ICT practitioner skills and training: graphic arts and media sector

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The **European Centre for the Development of Vocational Training** (Cedefop) is the European Union's reference centre for vocational education and training. We provide information on and analyses of vocational education and training systems, policies, research and practice.
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Preface

This study is part of a series of four studies launched by Cedefop in late 2002 under the project ICT platform. A working party, set up to accompany these studies, comprised some 20 eminent experts and expert bodies in the field. This ICT workshop has met three times since its constitution and has the task of advising Cedefop on the approach to, and content of, the surveys and on questions linked to ICT skills supply and curriculum development in general. Links were also established by Cedefop to parallel developments in the European Commission and especially to the e-skills forum and e-Europe action programme launched under the Danish Presidency. The workshop also relates to other important activities of DG Education and Culture on E-Learning. The contractors were invited, on the basis of their former experience and additional surveys, to edit a text of around 50 pages (without annexes) on the subject indicated in the introduction below.

These four studies are now available individually and will be combined in a synthesis report expected to be ready by the end of 2003.

In parallel to the studies, Cedefop cosponsored a workshop in the framework of European standardisation activities (CEN/ISSS). This was intended to validate the outcomes of the work of the Career Space Consortium, published by Cedefop in 2001 and 2002 (www.career-space.com) on ICT profiles and curricula aimed at university level skills and IT practitioner higher education.

Once this validation is concluded (anticipated at the end of 2003) the same procedure will be used to validate the outcomes of these four Cedefop studies (see also the virtual community under http://cedefop.communityzero.com/cen-ict, set up by Cedefop on this issue).

Werner Herrmann, Senior Advisor to the Cedefop Director

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Executive summary

This report examines the relationships and interactions among ICT job profiles and skills relevant to graphic arts and the media. Educational and training requirements for new skills and competences in relation to IT-ICT applications in this particular industry are examined and analysis of the specific characteristics of graphic arts and the media allows the needs for education and training to be defined. Curricula and options for education and training in this sector are discussed. Finally, a proposal for curriculum development guidelines is made, based on current and future requirements of the sector in its interaction with IT-ICT hardware and software developments.

Recent trends in technology, new e-business applications, and markets in diverse fields such as information technologies, networks and mobile telecommunications, have significantly influenced the graphic arts and media sector. Such developments have caused structural changes, affecting the business environment, market and products. As a result, new sector-specific business, administration, management and production processes are appearing.

The Comprint 2002 study suggests that the entire sector of communication, information, knowledge acquisition, and entertainment is undergoing a period of substantial change. New markets and new market forms are arising normally with one common aspect. The discovery of a possible market opening is accompanied by a forecast of virtually unlimited growth and rapidly booming market volumes. In addition, new technical possibilities in media integration and in telecommunication are opening up new forms of communication and information.

According to the study, today's companies and individuals need to adapt the knowledge they possess while continually adding to it. Companies and their employees must meet continually increasing needs in terms of their abilities and skills. It is becoming extremely important to structure and utilise knowledge effectively (Comprint, 2002).

Curricula and modules for vocational and sub-degree levels for graphic arts and the media sector in Europe need to be created by integrating traditional graphic arts and media courses, IT-ICT courses and non-technical social skills.

Relations between graphic arts and media education and training and IT-ICT modules are strong and multifaceted. The survey has shown that some IT-ICT courses and modules can be used in graphic arts and media education and training curricula. These include the use of computers, hardware devices, the operational systems Apple-OS for Macintosh computers and Windows, network administration applications and database processing. Text processing software can also be included.

A second group of IT-ICT applications, directly related to graphic arts and media, can form core modules in certain fields. This includes activities such as image processing, layout and page-making and graphic design, traditionally a part of this sector rather than relating directly to IT operations. They involve IT-ICT knowledge that is required to fulfil the specific task,

both basic knowledge and specific software application. However, the core task is to implement a certain process in graphic arts and media production. For example, image processing in the past has used chemical and photographic processing but nowadays requires the use of computers. An appropriate course could be 'learning the image processing module' which can then be applied as a specific competence in the pre-press field of print media production.

A third group of modules/courses are those involving graphic arts and media knowledge such as printing or operating a folding machine. The relationship to IT-ICT knowledge is relatively low with regard to the specific tasks to be performed. The operator of a printing machine, for example, needs to operate the machine interface and possibly to implement the tasks related to the delivery of data for production planning and organisation. He or she needs certain knowledge in the use of computers but the core business is printing.

As a general recommendation for curriculum guidelines the degree of interaction between traditional courses and the IT-ICT modules required is quite high, especially in the design and pre-press fields. The continuing development of technology within different sectors results in print and electronic media developing new cross-media publishing concepts, requiring new modules in graphic arts and media curricula. Such modules are HTML, XML and software applications for multimedia and website design and production.

A new training profile for the graphic arts and media sector can be defined. This combines traditional graphic arts modules and modules of design, processing and production of electronic media in a common curriculum. A prototype of this training profile is the media designer, *Medien gestalter/in für Print- und electronic Medien*, successfully introduced by the social partners and the federal education authorities in Germany. This training profile is analysed further in the report.

Graphic arts and media production are currently moving towards full digital workflows and digital printing, one of the most promising technologies in the sector. This creates new demands for competence which need to be addressed in the reform of education and training for the sector.

It can be concluded that vocational education and training is important for the further development of people to be employed in the graphic arts and media sector. IT-ICT and e-business skills constitute a significant part of the required abilities and therefore must be included in the curricula.

However, formal education and training is only one of the different forms of learning that are available and offered today. Formal education, continuous training, e-learning applications, individual learning, and on-the-job training form a new learning environment. This new form of learning can be defined as blended learning which needs to be taken into consideration in education and training policy reform.

Curricula should be created using modules including technical courses that are specific to the industry sector, general social and non-technical courses, and IT-ICT courses. The range of relevance of the IT-ICT and e-business skills varies according to the specific areas of applications in management and production fields and the respective courses oriented to these fields.

The perspective of EGIN (European Graphic/Media Industry Network) suggests that IT-ICT and e-business skills are just a part of a strategy for the development of human capital for the graphic arts and media sector in Europe. They should be complemented by the development of a positive image for the sector to encourage the recruitment of young people, the prevention of a skill shortage in the sector, and efforts for the homogenisation of the description of graphic arts and media job profiles in Europe.

A major priority for the sector is to work on the development of a system for evaluation and certification of competence at European level, contributing to the transparency of occupational standards. This is regarded as a first step in establishing a strategy for the development of people in the European graphic arts and media sector.

Introduction

The present study is the result of a long-term effort by EGIN (European Graphic/Media Industry Network) to establish cooperation with the EU and Cedefop in the fields of education and training for the graphic arts and media sector in Europe. The efforts for cooperation were triggered by the increasing interest of the graphic arts and media sector in Europe in issues related to people and their support and development in today's business and working environment. As this is the principal objective of EGIN, the efforts have led to the establishment of cooperation with those European authorities and organisations at EU level considered appropriate in developing people. The present report is a part of EGIN's whole range of activities within its strategy for human capital development for the graphic arts and media sector in Europe.

The work done by EGIN (Anastasios E. Politis and Hans Danielson) is oriented towards drafting the curriculum guidelines and recommendations for training solutions for the graphic arts and media sector with emphasis on IT-ICT and e-business skills. The focus is on non-university and vocational level skills (basic to professional).

It addresses the extent to which IT-ICT practitioners are needed in production and management processes in graphic arts and the media. It investigates the role of IT-ICT skills and qualifications, as well as the degree of relevance of competences. As a prerequisite, all of these require evidence of structure and the needs and specific characteristics of the sector.

Finally, based on these analyses, recommendations are provided for design of courses including IT- and e-business curricula, to meet education and training needs in graphic arts and the media.

When dealing with the relationship between graphic arts and the media and the IT-ICT industry it is of primary importance to understand the terminology in this report. Within the report, the term graphic arts and the media is used to describe the existing processes for design and production of print and new electronic media (websites and multimedia applications). In addition, in some parts of the report, the graphic arts and media sector is described as the printing sector or industry, and print media sector or industry. The acronyms IT–ICT are used to define the computer and informatics industry/sector.

1.   Methodology

The methods followed in implementing the study have been based on a wide range of sources including the results of various projects, seminars and conferences, and examination of various studies on the specific characteristics of the industry. Data on the structure and development of graphic arts and the media has been derived from studies conducted by the social partners' confederations of the industry in Europe - Intergraf (confederation of employers' federations) and UNI-Europa Graphical (trade unions' confederation).

Particular attention has been paid to the outcome of international seminars organised by the European graphic/media industry network (EGIN) on issues related to aspects of human capital development such as the image of the industry, recruitment policies and strategies, competence characteristics, vocational training and upskilling. The seminars include:

(a) specific sessions on human capital development in the EGIN annual international conferences in Budapest, (23-24 May 2002) and Berlin (19-20 March 2003);

(b) seminars on the subject of recruitment of young people in the sector (Amersfort, the Netherlands, November 1999 and Oslo, Norway, November 2000);

(c) seminars for graphic arts teachers and trainers on the role of teacher within the new learning environment (e-learning platforms and technology, distance learning, learning on-the-job, individual learning), Copenhagen, Denmark, January 2001 and 2002;

(d) seminar on qualifications and competence development for the sector with emphasis in digital pre-press technologies, Birmingham, UK, November 2001;

(e) seminar on upskilling policies for the graphic arts and media industry, Dublin, Ireland, November 2002.

Of particular interest are the studies mentioned below which have been used as references:

(a) the Comprint study *The horizon of print and publishing opportunities in the media economy*, Comprint International report, IBI, Duesseldorf in cooperation with the University of Wuppertal, Intergraf, Belgium, 2002, Comprint International 2002, IBI, Ltd;

(b) the joint project of the social partners' confederations of the industry in Europe – Intergraf and UNI – Europa Graphical on *Updating the qualification profiles for the graphic/media industry*, 2001;

(c) the Intergraf project on Benchmarking of competence for the printing industry in Europe 1998;

(d) the international EGF – AFETT seminar on *Technological change and its impact on work organisation in the graphical industry* Helsingor, Denmark, 11-16 October 1997 and Athens, Greece, 15-20 November 1997.

The authors have used their own research and expertise, as well as the expertise that is incorporated in EGIN. They have used data, information, and analyses collected from a wide range of sources.

2. Analysis of the graphic arts and media sector

2.1. Structure of the graphic arts and media sector

The graphic arts industry is characterised by a wide variety of areas of production, ranging from art and design applications to manufacturing and production processes. Print media production includes a large range of different product groups, most notably books, newspapers, periodicals, advertisements, brochures and catalogues. Packaging is another important segment and other significant types of printed matter are labels and posters. The main applications are publishing, advertising, and packaging.

The traditional categorisation of the stages of graphic arts production is:

(a) pre-press,

(b) printing or press,

(c) post press or finishing.

Many traditional graphic arts companies specialise in one of these principal production categories. Products require slightly different machinery, and so it can be more efficient and profitable for companies to be oriented towards a specialised area of printing. However, there are also companies that carry out all the stages of printed matter production, including pre-press, printing and finishing.

Another company categorisation is along the lines of specific printed products. Specialisations include:

(a) magazines,

(b) cartons (for food and other items),

(c) stationery, labels,

(d) print on metal (such as drink cans),

(e) catalogues,

(f) books,

(g) high quality colour printing (brochures, cards, fine art reproduction),

(h) newspapers,

(i) security printing (for bank notes and bond issues).

Traditionally, production areas have concentrated on printing although, increasingly, print-oriented companies are focusing on 'total solutions' for their customers. Nowadays, they may also design the items they print, and offer additional services in visual communications, advertising or web design.

2.2.   Changes in the graphic arts and media industry

Today, the graphic arts and media sector is coping with structural changes caused by rapid technological developments. These technological developments affect not only production but also the structure of the enterprises, the products, and their market position. There is a noticeable move from being manufacturing oriented to becoming oriented towards providing service.

One of the main characteristics of change is the wide application of electronic processing environments and the processing of not only printed but also electronic media, such as websites and multimedia applications. Digital printing is another technology influencing and accelerating the structural changes taking place currently within the sector and, consequently, the companies and the personnel involved.

Reorganisational strategies have been widely carried out in an attempt to adapt the sector to the new conditions. Initially this was characterised by investment in new equipment and systems, followed by significant changes in production workflow (Pira, 1999).

Further developments in graphic arts and the media are also dependent on parallel developments in other sectors and conditions that have an indirect relationship with it. One example is the competition of print and electronic media and the consequences for the future of printed products (Pira, 1999), (Comprint, 1998). Therefore, any development strategy for the sector as a whole or for specific fields should take into consideration these parallel developments and their implications (Pira, 1998).

It is also necessary to define other important factors that may affect the progress and development of the sector and to see to what extent they affect the development of education and training strategies for it. Factors that may be important to investigate are the development of electronic media, the formation of new structures for production workflows, management, the working environment and the changes caused by other sectors such as the information technology sector.

Some of the principal characteristics of the graphic arts and media industry in a number of European countries are presented below along with other important data. This analysis will provide some basic information on the current situation and development of the sector.

2.3.   Facts and figures about the graphic arts and media/printing industry

In this chapter, data on the development and structure of companies and the development of employees is presented and analysed. Most of this data has been taken from the survey on updating qualification profiles in the European printing industry (a joint project conducted by the sector's European confederations UNI-Europa Graphical and Intergraf, 2000, Brussels,

Belgium). They are used with the kind permission of Anne-Marie De Noose from Intergraf and are further processed within the report.

Tables 1, 2 and 3 provided by Intergraf present the turnover and investment and utilisation of the graphic arts and media industry. These tables show the printing sectors of Germany, France, Italy and the UK, have the largest turnover.

Table 1: *Turnover of the printing industry as a whole in 1997 NACE Rev 1-3 digit level: 22.2 EUR x 1 000 000*

Euro x 1 000 000	1997
Austria	1 288.67
Belgium	4 051.00
Denmark	3 097.25
Finland	1 603.40
France	8 525.48
Germany	15 121.54
Greece	152.84
Ireland	
Italy	10 195.52
Luxembourg	
Netherlands	3 503.16
Norway	
Portugal	
Spain	6 571.56
Sweden	3 861.51
Switzerland	4 049.84
United Kingdom	
Total Europe	62 021.77

Source; Intergraph

Table 2: *Turnover of the printing industry as a whole – years 1999, 2000, 2001 (level 22.2)*

	1999	2000	2001	1999	2000	2001
					National currency	
	EUR x 1 000 000			x 1 000 000		
Austria	1 537.05	1 607.13	1 675.42			
Belgium	2 472.00	2 626.00	2 715.00			
Denmark	3 542.52	3 679.23	3 704.55	26 333.00	27 436.00	
Finland	1 497.00	1 643.00	1 670.00			
France**	13 797.00	14 135.50				
UK*	21 389.10	23 639.10		13 699.72	14 486.04	
Germany	16 807.00	17 694.00	17 202.00			
Hungary	362.59	476.36		93 345.00	122 635.00	
Italy*	10 996.90	12 851.90				
Luxembourg	117.10	134.50				
Norway NO*	1 363.70	1 505.10		11 305.07	12 119.82	
Portugal*	1 247.81	1 299.00				
Spain	5 650.00	5 890.00	5 850.00			
Sweden	3 178.17	3 212.85		27 570.00	28 000.00	
Switzerland		4 245.16	4 311.49		6 400.00	
The Netherlands	3 616.17	3 712.00	3 792.00			
TOTAL EUROPE		98 350.83				
BR (in US$)	5 155.14	7 770.58	6 098.11	5 350.00	6 720.00	
*Eurostat data						
** FIGC						

Source: Intergraf

Table 3:   Ratio investment / turnover – years 1999, 2000, 2001

	1999	2000	2001
	Ratio investment/Turnover %		
Austria	7.40	9.00	
Belgium	6.97	6.92	5.54
Denmark	11.10	15.40	
Finland	7.60	7.50	
France	6.70		
Germany	7.00	6.90	
Hungary	7.90	10.90	
Italy	7.60		
Luxembourg	7.80		
Netherlands	11.10	13.00	
Spain	9.93	9.10	9.60
Sweden	6.60	6.80	6.10

Source: Intergraf

2.3.1. The graphic arts and media industry and its contribution to gross domestic product

Contribution to gross domestic product in 1999 by the European printing industry is between 1 % and 2 %, with only Denmark, France and Ireland making a larger contribution (Table 4). While the turnover and number of workers differ according to country size, the respective importance in terms of GDP is more or less the same throughout Europe.

Table 4:   Contribution of the graphic arts and media/printing industry to the Gross domestic product (GDP)

Percentage of printing industry as GDP (Gross domestic product)	
	Printing industry total in %
Austria	1
Belgium	1.9
Denmark	3
Finland	1.5
France	3
Germany	n. a.
Greece	1
Ireland	5
Italy	1.5
Luxembourg	< 1
Netherlands	1.8
Norway	1
Portugal	n. a.
Spain	1.37-1.8
Sweden	n. a.
Switzerland	1.77
United Kingdom	1.7
On average	1.9

Table 5 shows the financial situation, according to OECD, of the graphic arts and media industry in Europe.

Table 5: *Financial situation and printing production in 18 European countries – data without pre-press and post press or other parallel works and without VAT – OECD Europe, 1998*

Financial situation and printing production in 18 European countries – data without pre-press and finishing – post press or other parallel works and without VAT – OECD Europe, 1998					
Population		Graphic arts and media –printing industry			
Countries	Population in 1 000	Production of printed products 1998 (in million DM)	Per capita production of printed products (in million DM)	Newspaper readers per 1 000 people	Number of employees 1998
Austria	8 000	3 800	475	480	20 800
Belgium	10 000	5 124	512	320	25 600
Denmark	5 000	3 962	792	385	17 900
Finland	5 000	2 343	468	470	13 900
France	58 000	25 000	431	240	123 000
Germany	82 000	31 300	382	320	136 000
Greece	10 000	1 950	195	10	10 900
Iceland	300	168	560	520	900
Ireland	3 600	1 260	350	175	6 400
Italy	57 000	24 000	421	120	123 000
Luxembourg	400	316	790	390	1 500
Norway	4 500	3 060	680	610	14 800
Portugal	10 000	1 600	160	50	9 000
Spain	39 000	9 300	238	110	55 000
Sweden	9 000	5 500	611	490	27 500
Switzerland	7 000	6 700	957	415	32 400
The Netherlands	16 000	7 600	475	340	30 500
UK	59 000	24 000	407	360	126 000
Total	Total 383 800 +0.3 %	Total 156 983 +3.05 %	On average: 409 +2.7 %	On average: 331	Total: 775 100 −1.5 %

Source: Willkomm, H.: Die Druckindustrie in OECD – Europa hat sich 1998 erholt. OECD data 1998 in *Deutscher Drucker, journal*, No 6, 10.02.2000, pp. g14 – g17, Deutscher Drucker Lindau, Germany

2.3.2. Classification of companies by sub-sectors in the graphic arts and media/printing industry – changes in the number of companies 1994-99

The graphic arts and media sector is further divided into sub-sectors which represent either a certain field of production within the production workflow or a field for the production of a specific product. Using this approach, the sector is divided into the following sub-sectors:

(a) pre-press,

(b) printing,

(c) finishing,

(d) packaging,

(e) multimedia,

(f) newspapers.

The sub-sectors are defined as indicated below:

(a) pre-press – includes all employees involved in the various processes from design of printed or electronic media up to the production of the printing plate or cylinder or screen;

(b) printing – includes all employees operating printing presses, using any of the standard processes such as lithography, gravure, flexography, screen print or digital;

(c) finishing – includes all the employees who trim, fold and secure printed sheets or sections to produce the finished product;

(d) packaging – includes the production of packaging products such as cartons, envelopes, boxes, etc. This field includes pre-press, printing and finishing, with their specific characteristics in packaging;

(e) multimedia – the integration of text, image, audio, video and data for interactive products. This term was used at the end of the last decade to define the specific area of production of interactive media on CD-ROMs. However today this term has been replaced by the term electronic or new electronic media. The definition of this term is meant to include the design and production of multimedia applications and websites.

(f) newspapers – includes all employees in companies whose main output is newspapers. This field includes pre-press, printing and finishing, specifically oriented for newspaper production.

Table 6:   Development of companies in the years 1994-99

	Pre-press	Printing	Finishing	Packaging	Multimedia	Newspapers*
The number of companies in the different sub-sectors: 1) increased significantly, 2) increased, 3) not changed, 4) decreased or 5) decreased significantly						
A	4	3	-	-	1	-
B	4	4	4	n. a.	n. a.	-
CH	3	4	4	n. a.	n. a.	-
D	4	3	4	4	1	-
DK	4	3	3	3	2	-
E	2	2	2	2	2	-
EL	4	2	2	2	-	1
F	5	4	5	3	1	-
FIN	4	2	4	4	1	-
I	4	1	3	3	1	-
IRL	3	2	3	3	3	3
L	3	4	3	-	-	-
NL	4	3	4	n. a.	2	-
NOR	5	4	3	4	2	4**
P	2	3	3	3	3	-
S	4	3	3	4	n. a.	-
UK	2	4	2	2	1	2
mean	3.59	3.00	3.25	3.08	1.67	2.50*

* The mean result presented here is not representative since only four countries are part of this process.

** As a result of structural rationalisation, the number of news printing houses has decreased somewhat and merged with larger printing office units. The number of newspapers is fairly stable.

Source: Intergraf and *UNI Europa Graphical*

As indicated in Tables 6 and 7, the number of companies in the pre-press and finishing sectors declined during 1994-99, while the number of printing and packaging companies remained stable. Spain reported an increase in pre-press and print. Portugal and the United Kingdom also witnessed an increase of companies in the pre-press area and 5 of the 17 countries indicated a growing number in companies in the print sector between 1994 and 1999. The multimedia sector showed the fastest growth, though Ireland and Portugal experienced less than average growth.

While turnover in 1994-99 was steadily growing there was a decline in pre-press and packaging companies as a result of mergers.

The survey indicates a decline in the number of employees (Table 7) during the past five years (1994-99) with pre-press, finishing and packaging showing the greatest loss. Seven countries reported a decline in the number of workers in these sectors, with only Spain reporting an increase in employment in the core sectors of pre-press and printing. The increase in the number of multimedia companies was also reflected in a greater number of people employed in the sector.

Table 7:   Changes in the number of employees 1994-99.

From 1994-99 the number of employees in the different sub-sectors 1) increased significantly, 2) increased, 3) not changed, 4) decreased or 5) decreased significantly.						
	Pre-press	Print	Finishing	Packaging	Multimedia	Newspapers
A	4	3	-	-	1	-
B	4	4	4	n. a.	n. a.	-
CH	5	5	5	n. a.	n. a.	-
D	5	3	3	4	1	-
DK	4	3	2	3	2	-
E	2	2	2	2	2	-
EL (GR)	4	2	2	2	-	1
F	5	4	2	3	1	-
FIN	4	2	4	3	1	-
I	3	3	4	3	1	-
IRL	3	3	3	3	3	3
L	2	2	3	-	-	-
NL	4	3	4	n. a.	2	-
NOR	5	4	4	4	2	4
P	3	3	3	3	2	-
S	3	4	4	3	2	-
UK	2	4	2	2	1	4
Average	3.65	3.18	3.19	2.92	1.62	3*
* The average result presented here is not representative since only four countries are part of this process.						

Source: Intergraf and *UNI Europa Graphical*

2.4.   Structure of employment in the graphic arts and media industry

Table 8 illustrates the structure of the graphic arts and media companies with regard to the number of employees (expressed as a percentage of the total number).

Table 8:   *Number of employees in graphic arts and media companies (primarily in printing industry).*

	Less than 20 employees	20 to 50 employees	More than 50 employees
Central Europe	79 %	14 %	7 %
North America	82 %	11 %	7 %
Central and South America	89 %	7 %	4 %
Eastern Europe	65 %	20 %	15 %
Asia/Pacific	95 %	3 %	2 %

Source: Helmut Kipphan (ed.). Handbuch der Printmedien 2000, p. 9 (estimates by Heidelberg/worldwide information sources). In *The horizon of print and publishing opportunities in the Media economy,* Comprint International report, IBI, Duesseldorf in cooperation with the University of Wuppertal, Intergraf, Belgium, 2002

According to the UNI-Europa Graphical survey, Italy has the highest number of printing companies, followed by the UK and Germany. On an average 89 % of the companies were classified as small (up to 50 employees). In six countries more than 90 % of the printing sector was included in this category. Only in Italy, Portugal, and Finland were a third of the companies considered to be larger. However, the figures give a good indication of the size and dispersion of the different printing companies throughout Europe. The total number of employees working in the European printing industry totals about 1.25 million people, with more than half being employed in Germany, Italy and the UK (Tables 9 and 10 below).

Table 9:   *Employment situation, NACE 22.2*

Employment structure for the graphic arts and media industry.									
Total number of employees					**Total number of companies**				
	1998	1999	2000	2001		1998	1999	2000	2001
A	17 075	16 550	16 803		**A**	1 129	1 016	1 044	
B	22 374	21 930	21 708	21 929	**B**	1 821	1 785	1 798	
CH***	37 802	37 000	37 000		**CH*****	3 628	3 620	3 620	
D	135 872	135 662	136 723	136 119	**D**	14 246	14 201	13 922	
DK	18 239	17 776	18 129		**DK**	1 825	1 792	1 699	
E*	76 450	7 209	87 209		**E***		14 254	15 445	
F**		68 727	68 461	67 085	**F****	1 624	1 563	1 490	1 414
FIN	14 492	14 435	13 660	13 871	**FIN**	1 678	1 479	1 479	
HU	14 107	14 780	16 076		**HU**				
I*		91 766	99 099		**I***	19 449	20 168	20 386	
L	985	1 073	1 141		**L**	82	86	86	
NL	27 478	27 430	27 430		**NL**	2 981	2 908	2 949	2 818
NOR*		10 330	10 476		**NOR***	1 272	1 054	1 100	
P	28 058	27 788	25 737		**P**	3 694	4 177	4 145	
PO			70 000		**PO**			15 100	
S	24 480	24 236	23 033	22 728	**S**	2 215	2 228	2 060	
UK*		193 632	186 205		**UK***	19 405	19 785	18 937	
TOTAL EUROPE	417 412	710 324	858 890		TOTAL EUROPE	75 049	90 116	105 260	
BR			190 000		BR		13 841		
SA	38 000	37 163	36 702	36 393	SA	931	908	952	
US				1 200 000	US			46 000	
* Eurostat data					* Eurostat data				
** FICG data					** FICG data				
*** Estimated figures					*** Estimated figures				
l/500 employees									

Source; Intergraf and *UNI-Europa Graphical*

Table 10:   Number of employees in the printing industry (approx. number)

	Total	Percentage of each country
A	2 100	1.77
B	25 000	2.00
CH	46 400	3.71
D	215 500	17.23
DK	16 000	1.28
E	120 000	9.59
EL	20 000	1.60
F	122 600	9.80
FIN	16 900	1.35
I	301 500	24.10
IRL	13 800	1.10
L	1388	0.11
NL	48 200	3.85
NOR	30 600	2.45
P	22 000	1.76
S	29 000	2.32
UK	200 000	15.99
Total	1 250 988	100

Source; Intergraf and *UNI-Europa Graphical*

One characteristic regarding employment in the sector is that the number of women employed is increasing. This happens mainly due to the increasing production applications based in computerised systems (Table 11). The highest percentage of females working in the printing industry is found in the Scandinavian countries, Austria, Switzerland, and France, with the lowest percentage reported from Spain. In pre-press, an average of one third of the workers is female, with even more being employed in finishing and packaging. The ratio of women to men in the multimedia sector appears to be the same as in the pre-press sector.

Table 11:   Percentage of female employees in the different sub-sectors

	Pre-press	Print	Finishing	Packaging	Multimedia	Newspapers
A	40	few	-	-	50	
B	32	1-6	0.4	n. a.	32 (also pre-press)	-
CH	40	21	6	n. a.	n. a.	-
D	51	20	50	20	30	-
DK	50	<50	>50	n. a.	n. a.	-
E	7.7 - 13					-
EL	30	14	40	40	-	50
F	40	20	50	50	50	-
FIN	53	16	82	n. a.	30	-
I	36	25	27	n. a.	n. a.	-
IRL	28	36	45	28	n. a.	n. a.
L	approx. 30			-	-	-
NL	18	2.9	18.7	18.7	n. a.	-
NOR	21.5		39	28	n. a.	27.5
P	30					-
S	40	30	40	30	n. a.	-
UK	18					

Source: Intergraf

2.4.1.   Creating a working environment for the graphic arts and media sector

It is important to discuss some basic approaches for the creation of new working environments and the implications of different types of employment structures. This analysis is based on data provided by DG Enterprise and the IPTS and concentrates on the content of the media industry (excluding telecommunications infrastructure and software interfaces) in two main areas (IPTS, 2000):

(a) how digitalisation will change existing media, create new media, and subsequently affect employment and occupations;

(b) the responses of social partners and policy makers to ensure benefit from the changes underway.

With liberalisation, new techniques and new transmission and transport platforms such as the Internet creating new media outlets, the media sector will be subject to substantial industrial change over the next five to ten years. Workers seem to be less aware than employers of the possible changes ahead. A 1997 questionnaire distributed to European Media Unions (17.7 % response rate) revealed that only six unions think their members were well prepared for the challenges ahead.

However, as the ILO Symposium Information technologies in the media and entertainment industries: their impact on employment, working conditions and labour-management relations (Mars, 2000) illustrates, the issue is very much on the agenda of industrial relations. In fact, in one of the preparatory documents of the ILO meeting, it is stated: 'Traditional labour-management relations have problems coping with technology and other developments in media and entertainment, because the workforce is more fragmented than before, and enterprises are subcontracting work that used to be core business'.

New forms of social dialogue and interaction are seen by the ILO as essential for developing these industries. It is necessary to find a way of addressing the impact of information and communication technologies and issues relating to social protection and informal sector workers. Training must be promoted as a central strategy to safeguard the interests of all stakeholders. There is great scope for such initiatives in this restructured, more globalised, technological environment, and the Internet and e-mail offer increased scope for communication and organisation within and across sectors and countries.

2.4.2. Teleworking

Various studies reveal that distance or teleworking in Europe is increasing. A survey conducted within the Emergence EU programme in 7 268 companies with over 50 employees in EU Member States plus the Czech Republic, Hungary, and Poland has indicated that teleworking job numbers are increasing. According to the study, outsourcing of work to people working as employees or freelance takes place in 49 % of these companies. However, data shows that only a small percentage of teleworkers are based at home in comparison with the other locations (see table). The Internet is the most widely applied technology for this type of employment. In graphic arts and media, this type of employment can be applied in pre-press and multimedia operations but not for printing and finishing operations.

Table 12:   *Percentage of teleworking in Europe among teleworkers employed in different locations in the same country, outside their country and at home – percentage of companies employing teleworkers*

Country	Teleworkers employed in different locations in the same country.	Teleworkers employed outside their country.	Teleworkers employed at home.
Austria	8	5	4
Belgium	16	5	4
Czech Republic	14	19	1
Denmark	29	12	8
Finland	15	15	4
France	5	1	1
Germany	6	2	2
Greece	8	7	<1
Hungary	9	13	1
Ireland	4	5	1
Italy	5	5	1
Luxembourg	2	14	<1
The Netherlands	20	13	10
Poland	20	10	0
Portugal	4	3	<1
Spain	7	5	no data available
Sweden	20	5	no data available
UK	14	4	no data available
Total on average	10	5	2

Source: Emergence EU programme

2.4.3.   Freelance work

The volume of freelance work varies from country to country. For example, in Germany it is estimated that the self-employed constitute 10.6 % of all employees in the graphic arts and media sector, with the number of freelancers is increasing in the pre-press field.

The growing number of freelancers challenges the working conditions for other types of workers since the distance between the functions of employees and freelancers narrows (EGF, 1997).

2.5.   Terms and definitions: IT-ICT and graphic/media

Prior to continuing the analysis, it is important to discuss some of the terminology used, as well as the interpretation of sectors or description of industrial fields. The information and communication industry has already been mentioned above. The description is different, however, depending on the perspective of the graphic arts and media sector or the computer and informatics sector. For the graphic arts and media sector, ICT constitutes a wider field where content, information and data are processed and distributed through various channels of output. Within this framework, different media are used for presenting the respective information. From the computer and informatics sector's point of view, ICT is used to describe software development and, among other things, use of equipment. The word communication is common to both the graphic/media sector and the computer and informatics sector. It is very important that the term be interpreted accurately. For the purpose of this study, the computer and informatics sector will be defined as the IT-ICT sector or industry, combining information technology and information and communication technology.

2.5.1.   The IT–ICT sector relationship with the graphic arts and media sector

According to the Career-space consortium 'modern ICT solutions are combinations of both hardware and software, focused on meeting users' requirements. Consequently, ICT is a combination of many disciplines: basic technologies and science (microelectronics, materials); structural science (computer science, informatics); and the creation and implementation of specific solutions to meet customers' needs and realise business opportunities' (Career-space, 2001).

2.5.2.   Print as information technology

A different approach to the concept of information technology is provided by the graphic arts sector. Data provided by GAIN indicates that printing is America's third largest manufacturing industry, employing more than 1.2 million people in almost 46 000 companies and selling over USD 160 billion of products in 2001.

According to the study, print is defined as the 'original information technology' and has spanned an entire millennium. It remains the most widely adopted, portable, flexible, economical information technology ever invented. Print is at the core of all human communication (GAIN, 2002).

3. Graphic arts and media vocational education and training in Europe

Historically, in most countries, the media sector has had its own schools and colleges, specifically oriented towards its own specialised education and training needs. This is still the case today, despite the penetration of new technologies and merging skills and qualifications in graphic arts and media education.

Education and training in graphic arts and media has followed the pace of the main technological developments and innovations applied in the production of printed matter during the past 25 years. With reference to higher education, the sector previously concentrated on engineering, physics, and chemistry with regard to specific applications used in printing production. Design and creativity continues to be one of the essential fields of graphic arts education.

A significant proportion of core post-secondary education and training still concentrates on craftsmanship, mainly dealing with manual processes such as photography pre-press and plate-making, all aspects of printing technology, machinery and processes, the finishing of printed matters and paper, as well as knowledge of other printing substrates.

Automation techniques, advanced engineering processes, production management systems, and quality control techniques are gradually being included in training content.

3.1. Types of education and training for the graphic arts and media sector in Europe

Prior to discussing the types of education and training in the graphic arts and media sector in Europe, it is useful to make a few distinctions, beginning with the main differences between higher and post-secondary education in the sector. Universities and colleges offering courses in graphic arts and media usually include courses in management, quality control and management, production planning and organisation, media concepts, their structure and development and, in general, engineering in graphic arts and media described in a modern way.

The post-secondary level primarily offers educational programs for operators and technicians. Vocational training modules and other courses are also available at this level for professions such as printer or printing machine operator, pre-press specialists, etc. Vocational schools, post-secondary level colleges, and lyceums offer a wide variety of courses in techniques applied in graphic arts and media production. These courses are oriented towards graphic design, pre-press operations, printing and finishing techniques. At both levels, there is a wide application of IT, informatics, and management and production workflow techniques.

However, it is important to underline the fact that the borders between technological, managerial, and administrative tasks in the workplace are not clear-cut and tend to merge into a complex competence matrix that is mirrored by the education and training offered at the post-secondary level.

3.2. Overview of training in the graphic arts and media

A comprehensive overview of training in the printing sector in several European countries is presented below. This overview is based on information from a variety of studies and surveys, including a Cedefop report that reflects the status of training during the mid-1990s (Cedefop, 1995) and so allows an assessment of developments and changes that have taken place since the beginning of the millennium.

3.2.1. Recent developments

Important characteristics of the United Kingdom are:

(a) no legal regulations with regards to continuous training for employees;

(b) during the 1980s the 'bureaucratic' system of statutory training levies dismantled by liberal government and replaced by system of voluntary (employers) associations;

(c) during the 1980s the establishment of employer-led sector industrial training organisations (voluntary associations);

(d) during the 1990s, continuous training in accordance with regulations were included under the auspices of the structure for national vocational qualifications; the government recently set targets for lifelong learning;

(e) during the 1990s there was agreement on recruitment, training, development and apprenticeship between the social partners in printing and publishing.

Important characteristics of Norway are:

(a) no legal regulations for continuous training for employees;

(b) since 1994 a special chapter has been included in national main agreements between social partners concerning continuous training, i.e. competence development; this is binding for every separate special agreement for each sector;

(c) training paragraphs are included in special agreements between social partners for different branches of printing.

Important characteristics of Belgium are:

(a) since 1981 legal regulations exist concerning financing and funding of continuing training;

(b) since 1988 a training paragraph is part of cross-professional agreements between social partners; it defines objectives and sets limits for sector negotiations;

(c) training paragraphs are included in collective labour agreements for different branches of printing.

Important characteristics of the Netherlands are:

(a) no legal regulations concerning continuous training for employees; this is considered to be a responsibility of the social partners;

(b) since 1982, training is a part of the central agreement between social partners, having the status of recommendations for negotiations in sectors, the basis for training initiatives in many sectors;

(c) paragraphs included in collective labour agreements for different branches of printing.

Important characteristics of Sweden are:

(a) no legal requirements exist, but central collective agreements between the graphic and the newspapers employers' organisations and the graphic unions organisation have been revised several times since the 1980s. During the 1990s it was stipulated that graphics workers had the right to one additional paid week of leave annually for the purpose of further education;

(b) a fund for financing education and supporting new initiatives has been built up jointly by the social partners;

(c) about 100 secondary schools offer a three-year media program to approximately 3 500 students while 4 universities offer a media engineer degree programme to about 350 students per year. Most auxiliary education is provided through private consultants.

3.2.2.   Status of training agencies and other educational organisations in 1995

In the United Kingdom:

(a) the Department of Education and Employment stimulated development of NVQ 3 structure and set targets for lifetime learning;

(b) since 1982, the statutory industry training boards replaced by voluntary, employer-led industry training organisations (ITO); the employers' federation, the British Printing Industries Federation (BPIF) is responsible for the ITO function for the printing sector;

(c) the ITO has set up the printing occupations lead body to develop occupational standards (NVQs) for the printing industry and regional colleges of further education (FE) offer course programmes;

(d) the Joint Training Council (JTC) has been established by the employers' federation (BPIF) and the trade union of the printing and publishing sector, the Graphical, Paper and Media Union (GPMU), each having equal representation;

(e) in 1988, the employer-led regional training and enterprise councils (TEC) were established; the government gave local groups of employers a leading role in government-funded training; at the moment there is a serious gap in the TEC/ITO interface.

In Norway:

(a) traditionally, the Norwegian Graphical Union plays a strong role in the industry. In addition to making training a part of the bargaining process with employers, it offers its own series of courses as part of an active strategy to retrain and extend auxiliary education to its members;

(b) in 1972, the Graphical Training Fund was established and is jointly administrated by NGU and four employers' associations from the printing and newspaper sector. Both groups make contributions by means of a levy system;

(c) in 1987, the technology-based Graphical Institute was established and is now the leading centre for publishing and applied information technology. It is funded by a training fund, social partners, several research councils and a state regional development fund;

(d) in 1992, regional competence centres were established in major cities, financed by the training fund, and owned and run by the local graphical unions;

(e) regional labour market agencies provide funds to regional competence centres in order to provide training for unemployed graphics workers within framework of several specific labour market programmes and schemes.

In Belgium:

(a) two trade unions (one Christian and one Socialist) and an employers' association are involved in print training;

(b) in 1990, two sectoral training funds were established for the graphics sector, one for the Flemish community and one for the French. Both funds are financed by an employers levy on gross wages, with the percentage derived from biannual interprofessional agreements;

(c) there is a special training fund, organised cross-sectorally, for administrative employees which subsidises courses and projects from a broad range of training providers – public providers such as employment agencies, the institutes for social promotion and institutes for independent entrepreneurship, as well as private providers such as equipment suppliers;

(d) private training institutes play a limited role in the printing sector.

In the Netherlands:

(a) there is a long tradition of central administration of the sector by the social partners;

(b) in the Central Bureau, a policy-making institute, the employers' federation (KVGO) and the trade unions (Christian and Socialist) jointly develop sectoral policies, for example, in the field of technology, employment, labour, market, and training;

(c) since 1973, training policy as defined by the Central Bureau is organised by the Graphical Training Centre (GOC); the GOC unites two formerly separate organisations, for apprenticeship programmes and further training respectively;

(d) five regional schools for vocational education provide further training in printing occupations;

(e) since 1983 two sector training funds have been active, both financed through a levy on wages and administered jointly by the social partners (one equalisation fund and one training fund); almost exclusively, aside from a few equipment suppliers, the funds support training courses provided by the GOC; no specific private providers of training in printing are active;

(f) the employment exchange service and its regional offices offer training to the unemployed and other special risk groups in the labour market.

3.2.3.   Agreements between sector agencies

In the United Kingdom:

(a) there is a collaborative agreement concerning recruitment, training, development and apprenticeship between social partners, covering GPMU printing production process workers;

(b) an agreement between the employers (BPIF) and the government (DFEE) was entered into, the purpose of which was to delineate specific training targets for the printing sector within the framework of the national training and educational targets.

In Norway:

(a) since the 1990s there is a chapter on competence development in the main agreement between social partners, including statements concerning company-directed nature of continuous training, joint responsibility of employers and employees, measures to achieve higher levels of training in companies;

(b) the training paragraph in the special agreement between unions and the printing industry includes several measures to promote continuous training, a standing training committee for the sector, paid training leave for workers, a levy arrangement for the Graphical Training Fund, recommendations for training committees at company level, recommendations concerning certification of continuing training.

In Belgium:

(a) from the 1980s the biannual interprofessional agreement between social partners defines target groups for training and levy arrangements for the sectoral training funds;

(b) training evolution, under pressure from the employers, moves initial accent on the young and the unemployed to employees.

In the Netherlands:

(a) a long tradition of training regulations within collective labour agreements between social partners, including sectoral innovation and employment policies, occupational structures and training requirements, target groups, training funds and subsidy schemes for training, the Graphical Training Institute (GOC);

(b) since the 1990s there is a covenant between social partners, the GOC educational organisation and the government concerning renewal of vocational education infrastructure and programmes in the printing industry; as a consequence there is a separate covenant between GOC and graphical schools concerning division of tasks with regard to initial and adult education;

(c) a covenant between GOC and national employment exchange service to establish a framework for training the unemployed; regional covenants and regional employment offices have been set up that deal with the regional labour market, and the training and retraining programmes of specific target groups;

(d) formal agreements entered into by the GOC and training institutes of adjacent branches (e.g. audiovisual sector, packaging industry) concerning the development of training programmes for borderline occupations and sector crossing technologies (multimedia).

In Sweden:

Cooperation between employers and the employee organisations has a very long tradition that goes back to the 1960s. It started with changes in the work organisation resulting from new technology. In order to construct an organisation that was more open, with better channels for information flow, a process was started to create flatter organisations that had fewer managers. The implication of this new type of organisation was the necessity for graphics workers to increase their competence in many areas. They needed to improve their technical skills, working with customers, working in teams, reasoning and communications skills, proclivity control, and computer skills.

A special institute for further training was established in the late 1980s by the social partners and was financed jointly after the Dutch model (GOC). After about 10 years, a decision was made to dismantle this central institute due to travel costs for companies and tougher competition from private educational providers, as well as difficulty in keeping the 10-man organisation up-to-date on all of the latest techniques.

Digital printing and digital photography are currently major areas of interest in education. More companies would like to recruit personnel with a post-secondary education at university level. This is true even with small family companies.

Sector studies have revealed that these relationships occupy an important position in the intermediary area between education and employment, especially in Belgium, the Netherlands and Norway. As such, they provide a flexible connection, for which new developments within the labour system can become incorporated into education more easily.

3.3. Vocational education and training in the graphic arts and media sector in Europe

3.3.1. Description of the vocational training systems

Table 13 reflects the regulation and wide variety of types of vocational training systems in the printing industry throughout Europe. No statutory training requirements exist in five countries: Greece, Spain, Portugal, Sweden and the United Kingdom.

Table 13:   *Types of vocational training systems existing*

	Pre-press	Print	Finishing	Packaging
A	a, c	c	c	c
B	a, c	a, c	a, c	a, c
CH	a, c	a, c	a, c	a, c
D	c	c	c	c
DK	c	c	c	c
E	a, d	a, d	a, d	a, d
EL	a, b, d	a, b, d	a, b, d	a, b, d
F	a, c	a, c	a, c	a, c
FIN	c	c	c	c
I	b, c	b, c	b, c	b, c
IRL	b, c, d	b, c, d	b, c, d	b, c, d
L	c	c	c	-
NL	c	c	c	b
NOR	a, b, c	a, b, c	a, b, c	a, b, c
P	a, d	a, d	a, d	a, d
S	a, d	a, d	a, d	a, d
UK	a, b, d	a, b, d	a, b, d	a, b, d
a = off the job, official recognised school				
b = apprenticeship				
c = dual system (apprenticeship and school)				
d = not regulated (training on the job)				

Source: Intergraf and *UNI-Europa Graphical*

Table 14 shows that the average period spent in training is between two and three years, irrespective of the occupation of the trainee. However, training models exist in some countries, such as France and Finland, where training is provided for up to six years.

Table 14:   Duration of vocational training (in months)

	Pre-press	Print	Finishing	Packaging	Multimedia
A	36-42	36	36	36	42
B	30-36	30-36	30-36	30-36	n. a.
CH	48	48	36-48	24-36	36
D	36				
DK	48	48	42	n. a.	n. a.
E	36	n. a.	n. a.	n. a.	n. a.
EL	24 - 36				
F	24-72	24 - 72	24-72	24-72	n. a.
FIN	36-72				
I	24-36				36
IRL	24-48				
L	36- 60			-	-
NL	36-48				-
NOR	48				
P	4 – 36				
S	12–36				
UK	24 - 42				n. a.

Source: Intergraf and *UNI-Europa Graphical*

3.3.2.   Recognition of certificates and diplomas as precondition for employment

In general, certificates and diplomas awarded to workers are recognised by employers. However, according to the trade unions in Greece and Italy, official certificates are recognised in theory but not always in practice. In 10 of 17 countries covered by the survey, possession of the appropriate certificate or diploma is not a precondition for employment (Table 15).

According to experts in Spain there is a lack of clearly defined standards as well as a common description of qualification profiles. In Austria, Italy, Luxembourg and Switzerland a formal qualification in the form of a certificate or diploma is a precondition for employment, with other countries having specific requirements for only some areas (see footnotes to Table 15.).

Table 15:   Recognition of certificate and diplomas as precondition for employment

Is the certificate or diploma issued recognised a) nationally, b) regionally, c) only by certain enterprises		**Is achievement of the vocational qualification a precondition for employment in the relevant job? y(es), n(ot), p(artly)**
A	a	y
B	a	n
CH	a	y
D	a	p [1]
DK	a	p [2]
E	a	n
EL	a [3]	n
F	a	n
FIN	a	n
I	a [6] + c	y
IRL	a	n
L	a	y [4]
NL	a	n
NOR	a	p [5]
P	a	n
S	a	n
UK	a	n

[1] No, but professional title only for bearers of diploma
[2] Yes, in some areas of print. No, in the other sectors.
[3] Theoretically the answer is an a but in reality the answer is c). The trade union is trying to persuade companies to accept and recognise the certificates or diplomas as part of the terms for negotiating a higher salary for graduates of TEI. However, the employers do not support this agreement, because they are convinced that the educational preparation of the students is not adequate to the vocational skills needed.
[4] The CATP is required to be engaged as a craftsman. The *Brevet de Maîtrise* is needed to become a self-employed craftsman.
[5] Yes, in companies with a collective agreement for the sectors pre-press, printing, and bookbinding. No, for the other sectors.
[6] Certificates awarded by ITIS (which are state schools) are recognised all over Italy. There are also other schools which issue certificates at regional level; however they can also be in fact recognised.

Source: Intergraf and *UNI-Europa Graphical*

3.4. Further training

3.4.1. Organisation for further vocational training in the graphic arts and media/printing industry

With respect to Table 16, and with the exception of Denmark and Switzerland, vocational training institutions are publicly financed and organised. In 9 of the 17 countries included in the Intergraf/Uni/Europa study, social partners played an important role in further development of the vocational training systems. In nine countries certificates or diplomas were awarded to workers who successfully completed further vocational training, and were recognised on a national basis. For the purpose of this report, further vocational training is defined as additional training given to adult skilled workers in order to update or upgrade their skills.

Table 16:   Significant institutions for further vocational training

	Public (state or community financed)	Trade unions	Employers' associations	Recognised private schools	Machine manufacturers	Social partners
A	x	x				x
B	x				x	x
CH		x				x
D	x					x
DK	x					x
E	x					x
EL	x			x		
F	x			x		x
FIN	x			x		x
I	x					x
IRL	x				x	
L			x			
NL	x					x
NOR					x	x
P	x					
S	x			x		
UK	x				x	
Total	13	2	1	4	4	10

Source: Intergraf and *UNI-Europa Graphical*

The Comprint survey showed that on-the-job training is the most widely used method for providing further training to employees. This was the reply most often given by the employer to the question of what other further training methods were used by their company. The

findings show that on-the-job training plays a significant role in employee training in 84.5 % of the companies surveyed. 79.4 % of the companies employ in-house training and 76.5 % turn to external training courses. In Table 17 presents the results of the survey.

Table 17:   Further training methods used in graphic arts companies

Further training methods	Percentage of use – responses by print/media entrepreneurs (multiple responses possible)
Training on the job	84.5 %
Internal training	79.4 %
External training	76.5 %
Learning through technical literature	50.0 %
Learning by surfing on the Internet	32.4 %
Computer-based training	20.6 %
Cooperation with educational establishments	17.6 %
Cooperation with other companies	14.3 %
Web-based training	11.8 %

Source: Questionnaire: Trend scout for the future of print, Comprint international 2002, IBI, Ltd.

3.4.2.   Recognition of certificates and diplomas awarded for further vocational training

In most countries, training institutions provide an officially recognised certificate or diploma to be awarded upon completion of a vocational training course for further education (10 out of 17). In five cases the certificate or diploma is not generally recognised (Table 18). The certificate or diploma only has an official status in Austria and Norway, despite the fact that only certain Norwegian companies recognise them, and Austrian schools are not generally required to provide an officially recognised diploma.

Table 18: *Recognition of certificates and diplomas for further vocational training*

	Official recognition of certificates or diplomas (reference Table 16)			Recognition of certificates or diplomas (reference Table 16)		
	In most of the cases	Not in the majority of cases	In general no	Nationally	Regionally	Only in certain enterprises
A			x			
B		x		x		
CH		x		x		
D	x			x		
DK	x			x		
E	x			x		
EL		x				x
F	x			x		
FIN	x			x		
I	x				x	
IRL		x		x		
L	x			x		
NL	x			x		
NOR			x			x
P	x			x		
S		x		x		
UK	x			x		

Source: Intergraf and *UNI-Europa Graphical*

3.4.3. Number of workers involved in vocational programmes for further training in 1999 as well as length of time spent in a vocational programme for further training

The survey indicated that the percentage of workers involved in further vocational training the year prior to carrying out the interviews (Table 19) differed widely, ranging between 0.2 % and 30 %. However, Table 20 shows that the length of time spent on training was between 21 and 80 hours in 15 of the 17 countries investigated. In Germany, it was not possible to obtain an average figure since the courses offered for further education are combined with other courses.

Table 19:   Number of workers on further vocational training programmes in 1999

Number of employees that had the opportunity to attend a further educational programme in 1999 (approximate number)		
	Number of trainees	Total number of employees	% of employees
A	500	22 100	2.3 %
B	unclear	25 000	
CH	> 86	46 400	0.2 %
D	12 000	215 500	5.6 %
DK	1 850	16 000	11.6 %
E	65 6511	120 000	547.1 %
EL	105	20 000	0.5 %
F	4 300	122 600	3.5 %
FIN	4 300	16 900	25.4 %
I	unclear	301 500	
IRL	250	13 800	1.8 %
L	unclear ([1])	1 388	unclear ([1])
NL	1661	48 200	3.4 %
NOR	2 500	30 600	8.10 %
P	unclear	22 000	
S	unclear	29 000	
UK	5 000	200 000	2.5 %
Total		1 250 988	

([1]) 20 to 30 % of the employees (CATP) engage into classes for the *Brevet de Maîtrise*. At least 50 % of the employees are involved in training at company level.

Source: Intergraf and *UNI-Europa Graphical*

Table 20:   Amount of time spent on vocational training programmes for further education

	<20h	21-80h	>80h
A		x	
B		x	
CH		x	
D	x	x	x
DK		x	
E		x	
EL		x	
F		x	
FIN		x	
I			x
IRL			x
L	x		
NL	x	x	x
NOR	x		
P		x	
S		x	
UK		x	

Source: Intergraf and *UNI-Europa Graphical*

3.4.4.   Financing of vocational training programmes for further education

Most of the vocational training programmes for further education are organised by public institutions or employers who also usually fund the costs involved (see Table 21). However, in Austria, Germany, the Netherlands, Norway, and Switzerland trainees must also contribute financially to their educational courses for further training. Professional organisations and equipment manufacturers play only a limited role in this area of training.

Table 21:   Financing of vocational programmes for further education

Who pays the costs of further education?				
	Public	Companies	Trainees	Professional organisations
A	x	x	x	
B	x	x		
CH	x	x	x	
D	x	x	x	
DK	x	x		
E		x		
EL	x			
F	x	x		
FIN	x	x		
I	x			
IRL	x	x		
L	x	x		
NL		x	x	
NOR			x	x
P	x			
S		x		
UK	x			
Total	13	12	4	1

Source: Intergraf and *UNI-Europa Graphical*

3.4.5.   Assessment of training systems

Satisfaction with vocational training differs widely among those countries involved in the survey. Respondents were asked to express their views on a scale from one to five, with one being extremely good and five insufficient (Table 22). In principle, the representatives of trade unions view the vocational training systems less optimistically than do the employers' representatives (9 out of 17 countries). Each average cited in Table 26 covers all the observations of a given country. This ranking defines four groups of countries:

(a) the training situation with regard to meeting the demands of the printing industry is ranked very good or good (average up to 2.0) in Denmark, the Netherlands, and Switzerland;

(b) in Austria, Finland, France, Germany, Italy, Luxembourg, Norway and Sweden the ranking is just satisfactory;

(c) in Belgium, Spain, Ireland, Portugal and the UK, the social partner experts deem the situation not to be satisfactory (average more than 3.5);

(d) from those interviewed in Greece, the training situation in Greece with regard to meeting the demands of the printing industry is ranked as being extremely unsatisfactory.

Table 22:   Assessment of training systems

Assessment of training systems – degree of satisfaction with the training situation concerning the demands of the printing industry and the labour market			
	employers	trade unions	average
A	2	2.5	2.25
B	3	4.6	3.8
CH	2	2	2
D	3	4	3.5
DK	2	2	2
E	2.5	5	3.75
EL	5	5	5
F	3	3.5	3.25
FIN	2	3	2.5
I	2	3	2.5
IRL	4	3.5	3.75
L	3.25		3.25
NL	2	1.5	1.75
NOR	2	2.5	2.25
P	-	3.75	3.75
S	3	2.75	2.87
UK	3	5	4
1 = extremely good, 5 = insufficient			

Source: Intergraf and *UNI-Europa Graphical*

3.4.6.   Qualification structure for the graphic arts and media industry

The percentage of qualified workers having a diploma or certificate (Table 23) varies considerably within the European printing industry. At one extreme, in countries such as the Denmark and the Netherlands, the vast majority of skilled workers possess formal qualifications, while, at the other end of the spectrum, in countries such as Greece and the UK, few workers possess formal qualifications.

It is here that the differences in educational systems throughout Europe become obvious. Table 23 below reflects the differences in systems for vocational qualification, with some countries such as Austria, Germany, and Switzerland requiring the possession of a professional title or certificate as a prerequisite for entry into the labour market. In the UK, on the other hand, very few employees in the printing industry have a certificate or a diploma.

Nevertheless, these people are still recognised as qualified employees by their respective companies, because they posses the required competence needed to do the job properly.

Table 23: *Percentage of skilled employees with a vocational certificate or diploma in the different sub-sectors*

	Pre-press	Print	Finishing	Packaging	Multimedia	Newspaper
A	45 %	63 %	-	-	10 %	-
B	80 %	75 %	56 %	n. a.	n. a.	-
CH	60 %	65 %	50 %	n. a.	n. a.	-
D	57 %				60 %	-
DK	90 %	100 %	25 %	n. a.	n. a.	-
E	n. a.	n. a.	15 %	n. a.	n. a.	-
EL	1 %	1 %	0	0	-	5 %
F	60 %	45 %	50 %	50 %	n. a.	-
FIN	83 %	75 %	21 %	50 %	50 %	-
I	62 %	70 %	62 %	50 %	n. a.	-
IRL	25 %					
L	total 80-90 %			-	-	-
NL	photocopying: few, pre-press: majority	100 %	bookbinding: minority	n. a.	n. a.	-
NOR	85 %		60 %	15 %	n. a.	n. a.
P	20 %					-
S	n. a.	60 %	30 %	50 %	n. a.	-
UK	a minority*					
	*70 % of the workers are considered skilled although they do not hold a diploma					

Source: Intergraf and *UNI-Europa Graphical*

3.4.7. Types of organisation awarding diplomas

In general, printing schools that are officially recognised (10 of 17 countries), governmental institutions (8 countries) or social partner committees (6 countries) award certificates or diplomas. Only in Greece and Spain do companies alone award certificates. In Austria, Denmark, Finland, Ireland, Italy, Luxembourg, the Netherlands and Switzerland, only one body exists for the awarding of certificates or diplomas. However, in the remaining countries in Europe, there exist at least two different bodies within each country that can issue a certificate or diploma. In Norway, the theory is examined and certified by officially recognised schools, and the practical test is certified by the social partners' committee.

Table 24: *Types of organisations awarding vocational certificates or diplomas in the graphic arts and media/printing industry*

	Officially recognised schools	Professional or employers' associations	Social partners' committee	Governmental institutions	Enterprises
A			x		
B	x			x	
CH				x	
D		x	x	x	
DK			x		
E	x			x	x
EL	x			x	x
F	x			x	
FIN	x				
I	x				
IRL				x	
L				x	
NL	x				
NOR	x		x		
P	x				
S	x	x	x		
UK		x	x		
Total	10	3	6	8	2

Source: Intergraf and *UNI-Europa Graphical*

3.4.8. Titles of certificates and diplomas issued by different European graphics/media organisations

The following table lists and describes the titles of certificates and diplomas issued by each country.

Table 25: *Titles of certificates and diplomas issued by awarding organisations*

A	*Lehrabschlusszeugnis/Lehrbrief*
B	A1 (Diploma of the University for Applied Sciences). A2 (Diploma of the Vocational High school), A3 (Diploma of the High school, a = technical, b = career orientated), A4 unskilled worker
CH	*Eidgenössisches Fähigkeitszeugnis*
D	*Staatlich anerkannter/anerkannte* This is the general title, description for all occupations plus the definition of each specific occupation)
DK	Vocational Qualification of Graphic Arts
E	*Titulado en FP P.E. Artes Gráficas*

EL	*Ptychio IEK* is the title of a certificate awarded for the Graphic Designer for Print and Electronic Media awarded by the Organisation of Vocational Education and Training – OEEK. This is a post-secondary certificate (level 3). *Ptychio TEI* is the title of the diploma received upon completion of the study programme 'Graphic Arts Technology and Graphic Design' at the university TEI (Technological Educational Institute) (level 4).
F	CAP – *Certificat d'Aptitude Professionnelle*, BEP – *Brevet d'Étude Professionnelle,* BACPro – *BACProfessionnel*, BTS – *Brevet technicien supérieur* DIPL.UNIV. – *diplome universitaire*
FIN	The title of the certificate always has the name of the qualification profile, i.e. Certificate of Printer
I	n. a.
IRL	National Craft Certificate
L	*Certificat d'Aptitude Technique et Professionnelle* (CATP) (certificate in technical and professional skills) and *Brevet de Maîtrise*. The *Chambre des Métiers* is involved with the CATP exams – at least for that part which is workshop.
NL	The title of the certificate always has the name of the qualification profile, i.e. Certificate of Printer
NOR	Craft certificate and certificate of apprenticeship. (For media graphic designers, graphic printers and bookbinders, the traditional designation 'craft certificate' [*svennebrev*] is employed. For skilled operators in the packaging industry and serigraphers, the designation of 'certificate of apprenticeship' [*fagbrev]* is employed.)
P	n. a.
S	Professional Certificate
UK	NVQ in Printing at levels from 2 to 5, Modern Apprenticeship Certificate, National Traineeship Certificate/Certificate for Scottish Vocational Qualification in Printing, Certificate Modern Apprenticeship in Printing

Source: Intergraf and *UNI-Europa Graphical*

4. Skills characteristics in the graphic arts and media sector

It now necessary to define the main job profiles of the graphic arts and media sector. Management and administration job profiles are presented first, followed by the main production job profiles, performed by operators and technicians. This second group receives mainly initial vocational education, post-secondary education and vocational training (sub-degree level).

4.1. Classification of essential skills for different tasks in graphic arts production

Porter classifies five essential skills for production employees in a graphic arts company: creativity, knowledge of science, technology, electronics and mechanics.

Creativity comprises innovation, development of new ideas, and ability with design skills. Science is the knowledge of science as applied to production processes, materials, etc. Technology is the knowledge of technology in use for the various production operations. Electronics comprises knowledge and ability as applied to the control of quality and production. Mechanics includes design of technology, configurations, ergonomics, etc.

According to Porter, essential skills are those required by the job, and not those gained while doing the job if training is offered. These skills are mapped in the various tasks in graphic arts production. Table 26 illustrates the mappings of these essential skills:

Table 26:   Production worker practical skills requirement (essential skills)

		Creative	Science	Technology	Electronics	Mechanical
Original	DTP	xx		xx	xx	
	Scan	x	xx	xx	xxx	
	Plan/surface preparation		x	x	x	x
	Artwork	xx				
Printing	Sheet		xx	xxx	xxx	x
	Web		xx	xxx	xxx	xx
	Digital		xx	xx	xxx	x
Finishing	Auto/ mechanical		x	xx	xx	xx
	Hand/bench	xx	x			
Packaging	General	xx	x	xxx	xx	xx
Binding	Hand	xxx	xx			
	Mechanical		xx	xx	x	x
Design		xxx	x	xx	xxx	x

x= basic knowledge and ability, xx= working knowledge, xxx= in-depth knowledge, (Porter, 1993)

4.1.1.   Managerial and technical job profiles

A description of skills for various job profiles is briefly given as defined in the UK (Print team, 2000). These descriptions also apply for other countries.

At managerial level:

(a) managing director of a graphic arts and media company – excellent communication skills, the ability to solve problems, diplomacy, and vision;

(b) accounts executive – good communication skills as the job focuses on people. The ability to write letters and spell is also important. Personal qualities include flexibility and the ability to handle several jobs at once. Good qualifications in English, mathematics and business studies;

(c) sales executive – an understanding of customers' businesses. Friendly, personable manner and ability to persuade a potential customer. Good communication skills, both verbal and written, and accuracy with figures, details and in checking customer requirements. In addition, the ability to think creatively and an appreciation of good design, along with computer skills, are important together with good organisational and interpersonal skills;

(d) production manager – good mathematical knowledge is useful as well as an ability to deal with a large number of problems at once. Considerable tact in dealing with colleagues and

all-round resilience. Good organisational and interpersonal skills are a must, along with an appreciation of the importance of controlling costs;

(e) print estimator – accuracy with figures, details and in checking customer requirements is essential. Good verbal and written skills with keyboard and basic computer knowledge and the ability to work quickly are a necessity.

At technical level:

(a) graphic designer – English skills are a necessity. The ability to think creatively and an appreciation of good design, along with computer skills are important;

(b) printer – constant vigilance and concentration as well as careful attention to detail. Good colour vision is essential. Mathematics, computer studies and science are desirable;

(c) print finisher – good technical skills are important as is an appreciation of good quality and attention to detail. A good all-round education is desirable. Some jobs involve teamwork.

4.2.   Skills shortages and gaps

[1] Based on a report conducted in the UK, skills shortages and gaps are defined as follows (Beamish, 2000):

(a) skills shortages: recruitment difficulties due to an excess of demand over supply of required skills in the external labour market;

(b) skills gaps: a divergence between firms current skill levels and those that are required to meet firms' business objectives.

According to this report, information technologies (IT) are impacting on occupations at all levels in the print and graphic communications sector, changing both the nature of the production process itself, and communications across and outside the business. As a result employees constantly have to adapt to upgrade and broaden their range of skills.

In the Labour Force Survey (1999) 55.6 % of all respondents reported skills gaps across a variety of occupations – with little variation across the country as a whole. The main gaps perceived to exist are shown below (Table 27).

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[1]   *Source:* National Skills Task Force research report - *Skills for All – 2000.*

Table 27:   Perceived gaps and their most frequent occurrences in the graphic arts fields

Perceived gaps	Most frequent occurrences
Management skills	Management and supervision
	Sales and related areas
Personal skills	Management and supervision
	Sales
	Printing
	Binding and finishing
Computer literacy	Office and administration occupations
	Origination
	Management and supervision
	Sales and related areas
Problem solving	Binding and finishing
	Management and supervision
	Printing
Customer service	Sales and related areas, including customer service itself
	Account management
Flexibility	Printing
	Binding and finishing

Source: UK Labour Force Survey 1999

Table 28:   Skills gaps categorised by occupational group in the graphic arts sector in the UK.

Occupational group	Percentage of skills gaps
Management/supervision	25 %
Sales, marketing and related areas	15 %
Office/administration	13 %
Printing	18 %
Origination	17 %
Binding and finishing	13 %

Source: UK Labour Force Survey 1999

The Intergraf–UNI-Europa Graphical survey received mixed responses from trade unions and employers when questioned about the lack of employee skills. These are shown in Table 29 below. However, in 10 out of the 17 countries trade unions and employers agreed that there is a shortage of qualified workers, particularly in the pre-press and printing sectors. Only Denmark and Luxembourg reported unanimously no shortage in skills in the classical sub-sectors of the printing industry. Skills shortages are clearly a crucial issue within the printing industry.

Table 29:   Skill shortages among qualified employees in the printing sub-sectors

Skill shortages among qualified employees in the printing sub-sectors						
	Pre-Press	Print	Finishing	Packaging	Multimedia	Newspaper
A	yes/no	yes/no	-	-	yes	
trade unions	yes	yes	-	-	yes	-
employers	no	no - but yes for digital printing	-	-	n. a.	-
B	yes	yes	yes	yes	yes	-
trade unions	yes	yes	yes	yes	yes	-
employers	yes	yes	yes	yes	yes	-
CH	no/yes	yes	no/yes	no/yes	n. a.	-
trade unions	no	yes	no	no	n. a.	-
employers	yes	yes	yes	yes	n. a.	-
D	no	no	no/yes	no	yes	-
trade unions	no	no (for dig. Printing) yes (for Printing)	no	no	yes	-
employers	no (lack of IT-experts)	no	yes	n. a.	yes	-
DK	no	no	no	no	no/yes	-
trade unions	no	no	no	no	yes	-
employers	no	no	yes	n. a.	n. a.	-
E	yes	yes	yes	yes	yes	-
trade unions	yes	yes	yes	yes	yes	-
employers	yes	yes	yes	yes	yes	-
EL	no/yes	yes	yes	no/yes	-	no
trade unions	no	yes	yes	no	-	no
employers	yes	yes	yes	yes	-	no
F	no/yes	yes	yes	yes	no	-
trade unions	no/yes	yes	yes	yes (extreme)	no	-
employers	n. a.	n. a.	n. a.	n. a.	n. a.	-
FIN	yes	yes	no/yes	no/yes	yes	-
trade unions	yes	yes	yes	yes	yes	-
employers	n. a.	yes	no	no	yes	-
I	yes	yes	yes	yes	n. a.	-
trade unions	n. a.	yes	yes	yes	n. a.	-
employers	yes	yes	n. a.	n. a.	n. a.	-
IRL	yes	yes	yes	no	yes	yes
trade unions	no (but in the future yes)	no (but in the future yes)	no (but in the future yes)	no (but in the future yes)	no (but in the future yes)	no (but in the future yes)

employers	yes	yes	yes	n. a.	yes	yes
L		no		-	-	-
NL	yes	yes	yes	yes	n. a.	-
trade unions	yes	yes	yes	yes	n. a.	-
employers	yes	yes	yes	yes	n. a.	-
NOR			yes			
P	yes	yes	yes	yes	yes	-
trade unions	yes	yes	yes	yes	yes	-
employers	n. a.	n. a.	n. a.	n. a.	n. a.	-
S	yes	yes	yes	no/yes	n. a.	-
trade unions	yes	yes	yes	no	n. a.	-
employers	yes	yes	yes	yes	n. a.	-
UK	yes	yes	yes	yes	yes	yes
trade unions	yes	yes	yes	yes	yes	yes
employers	yes	yes	yes	yes	yes	no/yes

5. Recommendations for designing learning modules and curricula for the graphic arts and media sector

5.1. Factors affecting curriculum guidelines for the graphic arts and media sector

The educational structure of a particular sector must be seen in the complex and continuously changing environments in work, technology and production.

These factors vary from new conditions that seem to dominate in production to the structure of employment, the creation of a working environment, as well as new components in education, training and learning environments. These factors and characteristics are summarised as follows:

5.1.1. Specific characteristics that influence the graphic arts and media sector:

(a) creation of large enterprises;

(b) concentration and/or merging of suppliers and companies;

(c) working conditions and activities that take place in an open environment with stronger transnational competition, and a global market without borders;

(d) further development of Internet-based and e-commerce applications in the business environment, transactions and production;

(e) the majority of companies are micro, small, and medium sized;

(f) existence of a large number of individual workers within the sector.

5.1.2. Working environment characteristics:

(a) application of digital production workflows;

(b) dominance of certain industrial standards within the production environment;

(c) increased application of team–working environments;

(d) complexity of competence and qualifications;

(e) changes in job profiles for many traditional graphic arts professions;

(f) working environments influenced by flexible and distance working;

(g) stronger mobility of individuals.

5.1.3. Learning environments, education and training trends:

(a) requirement for the development of new modules, courses, and curricula;

(b) restructuring of studies mainly in graphic arts/media and printing departments and faculties of higher education, towards 'media' studies;

(c) new requirements for skills and qualifications;

(d) development and application of new learning environments – e-learning, distance learning, continuous further training and lifelong learning concepts;

(e) knowledge-management as a new field within the company environment.

5.2. Production characteristics of print and electronic media within the graphic arts and media industry – the relationship with IT – ICT fields and skills

5.2.1. Production of print media

Traditionally the graphic arts and media industry deals with the production of printed matters in quite a wide variety of ways. The main production areas for production are graphic design, pre-press, printing and finishing.

The basic structure of the production process in the graphic arts and media sector is presented in figure 1 as follows:

Figure 1: Production process in the graphic arts and media sector

Design	Pre-press	Printing	Finishing

Each of these principal fields includes several sub-fields. In each field, a diversity of very specific tasks is carried out by highly skilled people. Creativity, design and typographic expertise, knowledge of colours, colour science, imager, graphics and layout processing are the main fields in pre-press production. Furthermore, imposition, scanning, proofing and plate making, as well as output of data on film or printing plates are important production steps, followed by the various printing techniques.

Finally, some other areas to be included as part of production for the graphic arts and media industry concern post press production and follow the actual printing, e.g. paper processing, binding, finishing of printed matters, and packaging production.

Figure 2:   Business structure of the graphic arts and media sector

Customer	Advertiser	Graphic arts company	Final product
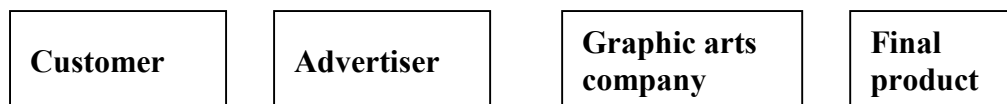
5.2.2. Relationship between print and electronic media production: the cross-media production concept

Production of print and electronic media followed different routes in the past. This happens also today, as companies specialise in different fields. However, there is an increasing trend in applying production processes which can facilitate both print and electronic media. In many cases, the separation of these processes is taking place at the point where the output medium is defined.

Graphic arts production is no longer only considered purely for production of print media. Technological convergence allows the processing of data and applications which can be used for both print and electronic media. Following this approach, the graphic arts production workflow in relation with the new electronic media can be presented as follows:

Figure 3:   Print media production

Typographic design, graphic design	Scanning of images

Text, image processing	→	Page layout	→	Output (film, plate, cylinder)	→

Printing	→	Finishing

Figure 4:   Production of electronic media

Graphic design of electronic media	**Scanning of images**

Input of video, animation and sound

Processing of data and production of electronic media

Output – multimedia application

Text, image processing

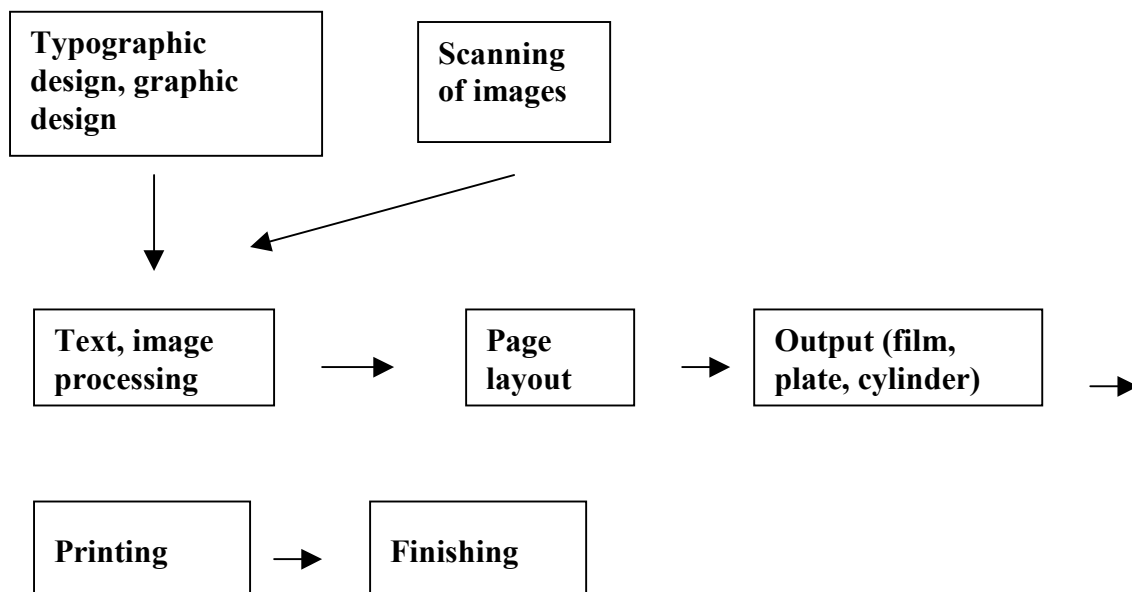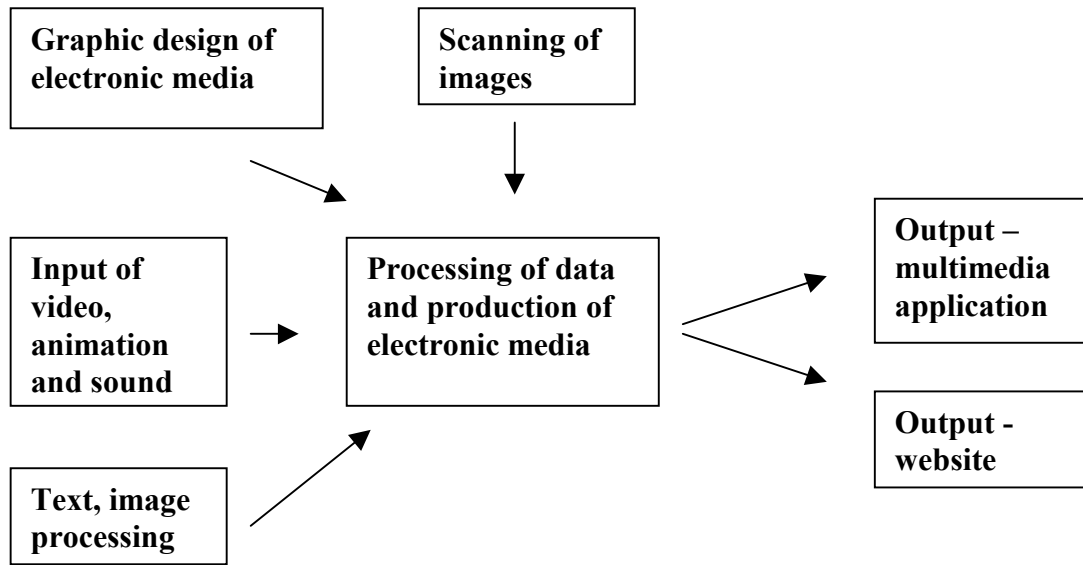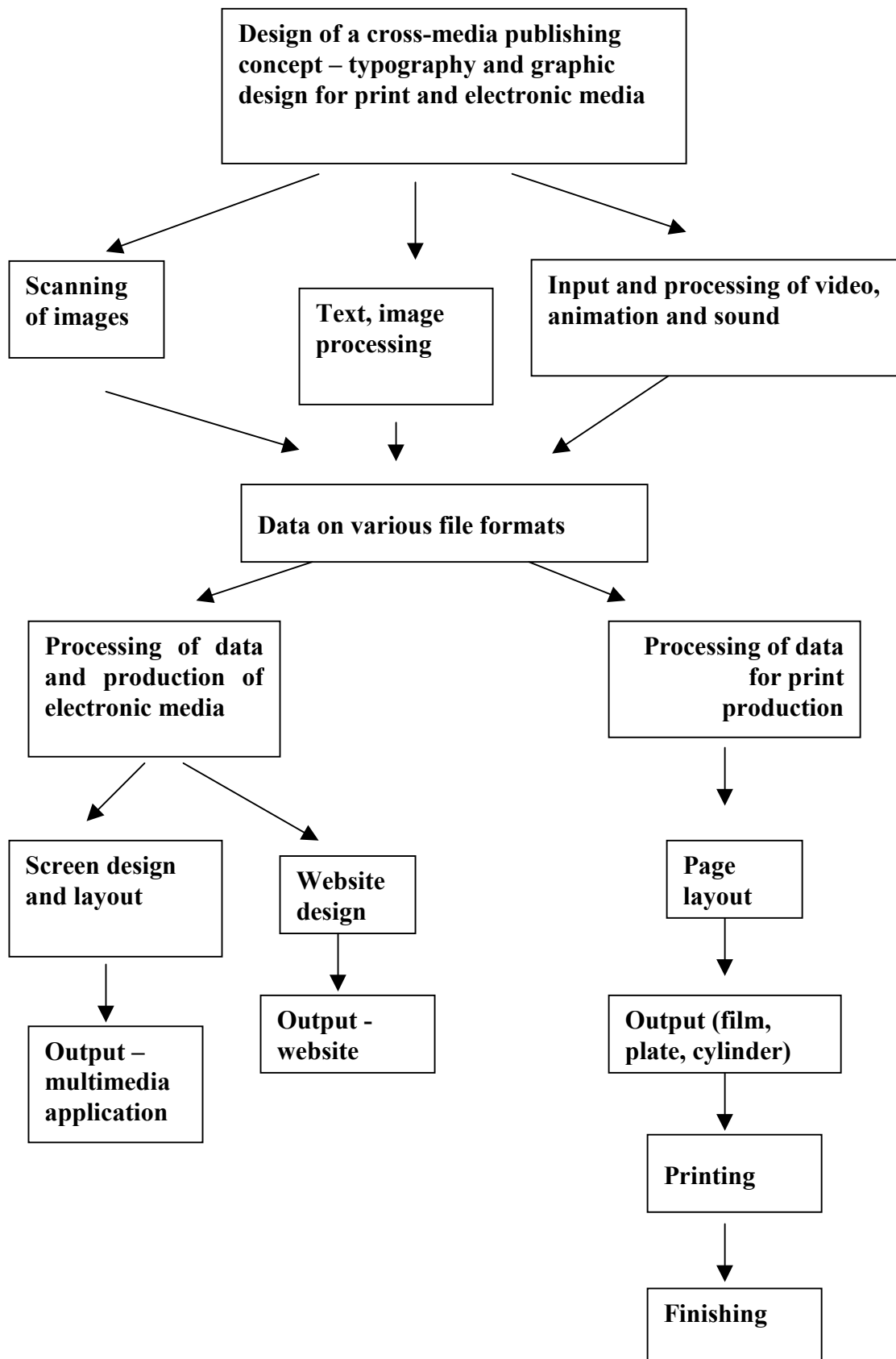**Output - website**

Figure 5:   *The cross-media publishing production concept – simplified production workflow of common production of print and electronic media*

```
                 ┌─────────────────────────────────┐
                 │ Design of a cross-media publishing│
                 │ concept – typography and graphic  │
                 │ design for print and electronic media│
                 └─────────────────────────────────┘
            ┌──────────────┼──────────────┐
            ↓              ↓              ↓
     ┌────────────┐  ┌────────────┐  ┌──────────────────────┐
     │ Scanning   │  │ Text, image│  │ Input and processing  │
     │ of images  │  │ processing │  │ of video, animation   │
     └────────────┘  └────────────┘  │ and sound             │
            ↓              ↓          └──────────────────────┘
            └──────────────┼───────────────┘
                           ↓
                 ┌─────────────────────────────────┐
                 │ Data on various file formats     │
                 └─────────────────────────────────┘
            ┌──────────────────────────────┐
            ↓                              ↓
   ┌──────────────────┐          ┌──────────────────┐
   │ Processing of data│          │ Processing of data│
   │ and production of │          │ for print         │
   │ electronic media  │          │ production        │
   └──────────────────┘          └──────────────────┘
      ↓          ↓                         ↓
┌────────────┐ ┌──────────┐       ┌──────────┐
│ Screen     │ │ Website  │       │ Page     │
│ design and │ │ design   │       │ layout   │
│ layout     │ └──────────┘       └──────────┘
└────────────┘     ↓                   ↓
     ↓       ┌──────────┐       ┌──────────────┐
┌────────────┐│ Output - │       │ Output (film,│
│ Output –   ││ website  │       │ plate,       │
│ multimedia │└──────────┘       │ cylinder)    │
│ application│                   └──────────────┘
└────────────┘                         ↓
                                 ┌──────────┐
                                 │ Printing │
                                 └──────────┘
                                       ↓
                                 ┌──────────┐
                                 │ Finishing│
                                 └──────────┘
```

5.3.   New print media workflows

Today the technological improvements that are applied widely in production and workflow management are based on a totally digital environment, mainly using software programmes developed for specific graphic arts applications. These include graphic design, page layout, typographic and image processing, together with software applications in preflighting, imagesetting, and proofing. In this newly formed production environment, the industry includes new media such as designing websites and production and multimedia applications.

In this environment a new production workflow is applied in the production of printed matter, covering the steps through which the creation of the product comes to life, from the printing order to the finishing and the delivery of the final product to the customer. This is a more complex workflow. Compared with the traditional pre-press-printing-finishing workflow this workflow contains additional elements and processes referring not only to the production steps and processes but also to other functions such as management issues and quality controls. In addition, the workflow can also have a more complicated structure, with processes that can run in parallel depending on the specific production processes and steps in a company's production characteristics.

Digitalisation and automation are the principal characteristics of the workflow for print media. First, workflow systems handled technical pre-press processes such as layout, imposition, trapping and ripping and extended later to the pre-adjustment of specific printing processes as well. Developments towards the application of holistic workflow solutions are becoming apparent in printing and finishing, also because of the installation of digital printing machines and systems.

The main components, with a short description of each production step, are presented in the text that follows:

Input and processing of digital files

In most cases a job for printing enters production as a digital file. All jobs imported or created in-house, need to be stored and able to be retrieved at any time. This requires the application of computers as workstations to carry out new production steps such as preflight, trapping, soft proofing and imposition. These workstations, in terms of workflow, can be placed after pre-press and before the ripping station.

Colour management

An effective colour management system is essential in order to achieve the proper quality in the printing process, since different colour spaces (RGB in screens and CMYK in printing devices and machines) are connected and interact during the graphic arts production process. In addition, many customers supply colour images which have not been processed properly and which contain many errors. This happens in particular, after the so called 'popularisation' of pre-press operations executed by people who do not possess the necessary skills for colour

and image processing. Another reason for the application of a colour management system is the specific characteristics of the printing process (conventional or digital) with which customers are not at all familiar.

Page assembly and ripping

The RIP combines the page template with high-resolution images and all other elements of the job. It translates the digital data imported from pre-press into the specific output characteristics (such as resolution) of the certain printing machine.

Imposition

This is a pre-press process and it refers to the assembly of pages of a document to be printed in a specific way, following rules for folding and binding. Imposition can be realised with the application of specific software.

File storage and transfer

The pages produced may contain low-resolution images and links to any variable data images or text blocks. The high-resolution images and variable data elements are then pulled in during the final page assembly and ripping process. A sufficiently fast network and RIP in order to process them at efficient production speeds is required.

Proofing

The proofing process refers to the production of a sample of the printed matter with which the assessment of accuracy regarding the colours. Proof is used as a reference quality control element for evaluating the printed sheets during the printing process.

Output

Output takes place after ripping in various forms. Digital data are transferred via networks on film, printing plates or cylinders or directly to printing machines. Imagesetters and platesetters are employed in production as well as digital printing machines.

These new production steps have been cited here in order to prove the complexity of the production workflow and the application of specific software which serves the production of printed matter. In this context some traditional graphical qualifications remain important, but they need to be supported by IT-ICT knowledge and skills, such as data and network handling within the digital production workflow.

Evidence for the trends in graphic arts and media companies regarding the requirements for new competence can be drawn from studies of labour market developments in interactive digital media all of which are affected by the graphics rich environment of the Internet, such as website design, e-commerce industry or entertainment and computer animation industry.

Many of the jobs created require hybrid skills, which are not yet well provided by existing bodies and institutions. The new skills for the new media industry will be based on more generic skill profiles. This will affect the structure of occupational definitions, professional accreditation, and training provision (IPTS, 2000).

Urgent needs/lack of competence in new media industry companies include:

(a) understanding digital media:

   (i)   know-how of cognitive psychology in the design of user interfaces and terminals;

   (ii) fluent application of teaching skills;

   (iii) ability to combine different media elements;

   (iv) know-how of interactivity;

   (v)   capability to create new business models and service concepts;

   (vi) evaluation and measurement of the effects of new media (e.g. how much it is used and what are the advantages and disadvantages);

(b) business know-how:

   (i)   marketing know-how;

   (ii) investment relationships, how to get financing;

   (iii) know-how of processes, entrepreneurship and knowledge of accounting;

(c) technical know-how:

   (i)   database design and programming skills related to databases;

   (ii) programming (e.g. Java, Perl, C++, ASP), information systems design and integration;

(d) communication know-how:

   (i)   advanced graphical design applicable to information networks;

   (ii) know-how to write multimedia scripts, script writing skills;

   (iii) know-how to understand the communication processes as an entity;

(e) leadership know-how:

   (i)   skills related to coping with fast growth;

   (ii) strategically skills;

   (iii) internationalisation skills;

   (iv) project management skills;

   (v)   ability to develop and manage competences and communication skills (internal and external) (IPTS, 2000).

5.4. Structure of skills

Technological changes are promoting the emergence of new professions in the media industry. In the content area a particular feature is the inter-disciplinary teamwork-based nature of the work, which calls for a combination of technical and creative skills as well as, occasionally, additional business skills that cut across traditional professions and training systems.

5.5. Need for ICT and e-business skills and competences for the graphic arts and media sector

There is a high diversity of relationships between ICT technologies and skills used in graphic arts and media sector production. The intensity of need and use of ICT skills differs according to production workflow. Two examples illustrate this.

One example is network administration which is a very useful ICT skill for graphic arts and the media since many devices are connected in a digital workflow for production. Scanners, workstations for graphic design, image processing and page layout, proofing printers, image setters and plate setters can be connected in such a workflow. This is an IT-ICT competence and it needs to be included in curricula for graphic arts and media education.

The second example is imposition, a specific production process within print media production. In this separate pages of a document are placed in the bigger space of a sheet for printing. Normally, eight A4 pages can be placed on both sides of a printed sheet of 61 x 86 cm. Traditionally this process was performed manually by placing the pages (in the form of film) on the imposition area.

Today, this process is carried out on a computer using specific imposition software developed for the purpose. In this case, the production step remains the same and there is a low IT-ICT skill relevance. What changes is the tool, digital pages and the computer replacing a light table and film.

5.6. Relations and interactions among skills, knowledge, levels of education of the graphic arts and media and the IT–ICT sectors

Tables 30 and 31 present a cross comparison between IT-ICT and the graphic arts and media sectors. Effort is made to present the related skills and job profiles/tasks as completely as possible.

Table 30: *Application of IT-ICT skills and knowledge in the specific fields of graphic arts and media management and production*

IT-ICT practitioners – application of skills and knowledge in the graphic arts and media industry	Graphic arts and media subsectors/fields
General software development – application of interface design, e-business applications	Application as producers or developers for individual companies: Production planning and organisation, quality control administration, production management, e-business applications, customer relationship management Interfaces of machinery and equipment for graphic arts and media manufacturers
Development of specific software, production oriented (core IT-ICT application in the graphic/media sector)	Web-Internet platforms, HTML, XML, SQL, database administration and processing, data handling exchange and processing, network design, administration and support
Development of specific software, production oriented (core graphic arts application in the graphic/media sector)	Text, graphic, animation, video, animation sound processing and production Page layout Graphic design, font design, multimedia application design and web-design Imposition, proof, scanning preflight Output formats – postscript and PDF
Systems integration	Pre-press and cross-media companies' integration of devices, machinery workstations and software in digitally networked production environments

Source: Anastasios E. Politis own data

The same (or similar) relationships and interactions are presented in a reverse view in the Table 31. Here the comparison is performed through the mapping of job titles/tasks of graphic arts and media with the specific application of IT-ICT skills and knowledge. In addition, the education level classification is included in the table, as an indicator of that required for each task/production step.

Table 31:   Graphic arts and media tasks/jobs and the use of IT-ICT skills and knowledge

Graphic arts job profile/title/	Task	Level	IT-ICT application
Graphic designer	Graphic design of print and electronic media	2,3,4	Use of hardware (computers mainly Mac) application of specific software (Illustrator, Freehand, Corel draw)
Scanner operator	Scanning process digitalisation of images, initial processing of data	2,3,4	Use of hardware – application of vendors' specific software, specific interface application
Pre-press operator	Process of image, text, and graphics Data handling and exchange	2,3,4	Use of hardware, application of specific software
Pre-press operator	Page layout typographic design	3,4	Use of hardware, application of specific software (Quarkxpress, Pagemaker, Indesign)
Pre-press operator	Imposition	2,3,4	Use of hardware, application of specific software
Pre-press operator	Colour processing, colour corrections colour management creation of ICC profiles	3,4,5	Use of hardware, application of specific software on colour correction and colour management
Pre-press operator	Data processing for output for electronic and print media, preflight	3,4,5	Application of specific software, handling of data and file formats (Postscript and PDF), definition of output characteristics, ripping, network management and administration
Pre-press operator	Proofing	2,3,4	Application of analogue and digital processes in proofing output on screen (soft) and on paper (hard proof)
Pre-press network administrator	Maintenance, operation and support of hardware (input, process and output devices machinery and workstations) – software and file format problems– solving	4,5	Application of software and hardware, network administration and support, file formats and connectivity, connection of devices and workstations, database processing, storage and retrieval of assets (images) from data banks.* *Note that these tasks can be performed by other pre-press operators in the company environment
Website designer, multimedia application designer	Creation, design and production of websites and multimedia application	3,4,5	Use of hardware and application of specific software (Director, Front Page, Dreamweaver, etc)
Platemaker, for offset and flexographic printing, gravure cylinder maker for gravure printing	Printing plate processing and production gravure cylinder processing	2,3,4	Use of machines connected to computers and application of vendors' specific interfaces

Pre-press operator for specific applications for packaging design flexo and gravure printing	Specific processes (processing of CAD data), step and repeat process, adjustments for the output of data	3,4,5	Use of hardware and application of specific software
Printer	Printing with one of the printing processes	3,4	Use of machines connected to computers and application of vendors' specific interfaces, knowledge of data input in production planning systems
Finisher, binder	Employment in one of the specific finishing tasks, cutting, folding gathering, binding	2,3	Use of machines connected to computers and application of vendors' specific interfaces
Packaging operator	Operation of die-cutting and folding-gluing machines for folding boxes	3,4	Use of machines connected to computers and application of vendors' specific interfaces

Source: Anastasios E. Politis own data

5.7. Competence characteristics and requirements for the graphic arts and media sector

Based on the previous analysis it can be concluded that the level of expertise required for the modern graphic arts and media company can be grouped into the following three wider skill areas:

(a) graphic arts skills;

(b) management, administration and social, i.e. non-technical skills;

(c) IT skills.

5.7.1. Graphic arts and media courses

These could include:

(a) publishing;

(b) design, graphic design;

(c) typography;

(d) photography;

(e) colour;

(f) printing: principles, methods, processes, machinery;

(g) graphical machinery and equipment for print and electronic media production;

(h) scanning;

(i) text, image, graphics and page layout processing. Additionally, sound, video, 2D and 3D;

(j) imposition, proofing and output of digital data for film, printing plate, and print. Postscript and PDF;

(k) output for multimedia applications and web-site design and production;

(l) proofing, platemaking, printing, finishing, binding, further processing of paper and other printed substrates.

5.7.2. IT-ICT courses

Image processing with the application of the respective software requires the knowledge of use of computers. Based on this basic knowledge, the course is applied as learning image processing which can be then applied as a specific competence in the pre-press field of the print media production. In addition, the same software can be applied for web-site design.

The degree of interaction and structure of courses between traditional courses and the IT-ICT modules required, especially in the design and pre-press fields is quite high.

A general recommendation for courses that are considered important for the graphic arts and media education and training at sub-degree level includes:

(a) general computer knowledge;

(b) operational systems (Mac and Windows);

(c) software and hardware;

(d) data handling;

(e) network applications;

(f) database processing;

(g) storage devices;

(h) data banks and digital asset management.

These modules are considered prerequisite skills and knowledge for successful further education and training in the fields of graphic arts and media technology.

5.7.3. Social – non technical courses

Social and non-technical skills are highly valued for certain roles in graphic arts and media. Core social and non-technical modules which are considered important are:

(a) communication skills,

(b) teamwork capability,

(c) customer contacts and management,

(d) management skills (also for the sub-degree level),

(e) business organisation,

(f) lifelong learning capability.

5.7.4. E-business skills – needs for the graphic arts and media sector

Traditionally, graphic arts and media companies have operated in an environment with a high degree of interaction among suppliers, customers, partners and subcontractors. In the main, the companies are defined as SMEs and a principal characteristic is the high degree of specialisation among companies, which leads to the need for further interaction. These interactions involve a high volume of transactions which must be managed.

In addition, there is an extensive use of management information systems (MIS), specifically developed for the graphic arts and media industry. Furthermore, software packages are used to serve management and administration, quality control, organisation and planning of the print and electronic media production. There is also a significant amount of software development and application either directly oriented for the sector or specifically developed for a certain graphic arts and media company. It is important to mention that many of these applications have been developed by graphic arts and media vendors.

Curricula development for the graphic arts and media sector and e-business skills would appear to require modules for the proper use of the Internet, software packages for management information, and generic administration systems or those specifically oriented for the sector. However, the necessary skills and competences for management are likely to be found in higher education.

Table 32 presents a general recommendation for curricula for graphic arts and media education and training at sub-degree level, with orientation towards pre-press and processing of print and electronic media (printing and finishing is excluded).

Table 32:   Curricula guidelines for the graphic arts and media education and training in the sub-degree level

Thematic areas	Modules/courses
Operational systems	Mac OS
	MS Windows
Media consultancy	Media consultancy customer oriented
	Media project management
	Cost and calculation for print media production
	Communication
Typography, design	Typography and design, graphic design
	Design for print media
	Design for interactive/electronic media – screen design, interface design
	Advertisement design

Application of sector specific oriented software for print and electronic media
QuarkXPress
Adobe InDesign
Macromedia FreeHand
Adobe Photoshop
Adobe Illustrator
Imposition software (Signa station, Impose)
File MakerPro
Adobe Premiere
Adobe Acrobat and PDF
Adobe GoLive
Dreamweaver
Macromedia Flash
Macromedia Director
Corel Draw
HTML programming
MS Office
Preflight software (e.g. Markzware, Enfocus)

Workflow production and data management
Processing of text, graphics and images
Exchange of data for print and electronic media
Digital pre-press processing and image processing
Postscript and PDF
Colour management, colour processing and chromatic corrections, creation of colour profiles
Scanning
Receiving of data

Digital Media
Production of interactive media
Storyboard creation
Video, animation and audio signal processing
Digital Photography

Source: Anastasios E. Politis own data

6. The media designer qualification: description of the prototype

Merging of technologies mainly in the pre-media, pre-press sub-sectors of the graphic arts and media industry has brought together production processes and applications used for different fields. Changes in production in this subsector have brought together processes used for print and electronic media (such as multimedia applications and website design). As an initial reaction, training and education organisations of the sector included multimedia and Internet modules in existing graphic arts curricula.

However, the trend in terms of technology used and production processes applied was to unify the separate production fields and, consequently, tasks in common processing and production steps for print and electronic media. The challenge for education and training was to create curricula where these modules and courses could be properly combined.

One successful reform at sub-degree level in the graphic arts and media sector occurred in Germany with the introduction of the course *Media designer for e-digital and print media* (*Mediengestalter/in fuer Digital und print Medien)*. The training profile was developed by social partners for the sector in Germany (BVDM and Ver.Di.) and integrates traditional pre-press qualifications (*Reprograf/in, Druckvorlagenhersteller/in, Schriftsetzer/in, Layouter/in*).

As part of the reform, traditional graphic arts modules have been implemented with IT-ICT multimedia and social, non technical modules. The modules are in four main fields:

(a) media consultancy,

(b) media design,

(c) media operating,

(d) media technology.

The modules are quite flexible, with selective courses following the core courses. Having been agreed by the social partners the modules have been accepted and legally applied in training schools by the governmental authorities (BIBB – *Bundesinstitut fuer Berufsbildung*) (BIBB, 1998).

6.1. Media designer/creator

A designer of digital and print media specialising in media consultancy will:

(a) carry out project planning for media projects both individually and in teams;

(b) attend to the needs of and advise clients;

(c)   carry out sub elements of project management, for example personnel and material planning and monitoring of budgets;

(d)   visualise and present projects;

(e)   carry out project related data processing activities.

A designer of digital and print media specialising in media design will:

(a)   develop design concepts both individually and in teams;

(b)   use computer software to help design text, images and graphics for print products;

(c)   use computer software to help design text, images and graphics, moving pictures and sound for multimedia products or for use in digital media;

(d)   advise clients on designing media products taking account of technical, production and commercial considerations;

(e)   develop and design press products in compliance with editorial and technical instructions;

(f)   develop design concepts on the basis of client specifications, taking account of technical and commercial considerations;

(g)   integrate different types of file to produce media products and prepare these for output in different media.

A designer of digital and print media specialising in media operations will:

(a)   plan production processes both individually and in teams;

(b)   import, transfer and convert files to multiple usage;

(c)   combine text, image and graphics, moving pictures and audio for multimedia products and output these in different data media and in different media;

(d)   advise clients on media-neutral design of data for multiple usages.

A designer of digital and print media specialising in media technology will:

(a)   plan production processes both individually and in teams;

(b)   use communications systems to import and enter various data;

(c)   prepare data and combine them in different media;

(d)   handle data output operations in various media products, in particular in reprography;

(e)   perform micro-reprography and digital printing;

(f)   produce consumer products individually and in series;

(g)   control, optimise and document the process.

6.2. Curricula content and modules of the prototype job profile *Mediengestalter/in*

Table 33:   *A prototype training job profile for the graphic arts and media sector*

Curricula content and modules of the prototype job profile *Mediengestalter/in*	
	Content
1.	Organisation/concept development
	Work organisation
	Concept development
	Project planning
	Production planning
2.	Design
	Design basics – introduction to design
	Work organisation based on design
	Typography, typographic design
	Advertisement design
	Design of print media
	Design of electronic media
3.	Data processing
	Text, graphic and image data processing
	Electronic image processing
	Data organisation and processing for a specific job
4.	Data handling, hardware and software
	Data handling
	Media integration
	Media integration for specific media products
	Storage media
	Hardware and software
	Application and processing of data banks
	Programming for media products
5.	Communication
	Communication basics
	Information resources
	Telecommunication
6.	Printing plate/printing/output and data exchange
	Traditional printing plate making
	Digital printing plate making
	Processing of cylinders for gravure printing
	Data exchange for print and electronic media
	Traditional printing processes
	Digital printing

	Curricula content and modules of the prototype job profile *Mediengestalter/in*	
	Content
	Pre-press techniques
	Finishing, binding
7.	Digital media
	Production of interactive media
	Storyboard creation
	Video, animation and audio signal processing
	Digital photography
8.	Sales and customer communication
	Processing of job order
	Cost calculation
	Customer relationship management
	Media consultancy customer oriented

Source: BIBB, Ver.Di and Bundesverband Druck und Medien (BVDM)

6.3. The Swedish 'Media gymnasium' (secondary level school)

Another development in media training profile has been introduced in Sweden where the media programme has been in place for six years. It is based on the model of cross-media modules and immediately became a very popular choice among Swedish teenagers.

The three-year programme has several modules including photography/image processing, graphic communication, sound media/radio, moving pictures/video, text and media communication. Computers are used throughout. A little more than 50 % of the curricula includes common basic courses like language, mathematics, religion, social science, gymnastics, biology, and the environment.

At present there are 100 schools in Sweden running this type of media course.

7. Conclusions and further actions recommended for the graphic arts and media sector

7.1. Certification of initial and continuous training

The interaction between continuing training and initial training deserves special attention. In most countries and sectors, including the printing industry, these segments have developed along separate lines. However, there is a growing tendency to establish interconnections.

The ways in which these interconnections are established differs from country to country, even from region to region. Influential factors include the state and the organisation of basic education, the sector-oriented nature of basic education, the involvement of the social partners in basic education, the flexibility of provisions and programmes for basic education, the tradition of cooperation between agencies in basic and continuing training and attitudes regarding cooperation between the dominant actors in the systems. Legislation on education and training is also an important factor. Legal systems which cover both basic and continuing education and training seem to contain more prompts for interconnection than do systems which only regulate basic education.

A specific type of type of interaction within education and training concerns developments in the certification of training. Traditionally, initial education and continuing training have had different certification systems. Initial education is certified by government agencies, according to national standards, set in collaboration with the sector. Continuing training is often not certified and, in so much as certificates are granted, these often do not meet any national standards and are not recognised by the government. This does not mean that they do not have any value – on the contrary, certificates recognised by a sector or branch may have a high added value for someone's position in the labour-market – but their occupational value is usually limited to the sectoral level.

7.2. Certification of 'blended learning': action for competence evaluation and certification

A first conclusion is that vocational education and training is important for the further development of those employed in graphic arts and media. IT-ICT and e-business skills constitute a significant part of the skills required today and therefore must be included in the curricula of vocational education and training in the sector.

However, formal education and training is only one of the different forms of learning that are available and offered today. Initial formal and continuous training, e-learning applications, individual learning and on-the-job training form a new environment in learning. This new

form of learning can be defined as 'blended learning' which needs to be taken into consideration in education and training policy reform.

Curriculum guidelines should ensure that every youngster in education at sub-degree level needs to be prepared properly. This requires modules including technical courses referring to the respective industry sector, general social and non-technical courses, and IT-ICT courses.

The content of vocational education and training should be flexible, allowing fast upgrade of modules to accommodate developments in the respective industry and consequent competence needs. Finally, curricula for initial vocational education and training should be designed with respect to the 'blended learning' environment.

These issues demand further actions regarding the development of graphic arts and the media in Europe. The EGIN perspective regarding vocational education and training in relation to IT-ICT and e-business skills is that they deserve consideration as part of a strategy for development of human capital for the sector.

The strategy should address the development of the sector's image in relation to recruitment of young people, avoiding skill shortages in the sector and efforts for the homogenisation of the description of job profiles in the graphic/media sector at European level.

The priority is further action for the development of a system for the evaluation and certification of competence for the graphic/media sector at European level. This would contribute to the transparency of occupational standards and assist the standardisation of professions for the European graphic media sector.

The main aspects are:

(a) the definition and description of the professions/occupations within the European graphics/media sector;

(b) competence definition and description for pilot professions/occupations;

(c) development of a method for competence evaluation for the pilot profession/occupation;

(d) pilot application of the evaluation process;

(e) development of a competence evaluation certificate for the sector.

Through the evaluation and certification process, valuable feedback will be collected and can be used for alterations and improvement measurements in courses and training modules.

7.3. Trends in education and training for the graphic arts and media sector

Trend 1

Graphic arts and media and the IT-ICT sectors have strong relationships and interaction among them but they are different sectors with different orientations at least for the foreseeable future.

Trend 2

Graphic arts education and training is formed by various learning applications including formal education and training, further training, on the job-training and individual learning.

Trend 3

The interaction between continuing training and initial training deserves special attention. There is a growing tendency to establish interconnections.

Trend 4

The set of skills required for competence in graphic arts and media education and training at sub-degree level comprises three main skill-groups:

(a) graphic arts and media skills,

(b) IT-ICT skills,

(c) non technical, behavioural-social skills.

Trend 5

There is an increasing application of the cross-media publishing concept, where production processes and management strategies are formed towards the common production and processing of print and electronic media.

Trend 6

Graphic arts and media production is oriented towards full digital workflows.

Trend 7

Digital printing is one of the latest technologies of the sector. The application of digital printing creates new demands for competence, which need to be addressed in the reforms in education and training for the graphic arts and media sector.

Trend 8

Technological changes are promoting the emergence of new professions in the media. A particular feature is the inter-disciplinary teamwork-based nature of the work, which calls for a combination of technical and creative skills as well as, occasionally, additional business skills that cut across traditional professions and training systems.

Trend 9

Many of the new jobs created in the sector require hybrid skills, which are not yet well provided by existing bodies and institutions. The new skills for the new media industry will be based on more generic skill profiles. This will affect the structure of occupational definitions, professional accreditation, and training.

Trend 10

Information technology (IT) is impacting on occupations at all levels in the print and graphic communications sector, changing both the nature of the production process itself, and communications across and outside the business.

Trend 11

There is a lack of clearly defined standards as well as of common descriptions of qualification profiles in graphic arts and the media.

7.4. Summary of main evidence indicating trends in curricula development guidelines for the graphic arts and media industry related with IT-ICT skills

(legend: + profile or element/module exists already, ++ will be established or added in due course, +++ will presumably be established or necessary in the medium and longer term)

Sub-sector or working area and level of skill training (2 to 5)	Denomination of sector specific comprehensive ICT skill and training profiles	Additional skill and training elements complementing existing profiles, denomination of profiles	ICT modules (skill and training) necessary for all employees: denomination of modules
Pre-press and cross media production (media design and production for print and electronic media) (2 to 5)	Application of specific oriented software for text, image and graphics processing, page layout, imposition and preflight. + Exchange of data for print and electronic media + Digital pre-press processing and image processing + Postscript and PDF + Database administration and processing ++ Networking administration ++ Digital asset management (for application of retrieving of images or other elements for the production of print and electronic media +++ XML, SGML +++	Scanning Colour management, colour processing and chromatic corrections, creation of colour profiles Proofing Imaging of film, printing plates and cylinders for gravure printing	Operational systems – Mac OS, MS Windows Hardware, workstations and input and output devices Storage devices File formats
Digital media	Production of interactive media HTML + Video, animation and audio signal processing + Storyboard creation + Digital Photography +		

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Anastasios E. Politis has also worked since 1989 on strategic analysis for the Greek and European Graphic Arts and Media sector, through Politis Research registered at Nikea, Pireas, Greece. The main fields of his activities within the graphic arts and media sector are technology analysis and documentation, research projects development and implementation, human capital development strategies, investment projects for the industry, business development and studies on education and training.

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ICT practitioner skills and training: graphic arts and media sector

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