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Esprit: First European Strategic Programme for Research and Development
in Information Technologies

Communication from the Commission to the Council

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Esprit

**First European Strategic Programme
for Research and Development
in Information Technologies**

*Commission communication
transmitted to the Council on 25 May 1983*

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English Edition

Introduction

Eight out of 10 personal computers sold in Europe are imported from the USA; nine out of 10 videotape recorders sold in Europe come from Japan.

European-based integrated circuit manufacturers supply 30% of their own home market and represent 13% of world production, half of which is manufactured in the USA by subsidiaries of European companies.

Large mainframe computer manufacturers in Europe have, without exception, entered agreements with overseas companies in order to benefit from their technological advance.

In the field of electronic data processing, office and factory automation, process control and telecommunications,¹ compared to the limited number of 'niches' in which Europe is performing fairly well, the list of areas in which Europe is struggling to catch up is lengthy.

Since the post war reconstruction period Europe has lagged behind in the industrial application of many high technologies and notably electronics.

Because of the increasing direct or indirect influence of electronics in practically all aspects of industrial life in the western world, what was in the past just technological dependence in a few specialized areas is now threatening to become industrial and economic dependence plain and simple.

In these conditions the identity of Europe and eventually its political independence will be seriously at stake.

At a time when, on the one hand US and Japan are taking new initiatives and increasing their investments² to improve their technological, industrial and commercial predominance, and on the other hand the emerging economies, in Asia and the Americas, are taking over more and more of the traditional manufacturing activities, Europe cannot afford to remain an observer.

The effects of the electronic revolution, that is now taking place, will impact directly on Europe's social and economic structure regardless of whether it has an active or passive role in it.

Changes offer new possibilities, but bring about alterations that are not always without problems:

only those who can control the determining factors of the changes can hope to minimize the problems.

Europe must therefore assume a positive role to be master of its future.

Being first in the line of fire, industry has been aware of this for some time and has tried, often assisted by its respective governments, to remedy the situation.

Measures taken so far, however, have not been sufficient to reverse the trend, and by and large have only managed to slow down the deteriorating process. The situation threatens now to get dramatically worse: our balance of payments in IT products and services, still positive in 1975, suffered a substantial deficit of USD 5 000 million in 1981 and this is believed to have doubled for 1982.

Representatives of the largest European companies active in the information technology field took the initiative in approaching the Commission in order to try to find a solution of a scale matching the problem.

In early 1983 they jointly wrote to Vice-President Davignon depicting the situation as follows:

'The figures of market share, i.e. European industry commanding only 10% of the world market and less than 40% of its own indigeneous market, make stark reading. Not only is the situation in itself of great concern but the low market share means that the volume of sales and profit is inadequate to provide the essential investment needed to safeguard the future. Even worse, all the indications are that the situation is deteriorating rather than improving.

¹ These are the sectors broadly encompassed by the term 'Information Technology'.

² e.g. the Japanese Government is investing USD 500 million on the Fifth Generation Computer Programme; in the USA the largest computer and semiconductor manufacturers are organizing themselves to conduct R & D programmes in joint ventures, for example the Semiconductor Research Cooperative (SRC) and the Computer Aided Manufacturing International (CAMI). These actions are being favoured by the US administration's Economic Recovery Tax Act signed by President Reagan in August 1981, that includes R & D tax credits, accelerated depreciation schedules and other incentives which are expected to stimulate an additional USD 3 000 million in corporate R & D over the next five years.

The situation is not a new one but has been developing over a period of years and many attempts have been made to reverse the trend. These include such things as acquisition of foreign technology and joint business ventures with Japanese and American firms. Whilst these may hold short-term benefits for those involved, they cannot be considered as providing a long-term answer.

In any case their contribution to the European economy as a whole has been slight; in some cases the effect may have been adverse. Some of the nations, recognizing the dangers, have instituted, (or are instituting), their own national programmes – so far the impact has not been great but it is growing. The situation has, however, reached such a state that even programmes on the scale of those now being considered in some of the larger Member States are unlikely in themselves to solve unaided the problem in Europe'.

Confronted with such a situation the companies see merging of efforts at Community level as a fundamental element of any remedial action: 'unless a cooperative industrial programme of a sufficient magnitude can be mounted, most if not all of the current IT industry could disappear in a few years time'.

The Commission shares this view and has formulated a proposal for the promotion of a concrete programme of action.

Long lead-time R & D at precompetitive level, sufficiently upstream of the product development phase, would appear a suitable domain for such cooperative action, and one which could be started without delay.

Further measures would obviously need to be taken to complement this effort and ensure the best conditions for the timely and effective industrial exploitation of the results of R & D in the Community. The aim of such complementary actions would include stimulating the creation of sufficiently large leading edge markets, encouraging investments, promoting the establishment of adequate infrastructure and services, for example in telecommunication.

This will be the subject of further analysis and may lead to new proposals.

The strategic objective of the current action was agreed with industry and Member States to be: 'the achievement of technological parity with, if not superiority over, world competitors within 10 years'.

Consultation with industry and academia has enabled the Commission to identify the technical objectives, define the methods for carrying out the programme and estimate the resources required.

The financial resources that, according to the estimates, would have to be mobilized for a first phase of five years are some 1 500 million ECU of which the Community would have to provide 50% i.e. 750 million ECU.

To sustain the development of the technologies on which most of the European high-added-value transformation economy is going to depend for its efficiency, the proposed Community intervention may appear almost negligible given an overall industrial research and development expenditure in the sector in Europe of some USD 5 000 million per year and given the fact that the largest American companies active in the field invest every year, individually, some USD 2 000 million.

If Community intervention is focused on promoting work of very advanced nature, however, and if a carefully selective approach is taken, the Commission believes that it will be adequate to stimulate strategic thinking, a growth of self-confidence and the joint efforts that are required to provide the European information technology industry with the basis for regeneration.

The Commission is now therefore proposing to launch the first five year phase of the 10-year R & D programme called Esprit: the European Strategic Programme for Research and Development in Information Technologies.

The programme includes the coordination of R & D activities in IT in the Member States and direct financial contribution to cooperative R & D projects to be executed within the Community.

To this end the Commission submitted a draft Council decision with the Communication, specifying the duration, the character and the main modalities of execution of the programme.

Explanatory memorandum

Purpose of the present communication

1. In 1982 three communications were sent to the Council which:

(i) analysed the importance of information technology (IT) and introduced Esprit;¹

(ii) outlined the concept of a pilot phase for Esprit and provided the main lines of an overall programme;²

(iii) provided a basis for a Decision on 16 pilot projects.³

2. A decision was adopted by the Council on 21 December 1982 to fund the pilot phase to a level of 11.5 million ECU, representing 50% of the first year costs.

3. The purpose of the present document is to provide the basis for a Council Decision on the overall Esprit programme. This is designed to be an essential element in the industrial strategy proposed by the Commission³ and is in line with the overall scientific and technical strategy proposed by the Commission in its communication on a framework programme.⁴

Background

4. Technological advance represents an essential ingredient of development particularly for those nations which, like ours, rely essentially on a transformation economy and depend on external sources for the bulk of their raw materials and energy.

5. The new technologies of information (IT) will be one of the dominant sources of technological advance for the rest of the century.

They hold the promise of providing the answer to many pressing problems of today; they will create new products, processes and services and thereby new export opportunities and employment.

IT industry

6. IT is already a major industry in its own right, comparable in size⁵ and value added to the automobile and steel industries. As a manufacturing sector the IT industry has been one of the fastest growing industries world-wide in the last decade, a decade which has seen general recession otherwise.

Growth is expected to continue at about 8%-10% overall until 1990 by which date, with an overall turnover of some USD 500 000 million (at 1980 prices), IT will be one of the world's largest manufacturing sectors.

7. Occupations concerned with information⁶ are becoming the single most important part of employment. The US Bureau of Statistics estimated that in 1980 nearly 50% of the employed civilian workforce were in 'Information', and European figures are similar. IT manufacturing alone employs 5% of the total Community workforce i.e. about 5 million persons.

8. The whole economy is significantly affected in its performance by IT although not always directly; altogether nearly two thirds of Community GNP is in one way or another influenced by IT. Less immediately influenced sectors like agriculture can also greatly benefit from IT, for example, from satellite observation followed by computer analysis for agriculture production monitoring and computation of optimal crop conditions. By the end of the century there will be no significant aspect of the economy that will not be affected by IT.

9. Telecommunications, office automation and factory automation play a key role since they provide crucial infrastructures for the whole economy.

¹ Bull. EC 5-1982, point 2.1.152.

² Bull. EC 7/8-1982, point 2.1.183.

³ Supplement 4/81 - Bull. EC; Bull. EC 6-1982, point 2.1.5.

⁴ Bull. EC 12-1982, point 2.1.173.

⁵ USD 237 billion 1980 annual sales world-wide.

⁶ This includes activities like TV broadcasting and the press that, although not encompassed by the term 'information technology', are heavily dependent on it.

The performance of the Community

10. The Community has not managed to keep pace with developments over the last ten years. Community based industry does not even cover one half of its domestic market that is today 34% of the world market. In 1975 the Community still had a trade surplus in IT products. By 1980 the trade deficit had reached USD 5 000 million, and according to certain sources, the USD 10 000 million mark was passed in 1982.

11. The problem of the trade deficit is compounded by the fact that Community imports are primarily high technology products – such as central processing units and computer memories – from the United States and Japan, while its exports are the more mature, older technology products that formed its past strength but are now only of interest as a replacement market and for the less developed countries.

Remedies

12. To improve this situation an increased effort in research and development must be the centre-piece of a policy to strengthen Community industry in the mid- to long-term.

European companies, in some cases stimulated and assisted by government actions, have taken up the challenge posed by the subject and by the increasing strength shown by US and Japanese firms. There is however evidence that the scale of resources committed in Community countries to R & D is too small to be effective individually and often not adequately focused towards internationally competitive innovation.

13. In its analysis of the shortcomings of Europe's research potential,¹ the Commission identified, amongst other things: insufficient multi-disciplinary research; large gaps in the research continuum between universities on the one hand regarding work as too applied and industry on the other hand regarding it as too basic; a mismatch between scientific 'supply' (research labs), scientific and technical demand (particularly that arising from industry).

A sufficiently ambitious 'industry driven' long-term R & D work programme, involving univer-

sities and users will have the ability to fill these gaps.

14. The main drive for such a large scale programme has come from industry. Facing the formidable competition of Japan and the USA, Community industry has acknowledged that, in order to reverse the trend of increasing reliance on importing technology, only joint strategic long-term research planning and the concentration of resources through the definition and funding of technology goals of common interest on a Community scale, can have a good chance of redressing the situation gradually but in a lasting manner by:

(i) ensuring that research teams achieve the critical mass to obtain results;

(ii) enabling optimization of resources that will result in reducing duplication and widening the spectrum of research tackled;

(iii) reducing the timelag effect caused by reliance on imported technology.

(iv) paving the way to the definition and adoption of standards of European origin.

15. An R & D action of this character can furthermore be started immediately and will provide new technology that is vital for competitiveness. As it is kept at pre-competitive level, industry can furthermore collaborate without impeding its ability to compete for markets.

Esprit objectives and R & D domains

16. Extensive consultations carried out over more than one year based on the above concepts with the leading IT companies, SMEs, academia and Member States' administrations has resulted in the formulation of a long lead-time R & D programme called Esprit: European Strategic Programme for R & D in Information Technology. The objective: to provide European IT industry with the technology base it will need to become and stay competitive world-wide within the next 10 years.

¹ Bull. EC 12-1982, point 2.1.173.

17. The main criterion used in defining the R & D work was to be highly selective in order to enable the programme to focus on the key technological factors. This was necessary because IT is so R & D intensive and technology becomes so quickly obsolete that trying to cover the whole spectrum is simply not possible, given the relatively scarce human and financial resources that can be made available, without putting at risk the more pressing short term product development activities that are essential to maintain the present industrial and market presence.

18. The particular focus of the programme is a function of two conclusions drawn from the current trends in the development of IT: one is that more and more people will have to learn how to use this technology; the other is that the products of the technology will have to become easier to use and better integrated into the entire pattern of our daily lives.

19. This latter objective can only be achieved through major advances in hardware (components) and software technology and systems architecture (the combination of hardware and software into systems). This is why Esprit places particular emphasis on these three technologies that give the key to any application. In addition, the areas where IT will have the greatest impact on social and economic life will have to be the subject of intensive research activity and technology test-beds. The office and the factory are the two¹ proposed areas, chosen in the light of their growth potential, of their impact on other large industry sectors and of the width of the technology spectrum underpinning their development.

The heavily interrelated areas² that form the object of research and development under Esprit are therefore:

- (a) *Advanced microelectronics* that provides the physical structure for any information system.
- (b) *Software technology* that addresses the medium that controls the behaviour of any IT system.
- (c) *Advanced information processing* that addresses the optimization of functional behaviour through the architectural combination of hardware and software.
- (d) *Office systems* that can be viewed as an archetype of the whole service sector. Furthermore, they require a very wide spectrum of

technologies and represent possibly the best tested for the outcome of R & D in the three key technological areas above.

(e) *Computer integrated manufacturing* that has a major strategic importance for the whole of the hard-pressed manufacturing sector in the Community.³ In addition to this the nature of this application has many technological requirements that are complementary to those of office systems.

Esprit actions and resources

20. Mounting a 'technology push' across the Community capable of achieving technical parity with, if not superiority over, our main competitors within the next 10 years represents an ambitious objective that will require for its achievement a joint effort drawing on all in the Community who can make an effective contribution to the R & D and to its exploitation: large and small industrial firms, research institutions, universities and individuals.

Only in this way will it be possible to obtain a concentration of human and financial resources of a scale proportionate to the goals.

21. To this end Esprit is designed to be a programme through which:

- (i) Funds will be made available to launch in the Community cooperative projects of precompetitive industrial R & D falling within agreed strategic technological lines.
- (ii) Systematic consultation will be promoted between Member States administrations, academe-

¹ As noted in paragraph 9 telecommunications are equally fundamental to the development and application of Information Technology. The R & D domains that are proposed for Esprit must and do therefore cover all their main technological needs as well. The nature and organization of telecommunication services however make them a particular application case requiring separate analysis. This is currently in hand and the Commission will present specific proposals shortly.

² For the purpose of presentation and discussion it appears more practical to group the various activities identified into reasonably homogeneous sectors. It has to be stressed however that this division is incidental and not intrinsic to the nature of the work; it would be wrong, indeed disastrous, for the whole programme, to try and treat them as separate domains.

³ In particular the small batch manufacturers of discrete parts since 70% of goods manufactured in the Community are small series.

mic institutions, industry and the Community on the definition, appraisal and adjustment of R & D activities, with a view to achieving the best coordination of efforts and utilization of resources amongst all the actors in IT throughout the Community.

(iii) Infrastructural and organizational facilities will be available to ensure careful selection, effective execution, proper monitoring and management and adequate dissemination of results of the actions.

22. In order to create the conditions for the gradual and effective build up and development of these activities, the Esprit programme is designed to span a period of 10 years. The first five-year phase is now proposed. The main outlines of the R & D work, for this first phase in the areas indicated above, are given in the technical annex to the draft Council decision. In this framework a more specific programme of work, necessary for the day-to-day implementation of the programme, will be established, as a rule every year, and updated as required.

This structure of programme will guarantee long-term perspective to the larger projects, flexibility to the smaller, and the possibility whenever required of timely adjustments in the light of results and technology evolution.

23. To this end it will be necessary to establish a close consultation between the Commission and the Member States as well as continuous monitoring of the sector to provide early identification of technology objectives and trends; the organization of the administrative infrastructure to ensure the updating of the operational work programme and its matching to real needs; objective and accurate appraisal of work; contract administration; coordination of the various projects, and the dissemination of results.

24. These activities will be carried out by the Commission with the advice of the Management and Consultative Committee (MCC) established by Council decision and whose members will be nominated by the Commission in agreement with the Member States' governments. The composition and main tasks of such Management and Coordination Committee are spelt out in the draft Council decision establishing such Committees that is the subject of a recent proposal of the Commission.¹

25. The definition and verification of the strategic technical objectives will be based on industrial inputs taking into account wider national and Community interests and will be supported by systematic analysis of the sectors. As for the projects for which a financial contribution is to be provided industrial R & D is acknowledged to rest essentially on two broad classes of projects:²

(i) Projects that require large infrastructure and resources, both human and financial, as well as clear and constant strategic perspective to ensure continuity of actions and the breadth necessary to reap the long-term benefits. Such medium to long term 'system driven' R & D activities, that will be referred to in this document as type A projects, will represent the strategic backbone of Esprit. The share of the overall Esprit effort represented by this type of project will reflect the contribution of organizations involved in basic R & D in the information technologies in the Community.

(ii) Projects that rely mainly on flexible infrastructure and on individual thinking rather than on a system approach, and require relatively much smaller resources. Such activities, that will be referred to as type B projects, could range from very long term, very speculative R & D to relatively shorter term very specifically oriented R & D, and are expected to account for a significant share of the overall effort under Esprit.

Financial support

26. Given the different size and requirements of the projects involved, different considerations for their inclusion in the Esprit programme would appear to be required.

(a) For projects of strategic character (type A projects) the Commission proposes that the degree of financial contribution by the Community shall

¹ OJ C 113, 27.4.1983; Bull. EC 3-1983, point 2.1.167. COM 83 (143) of 16 March 1983, communication from the Commission to the Council on Structures and Procedures for Common Policy in the field of Science and Technology.

² The response to the call for proposals for the pilot phase with 195 proposals involving 638 submissioners, including very many small to medium IT companies as well as IT users, gave clear indications on the level of interest as well as on the size and quality of contributions that can be expected from industry, universities and other research institutions.

be 50% in form of a subsidy. The remaining 50% should normally be provided by the industry itself.¹

(b) The smaller projects (type B) raise different issues, but in principle the Commission considers that whereas the norm should also be a 50% contribution by the Community, certain exceptions should nevertheless be provided for. For example:

(i) Where a request for industrial support comes from SMEs, or others with very limited finance available, Community support beyond 50% may be considered. In such cases particular arrangements concerning the access to or the exploitation of the results are also envisaged.

(ii) Where a research proposal is submitted by academic institutions which fail to secure an industrial partner or sponsor, if the Commission is satisfied that the technical features of the work are so outstanding that it should be supported despite the lack of industrial support, the proposal can be initially funded up to the level of 100%. However in this case a phased approach would be envisaged by which the project could be launched with the understanding that industry would take over a reasonable part of the financing after the project has achieved agreed milestones proving the validity of the chosen approach.

Project selection

27. In order to be eligible for aid, projects will have to be proposed by undertakings, including small and medium sized enterprises, universities and other bodies established and, as a rule, currently carrying out R & D work in the Community and the projects will have to be carried out in the Community.

Proposals will be submitted to the Commission in reply to an open invitation published in the *Official Journal of the European Communities*.

28. The following main criteria would as a rule be applied to the evaluation of all projects:

- (i) technical soundness,
- (ii) industrial strategy contribution in the light of Esprit objectives,
- (iii) Community dimension,

(iv) technical and scientific, as well as managerial capability to carry out the proposed programme of work,

(v) measures envisaged and approach to accessibility and exploitation of results.

29. Furthermore:

(a) For larger projects (type A) the participation of at least two companies not effective subsidiaries of each other and not established in the same Member State will be a mandatory requisite of eligibility.

(b) For the smaller projects (type B) such multinational participation, although not mandatory, shall be considered a major factor of preference all other things being equal.

Programme management

30. The overall responsibility for the execution of the programme will rest with the Commission. Advice and consultation of the Member States will be provided by a Management and Consultative Committee (MCC) nominated by the Commission in agreement with the Member States' governments.

31. In parallel with this formal advisory structure, the Commission will establish consultations with industry and where appropriate with academic and research institutions. It will organize them in such a way that large and small IT firms as well as users and academic and research institutions will have the opportunity of expressing their views and suggestions to the Commission on all major matters related to the content, structure and execution of the programme.

To this end the Commission has the intention of setting up appropriate industrial as well as scientific advisory boards.

¹ The degree of financial participation by industry is considered to be a test of the degree to which industry believes in the need for the work and will be one of the evaluation criteria. Whenever therefore there are direct financial interventions from national authorities, given the variation from country to country in the ways in which governments support industry, the Commission will examine the situation on a case by case basis bearing in mind the general principle.

Dissemination of information, access to and exploitation of results

32. A primary justification for Esprit is in the synergetic effect that it will have through focusing a 'critical mass' of research efforts on selected key strategic technological objectives. To meet this requirement adequate dissemination of information on work that is being planned or under way as well as on its possible results and their exploitation is going to be of fundamental importance. This will take into account the different kinds of information, the various groups to be served and their vested interests.

33. Apart from technical solutions designed for the main participants in research (like workshops for particular research topics, secondment of researchers etc.), a wider clearing house infrastructure is going to be established by which systematic information on work in progress, and information on the results that will have to be notified by the contractors to the Commission, would be collected and made available to an appropriate extent, e.g. through special conferences or over the Information Exchange System that will be set up to serve the needs of all participants in Esprit.

34. As for access to and exploitation of results, the general guidelines are, in principle, the same that apply to other projects financed by the Community, i.e. that ownership and the right to exploit any information and industrial property rights resulting from the work under any contract (foreground information) will normally reside with the contractors.

35. A number of principles must furthermore be obeyed:

(i) For cooperation to be meaningful arrangements between contractors must ensure that each participant in the same project, for the whole duration of the project and for the purpose of fulfilling its share of the work, has guaranteed and privileged access to the results of the work done by the others.

(ii) For the expected overall synergetic effect to take place, access for a project team to foreground knowledge generated by another team working on a different project within the Esprit framework shall also be arranged under privileged

conditions in as far as such information enables better or quicker results to be obtained from the project which needs it.

(iii) To promote improved competitiveness in the Community, companies in the Community which did not participate in a specific project but which have the ability to use its results and wish to do so, should have the opportunity to acquire the rights. The terms should be negotiated on a commercial basis taking into account the contributions of the originating parties as well as those of the Community.

Overall resources

36. The size of the overall programme is the function of the strategic impact that this is designed to achieve.

Such an impact can be broadly measured in terms of market and actual current level of expenditure. The total amount of industrial investment in research and development on IT in the Community can be estimated at some 5 000 million ECU/year: of this a negligible fraction is spent in Europe on long term precompetitive R & D activities as compared with the 5 to 10% of our main competitors.

37. To be meaningful and to stimulate the new strategic thinking that must underly the definition and execution of the R & D programme, a Community intervention would have to stimulate a joint long-term effort in precompetitive R & D of the same order of magnitude (i.e. of at least 5 to 10% of the current overall industrial effort). The conclusions that were reached after consulting with industry, governments and academia, taking into account the physical limitation of a realistic and gradual build-up of capacity, indicated that an initial effort of precompetitive long term R & D reaching some 2 000 man-years/year from the third year onwards could confidently and effectively be aimed at. The following table illustrates how resources for activities started during the first phase will build up during the first five years (1984/88) and tail off during the subsequent years. When the second phase of the programme will be planned a similar pattern of distribution of resources is expected for years 1983/93 that will maintain at least for the first three to four years of

the second phase (or possibly slightly increase in real terms) the yearly deployment of resources.

38. The conversion of these figures into budget estimates, according to current industry practice, leads to an estimated overall investment for the first five-year phase of some 1 500 million ECU. This would broadly correspond to 6 % of the total

industrial R & D investment in IT in the Community; very much in line with that of our main competitors and well within our possibilities. On the basis of an average 50% contribution the budgetary load for the Community would be 750 million ECU, including the costs of the management of the programme and access to and use of the Information Exchange System.

Table 1

Esprit programme: resource summary (man/years)

Activities started during first phase 1984-88

Pilot projects	0	1984 1	1985 2	1986 3	1987 4	1988 5	1989 6	1990 7	1991 8	1992 9	1993 10	Total
Projects starting in Year 0	230	325	327	192	125	30						999
in Year 1		420	551	629	540	519	20					2 679
in Year 2			547	766	670	545	140					2 668
in Year 3				328	428	450	256	68				1 530
in Year 4					204	276	180	85	45			790
in Year 5						92	140	125	105	80	60	602
Total: Man/years	230	745	1 425	1 915	1 967	1 912	736	278	150	80	60	9 268