EUROPEAN FILE

Esprit: key to the technological awakening of Europe

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Amid the very profound changes now sweeping through the sciences, technology and the structures of work and production, information technology is playing an increasingly decisive role. Its economic impact is a revelation:

- ☐ During the past decade, information technology has occupied a more and more prominent place on the international industrial stage. Its annual rate of growth is between 15 and 20% and all observers believe that this performance will be sustained in the 1990s.

- ☐ World expenditure on research and development in this field rose to US$ 35 billion in 1986 and could exceed US$ 90 billion in 1990.

At this rate, the time is not far off when electronics will replace the car industry as the leading industrial sector in world trade. This means more than a change at the top of the production statistics: it indicates a major qualitative change. From now on the level of development of our society depends less on the making of physical goods than on the mastery, as a priority, of an intangible product—information in all its forms. Whether it is a matter of collecting, processing, storing or transmitting data, or more particularly of inventing and developing applications for it, information technology has become a prime factor in economic and social life. Its primacy derives from the fact that it nourishes and stimulates the full range of human activities.

- ☐ Information technology is therefore an extraordinarily powerful and versatile instrument, the use of which intersects with other disciplines. It is associated with an unprecedented acceleration in discoveries and applications in all fields of science and technology.

- ☐ In industry itself, computer-assisted design and production, the increasingly spectacular progress achieved by robots, and automated management and control are shaking up production methods and radically transforming the conditions for competitiveness.

- ☐ Information technology is also revolutionizing the enormous services sector, which is enjoying unprecedented growth thanks to informatics and telecommunications.

At the same time, information technology is a powerful agent for change in society. It is revolutionizing living and working conditions. The applications of information technology are spreading out into more and more different areas: education, health, communications, etc.

Europe takes up the challenge

In seizing the opportunities offered by information technology, Europe was initially handicapped by its own inherited structures. The problem was not any lack of scientific and technological skills, but the partitioning of the market into

distinct national entities, so that potential was also fragmented. European industry could not achieve a 'critical mass' and benefit from the same economies of scale as its direct competitors — American, Japanese and, more recently, South-East Asian industry.

Although its own internal market represents a substantial segment of world demand, the European electronics industry has lost considerable ground over the past decade. In 1975 the Community still had a positive balance of trade in information technology, amounting to some ECU 1.7 billion.[1] Since then, however, it has been in the red, with a deficit of almost ECU 22 billion in 1988.

Only a far-reaching, Community-level initiative could halt this deterioration. It was a question of accepting an economic challenge of vital importance for Europe — and of ensuring the continent's independence in making the technological choices for its future, in an area which influences the entire development of society.

From the start of the 1980s, the Commission of the European Communities therefore undertook, in close consultation with industries in this sector, and with scientific circles and the national authorities of the Member States, an assessment of the particular handicaps to be overcome and the action to be taken. The following points emerged:

- ☐ The necessity to combat the scattering of research and development efforts, by strengthening in particular cooperation between industry and the universities.

- ☐ The need for a new European dimension, to be achieved by widening the market (notably by ending the old reflex of 'national preferences'), but also by seeking a larger optimal size for competitive companies and therefore a rationalization of the sector.

This is the context in which Esprit[2] was born. Following a short pilot phase, the programme was effectively launched in February 1984 for a 10-year period. Designed to mobilize both Community and private resources on a large scale, it has three basic objectives:

- ☐ To promote cooperation in the information technology field between industries, universities and European research bodies, on research and development projects up to pre-competitive level (prior to the development of commercial products).

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[1] ECU 1 (European Currency Unit) = about £ 0.70, Ir.£ 0.77 or US$ 1.11 (at exchange rates current on 16 October 1989).

[2] European strategic programme for research and development in information technology.

- To provide European industry with the basic technologies necessary to meet the competitive requirements of the international market in the 1990s.

- To contribute to the development and international recognition of technical standards essential for the development of information technology.

The core of the Esprit programme is a work programme which establishes an overall framework as well as various objectives in the main basic areas of information technology. The programme enables research and development projects to be carried out, involving at least two industrial concerns from two different Member States, with or without the participation of one or more universities or research institutes.

- The Esprit work programme, which is revised and adjusted annually, is drawn up following consultation and dialogue with several hundred experts of different backgrounds. This approach enables the European Commission to identify the lines of action corresponding to the needs actually expressed by industrialists and scientists.

- The Commission then proceeds each year with a public 'call for proposals'. The would-be participants define, in complete independence, the aims, scope and methods of their research. The projects, which are selected on the basis of an assessment by a group of independent experts, are supported financially by the Community. The Community is responsible for half of the agreed costs, the other half is supplied by the participants themselves.

The successes of Esprit I

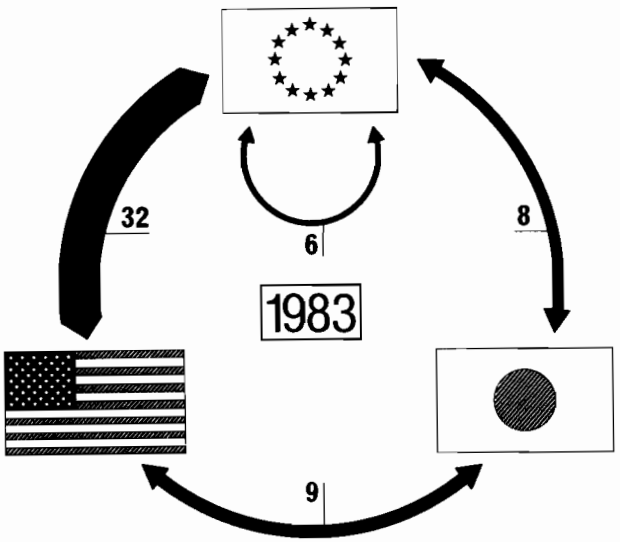
The Esprit programme was divided into two five-year phases and the first phase came to an end in 1988. The overall budget of Esprit I had been set by the Council of Ministers of the Community at ECU 1.5 billion, half of which came from the Community budget. The response from industry to the first two calls for proposals, in 1984 and 1985, was so positive that within the imposed budgetary limits, only one proposal in five could be selected.

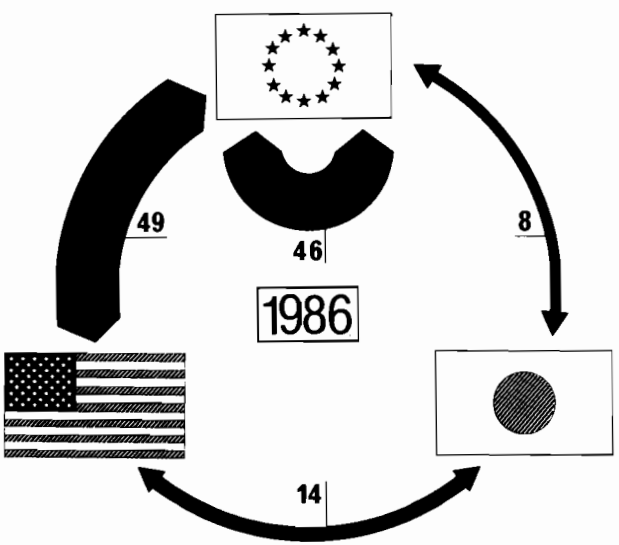
A total of 227 projects were implemented during the Esprit I phase. They involved 536 participating entities and some 3 000 full-time researchers.

- Of the 327 participating companies, almost 45% were firms employing fewer than 500 people (and two in five of those employed fewer than 50). Small and medium-sized enterprises (SMEs) were extremely active, being involved in more than half the projects and responsible for more than a quarter of the research work in 60% of the cases.

- Nearly 200 universities and research institutes participated in approximately 70% of the projects. In more than half the cases, these scientific institutions were responsible for at least 25% of the work.

International agreements between companies in the information technology sector





Source: Esprit conference, September 1987.

Because the duration of most Esprit projects is five years, a complete review of the industrial spin-offs of Esprit I is not yet feasible. None the less, by the end of 1988 it was possible to count nearly 165 projects with concrete and positive results.

- Of these projects, 75 have already helped to put specific products or services onto the market, while for another 60 projects, the research work has resulted in transfers of technology for uses not directly linked to the project itself. The following are examples of some of the most important achievements:

  - Significant results were achieved in the design and development of micro-electronic chips. One offshoot of the research conducted in the 'Bicmos' project, in which Philips (NL) and Siemens (D) were associated, is the announcement by Siemens of an investment of DM 200 million for the industrial production of a new, ultra-rapid, integrated circuit.

  - In the area of advanced data processing, different projects have resulted in major developments in the 'Prolog' computer-programming language.

  - The 'Supernode' project, in which notable participants were Thorn EMI (UK) and Telmat (F), has already led to the market launch, in the field of 'mini-super-computers', of a system combining a very competitive price and very high performance.

  - Due to work carried out as part of the 'Multisensor integration' project, two British industrial participants (Joyce Loebl and Mari) have developed robotic sensor systems which are both tactile and visual.

- In addition, nearly 30 projects have enabled substantial advances to be made in the establishment of internationally recognized standards. For example:

  - The PCTE project — Portable Common Tool Environment — has made it possible to develop, on a Community scale, a standard programming environment for software technology.

  - In the production area, the CNMA (Communications Network for Manufacturing Applications) — which has already been adopted by British Aerospace for the construction of the Airbus A320, and by BMW and Alitalia — enables diverse computer-controlled manufacturing installations, belonging to different manufacturers, to be linked together.

  - In the office equipment field, the Herode project has prepared the adoption, as an internationally recognized standard, of the ODA standard (Office Document Architecture), already used in six other application projects.

Apart from these examples of preliminary results, Esprit has a further valuable achievement: the profound change of attitude among operators in this sector as

regards the possibilities offered by cooperation between European partners. C. J. Van der Klugt, Chairman of the Board of Philips, believes that 'the Esprit model for cooperation has changed attitudes about working together'. Even though it is difficult to establish direct links between cause and effect, certain statistics confirm the trend. Before Esprit was launched, European companies in this sector very clearly preferred preferential agreements with American partners. But in the four years from 1983 to 1986, the number of transnational trade agreements between European partners was multiplied eight-fold to reach the level of USA-Europe partnerships (see diagram).

The promise of Esprit II

In view of the highly encouraging results from the first phase of Esprit, the Community's Council of Ministers gave the green light to phase II on 11 April 1988 and considerably extended the scope of the programme. The budget was more than doubled to an overall figure of ECU 3.2 billion (to be financed on a 50/50 basis by the Community and programme participants).

The response from industry was swift and confirmed the interest awakened by Esprit I. The first call for proposals of phase II resulted in a new batch of 650 research proposals, 159 of which were selected. Because of the quality and interest of the proposals, the Commission decided to exceed the ceiling of ECU 1.2 billion initially provided for the first instalment. This explains why the overall cost of the selected proposals is greater than half the total Esprit II budget. Another important factor is the increasing participation of SMEs, participating this time in nine out of 10 projects.

While continuing to pursue the general aims defined when Esprit was launched, and sticking to pre-competitive research and development work, the work programme drawn up for this second phase emphasizes the need to gear strategy to real needs. The most effective way for Esprit to strengthen the competitiveness of the European information technology industry is to select those aspects of technology which offer the best commercial possibilities. This is also the best way for the programme to help businesses to grasp all the opportunities which the creation of the large market will gradually offer. Realizing those opportunities will largely depend on an adequate level of interaction between supply and demand for the products and services provided by new technology.

Priority is given therefore to the effective integration of information technology in different applications:

- ☐ Synergy is sought with other industrial sectors, particularly in key areas such as industrial automation (production) and computerization in the tertiary sector (office equipment) and in the domestic environment.

- ☐ Multiplier effects are created, by strengthening cooperation both between the different information technology sectors and between manufacturers and

users. The key activities here are stimulating investment and production activities in 'downstream' companies and promoting transfers of technology, particularly in favour of SMEs.

The Esprit strategy in the second phase is essentially concerned with three major technological areas, for which the financial oulays are approximately equal:

- Microelectronics and peripheral technologies. The priority here is to stimulate an enduring European potential in the design and production of advanced electronic components, particularly integrated circuits or 'chips'. This sector is experiencing rapid development and affects performance at all stages: mastery of it is essential for enabling European industry to defend its competitive position.

  - The principal challenge for Esprit in this field is Application Specific Integrated Circuits (ASIC), which are a kind of made-to-measure chips, intended to answer the specific needs of different producers of electronic systems. This area is growing rapidly and will represent 30% of the world market for integrated circuits in 1990. Research is focused particularly on needs such as improving circuit performance (density, multifunctionality, speed) and the technology for computer-assisted design and manufacturing, etc.

  - The section of the programme devoted to peripheral technologies concerns the development of mass storage and retrieval systems, computer displays, non-impact printers, etc.

- The creation of technologies and tools for the design of information processing systems. Europe already shows a high level of creativity in this area, whether as regards software design, signal processing (speech and image comprehension, multi-sensor systems), knowledge engineering (artificial intelligence and expert systems) or man-machine interfaces. However, to progress to a higher level requires the development of systems which are more and more complex, more reliable, better performing and less costly.

- Enhancing the capacity for using and integrating information technology, principally with a view to extending the scope of its applications.

  - Computer-integrated production, the market for which is growing at an annual rate of 15 to 25%, is an essential application because it is revolutionizing the entire manufacturing industry sector. It is therefore one of the key areas for Esprit. The principal research areas are: interconnected systems architecture, computer-assisted design of systems and products, the management and control of industrial processes, robotics and computerized workshops.

  - Office computerization is already a reality, with a world market valued in 1985 at ECU 120 billion. However, developments in this sector are far

from over. Stand-alone equipment is losing ground progressively to integrated information systems, which combine office equipment, data processing and communications. The forecast is for a doubling of this market by the beginning of the 1990s.

- The domestic environment is another market of the future. Technological progress in this sector is expected to result in inexpensive mass-produced products which can be installed and interconnected efficiently and economically.

Whether in factories, offices or the domestic environment, the prerequisite for a successful integration of information technology is mastery of personalized systems which can be adapted to different specific applications in a broad range of environments. This calls for substantial progress in areas such as man-machine interfaces, configuration of workstations, decentralized and multi-function systems architecture, information storage and rapid search.

Finally, Esprit II includes a new section devoted to basic research. The aim of this sub-programme, which has an overall budget of ECU 130 million, is to consolidate and develop a reservoir of knowledge and expertise in the basic disciplines which are essential for the future of information technology in Europe. To judge by the 300-odd high-quality proposals submitted in response to the Commission's first call for proposals in 1988, this initiative has aroused intense interest among the scientific community. Some 62 projects have been selected to carry out basic research in such areas as supra-conductivity at high temperatures, optical and 'neuronal' computers, speech and image processing, etc., and 211 university laboratories, 57 research bodies and 17 industrial companies are participating in these projects.

A key programme — and a model

The scale of the Community's support for information technology can be assessed by reference to the overall Community framework programme of technological research and development 1987-91, of which Esprit is one element.[1] It is clearly an essential element, as it accounts for 30% of the overall Community outlay on research. However, this figure gives only part of the picture: to it must be added a share of the amounts provided for other activities closely connected to Esprit. Examples are the RACE programme in the telecommunications sector,[2] and specific activities such as Delta (the application of information technology to education), AIM (bio-informatics and computers in medicine), and Drive (computerization in the field of road traffic safety).

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[1] See *European File*, No 19/87: 'Research and technological development for Europe'.

[2] Research and development in advanced communications for Europe. See *European File*, No 15/88: 'Telecommunications: the new highways for the large European market'.

Overall, the credits allocated to help Europe make a successful transition to the new age of data and communications represent two-fifths of the framework programme. On the eve of the completion of the large internal market, this is evidence of the major importance that the Community authorities have attached to this challenge.

Esprit is not only a key programme in itself, it also serves as a model. The pilot phase and subsequent Esprit I stage served as a testbed for a new dynamic way of using the Community budget to support improved cooperation between European industrial and scientific circles. Apart from the RACE programme already mentioned, the 'Esprit approach' now provides the inspiration for a wide range of Community research and development activities. To name just a few: Brite/Euram (the application of advanced technologies to manufacturing industries and new materials), Joule (energy sector) BAP and Eclair (biotechnology), etc.

Esprit has become a symbol of the technological awakening of a European Community which has decided to take its future into its own hands. Along with its companion programmes, it stands at the heart of the European Commission's strategy for supporting transnational cooperation in the context of the large market ■

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