry has already experienced a shift from the CD-ROM market to the Internet market, where there is a lack of programmers. The retraining of off-line programmers to the on-line multimedia market would help the redeployment of the work force.

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5.2.2.3 Support the development of additional further training courses to solve specific shortages in the short term

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Italy			✓
Luxembourg	✓		
The Netherlands	✓		
Norway			✓
Portugal	✓	✓	✓
Spain			✓
Switzerland			✓
United Kingdom	✓		✓

5.2.3 Improvement of the quality of multimedia training

5.2.3.1 Study the opportunity to support the creation of an international resource centre for multimedia training

Based on the model of the Media Business School, a resource centre would monitor the trends of the multimedia industry, analyse the needs of the companies, establish models of training programmes and organise training sessions and seminars.

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Students should be given the opportunity to follow part of their curriculum in a foreign organisation.

5.2.6 Awareness of training provisions

5.2.6.1 Disseminate the inventory of courses both to the multimedia companies, and the students

The MIDAS Network should be used to promote the MULTIFORM database in the multimedia companies, schools and universities (see chapter 5.3).

5.3 - Recommendations as regards the MULTIFORM database

5.3.1 Further development of the database

The MULTIFORM database could be developed according to several orientations:

✓ *Evolution of the criteria used to search the data base*

A new, simpler, taxonomy of multimedia occupations should be implemented, provided a skill analysis is performed (see chapter 5.2.1.1.).

✓ *Incorporation of multimedia material*

The incorporation of multimedia material presenting the training organisations should be made available.

5.3.2 Update of the MULTIFORM database

✓ *Identification of new training organisations*

The MULTIFORM database should be enlarged with additional training organisations. In particular, more further training/education courses proposed by private organisations should be included.

The National Awareness Partners of the MIDAS network should be the first source of information for the identification of new organisations.

- ▶ Firstly, the MIDAS partners should be kept up-to-date about the database, as the members of the networks are the entry points for information on multimedia in each country;
- ▶ Secondly, the MIDAS network could be used to identify training structures which have not yet been included in the database.

Additionally, each year, a questionnaire would be addressed to all training organisations already included in the data base.

✓ *Data collection and validation*

The first MULTIFORM database has demonstrated that a process of validation of the data collected should be implemented. The following steps should be followed:

1. Once a training structure has been identified, it should be invited to fill an on-line questionnaire on the MULTIFORM database site. Multimedia material could be additionally provided by the organisation.
2. The questionnaire should be checked (consistence of the information, and level of language) by the manager of the database.
3. An e-mail should be adressed both to the training organisation and to the MIDAS node from the corresponding country for confirmation of the data to be included in the data base. The collection of information on new training structures as well as the update of data from organisations already included in the database should be centralised at the level of the consortium.
4. A paper copy of all data included would be sent both to the MIDAS node and the training organisation after incorporation in the database.
