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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL
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concerning

European Higher Education-Industry Cooperation :

Advanced training for competitive advantage

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Advanced training for competitive advantage

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Executive Summary

INTRODUCTION

1 This report is issued by the Commission of the European Communities (Task Force Human Resources Education Training and Youth) and examines the *current situation regarding Higher Education - Industry Cooperation in Education and Training*. It complements the three Memoranda which were issued during 1991 :

- Memorandum on Higher Education in the European Community
- Memorandum on Open Distance Learning
- Vocational Training in the European Community in the 1990s.

All three documents, and in particular the Memorandum on Higher Education, concern the higher education sector, recognising not only its economic and scientific contribution but also the unique social and cultural role which higher education has played and will continue to play at local, national, and international levels.

2 In terms of the overall context within which higher education operates, this paper has as its *target group* all those concerned with policy and implementation of cooperative ventures between higher education and industry. The objective is to formulate a number of detailed suggestions on good practice in order to :

- contribute to the debate on the role of university-industry cooperation in helping meet European training and skills requirements
- document and disseminate the experience which has been gained at both European Community and Member State levels
- promote greater exchange of experience with a view to stimulating further action.

3 Industry, higher education, and governments have cooperated to strengthen higher education-industry relations, with *three objectives* in mind :

- faster industrial application of the results of fundamental research
- improved output of technical skills
- more effective transfer of technology between sectors and regions.

Today the European scenery, as in all the advanced economies of the West, is dotted with new policies, new institutions, and new networks to bring higher education and industry into partnership, and European Community programmes, notably COMETT, have played an important role in this development.

4 *Public policies have supported an "indispensable complementarity" between industry and higher education.* Quite apart from the public interest in greater returns on the investment in higher education and a more efficient science and technology system with faster transfers of knowledge and technology, innovative culture is becoming more important for society as a whole, particularly in Europe.

5 The phenomenon of partnership between higher education and industry will accelerate, will continue to be supported by public policies, will be increasingly internationalised, because the development of markets, the strategies of enterprises, the internal logic of knowledge production and use all take place across frontiers.

REVIEW OF NATIONAL EXPERIENCE

6 The report gives an **overview of the national situations concerning higher education - industry cooperation at Member State level**. These provide snapshots of the extensive and rapidly developing pattern of activities in this field. Most surveys reveal that there is comparatively little direct legislation for the promotion of higher education - industry cooperation. Many national laws, however, contain enabling and exhortatory statements about the economic role of higher education and thereby the responsibilities of higher education in this area.

7 The major inspiration for collaboration between industry and higher education is the **widespread and growing awareness of the technological and human resource development gaps** which are emerging as a result of the factors outlined in the report.

8 There is a **tremendous awareness within higher education** of the importance of the interface with economic life generally and of the pressures for cooperation. This is reflected in constitutional and management change (eg incorporation of cooperative objectives in individual constitutions and mission statements) as well as in a wide range of specific initiatives, European, national, local.

9 While in several countries there remains within industry a level of distrust and scepticism about the role and value of higher education, there has emerged nevertheless a **much greater awareness within industry of the benefits of cooperation**. This is reflected, for example in the mission statements of some of the prominent multinational companies, some of which have initiated specific wide-ranging and ambitious schemes for collaboration. It is also reflected in the work of industrial organisations at European and national levels (eg European Round Table of Industrialists, UK Council for Industry and Higher Education), which set out programme statements which can almost be regarded as charters for collaboration.

10 With regard to the investment by industry in higher education, the studies undertaken have generated some data on this aspect, but it is partial and difficult to assess comparatively across time and territory. Insofar as a trend can be established, it can be said that industrial contributions are increasing, but from a very small base in most countries.

KEY MESSAGES

11 The report looks specifically at European aspects of higher education-industry cooperation in advanced training, taking particular account of the experience of the COMETT programme. It identifies a **series of key messages** which have emerged from European Community and national experiences. Certain of these key messages are given in the following paragraphs.

12 **Higher education-industry cooperation is not an end in itself**. The most successful cases of cooperation occur when the cooperation is adopted as a means of achieving specific goals. Also, real cooperation is best achieved when those involved agree that the cooperation gives results which are demonstrably better than would be achieved by higher education or companies working on their own.

13 Dialogue between industry and higher education needs to be maintained and strengthened, working towards new modes of partnership with clear goals and actions. If higher education-industry collaboration is to thrive, then it must be based on **clear understanding of the nature of higher education and business**. Aims and objectives are best shared when the partners respect the differences in the primary functions of business and higher education.

14 Higher education institutions and companies - but especially higher education institutions - need to integrate into their institutional mission and plan a **strategy regarding higher education-industry cooperation**, both generally and in regard to specific target sectors where such cooperation may determine success or failure.

15 Companies will rightly be primarily concerned with the direct and shorter-term benefits from higher education-industry collaboration. Over and above that concern, companies are increasingly becoming aware of a **wider social responsibility with regard to education generally**.

16 **Skills and training needs analysis** is a vital area where higher education-industry cooperation is indispensable and urgent in view of the clear and persistent skills gaps which are emerging.

17 **Higher education-industry structures** enable action to be carried through in an organised and sustained manner. They assist visibility, communication, and good financial management. They condition the manner in which partners can work together and help clarify roles and responsibilities. Training consortia, such as those set up under COMETT, are another way of providing a framework for constructive dialogue and action amongst the main actors concerned with advanced training (higher education, industry, local and regional authorities, employment associations, etc.). Such consortia should complement and not conflict with policy and action within individual higher education institutions or firms. Consortium activity needs to be part of a strategic approach.

18 As to **higher education-industry exchanges and staff development**, the key to technological innovation and business generation is people. They are the carriers of technology transfer and development. People should be rewarded, not penalised, for their international mobility and experience. In this respect, changes in institutional policies and practice are not keeping pace with European and global requirements.

19 **Student placements in enterprises** provide a range of benefits which are both educational and experiential for the higher education institution, for the company, and for the student. The organisation of effective student placements is labour-intensive but companies can be persuaded of the return on the investment made as a result of documented cases of the **economic impact of placements**. There is also a need for a better understanding of the actual capacity of European industry to receive placement students. A study on the actual capacity, based on a representative sample of companies of varying sizes and sectors, should be carried out, and should devote special attention ways and means of improving awareness of the benefits of student placements in industry.

20 The achievement of successful higher education - industry relations is totally dependent on the capacities and attitudes of the personnel concerned. Efforts are underway in both industry and higher education to effect a **cultural change which will encourage and support cooperation**. This cultural change must remain firmly grounded in the awareness of the respective characteristics of higher education and industry, with a necessary balance between "science push" and "market pull".

21 **Commitment to cooperation should be seen as an integral part of the job content** of higher education staff and of the relevant personnel within companies.

22 Collaboration in **education and training projects** is the most effective way of matching supply and demand. Projects provide a focus for addressing real business problems, both short and long-term. When managed well, they also provide measurable and cost-effective frameworks for building continuing partnership over a sustained period. Spin-off effects in other areas such as research and development will often occur as a result of such projects.

23 There is now a growing mass of experience of the implementation of training products based on higher education-industry cooperation. This points to a **European training market** in the course of development, a market which in fact consists of several different markets which need to be brought together. Success in this market depends on factors such as commercial opportunity, costing policy, marketing practices, quality assurance, and diffusion capability. Higher education institutions individually and companies individually are entering this market and are competing with each other for commercial success.

24 Expertise in **open and distance learning** as well as the potential benefits of open and distance learning is a common factor which links higher education and industry. This is especially so in relation to continuing education and training. To that extent, joint training projects present great opportunities to assist in strategic areas such as :

- the widening of access to higher education in Europe
- the promotion of distance and open learning for the recurrent and continuing training of the workforce (in particular SMEs)
- the promotion and introduction of new, notably computer-based, learning technologies.

FUTURE AGENDA

25 The final section of the report looks at key parts of the future agenda from the viewpoint of both higher education and business.

26 A fundamental recommendation is that higher education institutions should adopt cooperation with industry as part of their fundamental mission, especially in the continuing training field, and that companies themselves should have an explicit education and training strategy as well as an organised interface with higher education which will encourage and facilitate access and dialogue.

27 With regard to specific areas for action, there should be a focus on specific policy areas of fundamental importance as such, and where higher education-industry cooperation provides an effective basis for action. Priority areas of European concern include in particular :

- continuing education and training for industry through cooperative structures and training needs analysis (especially for SMEs)
- promoting measures to put continuing education and training fully into the mainstream of higher education efforts
- a European approach to skills shortages across the Community and the monitoring of manpower needs and supply
- improved analysis and information exchange
- strengthened higher education-industry relationships in R&D
- the improvement of educational productivity.

28 The annexes A and B give checklists which are recommended as a basis for internal analysis of the value of specific cooperation ventures. They are intended to contribute to the development of a specific **strategy** towards cooperation.

29 Having primed the European pump in this area, the relevant Community programmes should be increasingly devoted to the Europeanisation of existing and future higher education-industry networks. This reflects the reality that what Europe needs is not so much a set of national projects, but rather a European infrastructure of higher education-industry networks which can respond flexibly to a variety of needs, interact and cooperate, and cover all the main sectors and regions. New methods will need to be developed for this Europeanisation process.

30 The European infrastructure of higher education-industry networks needs to be directed towards priority areas of European socio-economic development. The innovative and qualitative role of Community actions in education and training reflects the reality that the main burden of producing adequate numbers of technical personnel can only be borne by the national education and training systems. However, higher education-industry consortia can play a useful role because they are at the grass-roots interface between the supply (higher education) and demand (industry) sides of the equation.

31 Finally, the higher education - industry partnership could play a greater role in the development of European training and qualifications markets. Methods should be further developed to accelerate this process, based on increased use of its existing approaches using personnel and student placements and transnational collaboration in specific training projects.

Part I

Introduction

1 The Commission (Task Force Human Resources) announced its **intention to issue a report on Higher Education - Industry Cooperation in Education and Training**. This document complements three Memoranda which were issued during 1991 :

- Memorandum on Higher Education in the European Community
- Memorandum on Open Distance Learning
- Vocational Training in the European Community in the 1990s.

All three documents, and in particular the Memorandum on Higher Education, concern the higher education sector, recognising not only its economic and scientific contribution but also the unique social and cultural role which higher education has played and will continue to play at local, national, and international levels.

2 In terms of the overall context within which higher education operates, this report has as its **target group** all those concerned with policy and implementation of cooperative ventures between higher education and industry. The objective is to formulate a number of detailed suggestions on good practice in order to :

- contribute to the debate on the role of university-industry cooperation in helping meet European training and skills requirements
- document and disseminate the experience which has been gained at both European Community and Member State levels
- promote greater exchange of experience with a view to stimulating further action.

3 A key point on **definition of terms**. The report, for the sake of brevity, uses the shorthand terms "higher education" and "industry" or "business". These terms should be understood in the following way :

- **higher education** embraces the entirety of the post-secondary education systems as well as individual institutions within those systems, whatever their specific nomenclature;
- **industry** is used primarily in the sense of all areas of economic activity, but also includes areas of professional activity which are not necessarily exercised for profit (eg Public Medicine, Public Administration). In places where more specifically profit-making activity is meant, the term **business** may also be used. In both cases, the terms are used to encompass both the economic and business systems as well as individual organisations active within them.

Despite the references to education and economic **systems** as such, there is a concern in the report for collaboration at the level of **individual** institutions and companies. The checklists given at the end of the document have this particular concern in mind.

4 This report has a **double source**. First, it draws heavily on experience of higher education-industry cooperation at national level as a result of the national profiles of current

experience which have been drawn up. A summary of these profiles as well as a synthesis of national experience is given in the report. Secondly, it derives from COMETT the particular experiences of transnational cooperation involving higher education and industry.

5 This communication falls within the general framework of Community policy in the area of higher education, which seeks, in particular to improve the quality of teaching in Europe, to promote exchanges with a view to accelerating change in the area of teaching and to increase its European dimension. This policy supports and reinforces national and local policies and those of enterprises and higher education institutions. The present communication complements existing memoranda in the field of teaching and training by providing items for reflection and discussion. By providing an inventory of national and European experiences in the field of cooperation, between higher education and industry, it attempts to initiate, and in other cases to nourish and broaden, discussion in this area. Concrete analysis of these cooperation projects should make it possible to consolidate them and to improve their results.

Part II

Background

1 Popular wisdom, leaning on the theory of magnetism, has it that the marriage of opposites is the basis of success. This "indispensable complementarity" might explain the partnership between higher education and industry which, despite many inherent difficulties, has seen significant development in the second half of this century.

2 The fundamental reality is that the advanced societies and economies of the West have been propelled into a world in which competitive strength depends on a faster translation of new knowledge into productive activity. For most observers this is explained by a wave of new technologies - a new technico-economic paradigm - which opens up new potentials for economic growth. But the key point is that success in exploiting these new technologies depends on a complex institutional environment in which education and training are of central importance. Thus, not only macro-economic policies, but increasingly micro-structural policies determine the capacity of economic systems to compete effectively. The United States, having been very successful in developing the mass production technico-economic paradigm, is now losing ground to Japan, amongst other things because of the relative failure of the education and training system. Europe, less committed to the obsolescent mass-production paradigm than the United States, stands poised to win the benefits of the 1992 Single Market if it can master the micro-structural changes which will improve the competitiveness of its enterprises and bring innovative products and services to the market. Yet, as the recent report of the European Round Table of Industrialists⁽¹⁾ makes clear, Europe is lagging behind the field in the production of skills needed to make the jump to the new economic structures.

3 It is not surprising therefore that industry, higher education, and governments have cooperated to strengthen higher education-industry relations, with three objectives in mind :

- faster industrial application of the results of fundamental research
- improved output of technical skills
- more effective transfer of technology between sectors and regions.

The ground has moved, changing traditional assumptions about the relative roles of academia and industry in relation to research and training. Higher education has ceased to be the exclusive locus for the creation and reproduction of knowledge, while enterprises have themselves become prime actors in R&D, including fundamental research previously conducted by the universities alone. This evolution has rendered obsolete the barriers which formerly divided scientific research from innovation, different scientific disciplines, the academic and industry cultures, and finally our various countries and continents. Today the European scenery, as in all the advanced economies of the West, is dotted with new policies, new institutions, and new networks to bring higher education and industry into partnership, and European Community programmes, notably COMETT, have played an important role in this development.

¹ *Reshaping Europe*, A report from the European Round Table of Industrialists. September 1991

4 But to understand what the future requires it is necessary to understand what the real motivations and interests are. Higher education has been going through a crisis, partly of identity and partly one of financing. Both are related to the rapid expansion of higher education in the post-World War II period, since it was impossible to achieve expansion simply through a proliferation of the classical universities financed by public funds. Closer links with industry brought finance for research and advanced training, better job prospects for graduates, a contribution to the training of faculty members and, not least, access to the management skills needed to respond to public calls for "accountability". But it has been more than a marriage of convenience. To maintain their scientific and intellectual leadership, higher education needs to be involved in the complex process of applying new knowledge to practical affairs : the laboratory, the market and society are now too close for the Ivory tower to survive.

5 Industry, on the other hand, might have gone it alone. Indeed, some large companies have set up their own schools of advanced technical and management training, and carry out basic research. Yet, as the year 2000 approaches, it is abundantly clear that the competitiveness of European industry depends on the capacity of the education and training systems in the Member States to produce and review an adequate stock and structure of qualified people. Given the nature of the technological skills needed by the emerging economy, and their fast rate of change, there is no way in which enterprises - either individually or collectively - can meet the challenge through their own efforts. Moreover, to compete means to innovate, the key to which is access to knowledge and skills as markets emerge. The networks to mobilise such resources as part of enterprise strategies cannot be mustered overnight. They have to be organically developed over considerable periods of time between the knowledge producers and the knowledge users. They are now part and parcel of the ongoing capacity to innovate, involving mobile but nevertheless permanent links between industry and higher education.

6 It is thus not surprising that public policies have supported this "indispensable complementarity" between industry and higher education. Quite apart from the public interest in greater returns on the investment in higher education and a more efficient science and technology system with faster transfers of knowledge and technology, innovative culture is becoming more important for society as a whole, particularly in Europe. Eurosclerosis could re-appear if the widespread institutional changes needed to sustain a rapid rate of economic and social change are not pursued. Amongst these, the partnership of higher education institutions and industry has a key place because of the new role of knowledge and information in the innovation process.

7 This analysis leads to a simple but clear conclusion : the phenomenon of partnership between higher education and industry will accelerate, will continue to be supported by public policies, will be increasingly internationalised, because the development of markets, the strategies of enterprises, the internal logic of knowledge production and use all take place across frontiers.

8 The emergence of a new technico-economic paradigm, sometimes referred to as the post-Taylorian revolution based on the new information and communication technologies, not only requires higher technical skills but also crosses the frontiers of the traditional scientific and engineering disciplines. A much faster response of higher education to those changing needs is required, and innovative programmes at both European Community and national levels have begun to assist in pioneering new curriculum and course developments (eg COMETT through its structure of university-enterprise training partnerships). European collaboration in particular represents added value because European cooperation can increase the speed of response of the national systems as well as sharing the costs of development work.

Part III

Review of National Experience

This section summarises briefly the situation concerning higher education - industry cooperation at Member State level. Annex C gives a summary of the national profiles which were prepared, and this section is structured in the same way. This section and the national profiles are, for reasons of brevity, only a partial snapshot of the extensive and rapidly developing pattern of activities in this field.

Specific legislation promoting higher education - industry cooperation

1 Most surveys reveal that there is comparatively little direct legislation for the promotion of higher education - industry cooperation. Many national laws, however, contain enabling and exhortatory statements about the economic role of higher education and thereby the responsibilities of higher education in this area. In fact, many of the pressures come from other sources, in particular :

- the widespread recognition amongst the parties concerned (government, academia, industry and commerce, scientific associations) of the potential and value of collaboration;
- several specific laws and programmes which promote cooperation indirectly, especially in the research field;
- adaptations of existing legislation on other matters in order to facilitate cooperation (eg regarding external resources for higher education, opening the constitution of boards and committees to both parties, or the terms and conditions of employment of higher education staff).

2 Over and above the national level, there is an emergence of local and regional level activity, where the relevant structures and funding will bring higher education and the economy into partnership and cooperation. Such structures are obviously most prevalent in countries with a strong regional structure where both public authorities and industry operate within well-established territorial sub-divisions and where there may also be specific economic development organisations dedicated to the region in question. Those economic development organisations will often themselves have specific programmes and funding which contribute to higher education - industry collaboration.

Specific programmes promoting higher education - industry cooperation

3 The major inspiration for collaboration between industry and higher education is the widespread and growing awareness of the technological and human resource development gaps which are emerging as a result of the factors outlined earlier in this report. The concern is for effective, flexible and rapid knowledge transfer rather than for institutional change as such. Much of the focus for collaboration remains, as in previous decades, in the research area, although the education and training dimension is penetrating through. The main types of collaborative programmes recorded are :

- specific R&D schemes based on joint or commissioned research, researcher mobility, facilities development and exploitation
- research training schemes, notably within key emerging technologies
- technology transfer activities and services, often centring on institutionalised transfer of Industry Liaison Offices
- continuing education schemes, in particular concerned with technology transfer and exploitation.

4 Many of these schemes have emerged during the 1970s and 1980s. While the national programmes under which they are run may have considerable duration, the type of support which they grant is of a fixed-term duration (typically 3-5 years), rather than being permanent. However, certain of the institutional structures have become more permanent as they have been integrated into the normal annual budgets of the organisations concerned.

5 In terms of responsibilities, most activities fall across a range of different actors, whether at :

- government level : national and regional government, different ministries (education, research, employment/labour, technology, industry, regional development), regional economic development organisations
- industrial level : agencies (national and regional employers, chambers of commerce and industry, sector-specific organisations, professional organisations, employee representative organisations), large companies, federations of small business
- higher education institution level : central and faculty/departmental level, individual institution and consortium approaches.

This often results in specific alliances which can combine funding sources towards ambitious objectives which could not be tackled by isolated action and funding.

Main developments in higher education

6 There is a tremendous awareness of the importance of the interface with economic life generally and of the pressures for cooperation. This is reflected in constitutional and management change (eg incorporation of cooperative objectives in individual constitutions and mission statements) as well as in a wide range of specific initiatives, European, national, local.

7 Part of the undoubted motivation for cooperation has come from the reduction in public funding for higher education. This has led to pressures on institutions to diversify their sources of income and increase the amount of income from sources other than the public purse. This has in turn led higher education to appraise the quality and value of its potential services.

8 The key activities involving cooperation are extremely diverse and are impossible to summarise satisfactorily here. They fall under the following broad headings :

- R&D activities
- technology transfer activities (including the development of industry services and science parks)
- continuing education and training, including commissioned training schemes (including researcher training)
- mobility and interchange, for both staff (eg associateships, joint chairs) and students (eg placements in industry, industrial projects, work experience)

- skills and training needs analysis, manpower development activities (whether region-based or sector-based).

9 Amongst the specific stimulation and management structures for cooperation at institutional level, we can note :

- representation of actors from economic life in institutional boards and committees
- creation of interface committees with industry
- establishment of Industry Liaison Offices and Officers
- enhanced organisation of the "representation" and "public relations" functions of top management within higher education institutions.

10 The management and financial structures for dealing with external revenues have also had to be adjusted accordingly, although national legislative change is necessary in many cases in order to facilitate the flexible administration of such new income. Other major areas which have necessitated review are the terms and conditions of employment of academic staff (eg remuneration and promotion, permissions for outside work, revenue-sharing) and policies for commercial exploitation of research results and training expertise (eg intellectual property rights and patenting).

Main developments in industry

11 While in several countries there remains a level of distrust and scepticism about the role and value of higher education, there has emerged nevertheless a much greater awareness of the benefits of cooperation. This is reflected, for example in the mission statements of some of the prominent multinational companies, some of which have initiated specific wide-ranging and ambitious schemes for collaboration. It is also reflected in the work of industrial organisations at European and national levels (eg European Round Table of Industrialists, UK Council for Industry and Higher Education), which set out programme statements which can almost be regarded as charters for collaboration.

12 The liaison and management structures for cooperation with higher education are, not surprisingly, most evident in the large companies, and can comprise :

- specific liaison officers for contact and cooperation
- reciprocal representation on boards
- work within joint committees
- science watchers and technology gatekeepers.

Especially in regard to the small and medium-sized companies, such contact structures are enhanced by the work of representative organisations (mainly national or regional, but sometimes sectoral), such as chambers of commerce, industry federations, etc. These organisations often provide a proactive focus for opinion-formulation regarding higher education as well as acting as a lobby group towards government. Such lobby work is as often supportive of higher education (eg on the issue of funding basic research, on increased access) as it is critical (eg on flexibility of technology transfer, on rapidity of reaction on course and curriculum development).

13 By definition, the key activities generating cooperation are similar to those recorded for the universities above, namely :

- R&D activities, but with the addition that specific industries may develop specialist research facilities which involve differing degrees of involvement with top specialists
- continuing education and training, including commissioned training schemes (including researcher training)

- mobility and interchange, for both staff (eg associateships, joint chairs) and students (eg placements in industry, industrial projects, work experience)
- skills and training needs analysis, manpower development activities (whether region-based or sector-based).

Investment by industry in higher education

14 The studies undertaken have generated some data on this aspect, but it is partial and difficult to assess comparatively across time and territory. A further difficulty arises from the nature of the higher education systems, their fragmentation into sub-systems, their "multi-sourcing" (i.e. the range of agencies which fund them), and the resultant difficulty of measuring public and private inputs. It is clear nevertheless that greater efforts are being made to collect and assess such information, particular as regards the proportion of external funding for higher education as compared with public funding.

15 Insofar as a trend can be established, it can be said that industrial contributions are increasing, but from a very small base in most countries. These contributions still represent a small minority of university research income. In no case was industrial income reported as being more than 20 % of the total for external research, although it may be that the emphasis on income alone underestimates the role of industry in setting the research agenda of higher education. Some research programmes at both national and Community level require an endorsement from an enterprise but no significant cash contribution. On the other hand, there is less evidence of a concerted rise in the proportion of industrial research expenditure being spent in higher education. In Italy, the proportion was given as 0.53 %, in Denmark less than 2 % and growing very slowly.

16 There was little evidence of a different situation in initial and continuing training activities (insofar as they are undertaken within higher education), although a notable exception was continuing education in France, where companies contribute to the costs of those institutions providing vocational training. It is estimated that industrial contributions in this area now represent 31 % of total higher education resources, an increase of 20 % since 1988/89.

17 Although gross contributions from industry are rising, the reports give little indication as to their net effect on institutional finances. The need for funds is regularly quoted as a major motivating factor for institutions which pursue external collaboration, a point made, for example, in the Netherlands report. If this is the case, then the long-term future of such collaboration may be fragile, since much of the collaboration takes place under publicly funded schemes which meet only a proportion of the full economic cost of the work. Industry has also expressed an unwillingness to meet such costs. Thus, while cooperation may be mutually beneficial in financial terms during periods when the institution has human or physical resources which are under-utilised, it may become less important when they are working to full capacity. Cooperation will also become increasingly relevant as institutions more clearly separate the costs of teaching and research activities.

Part IV

Advanced training for competitive advantage : European Higher Education-Industry Cooperation

This section looks more specifically at European aspects of higher education-industry cooperation in advanced training, taking particular account of the experience of the COMETT programme. The aim is to identify the key messages which have emerged from European Community and national experiences.

HIGHER EDUCATION-INDUSTRY COOPERATION GENERALLY

Higher education-industry cooperation is not an end in itself. The most successful cases of cooperation occur when the cooperation is adopted as a means of achieving specific goals. Also, real cooperation is best achieved when those involved agree that the cooperation gives results which are demonstrably better than would be achieved by higher education or companies working on their own.

1 Dialogue between industry and higher education needs to be maintained and strengthened, working towards new modes of partnership with clear goals and actions. If higher education-industry collaboration is to thrive, then it must be based on **clear understanding of the nature of higher education and business**. Aims and objectives are best shared when the partners respect the differences in the primary functions of business and higher education.

SOME KEY DIFFERENCES BETWEEN HIGHER EDUCATION AND BUSINESS	
Higher Education	Business
Primary functions of advancement of learning through teaching and research	Primary function is to achieve business success and profitability through their products and services
Pursuit of all types of knowledge (pure and applied), but with special concern for basic research and the extension of knowledge in all fields ("long term")	Direct concern for knowledge and skills crucial for performance of the business (although certain large companies have R&D investment), which therefore places high premium on commercially applicable knowledge ("short term")
Predominantly publicly funded, but with emergence of both private higher education institutions and certain functions undertaken on a commercial basis	Privately funded, but with certain public subventions or fiscal advantages where agreed within competition rules
Key employees normally enjoy high job security	Employees often have low job security
In many countries, higher education is part of the State machinery and are therefore closely controlled and subject to national funding and employment rules	Except for large State-owned companies, companies have considerable freedom to determine their own financial and personnel management structures
Especially in the case of the research universities, higher education institutions see themselves as part of an international Community of scholars. The degree to which their services are directed at the local Community varies considerably.	Most companies - with the obvious exception of the large multinationals - relate to a predominantly national or regional context

Basic management model is through peer group consensus and consultation, normally within very decentralised structures (faculties, departments). However, increasing recognition of importance of institutional management strategies and planning.	Basic management model involves hierarchy, authority, measurability, accountability. However, increasing recognition of new approaches based on knowledge transmission and teamwork.
Within their peer group, many higher education institutions are reserved about the principle of competition, setting a higher value on cooperation and collegiality.	Competition and free market principles are the keystones of the business approach and openly recognised as such.
Moves towards larger institutions (rationalisation; demographic and social trends)	"De-massification"

2 The most committed collaboration will be achieved if there is a "quality dividend" resulting from the pooling of effort in areas such as :

- the training dimension of the technology transfer process and the actual contribution of training to the transfer of technology
- the quality of graduates in terms of preparation for today's and tomorrow's markets
- the availability of high quality training materials and courses, for both enterprises and higher education institutions themselves
- the ability of higher education institutions to adapt to changing needs
- obtaining greater pay-off from R&D investment by linked training efforts
- the achievement of cost savings in training.

THE QUALITY DIVIDENDS		
Type of cooperation	Benefits for Business	Benefits for Higher Education
STRUCTURES FOR HIGHER EDUCATION-INDUSTRY DIALOGUE	<ul style="list-style-type: none"> ▶ higher level of awareness of business' needs in higher education ▶ extended links with higher education which can provide benefits in other areas (eg R&D cooperation, continuing education and training) ▶ European networking ▶ intelligence gathering on other companies in the same sector or region ▶ openings for developing inter-company cooperation 	<ul style="list-style-type: none"> ▶ regular and direct feedback on business needs, thereby improving the match between training supply and demand ▶ extended links with industry which can provide benefits in other areas (eg R&D cooperation, continuing education and training) ▶ European networking, including cooperation with other higher education institutions
JOINT EDUCATION AND TRAINING PROJECTS	<ul style="list-style-type: none"> ▶ direct influence on form and type of training given and on content ▶ access to latest R&D results and thereby to potential new products and processes ▶ more accessible and cost-effective training, particularly through open and distance learning ▶ improved market awareness through contacts with competitor companies 	<ul style="list-style-type: none"> ▶ feedback to enhance quality of initial education ▶ access to state-of-the-art expertise in leading edge and cost-intensive technology areas ▶ preparation for tomorrow's increasing and massive continuing training requirement ▶ access to new markets relevant for other activities (notably R&D) ▶ access to new sources of funding ▶ opportunities to develop marketing skills

STUDENT PLACEMENTS IN INDUSTRY	<ul style="list-style-type: none"> ▶ privileged access to high-quality potential recruits ▶ exposure to graduates from other countries of potential market interest ▶ opportunities to influence the content and quality of higher education programmes in the medium and long term ▶ opening up cooperation possibilities with foreign higher education institutions 	<ul style="list-style-type: none"> ▶ feedback on employers' requirements of study programmes ▶ continuing refinement of degree programmes in order to provide higher quality programmes and enhanced employment prospects for graduates ▶ opening up cooperation possibilities with foreign companies
EXCHANGES AND STAFF DEVELOPMENT INVOLVING HIGHER EDUCATION AND INDUSTRY	<ul style="list-style-type: none"> ▶ cost-effective introduction of new expertise into the company ▶ strategic cooperation possibilities giving access to latest R&D results ▶ provision of high quality internal training 	<ul style="list-style-type: none"> ▶ adaptation of research and training activities to changing industrial needs ▶ state-of-the-art updating for staff in areas where leading edge is in industry sector ▶ Improving strategic cooperation possibilities for the institution as a whole
TRAINING NEEDS AND TRAINING PROVISION ANALYSIS (TNA/TPA)	<ul style="list-style-type: none"> ▶ contribution to achieving a more responsive education and training system (speed and quality of adaptation) ▶ increased pressure on company to think through its future training needs ▶ embedding training needs analysis into company practice to provide information on a regular basis 	<ul style="list-style-type: none"> ▶ contribution to achieving a more responsive education and training system (speed and quality of adaptation) ▶ broad-based access to specific industry sectors and their needs ▶ enhanced local and regional role ▶ feedback through to initial education

3 Higher education institutions and companies - but especially higher education institutions - need to integrate into their institutional mission and plan a **strategy regarding higher education-industry cooperation**, both generally and in regard to specific target sectors where such cooperation may determine success or failure. In that respect, a special responsibility falls on senior management, who should be supported through European initiatives aimed at improving their strategic management ability. Assessment of the strategic importance of key technologies can be made easier through stable alliances with key centres of knowledge. Higher education-industry cooperation can help ensure these alliances.

4 Companies will rightly be primarily concerned with the direct and shorter-term benefits from higher education-industry collaboration. Over and above that concern, companies are increasingly becoming aware of a **wider social responsibility with regard to education generally**. The socially responsive company has an active policy towards its community, both locally and globally, not only with regard to education, but also in areas such as cultural affairs, urban and regional development, and the environment. Such policies should be seen as models and should be encouraged. Those policies will also support good communication between higher education and industry.

5 **Skills and training needs analysis** is a vital area where higher education-industry cooperation is indispensable and urgent in view of the clear and persistent skills gaps which are emerging. High-quality education and training requires a full and adaptable understanding of demand and supply. Neither higher education "suppliers" nor employers are as yet accustomed to constant analysis of the "match" between current training supply and the shifting demand, whether in terms of individual or employer needs. There are no standard tools available for this analysis, and work on developing and embedding better tools and methodologies is essential.

There is a need for increasing efforts along three lines :

- **sectorally**, in two senses :

► in science and technology sectors
► in business sectors
which are strategic for the European economy as a whole

- **regionally**, where the regions themselves should play the leading role, where relevant in partnership with national authorities
- **methodologically**, where there is a need for better understanding of various approaches to the analysis of developments in skills and qualifications and for training in the application of those methods.

6 Despite extensive experience in European and national programmes, there are still immense difficulties in ensuring the **contribution of training to business development within SMEs**. A special strategy has still to be developed, based on better appreciation of the circumstances in which a European approach is the right one. Exchange of experience will help transfer new approaches (eg sectoral groupings around new technological breakthroughs resulting from R&D), and further study and action are required, for example by creating greater awareness amongst SMEs of the value of cooperating within EC-wide competence networks related to higher education.

7 Company-centred training, especially of a technological nature, cannot be limited only to the advanced level. The strategic planning of training implies that both companies and the higher education sector take their part of **responsibility for training at all levels**. Universities in particular should associate in their work with industry other training institutions and responsible bodies active in the sectors concerned.

8 **Management of the interface between higher education and industry** is vital. In both the higher education institution and the company, management responsibility for this should be specifically assigned and linked to the top management level within the organisation. This will improve the strategic capabilities of the organisation as well as improve accessibility and consistency in dealing with outside partners and customers.

9 Structured higher education-industry cooperation remains a relatively new phenomenon. It is understandable that the organisational and financial structures to support such cooperation are still under development. The boundaries between public and private responsibility remain unclear on many points. In such circumstances, it should be a **particular responsibility of the public authorities to assist and stimulate such collaboration** at the formative stage, with the European Community taking its part where appropriate and necessary.

10 Much higher education-industry cooperation in education and training is carried out at local level without necessarily being transnational. The need for a European approach occurs in **areas of clear European value-added** linked to the developing Single Market. The types of value-added in question include :

- transnational transfer of technology and expertise
- the creation of permanent structures for European cooperation, particularly structures which had not previously existed
- the promotion of a European market-place of qualifications and training
- the contribution, direct and indirect, to the achievement of goals set by the European Community, whether in regard to specific programmes (eg in education/training, in R&D, in regional development) or in relation to other policies and activities (eg industrial policy, agricultural policy, environment)
- increasing European competitiveness

- the contribution towards achieving the cohesion goals of the Community with particular reference to achievements in ensuring balanced participation of all the regions, and to specific actions for the transfer of expertise to less-developed regions
- enhancing the role of the European Community world-wide
- the contribution to the promotion of the idea and practice of a Citizens' Europe
- improving foreign language competence in the EC, particularly regarding the less widely spoken languages
- increasing mobility in education and training
- the support for participating countries' activities to improve the quality of education and training and to facilitate convergence between education and training systems
- achieving financial synergy and improving the cost-effectiveness of education and training (eg through economies of scale, through facilitating access to other sources of financial support).

11 Leading on from the previous point, the European Community has been re-assessing its own **funding strategy** regarding higher education-industry cooperation, based on a clearer understanding and definition of different types of activities, and taking into account :

- the principle of subsidiarity
- the emergence of commercial training markets, which necessitates new policies which differentiate between "public service" functions (eg training needs analysis undertaken by COMETT consortia) and purely commercial training ventures
- the strategic nature of the sector concerned.

The provision of Community funding has often been the key which has unlocked complementary funding from other sources, whether public or private.

12 Finally, the **stock of knowledge and understanding of the process of higher education-industry cooperation** remains low. The traditions and practice regarding higher education-industry cooperation in training remain significantly different from Member State to Member State, as we have established in the previous chapter. Not enough is yet understood regarding those national situations. There is an increasing number of successful and unsuccessful ventures, but there is little time for the analysis of the factors which determine success and failure. Little is still known as to whether specific types of cooperation are likely to be more successful or cost-effective than others. The reluctance to share knowledge of potential commercial value (even in the training field) compounds the difficulty. Evaluation and monitoring efforts must be strengthened, especially in order to improve qualitative evaluation.

HIGHER EDUCATION-INDUSTRY COOPERATION STRUCTURES

Structures enable action to be carried through in an organised and sustained manner. They assist visibility, communication, and good financial management. They condition the manner in which partners can work together and help clarify roles and responsibilities.

13 There has been a considerable development of **industry liaison structures within individual higher education institutions**. Whether central or decentralised, committees or officers (or combinations of them), these structures need to be well-resourced, transparent and accessible both internally and externally, and, above all, well-managed. Part of that management is the persons appointed to carry out the liaison function, but at least as important are the positioning and the recognition of the structure within the institution as a whole.

14 As part of industry's strategies towards higher education, **companies should also reflect on their own liaison structures with higher education.** Only the largest companies appear to be in a position to justify a specific manager or department for contacts and cooperation with higher education. For companies unable to do so, especially the small and medium-sized enterprises, collaboration within a regional or sectoral consortium could be an alternative means of ensuring the interface.

15 **Higher education-industry training consortia**, such as those set up under COMETT, are another way of providing a framework for constructive dialogue and action amongst the main actors concerned with advanced training (higher education, industry, local and regional authorities, employment associations, etc.). Such consortia, which are also and increasingly the vehicle for European cooperation in Research and Technological Development, have proved that they can :

- have a substantial impact on the development of training policy at regional level or in relation to particular sectors
- provide a cost-effective infrastructure for addressing the training challenge, in particularly through focused work on skills and training requirements
- provide, together with counterparts in other countries, a European dynamic by forming a European network for information exchange and cooperation
- in themselves exercise a catalytic role in relation to many other activities and programmes, both European and national (eg in training, student placements, technology transfer, and R&D).

16 **Higher education-industry offices and consortia are also a catalyst for other activities.** They have often inspired other related activities going beyond one specific programme, in particular :

at European Community level :

- collaboration in a wider range of EC education and training programmes, in particular COMETT, ERASMUS, TEMPUS, FORCE and LINGUA
- parallel collaboration in Community research and development, particularly in technology-related programmes such as ESPRIT, BAP/BRIDGE, BRIT/ EURAM, and DELTA
- cooperative development of trans-European cooperation schemes originating from organisations other than the European Community (eg HERMES placement scheme)

at local and Member State level :

- skills survey activities on a regional or sectoral basis (funded by both Community and Member States)
- supporting regional development through activities linked to the structural funds or the Community Initiatives such as EUROFORM
- concerted action with the Euro-Information Centres directed at assisting SMEs
- supporting SPRINT technology transfer activities through complementary training actions.

Their full potential and performance should therefore be assessed in that broader context.

17 **Higher education-industry consortia have both sectoral and regional characteristics²⁾** which are important in determining their strategy and financial viability :

- **Regional** consortia can provide a sustained contribution to the goals of higher education-industry cooperation when they are **an integral part of regional strategies and programmes**. Where no regional training strategy exists, regional consortia can provide a stimulus towards creating one. This requires higher education to collaborate closely with regional authorities as well as with industrial and professional groupings in the region.
- **Sectoral** consortia can provide a sustained contribution to the goals underlying higher education-industry cooperation when they are **effectively linked to related scientific and professional strategies and programmes**. This requires higher education to collaborate with the relevant scientific and professional organisations - themselves highly active in education and training - as well as with industrial groupings at European level.

18 Higher education-industry consortia are at their best when driven by a strong motor. **The willingness of an organisation to act as a motor depends totally on the objectives and expected outcomes**. A consortium within an industry sector (eg automobile, textiles, pharmacy) is much more likely to find an enterprise willing to act as the motor force, while a consortium in a technology sector (eg software engineering, CIM, materials) will be more likely to find its driving force within the academic or research community. This is simply a reflection of the different primary goals of academia and enterprise. Those differences must be taken into account when designing a consortium and plotting its future potential.

19 There is an urgent need for the Community and the Member States to **coordinate proliferating networks** - whether European or national - to ensure coherence and a simple "user-friendly" service to enterprises, especially SMEs. Industry will not cooperate with complicated and overlapping structures. The aim should be to provide a service to industry in a clear and coordinated manner.

20 Higher education-industry **consortia should complement and not conflict with policy and action within individual higher education institutions or firms**. Consortium activity needs to be part of a strategic approach. In the interplay between consortium activity and individual institutional development, senior management (especially rectors of higher education institutions) have the key role. Consortia in particular depend on full recognition and support from their principal members, whether they be higher education institutions or enterprises.

21 There is no uniform **management model** for higher education-industry consortia. Based on the COMETT experience, their structure and membership are very diverse. Good management is essential, and it is important to draw lessons from the experience so far. This experience indicates that, within three years of activity, such consortia should have achieved :

- a clear legal structure including formal agreements amongst the partners
- membership arrangements which reflect different levels and intensity of input; **active** membership should be distinguished from **associate** membership in terms of both financial contribution and return
- a professionally prepared business plan, including in particular a clear programme budget allowing analysis over time of effectiveness within different areas of activity (eg

² A "regional" consortium targets its activities towards industry and higher education in one region only; a "sectoral" consortium takes as its focus a specific industry or technology sector (eg automobiles, computer-integrated manufacturing, textiles, environment) and will have a more transnational focus.

student placements, courses, training needs analysis etc.) and of the balance of investment and return in the respective areas

- a staffing structure which provides a critical mass of full-time staff, composed on an inter-disciplinary basis, including one high-level manager. Consortia will also depend on part-time inputs, given their spread of membership and the range of requirements (especially sectoral) to which they have to respond.

22 It is impossible to be categoric about the *ideal critical size* of a higher education-industry consortium, given their differing situations and environments. Nevertheless, it is clear that consortia can easily become over-extended in terms of their ability to perform their tasks. They are walking a tightrope between impact at European level and local effectiveness / efficiency within limited resources. In most cases, a consortium will only operate effectively if its composition meets the following conditions :

- *regional consortia*
 - ▶ a credible coverage of higher education institutions (normally all in the region)
 - ▶ a "hard core" of several larger companies in the region
 - ▶ a sufficiently large group of SMEs to allow insights into the SME situation and also, where possible, some homogeneity within specific sectors; such participation may in certain cases be secured through the involvement of associations of SMEs or of professional and economic organisations at regional level
 - ▶ decision-makers within the relevant regional authorities
- *sectoral consortia*
 - ▶ a spread of leading higher education institutions from several Member States with a credible training and research capacity in the sector
 - ▶ a "hard core" of several leading companies in the sector concerned
 - ▶ (where relevant) a sufficiently large group of SMEs to allow insights into the SME situation in the sector
 - ▶ participation by key professional associations in the sector.
- *and in both cases*
 - ▶ a motor force whose basic objectives are being served through its work on creating and developing the consortium
 - ▶ a well-defined management structure based on a central full-time manager and on regular and reliable communication processes within the consortium.

23 The *continuing training of the managers of higher education-industry cooperation* is vital. This is a market for training providers within newly emerging European markets, and the European Community should assist in stimulating that market in so far as national provision is not meeting the need. The aim should be to arrive at an ongoing and self-sustaining programme, backed up by consistent needs analysis and cooperation with the leading management training institutions. In planning such staff development programmes, the needs of the key institutional actors (eg higher education rectors, directors of industrial liaison) must also be met.

HIGHER EDUCATION-INDUSTRY EXCHANGES AND STAFF DEVELOPMENT

The key to technological innovation and business generation is people. They are the carriers of technology transfer and development. People should be rewarded, not penalised, for their

international mobility and experience. In this respect, changes in institutional policies and practice are not keeping pace with European and global requirements.

Student placements in industry

24 The **range of benefits** which student placements in enterprises provide are both educational and experiential :

- for the *higher education institution* :
 - ▶ extended links with economic life which can provide benefits in other areas (eg R&D cooperation, continuing education and training)
 - ▶ feedback on employers' requirements of study programmes
 - ▶ continuing refinement of degree programmes in order to provide enhanced employment prospects for graduates
- for the *company* :
 - ▶ extended links with higher education which can provide benefits in other areas (eg R&D cooperation, continuing education and training)
 - ▶ privileged access to high-quality potential recruits at a time when the competition for qualified manpower is intense
 - ▶ opportunities to influence the content and quality of higher education programmes in the medium and long term
- for the *student* :
 - ▶ first-hand experience of working life, thereby enhancing the student's preparation for and chances of employment
 - ▶ integration of that work experience within a recognised qualification
 - ▶ a European dimension to professional and academic development, drawing on the cultural and linguistic diversity of the Community

and for the European Community as a whole a greater pool of graduates with the right kind of experience required for the developing European labour market.

25 The organisation of effective student placements is labour-intensive and not every company will be persuaded of the return on the investment made. Nevertheless, there are documented cases of the **economic impact of placements**, where the placements have :

- provided high-level recruits for the company, thereby keeping the company at the forefront of the employment market without engendering high recruitment costs
- had a specific impact on economic performance through the technical development undertaken by the student during the placement
- stimulated new European market contacts and opportunities as a result of the student's skills
- provided the impetus for strengthening cooperative partnerships between the participating organisations (eg in R&D)
- contributed to an increased training culture and European awareness in companies wishing to develop their activities in the European Single Market.

Small and medium-sized enterprises in particular can benefit in all these ways.

26 Student placement mobility - inward and outward - can give direct benefits for **regional development policy**, especially when such mobility is substantial and concentrated in priority industrial sectors. Students placed in companies can be the vectors for technological and commercial development, especially within the developing European single market.

27 In the interest of convincing all parties of the value of student placements, a **code of good practice and quality** should be developed. It should be applied to all placement programmes funded by the Community, particularly within COMETT, ERASMUS, LINGUA, TEMPUS, and PETRA. Such a charter should include at least the following points relating to transnational cooperation :

- model contractual arrangements amongst enterprise, training institution, trainee
- measures for monitoring and recognition, including the integration of the placement within the overall course of study
- legal aspects such as social security and medical insurance
- arrangements to ensure adequate foreign language preparation
- non-discriminatory remuneration arrangements.

28 It is urgent to keep under review, with the collaboration of the Member States, certain aspects of the **treatment of student placement students under different national legislations**. The important areas include :

- social security and insurance provisions
- fiscal treatment of financial support received under national and/or EC grant/loan schemes.

29 Given different national legislation and academic practice, there should continue to be **flexibility regarding how placements are integrated into academic courses**. Nevertheless, except where national circumstances rule out such possibilities, the Community should give preference to placements which - whether during or after study towards a recognised qualification - are planned in a coordinated way with the study programme concerned.

30 It is important for a student placement abroad to be of sufficient duration to have a lasting effect on the student. The 3-month minimum **duration** for a student placement should be retained as the norm for Community support, given the situation across the Community as a whole. Nevertheless, companies and higher education institutions should strive towards longer periods in the interest of :

- the quality of the placement performance
- the efficiency of the investment being made, especially in situations where significant language and cultural adaptation is required
- having the greatest longer-term structural impact on courses and qualifications.

31 The supply of student placement opportunities is fragile and changeable, relying often on possibilities which emerge suddenly and for a short time only. There is a need for quick responses on the part of higher education institutions and the trainees. It is therefore vital to have **local administrative arrangements** for Community-funded placement grants. The European networking arrangements through the higher education-industry consortia under COMETT can be strengthened to provide the services required, including :

- location of placement opportunities
- coordinated scheme for placement offers and acceptances
- quality assurance in the selection and monitoring of students during placement

- student support during placement (financial, academic, linguistic, welfare).

32 **Industrial placement for advanced level "research-based" training** falls at the intersection between training and research, and both EC (principally the Human Capital and Mobility programme) and national schemes support such placements for "training through research". The centre of gravity for such training is moving towards such intersections between the academic and industrial milieux. Thus the training meets common needs and serves to create or reinforce a common scientific and technological culture.

33 There is a need for a **better understanding of the actual capacity of European industry to receive placement students**. A study on the actual capacity, based on a representative sample of companies of varying sizes and sectors, should be carried out, and should devote special attention to ways and means of improving awareness of the benefits of student placements in industry.

Personnel Development and Exchanges

34 The achievement of successful higher education - industry relations is totally dependent on the capacities and attitudes of the personnel concerned. Efforts are underway in both industry and higher education to effect a **cultural change which will encourage and support cooperation**. This cultural change must remain firmly grounded in the awareness of the respective characteristics of higher education and industry, with a necessary balance between "science push" and "market pull".

35 **Commitment to cooperation should be seen as an integral part of the job content** of higher education staff and of the relevant personnel within companies. In higher education, awareness of industrial needs and of practical approaches to cooperation should be enhanced. Where relevant, teaching staff should be encouraged to obtain experience of working within the economic sectors to which their scientific work relates. The commitment to working with economic life should be treated with the same importance as teaching and research functions when performance is being assessed for the purpose of recruitment or promotion.

36 Personnel exchanges between higher education and industry should continue to occur in **both directions (higher education <=> industry)**. It is imperative to determine clearly the objectives of the placement and define the programme accordingly. In terms of European value-added, the emphasis should be on the training of trainers and the transfer of know-how to the collaborating organisations.

37 While staff secondments of significant duration are likely to attain the greatest impact, there is **scope for a multiplicity of different exchanges and assignments**. These range from endowed chairs and joint professorships, through fixed-term fellowships, to short-time and part-time attachments (eg "science watchers", "technology gatekeepers"). Both higher education and industry need to remain flexible in adapting to various forms of staff interchange, and to monitor the volume and value of that interchange.

38 One effective and indeed cost-effective approach to personnel exchanges is the **integration of the exchange** into a broader higher education-industry training project. In that way, such exchanges can be more imaginatively used as one of the range of resources available to specific projects and programmes.

39 Exchange activities are often too dispersed and too small-scale. This is true of both personnel exchanges and of long-term placement of senior students in companies. There is a need to develop a **more concentrated approach** designed to achieve critical mass within target sectors and around key technology developments and techniques. Such an approach, in some cases linked to the EC R&D programmes, is more likely to motivate industry

(including SMEs), yield results of European significance, and to be cost-effective. Exchanges can assist in developing a technological culture in companies (especially SMEs) as well as better understanding of SMEs within higher education.

40 For all personnel exchanges, a **"dissemination plan"** after the exchange should be required. This would serve to communicate the results of the exchange to interested parties. Such a dissemination plan could include arrangements for public presentation of the results of the exchange (eg through de-briefing seminars) locally and, where appropriate, at Community level (eg within sectoral groupings).

General points regarding higher education-industry exchanges and mobility

41 There is a need to address the question of **imbalances in the placement flows between different regions**. Cost-of-living differentials in particular should be more specifically taken into account through directed funding and differentiated funding levels (provided suitably rigorous selection and monitoring is guaranteed).

42 The Community and Member States should examine the **scope for extending the range of fields** in which transnational placements are carried out. While the principal fields in which placements are currently carried out are in engineering, technology, business studies, and management, there is scope for extension into many other fields (eg medicine, paramedical fields, law, economics).

43 There is contradictory evidence on the question of whether and how European mobility programmes contribute to **"brain drain" from the less-developed to the more developed regions** of the Community. While some anecdotal experience points to such an impact, serious study over a sustained period may show a different and more complex reality. To that end, a specific study should be carried out by the Community, extending over a sufficient timespan.

HIGHER EDUCATION-INDUSTRY COOPERATION IN EDUCATION AND TRAINING PROJECTS

Collaboration in education and training projects is the most effective way of matching supply and demand. Projects provide a focus for addressing real business problems, both short and long-term. When managed well, they also provide measurable and cost-effective frameworks for building continuing partnership over a sustained period. Spin-off effects in other areas such as research and development will often occur as a result of such projects.

44 There is now a growing mass of experience of the implementation of training products based on higher education-industry cooperation. This points to a **European training market** in the course of development, a market which in fact consists of several different markets which need to be brought together. Success in this market depends on factors such as commercial opportunity, costing policy, marketing practices, quality assurance, and diffusion capability. Higher education institutions individually and companies individually are entering this market and are competing with each other for commercial success. The Commission should study these developments carefully and assess whether at European level there is a need for supportive action, especially with regard to the continuing training market (eg through information networks) and demonstration and clearinghouse networks.

45 The organisation of joint training projects (comparable to a product development cycle), particularly in a European context, requires the **blending of the skills of a wide-ranging course development team**. Design and marketing place a premium on the availability of skills which are often difficult and slow to harness within individual higher education institutions or companies (eg advice on multimedia tools, on costing principles, on customer trends, on

relative merits of in-house or external production). In this respect, clear agreements are indispensable to ensure the sound development of the project and to avoid the vulnerability which can arise when the project is person-dependent rather than organisation-dependent.

46 **Project management** needs to take better account of explicit project development stages, namely :

- needs analysis and market assessment
- conception/design, including specification of instructional objectives
- development and production
- testing
- commercialisation/marketing
- updating and maintenance
- ongoing monitoring procedures throughout the development of the project.

The balance of industry and higher education inputs at the various stages needs to be carefully monitored, especially in order to ensure adequate industry involvement at the first stages of needs analysis, conception/design, and marketing.

47 At the same time, the evaluation of the success of joint training projects should take into account that **the impact of projects is both short-term and long-term**. The short-term impact includes :

- the specific training provision (courses, qualifications, materials, databases)
- the formation of new partnerships amongst the key actors (including inter-higher education and inter-company partnerships).

The longer-term impact includes :

- enhanced collaborative analysis and understanding of training requirements, both locally and at European level
- the emergence of new inter-regional or intra-sectoral networks related to training and other related areas (eg diffusion of R&D results).

48 Leading on from the above, the new opportunities in education and training arise from both the developing market and the availability of new technology. The profession of "trainer" like all professions, implies more and more technology and market competences which were less evident in the past. The **training of trainers** becomes vital and is an area in which industry and higher education share common concerns. Higher education and industry will increasingly compete in providing qualified and adaptable trainers. The issue will present a particular challenge to higher education, in regard to which it has been estimated that by the year 2000 60% of teaching and learning activities will be in the lifelong learning area.

49 **European markets for short-course continuing training** are now developing and activities such as COMETT have helped ensure that institutions of European learning will aim to be at the centre of this market. That market will allow the development and exploitation of high-quality courses in several countries and in adapted language versions. The European dimension of such courses will be most efficiently obtained through :

- instructors drawn from countries other than that where the course is taking place
- sensitive development of new courses and adaptation of existing courses to meet new target audiences in other countries

- courses at the highest level where the networks are already European if not global in nature.

50 **Foreign language policy and practice** in joint training projects is an important market factor :

- in all areas of activity, cultural and linguistic adaptation of training materials and courses should remain a major concern. Particularly where existing rather than new materials are being developed for implementation in another country, promoters should have to demonstrate a sufficient client base in that country for the purpose of testing the proposed course or materials;
- the choice of the appropriate language(s) for courses and materials should be left to promoters themselves on the basis of normal market conditions.

51 **Transnational mobility (of both students and personnel)** should be more systematically utilised as a aid in training project development. However, the experimentation stage of a project must be distinguished from final implementation in order to protect clients from untested training approaches and materials.

52 Expertise in **open and distance learning** as well as the potential benefits of open and distance learning is a common factor which links higher education and industry. This is especially so in relation to continuing education and training. To that extent, joint training projects present great opportunities to assist in strategic areas such as :

- the widening of access to higher education in Europe by supporting the extension and development of distance education and training (at both initial and continuing education levels) in all parts of the Community. There are special opportunities here to strengthen educational infrastructures in less favoured and remote regions in Europe and for those categories of citizens that have inadequate access to education and training;
- the promotion of distance and open learning for the recurrent and continuing training of the workforce (in particular SMEs), with special attention for the priority sectors of industry, critical to the future of the Community internal market;
- the promotion and introduction of new, notably computer-based, learning technologies for in-company training, benefiting from and exploiting transnational collaboration and networking of open and distance teaching universities. This can also help promote collaboration between open and distance learning institutions and conventional institutions of higher education.

53 European Community support for joint training projects should be **based on areas of significance for the competitiveness of European industry**, involving :

- high European value-added
- analysing and responding to skills gaps at European level
- more effective diffusion of R&D results
- regional technology transfer through training
- further exploiting potential of new training technology leading to new education and training systems (i.e. going beyond the production of specific courses and products).

54 The European Community should continue and develop its *differentiated approach to project funding* :

- "seed-corn" funding at modest financial levels for small-scale activities (eg short course), where the emphasis is on devolution, the development of local initiative, and lightness of implementation and monitoring
- more significant investment in larger projects selected and developed proactively in relation to strategic Community goals and programmes, based on higher investment levels, more systematic monitoring, and explicit arrangements for the diffusion of results.

Part V

The future agenda : towards a strategy

This final section looks at the key parts of the future agenda from the viewpoint of both higher education and business. The intention is to offer to any individual company or higher education institution a set of practical questions which it can address in connection with the issues discussed in the previous chapters. This section then closes with some reflections on future European Community actions.

1 The previous parts of this report have outlined a general agenda, stressing the benefits of enhanced higher education-industry cooperation. In the final section of the report, we look at what that means in terms of **action at the level of an individual company or enterprise**.

The context for partnership

2 We have tried to look at the following general aims :

- enhancing the connections between higher education and economic life through policy development, encouragement of networks and mobility between higher education and industry.
- the need for efforts on a major and structural scale and the need for an overall approach by all the actors concerned, which therefore places pressure on public authorities to provide the framework.
- increasing responsiveness to client needs (individuals and organisations) and awareness of the importance of paid services.

3 A fundamental recommendation is that higher education institutions should adopt cooperation with industry as part of their basic mission, especially in the continuing training field, and that companies themselves should have an explicit education and training strategy as well as an organised interface with higher education which will encourage and facilitate access and dialogue.

Specific areas for collaboration

4 With regard to specific areas for action, there should be a focus on specific policy areas of fundamental importance as such, and where higher education-industry cooperation provides an effective basis for action. Priority areas of European concern include in particular :

- continuing education and training for industry through cooperative structures and training needs analysis (especially for SMEs)
- promoting measures to put continuing education and training fully into the mainstream of higher education efforts, including the preparation of first degree students for a life of continuing education and also the development of new structures of career development for teachers in higher education
- a European approach to skills shortages across the Community and the monitoring of manpower needs and supply :

- ▶ greater use of the higher education-industry networks as the focus for regular skills survey activities
- ▶ encouragement of better awareness at secondary education level of science, technology, industry
- improved analysis and information exchange :
 - ▶ further study and research on the position regarding higher education-industry cooperation, especially at Member State level, whether in regard to countries with a strong cooperative tradition or countries without any tradition
- strengthened higher education-industry relationships in R&D :
 - ▶ development of higher education-industry partnerships as a sectorally focused mechanism for advanced research training and exchanges at European level
 - ▶ coordination of major joint training projects as a vehicle for the diffusion of the results of EC R&D efforts
- the improvement of educational productivity
 - ▶ concentration on joint efforts in the multimedia and distance training area, where new investment and organisational efforts are required within both higher education and industry
 - ▶ the training of higher education teachers in the exploitation of new teaching technologies.

A checklist for individual companies and higher education institutions

5 The annexes A and B give checklists⁽³⁾ which are recommended as a basis for internal analysis of the value of specific cooperation ventures. They are intended to contribute to the development of a specific **strategy** towards cooperation. Strategy is action, and this entire report is primarily intended as a stimulus towards action as well as debate.

Future European Community Actions

6 The purpose of this working document has been to distribute experience and to launch debate. One specific area in which the Community will draw on that debate will be in its thinking on future actions at Community level. The programme of actions includes in particular the initiatives to be taken following the end of the second phase of the COMETT Programme.

7 Without prejudice to the discussions and evaluations to be conducted regarding future higher education - industry programmes at Community level, the Commission would already at this stage wish to record some preliminary reflections as part of the debate being launched.

8 First, the experience to date within COMETT and other relevant Community programmes, which is already considerable, needs to be made available to all those in the Member States and beyond who wish to develop higher education-industry partnership. This is a matter of making use of the existing capital from within Community programmes. It is indeed the purpose of this document.

9 Having primed the European pump in this area, the relevant Community programmes should be increasingly devoted to the Europeanisation of existing and future higher education-industry networks. This is the added value that the European Community can provide. It reflects the reality that what Europe needs is not so much a set of national projects (as have

³ These checklists are based on work undertaken in the United Kingdom by the Council for Industry and Higher Education and the Department of Trade and Industry.

been and will be developed by the institutions in the Member States), but rather a European infrastructure of higher education-industry networks which can respond flexibly to a variety of needs, interact and cooperate, and cover all the main sectors and regions. New methods will need to be developed for this Europeanisation process.

10 The European infrastructure of higher education-industry networks needs to be directed towards priority areas of European socio-economic development. This will depend on the decisions of the Community and the Member States in the aftermath of Maastricht, but certain general directions can be indicated.

11 This innovative and qualitative role of Community actions in education and training reflects the reality that the main burden of producing adequate numbers of technical personnel can only be borne by the national education and training systems. However, higher education-industry consortia can play a useful role because they are at the grass-roots interface between the supply (higher education) and demand (industry) sides of the equation. This supply/demand interface is one of the European weak points and explains to some extent the slow response to changing needs as compared with Japan and the United States. The existence of a range of regional and sectoral consortia should be exploited to secure more responsiveness to emerging skills and qualification needs, both in regions and in sectors.

12 Obviously, this partnership function could be of considerable importance in the process of industrial re-structuring and adaptation in the European Community, particularly in strengthening the competitiveness of strategic industrial sectors. Success is not only dependent on research and development capability, but also on the ability to build new organisational forms, particularly networking, to generate the professional competences and skills needed for managing the innovation process, and above all to ensure quality of process and product. In these strategic sectors, and in cooperation with Community industrial policy and research and development programmes, higher education - industry partnership could be a useful vehicle for structural funds to reinforce the Community's capacity for industrial adaptation.

13 However, it should be borne in mind that in today's fast-moving economies, leadership positions in industrial sectors change rather quickly. As the new technologies are diffused and become standard, the basis of competition shifts to costs, notably labour costs. This enable new competitors to enter the market; for example, U.S. domination of the advanced technology sectors in the 1960s was quickly challenged first by Europe and then by Japan. On the same logic, technological capabilities in the European Community should not be wholly concentrated in certain regions. The existing strong implantation of partnerships across the regions in the Community could then be used as a vehicle for reinforcing balanced economic development and cohesion.

14 Finally, the higher education - industry partnership could play a greater role in the development of European training and qualifications markets. There is little doubt that, as the Single Market takes effect, the Europeans will train, be qualified, and work as if they are in an increasingly unified economic space. This will not be a training and qualifications market, but many different markets emerging from grass-roots cooperation in regions, economic sectors, and cross-frontier zones. Each of the existing consortia developed within the Community programmes is a potential training and qualifications market, and cooperation between them could extend their scope and effectiveness. Methods should be further developed to accelerate this process, based on increased use of its existing approaches using personnel and student placements and transnational collaboration in specific training projects.

ELEMENTS OF A CORPORATE POLICY TOWARDS HIGHER EDUCATION - A Checklist⁽¹⁾**1 AIMS AND OBJECTIVES**

- 1.1 What does the company hope to achieve in its links with higher education ?
- 1.2 What are the company's objectives in adopting a policy towards higher education ?
- 1.3 Do these objectives go beyond meeting short/medium-term operational needs ?
- 1.4 How will we know whether we are meeting our objectives ?
- 1.5 Who is responsible for seeing that the policy is implemented, however decentralised the day-to-day decisions may be ?

2 STUDENTS/TRAINEES**2.1 SPONSORSHIP**

- 2.1.1 How many students or trainees would we sponsor each year ?
- 2.1.2 From which countries ?
- 2.1.3 In what subjects ?
- 2.1.4 How much will we spend ?
- 2.1.5 Is this a major tool for recruiting qualified staff ?
- 2.1.6 If yes, what implications are there for our sponsorship programme ?

2.2 SCHOLARSHIPS/BURSARIES

- 2.2.1 How many scholarships should we provide each year ?
- 2.2.2 For students from which countries ?
- 2.2.3 On what terms (eg particular subject areas) ?
- 2.2.4 How much will we spend ?
- 2.2.5 Are there any company purposes/objectives which involve this programme ?

2.3 RECRUITMENT

- 2.3.1 How many new graduates will we recruit this year ?
- 2.3.2 What level of qualification will these recruits have (eg first diploma, Master's, doctorate) ?
- 2.3.3 From which countries should they come ?
- 2.3.4 In what subjects ?
- 2.3.5 How will we seek out the best recruits ? Do we cover enough institutions ?
- 2.3.6 How will our recruiting needs change from year to year ? Do we get enough good applications ?
- 2.3.7 How much will we spend on our recruitment programme ?

2.4 WORK-EXPERIENCE AND TRAINING PLACES

- 2.4.1 How many of each of these places will we provide this year ?
- 2.4.2 Shall we provide places for students and trainees from abroad ?
- 2.4.3 In what fields/divisions of the company ?
- 2.4.4 How will we find the most suitable candidates ?
- 2.4.5 How does this relate to our sponsorship and scholarship programmes ?
- 2.4.6 How much will we spend ?

¹ These checklists are based on work undertaken in the United Kingdom by the Council for Industry and Higher Education and the Department of Trade and Industry.

- 2.4.7 What arrangements are necessary to ensure the placements have value for the company (eg through good project selection) ?
- 2.4.8 What do we see as the benefits ?
- 2.5 **VACATION JOBS**
 - 2.5.1 How many vacation jobs will we provide this year ?
 - 2.5.2 In what parts of the company ?
 - 2.5.3 Are we looking for any special type of applicant ?
 - 2.5.4 How much will we spend ?
 - 2.5.5 To what extent is this a divisional initiative ?

3 RESEARCH AND DEVELOPMENT

- 3.1 **APPLIED R&D and CONSULTANCIES**
 - 3.1.1 What areas do we want to pursue ?
 - 3.1.2 How will we monitor which academic departments are doing the best work in this area ?
 - 3.1.3 How will we define the terms of the projects ?
 - 3.1.4 Who is responsible as primary contact within the company ?
 - 3.1.5 How much will we spend ?
 - 3.1.6 Is the expertise available in this country or should we seek it in cooperation with partners from other countries ?
 - 3.1.7 How will we know our objectives are being met ?
- 3.2 **COLLABORATIVE/JOINT PROJECTS**
 - 3.2.1 What areas do we want to pursue ?
 - 3.2.2 Is the expertise available in this country or should we seek it in cooperation with partners from other countries ?
 - 3.2.3 With what departments/researchers ?
 - 3.2.4 How will we define the projects' terms ?
 - 3.2.5 Who is responsible as primary contact within the company ?
 - 3.2.6 How much will we spend ? How much time will be required ?
 - 3.2.7 How will we know our objectives are being met ?
- 3.3 **STRATEGIC AND BASIC RESEARCH**
 - 3.3.1 What are our interests in supporting these types of research ?
 - 3.3.2 How do we identify areas we are willing to support ?
 - 3.3.3 Where is the best work being done ?
 - 3.3.4 How much will we spend ?
 - 3.3.5 How long can we sustain this support ?
 - 3.3.6 How will we evaluate our changing interests and needs ?
- 3.4 **SHARING FACILITIES**
 - 3.4.1 Under what circumstances will we provide access to our own R&D facilities for academics, research students, and trainees ?
 - 3.4.2 Under what circumstances would we want to use R&D facilities located at a higher education institution ?
 - 3.4.3 What conditions, if any, would we attach to either of the above ?
- 3.5 **GIFTS OF EQUIPMENT AND SOFTWARE**
 - 3.5.1 Do we manufacture or produce any equipment or software which would be useful to a higher education institution ?
 - 3.5.2 If yes, are we interested in planning a programme of gifts of equipment or software ?
 - 3.5.3 What would be the benefits ?
 - 3.5.4 What would such a programme cost ?
 - 3.5.5 Do we own any equipment produced by others that we could give to a higher education institution ?

3.6 RESOURCES AVAILABLE

- 3.6.1 In addition to or in place of cash, can we provide help with any of the following :
- premises
 - equipment
 - people
 - management time
 - software.
- 3.6.2 If so, how can we provide these most efficiently and effectively ?
- 3.6.3 How does this relate to the objectives of our higher education policy ?

4 STAFF

4.1 TEACHING AND RESEARCH POSTS

- 4.1.1 In what subjects are we interested in supporting chairs and/or fellowships ?
- 4.1.2 Do we want this to be on an annual basis, by endowment, or by another arrangement ?
- 4.1.3 How much will we spend ?
- 4.1.4 How will we choose the recipient institution ?
- 4.1.5 Do we want to sponsor or top-up part of an academic salary ? By what means ?
- 4.1.6 What benefits do we think there will be ? How do these relate to our objectives ?

4.2 JOINT APPOINTMENTS

- 4.2.1 When would it be beneficial to support a joint professorship ? In what fields ?
- 4.2.2 On what terms would we agree to such an appointment ?
- 4.2.3 How should we seek out suitable places ?
- 4.2.4 How might this relate to other initiatives (eg in R&D areas) ?

4.3 LENDING/SECONING COMPANY STAFF

- 4.3.1 What would be the advantages of lending or seconding some of our employees to higher education institutions from time to time ?
- 4.3.2 What would be the disadvantages (from the employee's and company's point of view) ? How can these be overcome ?
- 4.3.3 In what areas (managerial expertise, science and technology, others) would we have skills to lend ?
- 4.3.4 How will we find interested institutions ?
- 4.3.5 How will we encourage our staff to participate ?
- 4.3.6 What would be the maximum level of participation by individuals ? By the company as a whole ?
- 4.3.7 How does this relate to our objectives ?

4.4 GOVERNING AND ADVISORY BODIES

- 4.4.1 Which of our staff currently serve on councils or committees within higher education institutions (eg governing bodies) ?
- 4.4.2 Which of our staff currently serve on advisory boards and committees relating to higher education ? Covering what activities (curriculum development, careers service, etc) ?
- 4.4.3 Which of these activities are seen as most beneficial ? By the participants ?
- 4.4.4 How do we promote such service among our employees ?
- 4.4.5 What would be the benefits (direct and indirect) to the company from more involvement by employees ?
- 4.4.6 How does this relate to the objectives of our higher education policy ?

5 COURSES

5.1 JOINT VENTURES

- 5.1.1 To what extent have we jointly planned courses with higher education institutions ?
- 5.1.2 What do we offer in-house ?
- 5.1.3 How do we coordinate our in-house programme with what is available from higher education institutions ?
- 5.1.4 Could we have a cooperative programme for validating our in-house training through cooperation with a higher education institution ?
- 5.1.5 What would be the benefits of greater cooperation, including cooperation with partners from other countries ? How will we evaluate our participation ?
- 5.1.6 How do we find willing academic partners ?
- 5.1.7 What subjects do we want to emphasise ?

5.2 CONTINUING EDUCATION AND TRAINING

- 5.2.1 What sorts of continuing education do we buy from higher education ?
- 5.2.2 What do we offer in-house ?
- 5.2.3 How do we coordinate our in-house programme with what is available from higher education institutions ?
- 5.2.4 What areas do we want to develop ?
- 5.2.5 Is the expertise available in this country or should we seek it in cooperation with partners from other countries ?
- 5.2.6 How much will we spend ?
- 5.2.7 How do we encourage our employees to take advantage of open and distance learning ?
- 5.2.8 How do we become a better customer (more informed, more communicative) for continuing education ?
- 5.2.9 How will this meet our objectives ?

5.3 STAFF DEVELOPMENT

- 5.3.1 How many employees do we support (via paid fees, study leave, etc) to pursue higher education ? What does it cost ?
- 5.3.2 How much demand do we expect to see from employees ?
- 5.3.3 How do we encourage employees to pursue higher education courses ?
- 5.3.4 What subjects would we be willing to support ? How do we maximise choice for our employees ?
- 5.3.5 How do we take advantage of open and distance learning institutions ?
- 5.3.6 What use do we make of business schools ? How can we develop it ?
- 5.3.7 How does this relate to overall corporate objectives ?

6 BUILDINGS AND DONATIONS

- 6.1 What financial or other help do we give to higher education for its buildings ?
- 6.2 Assuming we found the right location, would we consider building one of our own facilities on a campus ?
- 6.3 Would we participate in a multi-company initiative to build on a campus, or otherwise contribute to an academic building programme ?
- 6.4 What donations do we make to higher education ?
- 6.5 How much should we expand our donation programme ? In what areas ?
- 6.6 What would be the benefits of a more active programme of donations ? How will we evaluate our programme ?

**POLICY AND STRATEGY FOR COLLABORATION
A SELECTIVE CHECKLIST FOR HIGHER EDUCATION INSTITUTIONS⁽²⁾**

1 MISSION, AIMS AND OBJECTIVES

- ▶ What parts of our mission have been defined for us by external bodies ?
- ▶ What parts of our mission have been defined by ourselves ?
- ▶ What are our principal objectives for the next planning period in terms of teaching, research and service ?
- ▶ To what extent are relationships with business likely to contribute towards achievement of these aims and objectives ?

2 AUDITING POLICY AND PERFORMANCE

- ▶ In what areas have we either under-performed or exceeded our planning targets during the current or recent planning period ? To what extent, if any, have relations with the relevant section of business been contributory to this outturn ?
- ▶ What changes in the external environment (e.g social, demographic, technological, political, fiscal), likely to affect our work in the next planning period, are relevant to our relations with business ?
- ▶ What is (a) our policy and (b) the current position with regard to the following :
 - business contributions to the planning of courses, to teaching, supervising and to assessing student performance
 - business support and sponsorship for students (including both national schemes and local arrangements)
 - staff secondments to and from business
 - academic and research posts endowed or supported by business, and the contracts on which such appointments are held
 - research, development and contract consultancy work undertaken for industry and the public sector
 - donations of equipment and services from industry or business
 - the terms on which academic units and individual staff members undertake consultancy and contract work for third parties, especially costing and pricing policy and practice
 - the ownership of intellectual property

² These checklists are based on work undertaken in the United Kingdom by the Council for Industry and Higher Education and the Department of Trade and Industry.

- access by industrial and other bodies to institutional facilities eg the library and on-line databases; the evaluation of computer hardware and software; specialised research equipment; language teaching centres
- the letting status and level of interactive activity with any science park or high technology development with which we are associated
- the financial and trading status of companies set up with our support or in the work of which groups of staff are actively engaged
- consultancy assignments undertaken ?

3 ASSESSMENT AND EVALUATION

- ▶ Is the overall pattern of existing collaboration consistent with our missions, aims and objectives ?
- ▶ Do existing forms of collaboration reflect our strengths or compound our weaknesses ?
- ▶ Do the forms of collaboration presently in place contribute to our financial viability, responsive capacity and academic reputation ?
- ▶ Are there some subjects and professional groups currently not in dialogue with business and without collaborative arrangements in teaching and research, but which have potential for fruitful forms of association ? What needs to be done to release this potential ?
- ▶ Are there gaps and deficiencies in administrative arrangements and in incentive and reward structures that currently inhibit effective working together ?
- ▶ Do our student admission policies give due weight to business experience and to non-standard qualifications ?
- ▶ What action is needed, and by whom, to ensure that we are not missing out on opportunities for working with business that will strengthen our academic and financial position and enhance our reputation ?

4 POLICY ON COSTING AND PRICING

- ▶ Is there an agreed policy on costing and pricing contract work, known to and understood by all staff, which takes account of its contribution to knowledge and long-run potential for royalty and other payments ?
- ▶ Are there suitable arrangements for giving advice to staff involved in negotiating projects ?
- ▶ Do appropriate formulae exist for the calculation of indirect attributable costs, and for the distribution of income between the individual, his or her department or other academic unit and central funds ?
- ▶ Have we available appropriate sources of legal advice on any risks and liabilities that contract work may entail ?
- ▶ Do we have in place quick-acting and detailed budgetary control systems, which require monthly departmental returns on achievement vs. budget under main cost

headings; rigorous credit control; effective bad debt recovery; prompt and efficient methods for preparation of quotations and strong central control of planned surpluses on contracts ?

5 POLICY ON INTELLECTUAL PROPERTY

- ▶ Do we have a policy on intellectual property that is known to and understood by all staff, and which takes account of comparable policy and practice elsewhere ?
- ▶ Is this policy incorporated into staff contracts and conditions of service ?
- ▶ Is it understood that students involved in the development and exploitation of intellectual property are to be treated on the same basis as members of staff ?
- ▶ Is authoritative advice available to members of staff at each stage in the process of identifying, developing and exploiting intellectual property ?
- ▶ Are there means for resolving any disputes that may arise between individuals and with the institution concerning the ownership of and distribution of income from intellectual property ?

6 POLICIES FOR ENTERPRISE

- ▶ In what ways do our senior members seek to encourage closer and more effective relations with business ?
- ▶ Are academic units expected to report upon current activity and make known their plans for working together with business ?
- ▶ Are our practices in respect of academic advancement and recognition consistent with our policies on industrial collaboration ?
- ▶ Are individuals and academic groups rewarded for success in working with business through internal resource distribution or other means, in ways that motivate them to further successful effort ?
- ▶ Do our policies in this field take account of the experience of and attitudes to business that students bring with them from school, college or employment, and how these affect their expectations of higher education and of employment ?
- ▶ Are our students brought into contact with facilities for vocational guidance at a sufficiently early stage ? Do such services assist students to formulate career intentions that are realistic in terms of personal capacity and external opportunity ?
- ▶ Do we have in place staff development programmes that encourage teaching and supervisory practices consistent with the development of transferable skills, self directed learning, clear perceptions of individual strengths and weaknesses, and the ability to make decisions and accept personal responsibility ?
- ▶ Do students have opportunities for extra-curricular activities that enhance their employability and subsequent work satisfaction ?
- ▶ Are men and women working in business actively involved in the governance, teaching, research and service activities of our institution ?

7 STRATEGY AND STRUCTURE

- ▶ Are effective arrangements in place for industrial liaison and the stimulation of business contacts ?
- ▶ Are we effective in marketing our strengths and making known to potential collaborators ways in which we can help their businesses ?
- ▶ Have the costs and benefits of maintaining and establishing wholly owned or partnership companies to undertake particular activities been fully calculated and the results of these calculations acted upon ?
- ▶ Is our current and planned involvement in any property-based development of such nature as to encourage interactions that have positive academic and financial benefits ?

8 STRATEGIES FOR QUALITY

- ▶ Do we have a quality policy that embraces all aspects of our work and which encourages individuals to take direct responsibility for the quality of their own performance ?
- ▶ Are our procedures for the recruitment, motivation, assessment and development of staff consistent with our quality commitments ?
- ▶ Do we call upon men and women from business to help us in the assessment of our performance and in maintaining standards appropriate to our objectives ?
- ▶ Have we considered what relevance the concept of 'zero-defect' might have for our work, especially in our relations with business ?
- ▶ Can we offer quality in project management of a kind that carries conviction with our business partners and collaborators ?

REVIEW OF NATIONAL EXPERIENCE

The following section gives a brief review of key aspects of experience regarding higher education - industry cooperation at Member State level. The review looks at the following six aspects :

1	<p><i>Specific legislation promoting higher education - industry cooperation</i></p> <p>What specific legislation or national policy exists to promote higher education-industry cooperation?</p>
2	<p><i>Specific programmes promoting higher education - industry cooperation</i></p> <p>What national schemes and programmes exist to promote cooperative activities between higher education and industry?</p>
3	<p><i>Main developments in higher education</i></p> <p>What trends are there in <u>higher education</u> to become more actively engaged with industry in education and training activities (eg industry liaison offices, financial incentives, changing contractual conditions for higher education staff)?</p>
4	<p><i>Main developments in industry</i></p> <p>What trends are there in <u>industry</u> to become more actively engaged with higher education regarding their developments in education and training activities (eg policies for cooperation, training schemes based on greater use of higher education expertise)?</p>
5	<p><i>Investment by industry in higher education</i></p> <p>What data exists on the financial investment made by industry in higher education?</p>
6	<p><i>Other key points</i></p> <p>Any other major considerations which should be taken into account in assessing the national situation.</p>

These national snapshots are based on more extensive reviews undertaken by national experts for the specific purpose of assisting the Commission in the preparation of this document.

National experience : Belgium

1 *Specific legislation promoting higher education - industry cooperation*

- There is no specific legislation which regulates or promotes university-enterprise cooperation.
- Belgian constitutional decentralisation gives the regions, rather than central government, a direct promotional role in the establishment of University-enterprise links. This can impede the effectiveness of certain EC university-enterprise initiatives within Belgium due to the frequent EC requirement of dealing with the so called "national" authorities. This may have more effect on the research rather than education aspect of cooperation.

2 *Specific programmes promoting higher education - industry cooperation*

- IRSIA/IWONL (The Institut pour l'encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture) had the constitutional goal of promoting closer collaboration between universities, research centres and industry. This body has financed numerous individual programmes containing both university and enterprise partners. The institute sponsored (at 50 %) applied research in industry, often with the involvement of university partners. Currently this activity is being passed on to regional Flemish and francophone institutes which operate under similar conditions.
- The Industry-University Foundation actively promotes and develops industry-university cooperation in the area of management.
- Institutes of Engineers, mainly in the Flemish Continuing Training institutions hold numerous courses per annum for their members.
- There are 11 Joint Research Centres which manage 19 laboratories engaged on research activities partly financed by industrial interests, but closely linked to university departments.
- The National Council for Scientific Policy is a permanent committee composed of both university and enterprise members, with the mandate of debating strategy issues involving the cooperation of the two parties.
- Individual regions in Belgium have launched and financed their own technology promotion programmes such as DIRV in Flanders or Athena in Wallonia.

3 *Main developments in higher education*

- According to national law, universities have three aims : - teaching, research and scientific services. The State will fund only the first two activities. University teaching staff can engage in external consultancy work for up to 20 % of their spare professional time. Non-university higher education establishments are charged only with teaching and therefore their statutes do not cater for external activities of consultancy by their staff.
- Flemish legislation includes both "postgraduate training" and "continuing training" among the basic funded activities for universities.
- The value of research carried out in the higher education establishments funded by industry is steadily increasing.
- Each university has created its own organisation - usually internal - to manage the interface with industry; the role of these interfaces is largely to coordinate the running of science parks, commercialisation of technology property rights, and the setting up of business incubator services. These organisations have no teaching brief.
- The planning of an industrial placement period as part of the training programme is not widespread in universities. Most often, placements occur in short business

management training courses. Placements are growing in importance in the non-university higher education sector, in particular in the engineering schools.

4 *Main developments in industry*

- The industrial sector was at the base of the Industry-University Foundation, created in 1956 with the aim of promoting cooperation with higher education establishments with particular reference to their unquestioned strategic role of producing the training activities for middle and higher management. Initially exclusively focused on management education, the Foundation seeks to develop a systematic approach to govern the role of universities in their continuing education role.
- The industrial associations have a well-established role of being centre of debate and proposal for vocationally based training activities. However, with the exception of the engineering associations, there is little focus on higher education.
- There is some industrial representation on the management boards of the higher education establishments.
- The presence of enterprise personnel on the teaching staff of higher education establishments is relatively common - particularly in the non-university higher education sector.
- Some larger industries have created specialised personnel to manage the rapport with the universities, mainly in the research area.

5 *Investment by industry in higher education*

- The majority of the investment by industry in university is through indirect means involving, largely, bearing the costs of equipment for combined research purposes.
- Although there are no official figures, the approximate contribution by industry in the research budgets of the higher education establishments can be estimated at being around 10 % in 1990-1991.

6 *Other key points*

- The Belgian system of decentralised legislation results in there being substantial inequality between effective legislation and opportunity among the various regions.
- A secondary effect of the above regionalisation is the existence of a substantial amount of micro-level collaboration between the two partners, which is difficult to measure.

COMETT IN BELGIUM

COMETT I

Projects accepted : 90

Outputs produced : 52 materials, 85 courses, 6 studies, 2 newsletters, 4 databases

COMETT II (1990 + 1991 + 1992)

Projects accepted : 5

Budget allocated : ECU 6,576,828

UETPs : 2 regional, 4 sectoral

Students : 578 received, 555 sent

Projects dealing with short training courses : 20

Joint training projects : 12 + 2 Pilot projects

Organisations participating in accepted projects : 282 enterprises, 84 universities, 212 other organisations and 6 UETPs

National experience : Denmark

1 *Specific legislation promoting higher education - industry cooperation*

- 1990 Law on Promotion of Industry (N° 394) established the legal framework for increasing the cooperation between private industry and public research institutions.

2 *Specific programmes promoting higher education - industry cooperation*

- Due to historic hostility of higher education establishments towards the private sector from the 1960's recent government policy has set up Technological Service Networks. These are independent institutions which receive their incomes from the sale of knowledge and research-intensive services to industry. They often provide the services which are commonly performed by higher education establishments in other EC countries.
- Ministry of Education and Research has strongly argued for a formal representation of industry in education establishments, in particular on the boards of management. So far, little has been formally achieved.
- Industrial Researcher Scheme offers economic support for about 50 Ph.D students per year who are working on projects involving cooperation between a private company and a higher education establishment.
- Danish Research Academy finances postgraduate students who are engaged on Ph.D research in private companies.
- Danish Centre for I.T. Research and Education established in 1985 to promote the application of I.T. knowledge in public research institutions and private companies.
- The Research for technological Development Programme (1984-88) had a budget of 25 MECU to promote university-industry relations.
- The Bio-technology programme (1987-90) had a budget of 50 MECU to establish 13 centres for cooperative research.
- Other R&D programmes in materials, networks, food technology, environmental technology, clean technology, agricultural production the general Technological Development Programme were and/are designed to have increased cooperation between the partners as a spin-off.

3 *Main developments in higher education*

- Higher education establishments enjoy substantial degree of self government. Therefore the links with industry tend to be personalised.
- Many higher education establishments offer in-service training for companies. These arrangements vary from the offering of a part-time degree to the organising of short, intensive ad-hoc courses for individual clients.
- Engineering schools in Copenhagen and Aalborg have created formal units for R&D on a cooperative or consultancy basis which enjoy, therefore, income from external sources.
- Four science parks have been created on university campuses. They are governed by independent boards including representation from private industry and have proved successful instruments for promoting synergy.
- Most universities have liaison officers ensuring the development of links with local private industry.

4 *Main developments in industry*

- Private companies do have links with higher educational establishments, however, these tend to be extremely personalised by nature.

5 *Investment by industry in higher education*

- The only data which exists shows the presence of private company funding for R&D projects performed at higher educational establishments. This is extremely low, however, over the last 10 years it has grown from less than 1 % to nearly 2 %.

COMETT IN DENMARK

COMETT I

Projects accepted : 35

Outputs produced : 19 materials, 17 courses, 7 studies, 3 newsletters

COMETT II (1990 + 1991 + 1992)

Projects accepted : 47

Budget allocated : ECU 4,439,442

UETPs : 3 regional, 2 sectoral

Students : 421 received, 528 sent

Projects dealing with short training courses : 9

Joint training projects : 9 + 2 Pilot projects

Organisations participating in accepted projects : 175 enterprises, 70 universities, 92 other organisations and 4 UETPs

National experience : Germany

1 *Specific legislation promoting higher education - industry cooperation*

- The third version of the "Hochschulrahmengesetz" (Framework Law on Higher Education), 1985, confirms that the higher education system consists of various types of higher education institutions (e.g. universities and "Fachhochschulen").
- This version contains information on externally funded research and facilitates practical application.

2 *Specific programmes promoting higher education - industry cooperation*

- The "BMFT" programme (Bundesministerium für Forschung und Technologie) promotes cooperation between industry and higher education and funds training for technology transfer specialists who will work in industry (duration of programme : 1984-1991).
- The "Personalkosten-Zuschußprogramm" (Personnel costs/grants programme), run by the Bundesministerium für Wissenschaft (Ministry of Science) and the Bundesministerium für Forschung und Technologie (Ministry of Research and Technology). Introduced in 1985, this programme appoints R&D personnel to small and medium-sized companies.
- Under the BMFT programmes, funding is also available for university-enterprise consortia.
- Within the framework of the 1986-88 project to promote higher education-industry cooperation, the Bundesvereinigung deutscher Arbeitgeberverbände - a consortium of regional training associations, initiated a number of projects and schemes to bring local partners together.

3 *Main developments in higher education*

- By 1986, 49 higher education institutions had become involved in technology transfer. Some 28 of these institutions have offices with full-time staff while 21 of them carry out activities on a part-time basis with the help of experts. Some institutions offer advisory and consultancy services at faculty level.
- Partners cooperated via national networks of research centres and were jointly funded by several government sources (both national and federal). They also received funding from private institutions (e.g. from the Max-Planck Institute or the Fraunhofer Gesellschaft).
- In the areas of research, technology transfer, student placements, continuing education and training, Fachhochschulen established good regional and industry-related contacts.
- Creation of private higher education institutions based on market needs and income generation.
- Increasing development of study programmes with integrated placements in industry. In some Länder these are supported by Länder-based coordinating offices.
- Increased promotional and information activities targeted specifically at industry (e.g. trade fairs, handbooks designed to document R&D processes etc).
- Widespread individual contacts between professors and industry, including areas such as commissioned research, consultation/advisory services, evaluation, use of equipment, transfer of research results, etc.
- There are technology transfer offices in some 60 universities in the old German Länder and 20 in the new Länder. Eight universities have particular responsibilities while a further 25 universities have appointed a contact person to deal with technology transfer even if they have no dedicated office facility. Eleven regional institutes have been set up in private organisations with responsibility for technology transfer at a

Länder level. There are 12 technology transfer offices in trade unions premises, many of which have links with universities.

4 Main developments in industry

- A number of Chambers of Commerce and Industry have cooperation agreements with higher education institutions (particularly with Fachhochschulen), covering study/teaching, research, continuing education and technology transfer.
- Increased participation in European partnerships related to EC programmes (COMETT, ERASMUS, PETRA, SPRINT).
- Individual activities such as major national symposiums (e.g. BDI or IDW), guest lectures, continuing training events, use of higher education staff as experts, etc.
- The Bundesverband der Deutschen Industrie - BDI (Confederation of German Industry) supports the creation of new faculties in the new Länder. The BDI also sponsors programmes for young scientists.
- Several important industry-initiated foundations and research associations (e.g. AIF), have broad-ranging programmes which can provide financial support for higher education and industry cooperation (particularly in the field of research).

5 Investment by industry in higher education

- Industry's contribution to research activities in higher education is varied and ranges from 2 or 3 % of external funding (estimated by the Wissenschaftsrat (Science Council) in 1986) to just over 15 % (Wissenschaftsrat study on external funding, 1986).

6 Other key points

- Major developments have been achieved through individual contacts and cooperation agreements with established structures.

COMETT IN GERMANY

COMETT I

Projects accepted : 126

Outputs produced : 73 materials, 208 courses, 6 studies, 2 newsletters, 1 databases

COMETT II (1990 + 1991 + 1992)

Projects accepted : 205

Budget allocated : ECU 17,043,754

UETPs : 19 regional, 8 sectoral

Students : 2,213 received, 1,702 sent

Projects dealing with short training courses : 47

Joint training projects : 31 + 4 Pilot projects

Organisations participating in accepted projects : 1,450 enterprises, 322 universities, 473 other organisations and 27 UETPs

National experience : Spain

1 *Specific legislation promoting higher education - industry cooperation*

- In 1983, the Ley de Reforma Universitaria (LRU) established the framework for the universities to collaborate fully with the private sector both for research and for teaching projects subject to the particular statute which governs each individual university.
- This legislative position was developed further in laws of 1984 and 1986 which officially sanctioned teaching staff participation in joint university-enterprise activities.
- In 1986, the Ley de la Ciencia established that the forthcoming National Plan for technological development would actively promote not only communication but also concerted action between the public and private sectors.
- In 1988, the Plan Nacional de Investigacion Cientifica y Desarrollo 1988-91 was published. The National Plan involved both university and enterprise collaborating in direct contact.
- Government legislation, and in particular the Plan General de Contabilidad, encourages R&D activities among enterprise through a system of fiscal advantages.

2 *Specific programmes promoting higher education - industry cooperation*

- Following the publication of the National Plan, the Government set up Oficina de Trasferencia de Resultados de Investigacion (OTRIs) to be the interfaces between the various public and private actors in R&D activities. The primary objective of the OTRIs is to appreciate the commercial potential of technological development emanating from research centres and transfer the know-how to enterprise. In the first two years of the National Plan, 53 "Oficinas" were set up - mostly sited in the universities. The OTRIs have been a most successful programme, working predominantly (61 %) in the field of R&D, and handling 6.000 contracts in 1991 for a value of 19.972 Mpts.
- The State has sponsored the development of a database by the name of DATRI for the coordination of the supply and demand market for technological development and its commercialisation. This database is available for all SMEs on subscription from the national association of SMEs.
- The PETRI programme encourages short term industrial application of R&D technological advance. This programme co-funds the necessary feasibility studies to ensure successful industrial implantation of the development.
- The "Proyectos Concertados" programme promotes R&D activities on behalf of enterprise and, principally, the national research organisations.
- The National Plan promotes the exchange of research personnel between research centres and industry. This initiative is also designed to stimulate the development of research units located in enterprise.

3 *Main developments in higher education*

- Postgraduate doctoral theses in R&D areas are increasingly prepared based on direct industrial experience, particularly in the research units of enterprises. In 1989-90 137 doctoral theses were prepared following these guidelines.
- The higher education establishments are developing placement sequences as part of their training curricula for undergraduates. In 1990 some 900 students benefitted from direct enterprise placements.

4 *Other key points*

- In 1973, due to the obstacles which both universities and enterprises felt were preventing profitable cooperation, the concept of the Fundacion Universidad-Empresa was launched. The role of the Fundacion is to be a prepositive interface between the two parties centred in a particular geographical area. The first one to be created was the FUEM at Madrid in 1973, and, since then, there have developed similar initiatives in all the major university cities of the country.

COMETT IN SPAIN

COMETT I

Projects accepted : 122

Outputs produced : 51 materials, 84 courses, 16 studies, 6 newsletters, 3 databases

COMETT II (1990 + 1991 + 1992)

Projects accepted : 137

Budget allocated : ECU 11,350,338

UETPs : 12 regional, 6 sectoral

Students : 590 received, 1,509 sent

Projects dealing with short training courses : 29

Joint training projects : 20 + 2 Pilot projects

Organisations participating in accepted projects : 802 enterprises, 155 universities, 389 other organisations and 15 UETPs

National experience : France

1 *Specific legislation promoting higher education - industry cooperation*

- Reforms in 1969 (loi Edgar Faure) and 1984 (loi Savary) institutionalised relations between universities and enterprise. In particular, industrial presence was made possible both on the management boards and among the teaching staff of the universities.
- The universities are permitted by law to create other public or private organisations with industrial partners.
- A legal framework allowing university teaching staff to be seconded into enterprise has also been developed.
- University teaching staff are legally allowed also to work for third parties. Furthermore, should the staff, either teaching or management, participate in external contracts on behalf of the university, then they can receive financial recognition for those services.
- In 1982 the government sanctioned the creation of Groupements d'Interêt Public (GIP) with the object of allowing the cooperation of university and enterprise in common organisations, above all on research programmes. An example is PROMIP at Toulouse involving the Institut National Polytechnique de Toulouse and the CNRS.

2 *Specific programmes promoting higher education - industry cooperation*

- Since 1967 the national agency for the promotion of research and technology transfer (ANVAR) has been set up to ensure the organisational and commercial success of the university-industry rapport. ANVAR has significantly contributed to the widespread creation of private companies or associations which the higher education establishments have set up to exploit the commercial potential of their research activities and know-how.
- Various consultative committees have been established to ensure continuity in the relationship between university and enterprise. In 1986 the permanent Haut Comité Education Economie (HCEE) was founded to oversee this relationship. There is also the Conseil National de l'Enseignement Supérieur et de la Recherche (CNESER), la commission des titres d'ingénieur (CTI), and the commissions professionnelles consultatives (CPC) which play influential roles in this area.
- The "conventions industrielles de formation par la recherche" (CIFRE) financially encourages enterprise to sponsor research leading to doctoral thesis by young engineers with a view to their employment following the period of research. 700 of these grants were awarded in 1991.
- the "conventions de formation des techniciens supérieurs" (CORTECHS) encourage industrial concerns to sponsor graduates for short training courses.
- The "pôles de formation des ingénieurs par la recherche technologique" (FIRTECH) encourages the cooperation of university and enterprise to increase the number of engineers trained through research activities and to expand the amount of technological research carried out in collaboration with enterprises. 30 such poles were created between 1984 and 1989.

3 *Main developments in higher education*

- Several universities, such as Grenoble and Compiègne, have signed agreements with enterprises either to formalise "partnership", or for the sponsorship of particular vocational training courses.
- There is enterprise presence on pedagogical committees which determine the content and the recruitment market value of vocationally targeted training courses.

- The 1987 Law concerning Apprentissage has established the framework for periods of apprenticeship in secondary level technical training programmes, and in particular in courses for engineers.
- Although industrial placement is already an obligatory requirement in the vast majority of technical, engineering and business studies courses, higher educational establishments have recently developed courses involving industrial "stages" for up to 50 % of the study period. This type of experimentation has received substantial encouragement from the ministerial circles.
- Universities have recently established services to cater for the created demand for continuing education from enterprise. Due partly to developments initiated by legislation in 1971, and partly also to the regulation of continuing education since the governmental decree of October 1985, the market for this sector of training has boomed from FF200 million in 1980 to FF617 million in 1989. The number of students has grown accordingly from 130.000 to 250.000 in the same period.

4 *Main developments in industry*

- The majority of the larger enterprises have developed a specific department and have a "campus manager" to deal with universities, and in particular with the arrangement of stages.

5 *Investment by industry in higher education*

- Enterprises are required by the "loi d'Apprentissage" to contribute 0.6 % of their personnel costs towards the institutional costs borne by organisations which deliver vocational training programmes. The enterprises themselves choose the establishment which will receive their grant. 30 % of the generated funding goes into higher education, of which 64 % is handled by private educational establishments.
- Industry also invests in higher education through the acquisition of university services such as research, use of laboratories etc, and also by the hosting of placements. Some of the larger enterprises also finance particular courses of secondary level study and even academic chairs.
- The global investment of industry in public higher education establishments in FF1.4 billion in 1990, out of a total budget for public institutions offering initial or continuing training activities amounting to FF34.5 billion. The funding given by industry for continuing education activities amounts to 31 % of the resources of the universities. Industrial financing of the university services grew by 20 % from 1988-89.

COMETT IN FRANCE

COMETT I

Projects accepted : 359

Outputs produced : 178 materials, 137 courses, 36 studies, 6 newsletters, 7 databases

COMETT II (1990 + 1991 + 1992)

Projects accepted : 307

Budget allocated : ECU 22,320,785

UETPs : 21 regional, 10 sectoral

Students : 2,197 received, 2,208 sent

Projects dealing with short training courses : 70

Joint training projects : 48 + 4 Pilot projects

Organisations participating in accepted projects : 1,944 enterprises, 740 universities, 975 other organisations and 31 UETPs

National experience : Greece

1 *Specific legislation promoting higher education - industry cooperation*

- There is no general legislative framework to facilitate industrial cooperation except in the specific area of research projects.
- Government is currently involved in development of a national vocational training structure in polytechnics.
- The Greek government has declared its intention under various policy issues concerning development, industry, decentralisation and the role of universities, to create a new environment of collaboration between the worlds of industry and academia.

2 *Specific programmes promoting higher education - industry cooperation*

- In 1977, the General Secretariat of Science and Technology (GGET) was created to organise funding of research, development of technological innovation and transfer. Secretariat was originally called Ministry of Research, but later became an agency belonging to the Ministry of industry, Energy and Technology.
- In 1987, the government programme for Industrial Research "PAVE" was launched. The programme was subdivided into funding for both applied and technological research and another funding innovation. In 1990, 134 proposals were funded for a total of 6.2 MECU.
- The GGET coordinates National Research Programme - a funding mechanism for research proposals by universities, research centres and/or industry. A "research budget" established in all the universities through which all the external funds for research can be administered allowing industry directly to finance a university-based research programme.

3 *Main developments in higher education*

- Greece has 17 universities offering, on the whole, formal structured curricula administered with a strict intra muros policy, which does not easily recognise the demands of industry. This policy is, however, becoming more liberal as Greece adopts a more "American" system.
- In the last 20 years there has been an ambitious programme to create Polytechnics oriented towards practical studies with the mandate to create intermediate level technicians for business, industry and administration.
- Little funding and facilities are available for postgraduate research - especially in the engineering schools. However, a recent law provides for the organising of structured postgraduate studies in all the Universities.

4 *Main developments in industry*

- On the whole, Greek industrialists still tend to view the academic world with some suspicion.
- The last 30 years has seen a rapid growth away from a largely agriculture based economy to an urban society with strong industrial and tertiary sectors. The industrial map of the country is still highly volatile and, by nature, does not command the necessary capital to make substantial long-term investments based on university-enterprise collaboration.
- More than 40 % of employment is in the tertiary sector and in particular in tourism. Greek industry is typically small in size with low technological input and limited

technological innovation. International industry, such as pharmaceuticals, tends to be dominated by multinational capital and therefore imported know-how.

- The Federation of Greek Industry has declared their intention to create a new environment of collaboration with universities in order not to miss the technological revolution. This is, at least, creating the rhetoric of change.

5 *Investment by industry in higher education*

- Industry is traditionally very reluctant to invest in research projected developed by the Greek higher education structure.

COMETT IN GREECE

COMETT I

Projects accepted : 105

Outputs produced : 49 materials, 79 courses, 4 studies, 2 newsletters, 1 database

COMETT II (1990 + 1991 + 1992)

Projects accepted : 117

Budget allocated : ECU 8,781,914

UETPs : 7 regional, 7 sectoral

Students : 647 received, 967 sent

Projects dealing with short training courses : 29

Joint training projects : 16 + 2 Pilot projects

Organisations participating in accepted projects : 471 enterprises, 93 universities, 202 other organisations and 14 UETPs

National experience : Ireland

1 *Specific legislation promoting higher education - industry cooperation*

- Existence of different sectors of higher education system (university sector, of which former National Institutes of Higher Education (NIHE) are now a part) and vocational training sector (regional technical colleges)
- Constitutions of HEIs specifically provide for consultancy, applied research, and other commercial activities
- Tax relief is given to encourage investment in R&D, patenting of inventions, and payments to higher education institutions for specified research and training activities.

2 *Specific programmes promoting higher education - industry cooperation*

- In the early 1980s the National Board for Science and Technology generated the National Science and Technology Programme. It initiated changes in the basis of apportioning funding by focusing on precompetitive research in areas of strategic importance for industrial development, such as information technology.
- The Department of Industry and Commerce has created EOLAS (the Irish Science & Technology Agency), which aims at encouraging higher education industry cooperation, and provides support for research and industrial liaison offices. Under the EOLAS scheme in 1992, 80 companies will receive 50 % of the costs of sponsoring a graduate undertaking a Masters Programme by research into an aspect chosen by the enterprise.
- The industrial development Authority (IDA), another creation of the Department of trade and Commerce, provides support for innovation centres and start-up companies
- The ERDF (Irish Programmes with EC Regional Development Fund Support) for :
 - Programmes in Advanced Technology (PATs) : funding for development of critical mass of expertise, equipment and facilities in technology niche areas
 - Higher Education - Industry Cooperation Scheme : co-funding of collaborative R&D between HE and industry
 - Applied Research Programme : the development of R&D capability in the vocational education colleges
 - Industrial Liaison Officer Programme : pump-priming funding of establishment of Industrial Liaison Offices in vocational training sector
 - Placement Programmes : Techstart and Technology Management Programme for transfer of skilled personnel into firms
 - Regional Infrastructure Development : for development of campus infrastructure (eg buildings for regional centres of expertise)

3 *Main developments in higher education*

- Industrial Liaison Offices have been created in most third level colleges, generally accompanied by Industrial Liaison Committees or Industry Advisory Boards
- National network of Industrial Liaison Officers (linked to UK UDIL organisation) has been launched
- Most universities have developed supportive policies and procedures for establishment of campus companies to commercialise ideas arising from research programmes, or to commercialise university services in a particular technology area. some universities have developed holding companies specialising in licences and patents. Other universities offer incubator facilities for developing SMEs.
- Policy move towards strategic research support, thereby encouraging industry linkage
- Specific policies for commercial exploitation (eg intellectual property policies)
- Growth of continuing education and training on a commercial and collaborative basis

- Legislation currently under consideration before the Irish Parliament will give the regional Technical Colleges substantial autonomy and formally legalize their research and commercial activities.

4 *Main developments in industry*

- Participation in Governing Boards of newer universities and of vocational training colleges
- Support of specific initiatives (eg scholars' programmes, endowed chairs) such as, most notably, the Smurfit funding of the Graduate School of Business at University College Dublin.
- Location of industry R&D activities on university campuses
- Participation in curriculum development and validation through collaboration in the NCEA (National Council for Educational Awards)
- Increased participation in student placement schemes (estimated 1700 placements annually)
- Gifts for specific major facilities at HEIs
- Increased participation by chambers of commerce and industry associations in various cooperative programmes
- Many companies provide sponsorship for their employees to attend Masters Programmes such as MBA and Master in Industrial Engineering.

5 *Investment by industry in higher education*

- (Only published data relates to R&D) Industry contribution to R&D expenditure by higher education rose from 7.2 % in 1986 to 8.5 % in 1988
- It is estimated that the total amount of private funding of projects for the development of facilities in the public sector has totalled over £50 million in recent years.

COMETT IN IRELAND

COMETT I

Projects accepted : 50

Outputs produced : 8 materials, 50 courses, 5 studies, 1 newsletter ...

COMETT II (1990 + 1991 + 1992)

Projects accepted : 81

Budget allocated : ECU 6,134,498

UETPs : 3 regional, 2 sectoral

Students : 594 received, 722 sent

Projects dealing with short training courses : 15

Joint training projects : 12 + 2 Pilot projects

Organisations participating in accepted projects : 293 enterprises, 42 universities, 89 other organisations and 5 UETPs

National experience : Italy

1 *Specific legislation promoting higher education - industry cooperation*

- In 1980 the Italian government passed the 382 law regulating the presence of private industry in the universities through activities of R&D. The law also proposed a framework through which university staff could receive remuneration for such extra-curricular activities.
- In 1985 the 705 law established the framework for the presence of the universities in consortia and research companies.
- In 1990 and 1991 the government legislation regulated private sector involvement in teaching duties in the universities and also encouraged the universities to offer more targeted vocational courses.

2 *Specific programmes promoting higher education - industry cooperation*

- The Three Year Development Plan 1987-89 budgeted 33 MECU for the development of cooperation between university and enterprise.
- The Three Year Development Plan for S. Italy 1990-92 also encouraged the development of cooperation above all in the sphere of Science and Technology Parks.

3 *Main developments in higher education*

- Universities consider that 63 % of the collaboration they have with private enterprise is through R&D projects, while 10 % is through consultancy activities.
- Most universities have industrial liaison offices.
- Universities have established offices with responsibilities for R&D, European Programmes and student mobility.
- Most universities collaborate in R&D consortia.

4 *Main developments in industry*

- Private companies consider that 44 % of the collaboration they have with universities is on R&D projects, 12 % on consultancy and 11 % on mobility grants.
- In 1990, the Confindustria established an agreement with MURST to regulate university career guidance, innovation of teaching curricula, development of targeted short diploma courses and vocational post-secondary level training courses and R&D.
- Many of the larger companies have developed university liaison executives which specialise in the establishing R&D contracts, student mobility demands and supplying products to the university market.
- All local Industrial Associations have offices which manage their relations with higher education establishments in the area.

5 *Investment by industry in higher education*

- In 1987 universities received 4.7 % of their funds from contracts with third parties, mainly industry.
- In 1986 only 0.53 % of the total industrial budget for R&D was awarded to universities. In over 75 % of these cases the individual research contract was worth under 6.500 ECU.

6 Other key points

- Two of the major universities in Italy (Bocconi, LUISS) are the result of private industry-based entrepreneurial initiative private and are not, therefore, State organisations.

COMETT IN ITALY

COMETT I

Projects accepted : 99

Outputs produced : 89 materials, 151 courses, 20 studies, 4 newsletters, 8 databases

COMETT II (1990 + 1991 + 1992)

Projects accepted : 160

Budget allocated : ECU 13,417,108

UETPs : 13 regional, 6 sectoral

Students : 1,194 received, 1,177 sent

Projects dealing with short training courses : 38

Joint training projects : 32 + 2 Pilot projects

Organisations participating in accepted projects : 760 enterprises, 141 universities, 454 other organisations and 19 UETPs

National experience : Luxembourg

1 *Specific legislation promoting higher education - industry cooperation*

- There is a need to take full account of the special situation of a Luxembourg, where the range of industrial activity as well as the scale of its higher education provision is limited.
- Creation in 1987 (through the Law on Research and Development) of Public Research Centres ("centres de recherche publics") within the Centre Universitaire de Luxembourg and the Institut Supérieur de Technologie. These centres have autonomous status and legal personality and have as their mission to create competence centres able to effect technology transfer to industry.

2 *Specific programmes promoting higher education - industry cooperation*

- No specific programmes other than the activities of the Public Research Centres (described below), covering technology transfer, high-level industrial training, and training grants for researchers.

3 *Main developments in higher education*

- There are limitations on the capacity of higher education institutions to engage in cooperative activity in so far as they have no separate legal status and are therefore unable to enter into contractual obligations in this area. A study is in course on the organisation of higher education in Luxembourg, where the legal framework for extended higher education activities will be examined.
- Public Research Centres ("centres de recherche publics") within the Centre Universitaire de Luxembourg and the Institut Supérieur de Technologie. These centres have autonomous status and legal personality and have as their mission to create competence centres able to effect technology transfer to industry (which is carried out by means of specific agreements between the centres and the industries concerned). Industry is widely represented on the governing bodies of these centres.
- Creation, in cooperation with industry and the services sector, of new 2-year training cycles at post-secondary level, leading to the BTS qualification.

4 *Main developments in industry*

- Despite recent difficulties as a result of the recession, the cooperative activities with the Public Research Centres are now beginning to bear fruit.

COMETT IN LUXEMBOURG

COMETT I

Projects accepted : 5

Outputs produced : 17 materials, 27 courses, 4 studies, 1 newsletter

COMETT II (1990 + 1991 + 1992)

Projects accepted : 5

Budget allocated : ECU 1,085,000

UETPs : 1 regional

Students : 38 received, 6 sent

Projects dealing with short training courses : -

Joint training projects : 3 + 1 Pilot project

Organisations participating in accepted projects : 19 enterprises, 4 universities,
20 other organisations and 1 UETP

National experience : Netherlands

1 Specific legislation promoting higher education - industry cooperation

- The higher education sector is divided into university (WO) and higher vocational training (HBO) sectors
- Community service is explicitly mentioned in 1986 Laws on higher education as one of higher education's objectives (Government concern for accessibility of scientific knowledge and for relationship between higher education and labour market)

2 Specific programmes promoting higher education - industry cooperation

- Scheme for collaborative development of postgraduate university courses
- Foundation for Technological Research (STW) subsidies for research of high commercial value
- Ministry of Economic Affairs has two large programmes : Innovation-directed Research Programmes (stimulating technological research) and Programmatic Enterprise-directed Technological Stimulation (PBTS) (assisting collaborative development of new commercial products)
- Ministry of Education agreements on specific collaboration (eg stimulation of student interest in science).
- Internship programmes within degree programmes of both HBO and university institutions
- Special 2-year vocationally focused training programmes have been developed, especially in the technology sectors such as engineering, involving the Ministry of Education and Science - KIVI - RCO.

3 Main developments in higher education

- In HBO sector (vocational higher education sector) Board members and vocational committees often include industrialists
- Increased use of quality assessment schemes which include peer group and industry review
- Coordinators for internship programmes in HBO institutions and (where there are internship programmes) in universities
- Industrial Liaison Offices in most HBO institutions (some cooperating with liaison offices of nearby universities, some integrated into local chambers of commerce)
- Industrial Liaison Offices/Transfer Points in universities
- Permanent education programmes in expansion in both higher education sectors
- Exchange chairs and guest teacher provision in universities
- "Integrand" scheme organised by students as brokerage for industry-based projects for students.
- In HBO sector 6 month-1 year industrial student placements are an obligatory part of the curriculum. Such placements are less frequent and, when they occur, shorter in WO sector.
- The reduction from 5 to 4 in graduate study years in engineering degrees has decreased the importance of the role of industrial placements.

4 Main developments in industry

- Funding of professorships and guest tutorships in higher education institutions
- Receipt of internship and vocational training project students
- Funding of trainee research assistantships (salary and equipment)
- Supply of equipment for contract research

- Large companies have specific officers concerned with contact with higher education

5 *Investment by industry in higher education*

- Total flow of "third" funds to university budgets rose from 7.3 % in 1985 to 10.8 % in 1988
- Percentage of total industry R&D budget allocated to universities has remained fairly constant between 1986 and 1989 at about 0.30 %

6 *Other key points*

- National level contact and dialogue between national bodies (eg RCO, VSNU, HBO-Council, Ministry of Education and Science)
- Financial retrenchment has placed more pressure on higher education to generate additional income from other sources

COMETT IN THE NETHERLANDS

COMETT I

Projects accepted : 83

Outputs produced : 26 materials, 74 courses, 4 studies, 4 newsletters, 1 database

COMETT II (1990 + 1991 + 1992)

Projects accepted : 90

Budget allocated : ECU 7,658,939

UETPs : 3 regional, 6 sectoral

Students : 825 received, 693 sent

Projects dealing with short training courses : 16

Joint training projects : 15 + 3 Pilot projects

Organisations participating in accepted projects : 389 enterprises, 106 universities, 239 other organisations and 8 UETPs

National experience : Portugal

1 *Specific programmes promoting higher education - industry cooperation*

- In 1980 the INESC (Institute for Systems and Computer Engineering) was established to provide an interface between the Technical University of Lisbon and the communications and IT sectors. The main focus of activity is to encourage R&D and training in advanced technology. The institute now numbers 800 staff working on EC Programmes (29 Esprit projects), contract research, training and associated ventures. The Institute is managed by a joint university-enterprise board. The university enterprise partners of INESC generated AITEC (Tecnologias de Informação SA), a joint stock company, in 1987 to act as a technology transfer and business incubator service
- In 1984 FUNDETEC (Fund for the development of teaching Electrical, Electronic, and Computer Engineering and Technology) was established by the Technical University of Lisbon to develop new training programmes for engineers in partnership with industry.
- In 1986 INEGI (Institute of Mechanical Engineering and Industrial Management) was established at Porto to improve the university enterprise links in the sector of mechanical engineering. The Institute undertakes training programmes for both managers and executive engineers as well as R&D.
- In 1987 ITEC (The Technical Institute for the European Community) was established by the Technical University of Lisbon to encourage the Portuguese participation in EC Programmes through the establishment of university-enterprise interfaces.
- In 1988 the Government established the CESE (Conselho para a Cooperação Ensino Superior-Empresa) to propose procedures and policies to the Government to improve collaboration between the HE sector and industry. CESE also hosts the COMETT national Information Centre.

2 *Main developments in higher education*

- There are 4 traditional universities in Portugal (2 in Lisbon, Coimbra and Porto). From 1973 important new universities have been founded in Lisbon, Minho and Algarve bringing the number of public universities to 14. There are also 8 private universities.
- There are 14 polytechnic Higher Education establishments.
- HE establishments are creating Industrial Liaison Offices.

3 *Other key points*

- The concept of joint university-enterprise Science and Technology Parks encouraging collaboration between the industrial and academic sectors has recently developed . Of particular importance are the ones in Lisbon and Porto, in the North.

COMETT IN PORTUGAL

COMETT I

Projects accepted : 69

Outputs produced : 47 materials, 214 courses, 10 studies, 6 newsletters, 1 database

COMETT II (1990 + 1991 + 1992)

Projects accepted : 96

Budget allocated : ECU 6,687,427

UETPs : 5 regional, 5 sectoral

Students : 572 received, 613 sent

Projects dealing with short training courses : 24

Joint training projects : 13 + 2 Pilot projects

Organisations participating in accepted projects : 299 enterprises, 63 universities, 157 other organisations and 10 UETPs

National experience : United Kingdom

1 Specific legislation promoting higher education - industry cooperation

- The Department of Trade and Industry (DTI), The Department of Employment (DoE) and the Department of Education and Science (DES) are all involved in policy development for the university-enterprise collaboration. Most government departments, and especially Ministry of Defence and Department of Health are customers for research and other services.
- Government policy makers aware that UK suffers from a "technology transfer gap".
- March 1991 budget allowed tax incentives for training. The estimated cost of this action in 1992-3 is £20M.

2 Specific programmes promoting higher education - industry cooperation

- Teaching Company Scheme, founded in 1970s, funds young graduates, employed by academic institutions to work on defined projects on industrial premises. SMEs can profit from a 50-70 % contribution to the total costs. Over 1000 projects funded so far.
- LINK, established in 1987/8, offers public support up to 50 % for research projects involving one "science based and (usually) two industrial partners". Estimated 301 projects to be funded by December 1992.
- CASE encourages industry to sponsor postgraduate students, normally for three years, in return for work on a particular project. This programme, extremely popular with SMEs, organised 800 awards in 1991.
- Enterprise Initiative offers companies the opportunity to engage university consultants for short periods with 50 % costs being met through public funds.
- In 1991 the DTI allocated £6M to support schemes to strengthen university-enterprise collaboration and in particular to encourage technology audits.
- In March 1992 a further scheme was announced for the creation of "Faraday Centres" for the training of postgraduate researchers on industry-relevant projects, largely to take place on industrial premises. This programme is based on the German Fraunhofer scheme.
- Enterprise in Higher Education Scheme, launched in 1988, encourages higher education establishments to become involved in enterprise related activities, including curriculum development and the creation of employer relations. 56 institutions have so far obtained public co-funding of up to £2M for 5 years.
- 1989 National Training Task Force generates a regional network of Training and Enterprise Councils (TECs), which seek to prioritise vocational training issues by encouraging entrepreneurs to see the link between effective training and business performance. The TECs promote a variety of training schemes which can involve university participation such as Employment Training, Business Growth training.
- National Vocational Qualifications initiative, based on standards defined by lead bodies representing industry and commerce.
- High Technology National Training (HTNT) programme for unemployed people in which employers carry out a teaching role.
- In Scotland and Wales there are autonomous government sponsored programmes promoting synergy between university and enterprise. In Scotland there is the Scottish Enterprise programme, while in Wales activities are coordinated by the Training, Enterprise and Education Advisory Group.

3 Main developments in higher education

- There is extensive representation of professional and industrial bodies on the governing bodies of higher education institutions (and their sub-committees).

- Pickup scheme funds the development of new vocational and continuing education courses to be held by higher education establishments.
- The concept of corporate status is increasingly extended to higher education establishments. A high number of universities have also created separate limited companies - particularly for licensing technology.
- University staff may now be actively encouraged to participate in research and its commercial exploitation through revenue sharing schemes. Such schemes are, however, still comparatively rare.
- Most universities have industrial liaison offices as reflected in the creation of two national organisations. UDIL (University Directors of Industrial Liaison) and AILO (Association of Industrial Liaison Officers).
- 36 universities have developed science parks frequently on their own premises.

4 *Main developments in industry*

- Members from industrial concerns make up 50 % of the boards of the Universities Funding Council and the Polytechnics and Colleges Funding Council, which are the two major UK grant giving bodies for higher education.
- In 1985 the Council for Industry and Higher Education (CIHE), an independent body of directors of large corporations and heads of H.E. establishments was formed. It promotes a fundamental broadening of the concept of general education as well as the development of networking at many levels between universities, polytechnics and companies.
- CBI is used to negotiate industry's position with regard to higher education in the absence of a specific national body.
- Accreditation by higher education institutions of company training courses (CATS).
- Some major industries have also nominated education liaison officers. This is rare and absent in SMEs.
- Industry has developed the Association of Graduate Recruiters, a representative body expressing the qualitative and quantitative needs it has in the field of graduate recruitment.

5 *Investment by industry in higher education*

- Investment by industry in university research budget rose by 76 % 1986-90 to £104M.
- Business support in universities amounted to 6.3 % total university income in 1987-8. This is compared to only 2 % in polytechnics.

COMETT IN THE UNITED KINGDOM

COMETT I

Projects accepted : 216

Outputs produced : 111 materials, 142 courses, 30 studies, 15 newsletters, 17 databases

COMETT II (1990 + 1991 + 1992)

Projects accepted : 258

Budget allocated : ECU 21,599,279

UETPs : 17 regional, 11 sectoral

Students : 2.240 received, 2.439 sent

Projects dealing with short training courses : 54

Joint training projects : 42 + 4 Pilot projects

Organisations participating in accepted projects : 1,658 enterprises, 372 universities, 427 other organisations and 28 UETPs