Utilization of the results of public research and development

in Spain and Portugal

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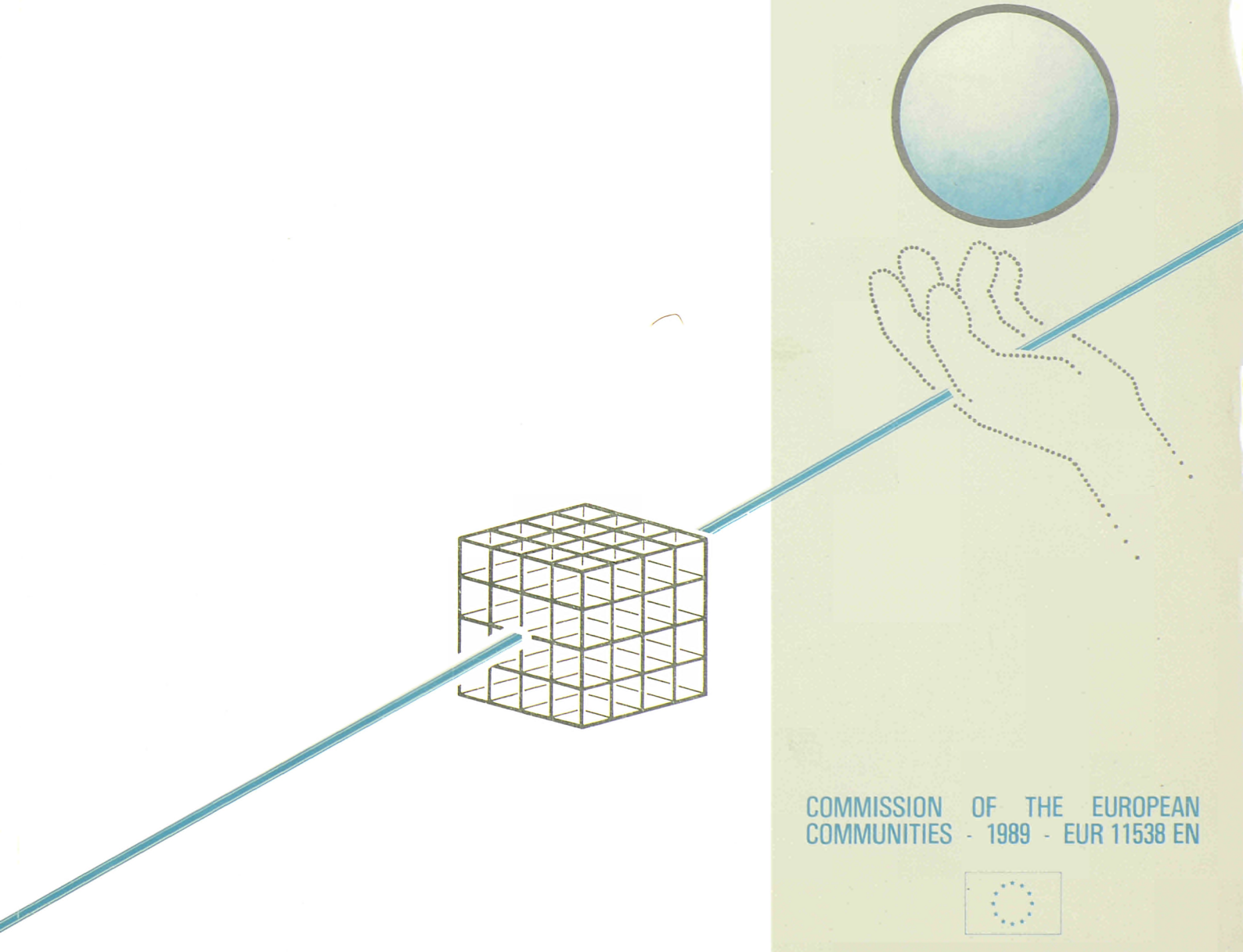

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Utilization of the results of public research and development in Spain and Portugal

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PREFACE

There has been growing concern in recent years that the results of publicly funded research and development should be fully exploited and that society should derive maximum benefit from them. This concern has shown itself in a number of ways, and indeed, the Commission of the European Communities has taken positive steps to ensure that the results of Community Research and Development and Technology programmes are exploited. The Community Framework Programme for R, D&T foresees specific programmes for this purpose, and it is also dealt with under the Community Innovation and Technology Transfer Programme (SPRINT).

Despite this growing general concern, however, there has been a lack of information on the actual measures adopted throughout the Community and on their effectiveness. In order to fill this gap and to identify measures which might have general utility, the Commission initiated a series of studies to be made under the SPRINT programme by groups of independent consultants. The objectives of these studies were to examine the procedures adopted in each Member State to promote the effective utilisation of publicly funded R&D and to suggest measures which, in the opinion of the consultants, would be useful at both the National and the Community level.

The present report provides an overview on the situation in Spain/ Portugal and is being published simultaneously with studies on all other Member States and with a report which is intended to summarize the main findings and recommendations from all the country reports and to draw conclusions which might help in the formulation of future policies.

A.S. STRUB
Director for Exploitation of
R, D&T, Technology Transfer
and Innovation

The project "Improving the Utilisation of public and publicly funded R&D" was carried out by the Commission of the EC under the SPRINT programme.

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CONTENTS

ACKNOWLEDGMENTS

The researchers wish to acknowledge the support of the EEC to elaborate this report. Particularly helpful were the supervisors of the project Mr. H. Corsten and Mr. K.O. Junginger-Dittel. In Spain, high ranking officials of the Ministries of Industry, Education and Science, Defense, Agriculture, and Health accepted to be interviewed. Researchers and/or administrators of the CSIC, the CAICYT, the INTA, the JEN, IKERLAN, the Polytechnic universities of Madrid and Barcelona, the CIDEM and the CDTI were also interviewed and provided published and unpublished data. Several companies, participating in either Spanish R&D support schemes or in European R&D projects (or both), were also interviewed. Particularly helpful were Biokit, Luis Ayuso, Hispano Quimica, CEPSA, Fagor, CASA and PEGASO.

In Portugal, high ranking officials of the Ministries of Education and Industry as well as directors of institutions like the INICT, INIC, and the LNETI accepted to be interviewed and supplied published and unpublished data. Several directors of university laboratories spent also time with the researchers.

The researchers acknowledge the help received from all these experts while remaining the exclusive responsible for the content of the report.

The budget allocated by the EEC to this project was 20.000 ECU. The project was implemented between July, 1986 and February, 1987.

Pedro Nueno
Director of Research
IESE

INTRODUCTION

This study addresses the issue of utilization of research financed with public funds in Spain and Portugal. Both Spain and Portugal lag behind other members of the European Economic Community in terms of their national committment to development and application of scientific and technical knowledge. In both countries this is the result of the relatively low priority assigned to research and development by the public and the private sectors over a long period of time. This situation was known in the two countries and supranational institutions such as the OECD and the World Bank had urged the governments of the two countries to formulate policies to stimulate public and private R&D. The percentage of the GNP spent in R&D in Spain, is close to 0,5 per cent and lower for Portugal.

There is an even worse aspect of this problem. This is the fact that the traditional focus of publicly funded R&D in Spain and Portugal has been on basic rather than applied research. In addition, the sources of research in both countries tended to stay away of the potential users of the technological knowledge they were developing and a certain mutual lack of interest developed over time.

The seventies and eighties have brought many changes to these two countries, the most important being the advent of democratic governments and membership to the European Economic Community. The process of building a democratic regime has a tremendous short term cost, however, since the highest priorities should be assigned to political and institutional issues. Economic aspects tend to be relegated, relatively weak governments can not formulate aggressive economic and industrial policies, and young unions must test their room to maneuver. This is what happened in Spain and Portugal.

The two countries did not react for several years to the increases in the price of energy and to the recessionary situation that was created. Inflation grew and public spending grew and many companies had to either close down or reduce their size with the corresponding unemployment consequences. It was in the eighties that both Spain and Portugal started to seriously consider and launch positive schemes to stimulate the creation of new enterprises, and the improvement of the technological base of existing companies in order to strengthen their competitiveness.

Both Spain and Portugal have had a concern for the utilization of publicly funded research, but until very recently few measures were taken to improve this utilization. Even now, as this study will show, the major concern is with the increase of technological inputs, but steps are also being taken to assure a better utilization of the produced knowledge.

This study will be organized in three parts. Part I will be general, outlining basic principles and definitions that will be common to the cases of Spain and Portugal.

Part II will present the case of Spain, and Part III the case of Portugal. The study will follow as much as possible, the guidelines suggested in the "detailed breakdown" which were received form the supervisor of the study (Annex 1).

Methodology

The study is based on the analysis of published literature in the field of research and development in Spain and Portugal. This literature includes books, articles and annual reports of relevant institutions. The survey of the literature showed that the information available was relatively old and incomplete. Therefore, it was decided to undertake an extensive interview effort. Since a study on a parallel topic had been conducted recently it was not difficult to have access to the appropriate persons. The interviews showed that many institutions have information –even quantitative– which they do not publish and that was helpful to better understand the problem under study. Most of the figures and tables shown in this report have been elaborated by the authors on the basis of interviews. Annex 2 contains a list of books and publications which have been found useful sources.

Exchange rates

For the convenience of the reader, the exchange rates of the peseta and the escudo to the ECU were

1985: 1 ECU equals to 129,30 pesetas or 130,68 escudos

1986: 1 ECU equals to 137,16 pesetas or 146,29 escudos

PART I

BASIC PRINCIPLES

PART I

BASIC PRINCIPLES

I. DEFINITION, PHASE AND CLASSIFICATION CRITERIA OF PUBLIC OR PUBLICLY FUNDED R&D.

We will consider public R&D the research and development activity that is conducted directly in government owned premises (state universities, state laboratories, government owned companies). The concept of publicly funded R&D will be slightly more comprenhensive and will also include R&D performed outside the public sector (for example, in the laboratory of a private company) but financed with public funds.

1. Definition of the term "R&D".

Of the many possible definitions of R&D, following the study published by M.P. Sanchez-Muñoz (1), we will accept two similar definitions. The first one from OECD's Frascati report indicating that research and development include creative work performed in a systematic way in order to increase the amount of knowledge, as well as the use of this knowledge for new applications; the second, produced by the Commission for International Accounting Standards defines Research as any original an planned study undertaken with the purpose to obtain new scientifc or technological

knowledge, and Development as the adjustment of the research or other scientific knowledge to the production of new materials, products, methods, processes or systems, through a specific plan. As the referred author says, the second definition makes a good synthesis of the relevant elements: Research is associated to a systematic and organized activity aimed to a specific new knowledge objective, while Development is associated to the application of new knowledge to new or improved products.

2. Definition and distinction between basic research, applied research, development and testing, and marketing.

2.1 Basic research.– The objetive of basic research is to produce new knowledge about the fundamental aspects of phenomena and observable facts. Basic research aims to expanding the front state of the art in a certain field even if no immediate application can be imagined for the additional knowledge created. Basic research is thus directional, mission oriented and pre-competitive in most cases. Typically, basic research is performed by the public sector (university laboratories, official laboratories) or financed by the public sector. Large corporations might engage in basic research in areas they consider that at some point could give them a competitive advantage, although it might be difficult to establish when and how. Concerted efforts –public funds and private funds together– are becoming a normal approach in most developed countries to push forwards the limits of knowledge in pre-competitive research (the European Economic Community and the EUREKA project offer partial support to some of these efforts in Europe, and the National Science Foundation in the USA). Estimates of M.P. Sánchez-Muñoz (2) indicate that basic research represents 15 to 20 per cent of the total research expenditures of OECD countries.

2.2 Applied research.– Applied research has a definite objective towards a practical application; it implies a certain narrowing down of broad knowledge into specific aspects that might lead to a new product (broadly understood) or process. According to the same source quoted, applied research represents 35 to 40 per cent of the research expenditures of OECD countries.

2.3 Development.– We will define development as the application of the results of basic and applied research to obtain new or improved products (goods and/or services) and/or processes. The referred source estimated that development activites account for 40 to 55 per cent of the research expenditures of OECD countries.

2.4 Commercial deployment.– Once the new concept (product or process) has gone through the development stage the commercial stage can be started. We could define the commercial stage as the phase in which the new concept has been carried to a point where it is possible to produce, sell or transfer it because the appropriate standards or especifications are available.

It is often difficult to establish the frontier between basic research, applied research, development and commercial stage, in general terms. It is easier to do it with reference to certain industry. For example, a chemical corporation might consider that the understanding of the molecular phenomena that take place inside the cells pertain to the domain of basic research. They could decide to draw from knowledge available in universities or government laboratories in this field rather than engage in their own research. The genetic manipulation of certain cells to "design" a microorganism with

given characteristics could be considered applied research and they could perform it in their central laboratory. The utilization of the genetically designed microorganism to produce a certain protein could be fine tuned in a pilot project in a small reactor; this reactor could be located either in a central laboratory or in the laboratory of a manufacturing division; this activity would be considered development. Finally, once the pilot project would work successfully, the process could be scaled up and deployed as a commercial venture, or sold to a third party. A large Spanish chemical corporation with an important research track that was interviewed for the study had the four phases well defiend although it accepted that in many instances it was difficult to establish the limits between aplied research and develoopment, and that in practice, although the personnel involved in each stage was different, it was necessary to establish a good interaction between the people involved in each pair of stages to assure the transfer of knowledge down stream.

2.5 Other definitions.– Research and Development (R&D) include thus basic research, applied research, and development. There are however related concepts that require also a definition. These are technology, invention, innovation, and technological innovation.

2.5.1 Technology.– According to E. Mansfield (3), technology is society's pool of knowledge applicable to industrial arts.

2.5.2 Invention.– Invention is a new concept leading to a new product or process prior to its implementation into such product or process.

2.5.3 Innovation.– Innovation is a new concept transformed into a new product or process, or an improvement of a product or process, once it has been accepted or is ready to be introduced in the market. This definition is consistent with the one included int he Frascati Handbook (4).

2.5.4 Technological Innovation.– According to Frascati Technological Innovation is the result of the first application of technical and scientific knowledge to the solution of the problems confronted by industry in the production of products and processes.

II. DEFINITION AND CLASSIFICATION CRITERIA OF R&D RESULTS.

1. Differentiation of results of the various phases.

The differentiation between the results of the various phases of the R&D process (basic research, applied research, development, commercial deployment) is important for a variety of purposes: to study and understand the process, to manage the process, to evaluate results, to establish budgets, to control the process, etc. For institutional objectives, such as government support, statistical control, etc., it is also important to be able to distinguish between the different phases; por example, the government support mechanisms to stimulate basic research must be different from those to stimulate development. Nevertheless, it is often difficult to separate the different phases in real life. This is due to a variety of reasons and they hold particularly in the case of Spain and Portugal.

Let us first describe the three "modes" of R&D (5), this is to say, the three different approaches to technological innovation that can be found. Mode I is the entrepreneurial approach: a scientist-entrepreneur or just an entrepreneur with an idea are in many cases the engine of the R&D process. They "own" the process and lead the activity. If this takes place in the private sector these entrepreneurs might become owner-managers of new companies based on the innovation. This is the model of the small high-technology based company (typical of Silicon Valley in the seventies).

Mode II is the well structured R&D process. The process is divided in phases, each phase has a responsible, takes place in the appropriate laboratory; a flow of R&D processes takes place simultaneously; there is a budget, a plan and a control system. This is typical of large corporations. Different parts of the process take place in different laboratories under the responsiblity of different managers. R&D becomes another function (like manufacturing, sales or administration) of the corporation. The innovations are the result of a team effort. The whole process, however, takes place inside the corporation.

In Mode III, the innovation is the result of a linked process in which a variety of institutions participate. Parts of the R&D process are subcontracted, consultants are used, government (or other institutional) support is received for some phases of the project, joint-ventures are established with other companies to exploit some results, agreements on standards are also established prior to enter the development stage, etc. In Mode III, the innovation is multi-institutional: risk of failure and options to success are, to a certain extent, shared in the precompetitive stage of the R&D process. Mode III is the most modern approach to R&D, and is being stimulated particularly in Europe by supranational institutions like the CEE and EUREKA.

The analysis of the R&D process is easier, particular for reporting purposes, when Mode II is the one being followed by the corporations or institutions under study. However, if Mode I or Mode III are being used, then the differentiation between basic research, applied research, development and commercial deployment might be very difficult. The case of Mode I is obvious: the entrepreneur is opportunity driven and has little interest in establishing organization barriers between the different phases of the R&D process (in some cases it is possible to find even overlap between R&D and manufacturing). The entrepreneur is market oriented.

In Mode III the complexity of the links between the different institutions involved make also difficult to establish the boundaries between the different phases.

The data gathering effort made for this research showed that in Spain and Portugal Mode I is the prevailing one in the private sector, (because companies are relatively small and companies doing R&D tend to be in the bracket of the smaller companies). R&D oriented companies in Spain and Portugal are quickly shifting to Mode III to benefit from support schemes and to use better their limilited R&D resources. Mode II can be found, to a certain extent, in big government laboratories, but the size of projects being, in general, small, leads in many cases to find Mode I also as the prevailing one in these centers and in universities. In conclusion, in Spain and Portugal it is difficult to report about the R&D process with clear differentiation between basic research, applied research and development, because of the high trend towards Mode I or Mode III in the approach to R&D organization.

2. Differentiation of approach in line with the form assumed by the results.

The results of R&D tend to be better define to the extent that the R&D process itself is better oganized and structured. Thus, when Mode II is used, the output of each phase of the R&D process tends to be well defined. However, when Mode I prevails, the outputs of the different phases are loosely defined. The data gathering effort in Spain and Portugal show that little accounting exists according to the form assumed by the results: intangible (general knowledge, published description, formula, blueprint); tangible (model, prototype, pilot project).

Nevertheless, it is possible, to a certain extent, to aggregate results since the output of the R&D produced by certain institutions tends to be in a given form more frequently than other.

3. Differentiation of approach in line with the possible commercial exploitability of the R&D results.

This refers to the extent that publicly funded R&D can be exploited directly or the results require modification prior to be exploited. A difference has to be made between R&D carried out by a company with public funds, in which case, most often the results of the R&D are exploited right away, and the publicly funded research carried out within the public system. In this second case, the trend is towards producing results that can be exploited without further modification. To encourage this trend, it was found in Spain and Portugal, many public research centers are encouraged to

directly exploit their R&D output or to find partners that can help them exploiting this output. The policy seems to be producing goods results, but public R&D centers in both countries still position themselves far from the exploitation responsiblity, and, therefore, not too much concerned with the direct exploitability of their R&D output.

4. Consequences and problems associated with the protectability of the results.

The issue of protectability is also handled differently depending on whether R&D is performed by a company under public financial support or directly within the public system. Companies are more likely to be concerned with secrecy and protectability than public research centers. Private R&D managers today, particularly in Spain, tend to encourage researchers to protect their research output as soon as it reaches a protectable entity. Companies engaged in Mode III R&D (those involved in EEC programmes, EUREKA projects, and other R&D linkages) are particularly concerned about the loss of key scientif knowledge through the R&D connections, and, as a result, tend to be extremely sensistive to the issues of secrecy and protectability.

Public laboratories are less concerned with these issues and this became evident in the data gathering stage, when, in some instances, access to R&D facilities was very easy and free of control.

5. Problems that arise in passing on protected and unprotected results.

The main problems in the transfer of technology are associated with the communication between the potential users of R&D output and the producers, when these are public institutions. In both Portugal and Spain, most public R&D institutions are not connected to the world of business –public and private business–. There is little concern in public R&D institutions for disseminating information about the R&D products they could offer and, as a result, limited interaction.

III. DEFINITION, PHASES AND CLASSIFICATION CRITERIA FOR UTILIZATION.

Utilization of results is the overall process of pinpointing, disseminating and commercially exploiting R&D results.

1. Understanding the term "utilization".

The utilization of publicly funded R&D can be understood as the process of exploiting its results to obtain a desired new situation like:

a) an improvement of the level of scientific and technical knowledge of the client or user of the results,

b) a potential to produce a new product or a new process (by the client or user of the results).

The results of the R&D effort of a university laboratory could serve just to improve the quality of the teaching, in which case the user or clients (students) would obtain a benefit such as described in a). Or, in addition, the results of this R&D, with the appropriate documentation and protection, could be sold through licensing agreements to companies for use in commercial applications, in which case these companies would obtain a benefit such as described in b).

2. The sub-phases of utilization.

Potential users of results of publicly funded R&D can take these results at different stages (from basic research to completed development research to uncompleted research in any intermediary stage). The R&D policies of publicly funded research can also establish priorities leading R&D producers to focus on certain stages and on certain outputs. In general, the situation of Spain and Portugal is different for R&D sponsored by the government but performed by commercial exploiters versus publicly funded R&D performed within the public laboratories. The first will tend to reach an advanced stage –starting often at intermediate stages–, while the second will reach only intermediate stages, starting at an early one. Figure 1 shows this:

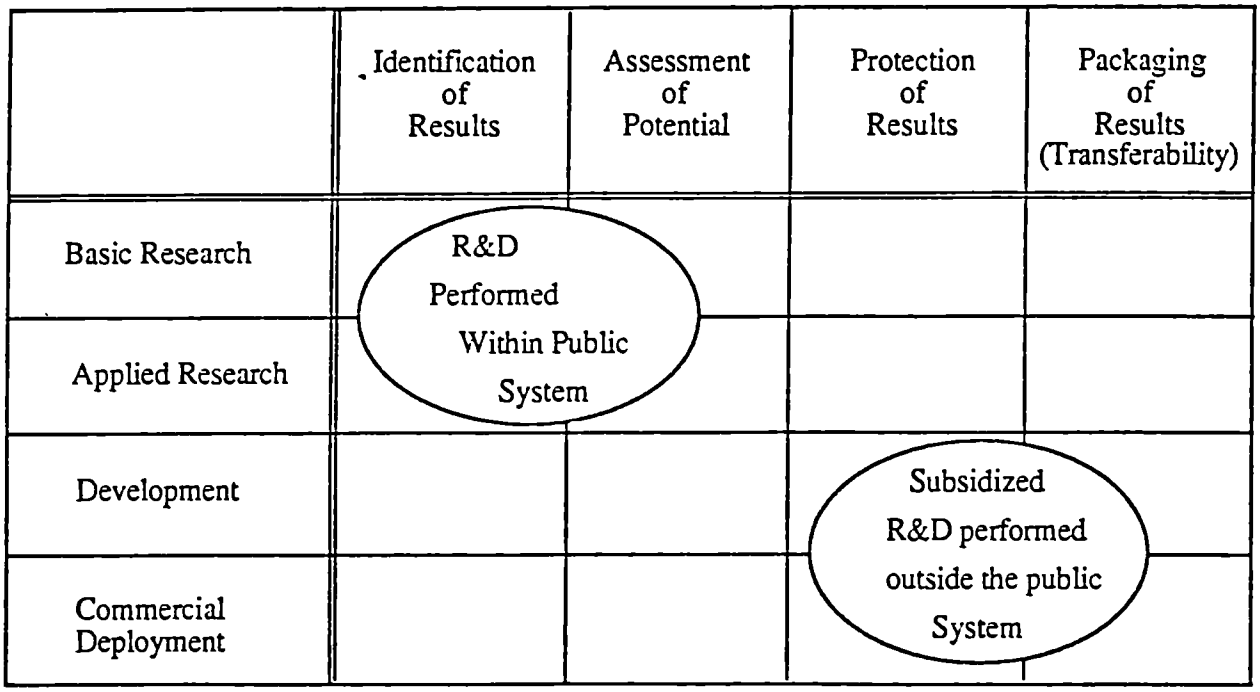

Figure 1. Relationship between stage of R&D, sub-phase of utilization and R&D performer in Spain and Portugal.

PART II

SPECIFIC ASPECTS CONCERNING SPAIN

INTRODUCTION

To analyze the problems associated with the utilization of the results of public or publicly funded R&D it is important to understand first the model of spending R&D funds in the country. The researchers were able to ellaborate, largely based on information supplied in interviews with officials of the Ministry of Science and Education, an estimate of funds budgeted by the different sources –ministries– and the allocation of these funds. It was found that the typical model of spending involves three levels: the programmes controlled by the source itself, a major distributing body controlled by the source, and major laboratories or institutes controlled by the source. In some cases funds are allocated to user institution bypassing the source, but the source controls the funds anyway (this would be the case of public universities, for instance). Figures 2 and 3 show the model of spending in Spain for the years 1985 and 1986.

The major distributing bodies are the CAICYT and the CDTI (1). These two bodies can channel funds to third parties –including private institutions and enterprises–. The other institutions listed in the first column are laboratories or institutes that perform R&D in their own premises.

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(1) See Annex 7 for a description of these institutions.

SOURCE / APPLICATION	MINISTRY OF SCIENCE AND EDUCATION	MINISTRY OF INDUSTRY AND ENERGY	MINISTRY OF DEFENSE	MINISTRY OF AGRICULTURE AND FISHING	ALL OTHER PUBLIC SOURCES	TOTAL
PROGRAMMES MANAGED BY SOURCE ITSELF	961,3	9.026,0	2.244,1	283,7	5.444,9	17.960,0
CAICYT (1) PROGRAMMES	8.669,5					8.669,5
CDTI (2) PROGRAMMES		6.834,2				6.834,2
PUBLIC UNIVERSITIES	15.448,0					15.448,0
INTA (3)			6.921,4			6.921,4
CSIC (4)	16.367,1					16.367,1
JEN (5)		5.281,3				5.281,3
INIA (6)				2.671,7		2.671,7
IEO (7)				2.199,5		2.199,5
OTHER	1.854,8	616,7			7.165,4	9.636,9
						91.989,7

Figure 2. Distribution of Public Funds for R&D in Spain. 1985. (Millions of Pesetas)

(1) Advisory Committee for Scientific and Technical Research.
(2) Center for Industrial Technology Development.
(3) National Institute of Aeronautic Technology.
(4) Superior Council for Scientific Research.
(5) Nuclear Energy Council.
(6) National Institute of Agricultural Research.
(7) Institute of Oceanographic studies.
CAICYT and CDTI can be considered administrative agencies that distribute funds for research.
INTA, CSIC, JEN, INIA and IEO could be considered major public laboratories that perform research.

Source: Ministry of Science and Education.

SOURCE / APPLICATION	MINISTRY OF SCIENCE AND EDUCATION	MINISTRY OF INDUSTRY AND ENERGY	MINISTRY OF DEFENSE	MINISTRY OF AGRICULTURE AND FISHING	ALL OTHER PUBLIC SOURCES	TOTAL
PROGRAMMES MANAGED BY SOURCE ITSELF	3.317	9.567	7.114	285	3.890	24.173
CAICYT PROGRAMMES	11.943					11.943
CDTI PROGRAMMES		7.078				7.078
PUBLIC UNIVERSITIES	22.690					22.690
INTA			8.911			8.911
CSIC	18.233					18.233
JEN		7.934				7.934
INIA				2.891		2.891
IEO				2.124		2.124
CEDEX (1)					3.241	3.241
INSALUD (2)					1.560	1.560
IDAE (3)		3.702				3.702
OTHER	33	208	530	7	380	1.158
						115.638

Figure 3. Distribution of Public Funds for R&D in Spain. 1986. (Millions of Pesetas)

(1) CEDEX. Laboratories of the Ministry of Public Works and Urban Development.
(2) INSALUD. Laboratories of the Ministry of Public Health and Consumption.
(3) IDAE. Institute for Energy Studies of the Ministry of Industry and Energy.

As these two figures show, there is an important increase (26 per cent) in the public R&D effort of Spain between 1985 and 1986. Distributing bodies received 16 per cent of the public funds, Public Universities 20 per cent and Public Laboratories consumed 64 per cent of the public R&D budget.

To these figures, the funds allocated to R&D by autonomous governments (1) should be added. It would be difficult to estimate the total amount under this category since the allocation at local level in less rigorous with regard to the definition of R&D. The researchers, however, estimate that the total amount allocated to R&D by autonomous governments in equivalent to less than 10 per cent of the central government figure.

Another point that requires a comment is the amount allocated to R&D by Public Universities. The quantities shown in Figures 2 and 3 are global estimates of officials interviewed in the Ministry of Science and Education, based on the assumption that 15 per cent of the total budget of the Public University system is spent in Research and Development. Interviews with university rectors indicate that this assumption might be very optimistic and that real R&D can be as low as 5 per cent of the budget in some universities.

The most important change shown by Figures 2 and 3 is the tremendous growth of the R&D effort of the Spanish Ministry of Defense. According to interviewed official of this ministry this is due to the fact that Spain needs to modernize its army, going from a men-intensive army to an equipment-intensive one. In the past, most equipment needs were supplied by imports. The cost of modern weapons is so high, however, that to meet the needs of the Spanish army without producing a big negative

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(1) See what is said in page 30 and 31 about R& D policy of Autonomous Governments.

effect on the country's balance of payments, Spain is now importing weapons under counter-trade agreements. The next step, however, is to get Spanish companies involved in manufacturing modern weapons through joint-ventures or consortia and, gradually, increase the domestic content in these systems. Membership to NATO puts some pressure upon this process and contributes to explain the growth in R&D expenditures which is expected to continue to increase at fast rates in the coming years.

VECTORS (*) AND LEGAL BASES, OBJECTIVES AND PRINCIPLES OF UTILIZATION

As a general introduction to this part of the study it is possible to say that the legal framework for scientific and technological policy in Spain is the so called "Law of Science" published in 1986. This law, as it was approved, appears as Annex 3. The law is still in the process of development of the different articles and therefore its implementation can not be evaluated yet. Nevertheless, the different individuals and institutions interviewed for this study tend to agree that the new law will improve the current situation.

(*) The supervisor of this study indicated that by vectors the authors should understand: people and/or institutions that are able to influence policy making.

I. VECTORS AND LEGAL BASES GOVERNING THE UTILIZATION OF RESULTS.

Annex 4 contains a list of the most important institutions involved in the Spanish system for development of scientific knowledge and technology. Figure 2 showed the input-output aspect of the Spanish system in a global perspective.

1. Process of pinpointing (*) the result.

In the last years the pressures put upon the system try to force it to increase the importance of development, de-emphasizing basic and applied research. As a result, most institutions in the Spanish system have reacted in one way or another to produce some "visible" answers to the outside pressures to become more application efficient. Old institutions, particularly big government laboratories like the CSIC, still do most of their activity in the area of basic and applied research.

The limits between basic, and applied research are difficult to establish. Nevertheless, the CSIC has made an effort in this direction and in recent publications there is a more clear classification of projects. The 1985-87 Programme (6) of the CSIC, published in 1986 clearly separates research projects associated to "General Promotion of Knowledge" –or basic research– from applied research and development projects which are aggregated. This publication shows the objectives of the different projects and in some cases, the expected results. The same institution is encouraging its scientists to patent the results of their research to the maximum extent possible and, in order to help them in the process, has established a "patent office" to advise scientists

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(*) The supervisors of this study indicated that pinpointing should be understood as: sorting out.

on how to do it. This office publishes regularly in the leading newspaper of Spain –El País– the patents issued.

An interesting recent development is the Programme of Applicable Objectives Follow-up (Programa de Seguimiento de Objetivos Aplicables, PROA) established between the CSIC and the CDTI. The administrators of the CSIC will carefully screen the research projects going on inside the institution and if they find projects that seem to offer a good application potential, they will contact CDTI in order to stimulate the real application of the results. Since CDTI is an institution with closer links with industry, the idea is that CDTI plays a pro-active role trying to find somebody interested in applying the results of the scientist's output. The evaluation process that the CSIC has established to identify candidates for the PROA scheme requires the classification of results of R&D and the clarification of the concept of applicable results. Currently (early 1987) the CSIC is in the process to evaluate the 275 research projects under way to pinpoint applicable results.

These examples indicate a growing interest to sorting out the results of research and development at different stages or phases. Nevertheless much remains to be done in this field and situations as the ones described are exceptions.

2. Institutions that disseminate the results.

The role of disseminating the results is the responsibility of the institution that produces the results; this is the general rule. The field research does not show important differences associated to the phase of the results. There are important differences however associated to the institutions.

The CSIC has under its control the ICYT (Institute of Science and Technology). This is the most important documentation center that exists in Spain. The ICYT has an excellent data base and a department that runs it. The Polytechnic University of Madrid publishes a Bulletin that offers some information about research contracts signed with the university. The Industry-University Foundation of Madrid publishes also a Bulletin listing the research contracts in which the foundation has intermediated. Most institutions and major laboratories publish annual reports which offer information about research projects going on and, eventually, results available. In general, there is a lack of standardization and rigor in the approaches of most institutions to disseminate the results.

With regard to the method of dissemination, in the majority of the cases this is a publication of lists with short descriptions. Few institutions play a more active role. The CDTI is probably the most aggresive institution in terms of disseminating results. The CDTI has a good knowledge of industry and has established an excellent network of contacts with other government institutions and with companies. As a result, CDTI might get to the point of directly approaching a company with a suggestion to apply a certain R&D result that is brought to its attention by a scientist or the director of a public laboratory. In addition, the CDTI publishes research results of other institutions (7), and organizes research fairs or exhibitions.

3. The commercial utilization of results, differences by size of user and industrial sector.

In general, it can not be said that the public R&D expenditures give preference to small or to large users from a policy perspective. The field research seems

to indicate also that the aspect of private/public user is not an important issue; on the contrary, in many cases, a private user might be perceived as a more attractive client by a public research center.

Employer associations interviewed complained that it was difficult for a small company to have access to either public support for R&D, or to the results of publicly funded R&D. Interviews with institutions such as CAICYT and CDTI, which channel R&D funds, show that many small companies have indeed had access to their support, and that, so far at least, the aspect of size has not been a discriminatory criterion. Institutions like the CDTI, for instance, made an effort to facilitate the access of small companies to its R&D support schemes through a mobilization programme in collaboration with the Chambers of Commerce and other institutions: an agent visited small companies and discussed with their management the possibility of developing a proposal for a research project that could receive the CDTI's support. The size of the projects approved by this institution is relatively small, 79 million pesetas on the average, up to 1985. Assuming a lead time of three years for the implementation of the average project, this would mean 26 million pesetas of investment per year (equivalent to an estimate of the cost of ten man-years for a typical personnel mix). These figures suggest small projects which, in turn, are likely to come from small and medium size companies. Figure 4 offers a summary of the projects approved by the CDTI up to 1985.

	1977/83	1984	1985	TOTAL
Nº projects approved	216	82	216	514
CDTI investment (Million Pts.)	4,431	3,827	11,416	19,674
Total investment (Million Pts.)	8,116	9,395	23,167	40,678

Source: CDTI

Figure 4. Projects Approved by CDTI. 1977 to 1985

There are certain industries where small companies are scarce, like energy, steel, shipbuilding, and telecommunications. In these industries, of course, most of the R&D support goes to large corporations. The results of laboratories focused on these industries –like the JEN in the energy sector– are obviously more likely to end up being applied by large companies.

The analysis of a sample of 146 suppliers of Defense, the fastest growing R&D spender, shows that their average size was 1190 employees (8). It is likely that these suppliers are also the major beneficaries of the R&D support of this ministry as well as the users of the results of the R&D produced by the Ministry of Defense laboratories.

The analysis by industrial sector suggests that advanced technologies receive a lot of attention with regard to public support for research and development. Figure 4b shows the projects approved by the CDTI in 1984 and 1985 by branch of industry.

Area	Nº of projects		Total budget (Millions Pts.)		CDTI contribution	
	1984	1985	1984	1985	1984	1985
Food and agriculture	17	39	956	4,168	345	2,122
Biotechnology, medicine, chemistry	14	51	1,155	5,678	532	2,682
Electronics computing	28	41	4,394	4,789	1,587	2,312
Energy and others	8	41	850	3,262	491	1,735
Mechanics and processes	15	41	2,040	5,054	871	2,549
Other Programmes	-	3	-	216	-	-76
	82	216	9,395	23,167	3,826	11,476

Source: CDTI

Figure 4b. Projects Approved by the CDTI in 1984 and 1985, by branch of industry

There are certain scientific areas that have received priority in the recent past. Interviews held at CSIC –the leading laboratory of the Ministry of Science and Education– indicate that this institution is giving priority to the following fields:

- New Materials
- Biotechnology
- Toxicology
- Food
- Radioactivity

The Ministry of Industry gives priority to electronics through the Informatics and Electronics Plan (Plan Electrónico e Informático, PEIN) and, to a lesser extent other specific fields. See Figures 5 and 6.

Microelectronics	8,200
Consumer Electronics	7,200
Electronic Components	9,800
Telecommunications	13,950
Informatics	23,040
Industrial Electronics	21,500
Electromedicine	3,300
	86,990

Source: Ministry of Industry. PEIN

Figure 5. PEINplanned investments of the Ministry of Industry and Energy (several objectives) from 1983-87. Millions of Pesetas.

- Special aquaculture R&D programme.
- Special agroenergy R&D programme.
- Special microelectronics R&D programme.
- High energy physics promotion programme.
- Biotechnology promotion programme.
- Pharmaceutical industry promotion programme.
- National new materials programme.
- Sectoral foods programme.
- Energy research plan.

Figure 6. Specific R&D programmes of the Ministry of Industry and Energy, 1986.

One important aspect to keep in mind in the case of Spain is that in addition to the R&D policy of the government, the different autonomous governments of the regions have also their R&D policies. Until now the resources that the regional

governments have channeled to R&D have been limited and, in most cases too fragmented to produce any impact at all. The Catalan government, for instance, had a total budget of 561 million pesetas in 1985 for R&D in Numerical Control, Robotics, Microelectronics and Other Advanced Technologies. These 561 million pesetas were allocated to 294 projects, this is to say 1,9 million pesetas per project in total (less than one researcher-year equivalent).

Interviews show however that there might be a change in the near future. The central government might evolve in the direction of concentrating R&D funds in bigger blocks assigned to less projects. This could lead to support R&D carried out by larger institutions. Regional governments would be expected then to take care of supporting the R&D efforts of smaller institutions.

One of the high ranking government officials interviewed said that, in order to facilitate the commercial success of R&D supported by his agency, he had selected a few fields were he believed that Spanish companies could make a contribution. He was conducting a survey of companies to get an inventory of potential R&D projects in these fields. His idea was to develope a list of criteria to be able to allocate his budget to no more than 15 or 20 projects in 5 or 6 areas.

The participation in European research projects, either at EEC level or at EUREKA level, is also contributing to create the image that Spanish R&D efforts have been approached with a rather small scale until now.

The loosing economic sectors, in terms of exploitation of R&D results, are several of the intermediate or low technology industries –traditional industries– which are important in Spain (furniture, toy, shoe, printing, etc.). The textile industry might

be an exception, at least in terms of fashion and design, since there is a special programme of the Ministry of Industry to improve the intangible technological content of this industry. Figure 7 shows data about this programme.

Programme title	1984	1985	1986	1987	1988	TOTAL
Design schools	5	170	290	400	265	1.130
Promotion of designs and their integration in industry	-	170	230	275	305	980
Creation of design infrastructure	-	100	180	215	300	795
Promotion through trade fairs and competitive exhibitions	145	950	1.450	1.800	2.200	6.545
Promotion of research and standardization	15	155	210	275	285	940
University courses, vocational guidance and ongoing training	-	70	75	105	115	365
Textile industry information and promotion systems	-	175	155	125	140	595
Fashion promotion through communications media	15	415	615	725	870	2.640
Total Institutional Intangibles	180	2.205	3.205	3.920	4.480	13.990
Investments in Collective Intangibles	650	300	600	1.000	1.500	4.050
TOTAL	830	2.505	3.805	4.920	5.980	18.040

Source: Ministry of Industry

Figure 7. The Textile Intangibles Plan of the Ministry of Industry. Millions of Pesetas.

II. OBJECTIVES OF UTILIZATION

The objectives of the utilization of the results of public or publicly financed research and development are outlined in the "Law of Science" of 1986 (Annex 3). These objectives are:

a) The progress of knowledge and advance of innovation and technological development

b) The conservation, enrichment and exploitation of natural resources

c) The economic growth, promotion of employment and improvement of working conditions

d) The development and strengthening of the competitive capabilities of industry

e) The development of public services and, particularly, those of housing, communications and transports

f) The promotion of health, social wellfare and quality of life

g) The strengthening of national defense

h) The protection and conservation of the Historic and Artistic endowment of the country

i) The promotion of art creation and the progress and difussion of culture in all the environments

j) The improvement of the quality of education

k) The adaptation of Spanish society to the changes associated to scientifc developments and new technologies.

The objectives included in the law are general guidelines. The interviews held in a variety of institutions show a growing interest in the application of results. The directors of major laboratories and the rectors of universities show, in most cases, a lot of interest in application of R&D results. The budgets of their institutions might increase if application can be found for the research output.

Interviews with researchers however often show a certain level of frustration. The channels to put in contact the researcher or the research result with th potential user seldom exist and, when they exist, do not work efficiently.

The University-Enterprise Foundation of Madrid (Fundación Universidad Empresa, FUE) was established in 1973 by the four universities of Madrid and the Madrid Chamber of Commerce and Industry. Its objective is to serve as a link between products of research results and users. From 1973 through 1986, the FUE has intermediated in 500 projects with a total budget of 200 million pesetas. Currently 200 projects are intermediated with budgets ranging from 3,5 to 5 million pesetas. This shows, that although there is no doubt about the uselfulness of the foundation, its results are very small in the context of the Spanish R&D utilization needs. Other university-industry foundations have similar (or poorer) records.

Judging thus by the current results, it could be possible to say that the objectives of the users of public or publicly funded research and development in Spain are as will be described following. Figure 8 shows the flow of funds and research results and can help understanding the objectives of the various institutions.

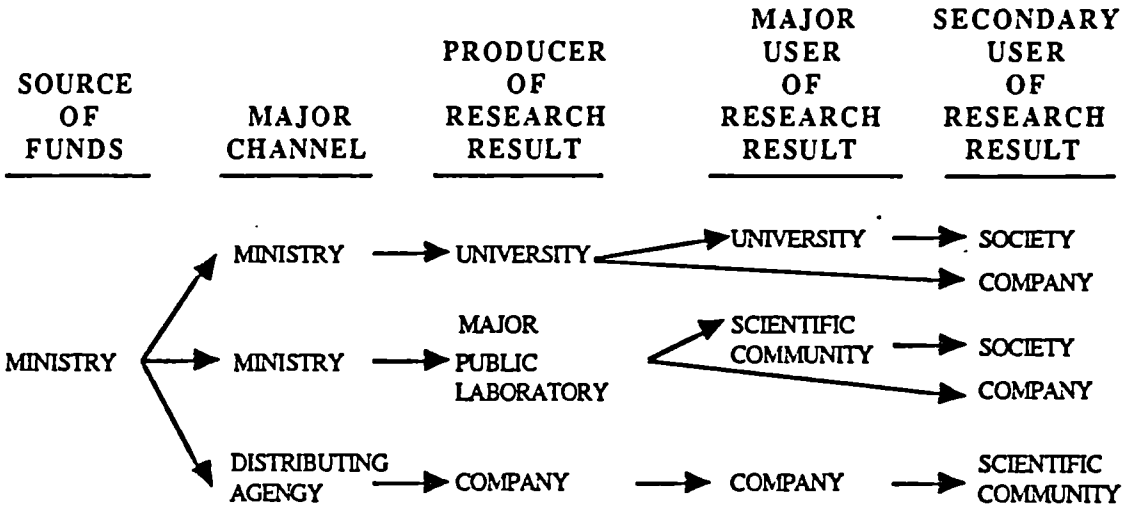


Figure 8. Flow of funds and research results

The funds are channeled by the ministries themselves or by major distributing agencies like CAICYT and CDTI. The results of university research go to the greatest extent to the university itself and, in most cases, this means to the same university. In other words, university research serves the purpose of improving the level of knowledge available in the university and, through this, the quality of education and the production of researchers. To a certain extent there is a secondary user or beneficiary: society in general; this benefit is obtained through the difussion of research results via publications. There is also a portion of university research which results flow to industry. This portion is very small. It is possible to say therefore that the implicit objective of university research results in the enrichment of the level of knowledge available within the university system.

The major public laboratories, like the CSIC and the JEN are, to a great extent, engaged in basic and applied resarch, with little involvement in development. In this case, the results of this research flow to the scientific community via publications.A small percentage goes also to companies since these laboratories engage in concerted and contracted research. The implicit objective of research conducted by major public laboratories therefore can be considered to be the enrichment of the amount of knowledge available within the scientific community.

The amount of publications produced by either universities or major laboratories is small and Spain does not have prestigious scientific journals. Publishing abroad is considered a measure of research quality. According to the Foundation for the Promotion of Automated Information (Fundación para el Fomento de la Información Automatizada, FUINCA) there are 18 distributors of data bases in Spain, distributing information from 70 domestic data bases. Utilization of data bases is still very low in Spain. The research conducted for this study suggests that the Spanish telecommunications infrastructure can not handle the adequate flow of information from data banks. Utilization of these bases is expensive and inefficient. There is a lack of qualified personnel also to facilitate the utilization of networks. These problems contribute to isolate the results of research produced by both universities and major public laboratories.

Finally there is another channel of funds, the distributing agency, like CAYCYT and CDTI. They provide funds for research to be performed by companies. Obviously, in these case the user tends to be the company itself. Distributing agencies tend to support development research with CDTI focusing on closer to the market development and CAICYT focusing on closer to applied research development. To a certain extent, it could be said that the scientific community is a secondary beneficiary of this research through the supervisory role that often plays in projects supported by these

agencies. The implicit objective of research funded through distributing agencies therefore is to improve the competitiveness of companies through the strenghtening of their technological base.

III. PRINCIPLES OF UTILIZATION.

The legal framework for utilization of the results of public or publicly funded research was not clear at the moment of conducting this research. The new "Law of Science" was not completely developed yet. Each institution seemed to have its own rules and practices. The researchers looked at the CSIC, the major public laboratory of Spain, spending 16 per cent of the total public funds in 1986, to see the perspective of this key institution. In the Scientific Programme for the period 1985-87, published in 1986 (9). Page 51 of the referred Programme makes some comments about the valuation and transfer of research results, indicating the importance of the aspect, the fact that the laboratory is concerned about it, it is increasing the resources to take care of it, and it is planning to do something about it, but there are no specific facts, figures or guidelines. The CSIC is leading, however, in the effort to make information available to public about what is going on inside. This might be an indication of an implicit principle of making publicly funded research wide available to the public. Companies interviewed indicated that there was no general pattern: in some cases, researchers in public laboratories opened their basic or applied research completely, while in other cases was difficult to even establish a relationship. The trend seems to clearly go in the direction of making public research more accessible.

As it has been said above, there are internal (to universities and public laboratories) and external offices trying to play an intermediary role between the industrial world and the scientist. Industry-university foundations are the typical example. Contract units and patent units within universities and public laboratories are also examples.

IV. THE PLACE OF UTILIZATION POLICY, WITH REFERENCE TO INSTITUTIONS AND OVERALL APPROACHES, IN THE GENERAL FABRIC OF NATIONAL POLICIES ON R&D AND ECONOMIC AFFAIRS.

The fact that Spain has just approved the legal framework for science and technology and it has not been yet developed completely, makes difficult to specify the relationships between the R&D policy and the general economic background of the country. The current situation is a combination of the inertia of the past and the preparation to adopt the philosophy of the future. It is possible thus to see initiatives being taken by the different institutions in certain directions. Figure 9 shows a list of the implicit objectives which seem to be addressing the most recent initiatives of the leading public institutions of the Spanish R&D system:

Economic Objective	Institutions More Involved
– New Enterprise Creation	BCI, IMPI, CDTI
– Employment Generation	BCI, INI
– Access of Spanish Companies to New Technologies	CDTI, CAICYT, CSIC
– Access of Spain to European R & D Programmes	CDTI
– Technological Independence	INTA
– Import Substitution	INTA, MINISTRY OF INDUSTRY

Figure 9. Relationships between institutions of the Spanish R&D system and general economic objectives.

There is without doubt a general concern in the whole Spanish R&D system for the efficient utilization of research funds, and efficiency tends to be associated, in most cases, to commercial utilization. Many programmes can be found therefore to put presure upon researchers to find ways to utilize the results of their research output. Annex 5 and Annex 6 include two mini-cases, resulting from the field research, which might contribute to better understanding the current situation.

As it was pointed out earlier, the major policy formulation effort with regard to R&D (as well as other industrial aspects) has been associated with the two ends of the industrial spectrum: nature industries, where R&D is expected to play a de-maturing (10) role, and new industries, where R&D is expected to play the key role as the basis for the viability. The middle segment, traditional industries, has

received less attention. This segment is big in Spain and, although it enjoys a reasonably good health, it could be lagging in terms of technological up-date.

Annex 7 includes a summarized description of the major institutions of the Spanish R&D system. In this description, the main explicit objectives of these institutions are included.

INSTRUMENTS, METHODS, RESULTS, AND EXPERIENCE OF USING R&D RESULTS, WITH PARTICULAR REFERENCE TO THE R&D SECTOR PRODUCING THE RESULTS AND THE NATURE OF THE RESULTS

The researchers have not indentified published information or previous studies on this topic. Most of this section is therefore based on the results of personal interviews.

Spain has had low barriers to imports of technology for many years. Figure 10 shows the technological balance of payments of Spain.

Year	Payments	Receipts
1974	314	36
1975	292	49
1976	468	61
1977	390	59
1978	398	73
1979	517	114
1980	618	152
1981	567	180
1982	707	143
1983 *	632	130
1984 *	532	130
1985 *	606	143

* Estimated

Source: Ministry of Industry and Energy

Figure 10. Payments and Receipts for Technical Assistance and Patent Royalties 1974-85. Millions of USA dollars.

Figures 11 and 12 show information about patents in Spain. According to interviewed government officials, the CSIC is the first Spanish institution (including all public and private companies and other types of institutions) in number of patents granted with about 5 per cent of all the patents granted to Spanish applicants.

The percentage of patents requested and granted to Spanish applicants, roughly 20 per cent, and the technological deficit indicate that the overall utilization of research output falls very short with relation to both, the needs of the country and the opportunities of the Spanish market.

COUNTRY OF ORIGIN OF APPLICANT	NUMBER OF APPLICATIONS BY YEAR			
	1982	1983	1984	1985*
USA	2500	2654	2831	2831
SPAIN	1646	1498	1784	2149
WEST GERMANY	1603	1408	1535	1676
FRANCE	1155	1149	1091	1073
U.K.	676	682	657	661
JAPAN	476	495	607	612
SWITZERLAND	510	503	501	561
ITALY	510	420	476	486
THE NETHERLANDS	316	288	332	330
SWEDEN	148	151	178	179
BELGIUM	81	108	126	109
OTHER	580	494	586	494
TOTAL	10201	9850	10700	10667

* Provisional

Source: Department of Studies of CSIC

Figure 11. Applications for Patents in Spain by Country of Origin of Applicant.

COUNTRY OF ORIGIN OF APPLICANT	NUMBER OF PATENTS GRANTED BY YEAR			
	1982	1983	1984	1985*
USA	2278	2189	2069	2536
SPAIN	1714	1291	1275	1498
WEST GERMANY	1555	1474	1314	1113
FRANCE	1119	1044	990	677
U.K.	598	561	520	653
JAPAN	408	434	395	624
SWITZERLAND	485	420	366	526
ITALY	500	436	381	446
THE NETHERLANDS	316	308	265	248
SWEDEN	143	117	134	123
BELGIUM	77	71	77	127
OTHER	517	552	427	552
TOTAL	9710	8806	8213	7533

* Provisional

Source: Department of Studies of CSIC

Figure 12. Patents Granted in Spain by Country of Origin of Applicant.

In general Spanish research institutions have not provided good information about the research activity going on in their laboratories. Scientific publications are scarce and their quality is rather low. The professional associations are weak and their activities do not have a high scientific transfer capability. Technology parks are scarce, relatively new and/or under study. Data bases, as already indicated, are difficult to use. The country suffers an important and generalized problem of transfer of results from sources to potential applicants.

In recent years efforts are being made to bridge this gap. Some institutions create their own transfer offices. Autonomous governments also create institutions, like the CIDEM, of the Catalan government to play this transfer role.

Most companies and institutions, potential users of R&D results, ignore to a great extent however what is available in Spanish universities and public laboratories. There is a certain attitude and/or inertia that will make difficult to change this situation. Universities and public laboratories, in turn, find difficult to create the transfer mechanisms and incentives.

Some of the companies in high technology fields interviewed indicated that it is difficult to establish a good relationship with a public research institution in Spain. However, once the relationship is established, it is possible to benefit from excellent researchers capable of producing good results at low costs.

Younger institutions, like CDTI, designed with less bureaucracy, seem to be able to play a better transfer function than older institutions with heavier administrations.

Another aspect associated to the transfer problem is the evaluation capability of the institution producing the result. If has been shown throughout this report that the Spanish R&D system is fragmented in terms of institutions, size of projects, and variety of sectors. Most institutions, at national and regional levels, will accept research projects in a wide range of scientific and technological fields, and with focus going from basic to development. It can not be expected to find in every institution teams of experts capable to evaluate any type of project. In additon, many institutions tend to approach evaluation on an autonomous basis (rather than networking with other institutions in order to share specialists in evaluationt tasks).

Under these circumstances, the evaluation is often weak both, at the point of accepting the project and at the point of pinpointing the results. The situation found is that the level of transfer depends often from the quality of the evaluation capability of the institution. It is thus possible to identify an institution that has an excellent transfer capability in biotechnology, because there are evaluators who are very knowledgeable in this field, but has a very low transfer capability in electronics, because the evaluators of this sector are weak.

As it was indicated earlier, however, there are evident signs of a growing degree of coordination and concentration of the research effort of the country. The new Law of Science will help to improve in this direction and this, in turn, will benefit the key aspect of transfer of research results.

PROBLEMS OF USING R&D RESULTS FROM THE POINT OF VIEW OF THE USER

Some of the problems have been discussed already, earlier in this report.

1. Phase-related problems.

Results of basic and, to a great extent applied research, do not find easily a client in Spain. Therefore they stay in the system that produced them serving the purpose of enrichment of the knowledge base of the centre. The country still spends a small amount of resources in R&D and, as it could be expected, the emphasis of this effort is in development. There are, however some instances in which transfers of basic and applied research have been attempted and, in some cases, successfully. This has been the case of companies with a strong scientific base that have had the opportunity to "subcontract" phases of research they felt they needed to public laboratories in order to partially subsidize a major research effort. A typical situation of this nature would be established on a personal basis; the company would convince a scientist from a public laboratory to engage in a certain research. The scientist would apply for funds to his institution –often requesting some help from the company, which might take the form of fellowships granted by the company to the institution on the basis of the scientlst criteria–. The company would then closely follow the results of the research implementing the transfer as it seems appropriate.

2. Problems related to the size of the user's enterprise.

The economic tissue of Spain is made of small and medium size companies. The majority of the large companies are public companies, banks, construction

companies and multinationals. These large companies do not spend too much in R&D in Spain, with few exceptions.

Some approaches have been put in operation to stimulate the research activity of large companies. For example, in the energy industry, where most companies are big, the concept of OCI (Research Coordinating Body) has been created. Unitl recently, companies had to spend a certain percentage of their revenues in R&D, but they did not, using these funds for training, investments, etc. In order to stimulate the real spending of these funds in R&D, companies will have to deposit now this percentage of their revenues into a new entity, the OCI. The OCI will be supervised by a committee with representatives of the companies of the sector. Several OCI's have been created by type of energy –electricity, oil, coal, etc.–. The idea is that OCI's will promote and manage precompetitive research in the sector. The OCI's are starting their life, but according to the director of one of them, the member companies seem more interested in getting back the funds they contributed than in bringing ideas for jointly sponsored research. The OCI's handle big R&D budgets but the use of these funds is very limited by the legal definition of the body. For example, it seems that the OCI-oil can not get involved in R&D in petrochemicals, it must concentrate on aspects related to oil exclusively –exploration, transport, refining, distribution–.

An in-depth study conducted by the Department of Research of IESE on ten companies that had received support from CDTI for Development research (11) showed the following results:

a) Most projects were small and short term oriented because the companies:

a.1 Had limited R&D resources

a.2 Were hesitant to embark in a major project because they did not have confidence on the capacity of CDTI to support them over a period of several years (*).

b) Often projects were not part of a technological sequence, were one research stage would build on the previous one, leading to strengthening the technological base of the user in a certain subsector.

c) The results of R&D were difficult to exploit commercialy because of lack of international distribution channels.

d) Results of Spanish R&D were difficult to exploit commercialy because of the poor image of the "made in Spain".

e) Management of technology was weak in most companies and lots of energy were lost in internal conflict. A high turnover was found amongst R&D personnel and scientists.

(*) These fears have been found in many companies. They are afraid of starting projects requiring the support or the collaboration of a public institution or laboratory over a long period of time because political changes in Spain often imply bureaucratic changes and policy reviews. In fact, experience supports this. The CDTI, for instance, has had three different General Directors in less than five years, and over this same period other institutions have appeared, become very relevant, and almost disappeared again. This would be the case of ENISA (National Enterprise for Innovation), a venture-capital like approach started by the Spanish state industrial holding INI, or the case of the CARIC (Commission to Help Industrial Reconversion in Catalonia) which was also concerned with promotion of technology.

f) The biggest successes found were in small and medium size companies.

g) Success and/or failure could not be associated to a specific industrial branch.

3. Problems related to the legal form.

In addition to problems due to inadequate legal framework such as those described in Annex 6, which might be solved in the future with the detailed development of the Science Act and the University Reform Act (LRU) –the two laws that provide the basic legal framework for R&D in Spain– the most important issue is the new Patent Law. Published in March 26th, 1986 (12), this law adapts the Spanish situation to the conditions of the EEC. The new law, which has not produced yet a major impact because certain articles still need further development, represents big changes, and therefore potential problems, for the Spanish scientific and industrial community. The most important change is the emphasis on the product patent and the need for eventual patent violators to demonstrate that they are not violating the patent (as opposed to the previous situation, when it was the owner of the eventually violated patent who had to demonstrate the violation).

The patent legislation of Spain had had few changes since 1929. The new legislation, in addition to the introduction of the product patent (fully applicable after 1992), eliminates the concept of "patent of introduction", and reduces the duration of the protective period of the concept "model of utility" from 20 years to 10 years. The granting of patents will require also a much more ellaborate application.

SUGGESTIONS FOR IMPROVEMENT AT NATIONAL LEVEL.

1. General Recommendations.

There are four general recommendations which would apply to all levels of results of public or publicly financed research and any type of utilization of these results. These are:

a) Better linkage of the problem of utilization of results and national socio-economic priorities. So far the R&D expenditure of Spain has been the major concern. Spain is close to the end of the list of European countries with regard to public (and private) expenditure in R&D. It was therefore perceived as a priority to increase the R&D budget and, as it has been shown in the report, measures have been taken in this direction. Although there is an implicit interest in the efficient utilization of the results of the increased R&D effort, however, few specific measures have been taken in this direction. Therefore, in the near future it is important to focus the attention on the type of problems described in this report and establish the measures and incentives necessary to correct them.

b) The standardization of the classification of research projects and research results. The classification "basic, applied, develoment, commercial exploitation", should be adopted by all the public institutions. They should use this classification in their application procedures, evaluation processes, diffusion instruments, etc.

c) The economic accounting and reporting should be also standardized using the same classification. This would allow to know how much a certain public institution spends in what type of research.

d) The information about research results should be collected and disseminated. Two alternatives are possible:

d.1 On a centralized basis

d.2 On a decentralized basis.

The centralized collection and dissemination of results of public or publicly funded research would have the advantage of promotion of a standard format, identification of overlap, easy access, and easier diffusion.

The decentralized approach (by institution), which is currently being used has the advantage of supplying peripheral information and details which can be valuable, but the disadvantage that the information supplied by different institutions is heterogeneous in standards, dates, budgets, ways of access, etc., and some institutions do not supply any information at all.

The means of dissemination should be strenghened. Major areas of knowledge should have a good basic journal. Professional meetings should be promoted. Modern difussion systems, like computerized data bases, should be promoted and the telecommunications infrastructure to make it possible must be prepared.

2. Recommendations by type of institution.

Three levels will be considered: universities, major public laboratories and major fund distributing institutions.

2.1 University level.– Universities tend to concentrate on basic and applied research and this makes good sense. There are several aspects that could improve the utilization of results of university research.

a) The system of promotion of faculty members should give more attention to their publications.

b) The universities should establish "contracting departments". These departments should market the research results of the university acting as bridges between the researcher on the laboratory and the potential client.

c) The administrative systems of universities must allow for some of the revenues associated to the exploitation of results to go to the researches. Unless incentives are established it is doubtful that the researchers will make efforts to have the results of their research utilized.

d) The advantages of protecting results (through patents or else) should be made clear to the researchers. A publication on the advantages and basic procedures could be useful. A specialized service in the university might help.

e) The incorporation in the research budget of a certain amount for the diffusion of results could help. Certain criteria could be used to have access to this budget: having a published output, holding a patent on a result, etc.

2.2 Major public laboratories.– In Spain, these laboratories tend to focus in basic and or applied research. Probably a certain emphasis on applied –leaving basic research to universities– could be advisable. The recommendations for these institutions are parallel to those made in the case of universities. Recommendations b, c, d and e can be applied to this case.

2.3 Research funds distributing centers.– Several ministries have this type of institutions to channel funds to development projects primarily. This is the case at national and also at regional level. The most important recommendations for these institutions are:

a) Concentrate funds in less projects and in less fields in order to sponsor really duable research projects.

b) Strengthen the evaluation capability of the institutions. An effort must be made to better select and train evaluators and to establish networks of specialists to share their evaluating capabilities.

c) Give more attention to projects addressing the incorporation of technology to traditional intermediate technology industries.

SUGGESTIONS FOR IMPROVEMENTS WITH REFERENCE TO THE EUROPEAN DIMENSION

The scope of this research was limited to the cases of Spain and Portugal. The seminar held in Luxemburg during the initial stages of this research however showed that the problems in other European countries seem to go in similar directions. The European situation with regard to the utilization of results of public research is not well known by the resarchers, however, and therefore, only some comments will be made, resulting from the interviews held for the study.

Companies interested in participating in European research programmes would find useful systems to have access to: a) results of research available in Europe; b) institutions (companies, unviersities, laboratories) working in certain areas. They would wellcome data banks with results of research classified by knowledge area, phase of research, type of result. This data bank should use standard format and language.

SUMMARY AND CONCLUSIONS

The utilization of public or publicly funded research has not been studied in depth in Spain. Very limited published evidence exist on this subject. This report shows that Spain is entering a new period: political changes within the country and membership to the EEC are reshaping the whole R&D environment. The new Science Act, the new University Law, and the new Patent Law provide the legal background that will be the basis for R&D policy formulation and implementation. The major priority so far has been in the organization of the legal foundations and the icnrease of the overall R&D budget. Utilization of results has received indirect attention.

The utilization of results would benefit from the following actions:

a) Standardization of the classification of research results according to their nature (basic, applied, development) by all the Spanish institutions contributing to the R&D system.

b) Standardization of economic accounting and reporting of R&D at national, regional and institutional level.

c) Collection and dissemination of research results.

d) Strengthening of the dissemination infrastructure.

e) The system of incentives for researchers and research institutions to become concerned with the utilization of their research results should be reviewed.

f) The administrative organization of research institutions should include "marketing units".

g) The overall research effort must be more concentrated and better coordinated: less projects, bigger projects, less overlap.

h) The evaluation capability for most institutions must be strengthened, both to evaluate research to be done and to evaluate result of research.

i) Intermediate technology industries must receive more attention regarding utilization of R&D results.

PART III

SPECIFIC ASPECTS AFFECTING PORTUGAL

INTRODUCTION

As in the case of Spain, the researchers wanted to understand first the model of R&D spending of Portugal. Figures P.1, P.2 and P.3 show the results of the data gathering effort, with 1984 as the most up-dated information available, late in 1986.

An analysis of these Figures indicate that the Ministry of Education spends 40 per cent of the total R&D budget; 84 per cent of the R&D expenditures of the Ministry of Education are basic or applied research. Only 31 per cent of the R&D effort of Portugal is Development research. Most of the authorities interviewed considered this a mistake, because, Portugal has scarce resources and small scale and it is unlikely that the Portuguese institutions and/or researchers can be able to make relevant contributions (with their resources and scale) to basic knowledge. The country would benefit a lot however from a general technological improvement, and this would require more focus on development.

The biggest R&D implementer is the State that spends directly 58 per cent of the public R&D budget. The Ministries of Industry and Agriculture spend together 11 per cent of the country's budget in development; this is a measure of the country's

concern for the up-dating of the technological base of their industry and agriculture, sectors that play an important role in the Portuguese economy.

In spite of the fact that it was possible in the case of Portugal, to obtain public R&D expenditures with great detail by phase of research and source, it was difficult for the researchers to study the utilization of R&D results in a way that would allow answering the detailed breakdown of Annex 1. A different scheme will thus be followed to present the data gathered.

YEAR	CURRENT PRICES	CONSTANT PRICES (1)	PPCC (2) 10^6 USA $	% OF GNP
1980	4118.5	4118.5	129.9	0.34
1982	6541.5	4606.5	169.5	0.35
1984	11307.6	5111.9	203.6	0.40

(1) Using the GNP correction factors (1980 = 100).

(2) Applying the index of the consumer prices increase.

Figure P.1. Evolution of total R & D expenditures

Millions of Escudos

Source / Application	Presidency Council of Ministers	Internal Administration	National Defense	General Command of The Armed Forces	Ministry of Justice	Ministry of Finance and Planning	Ministry of Education	Ministry of Labor and Social Security	Ministry of Health	Ministry of Agriculture Forestry and Food	Ministry of Industry and Energy	Ministry of Commerce and Tourism	Ministry of Culture	Ministry of Social Equipment	Ministry of Quality of Life	Ministry of the Sea	Regional Government of Azores	Regional Government of Madeira	TOTAL	%
R&D Expenses by Category of Activity																				
Basic Research	1.3	0.5	2.0	–	–	17.6	1230.2	–	235.9	39.2	41.5	–	1.9	71.9	3.5	46.2	–	–	1691.7	22.7
Applied Research	24.5	0.5	1.0	151.3	–	64.3	1277.3	28.5	126.5	549.2	492.2	0.9	6.9	460.1	11.1	231.1	3.7	–	3429.1	46.0
Development	18.7	10.2	0.8	116.6	122.3	27.7	484.4	30.1	35.6	476.1	352.1	1.0	5.0	441.0	6.6	52.8	144.9	1.7	2327.6	31.3
TOTAL	44.5	11.2	3.8	267.9	122.3	109.6	2991.9	58.6	398.0	1064.5	885.8	1.9	13.8	973.0	21.2	330.1	148.6	1.7	7448.4	100.0
Expenses by Scientific Category																				
Exact Sciences			0.9	18.3			598.2			11.9	130.5	1.5		15.6	1.8				777.8	10.4
Natural Sciences				138.7			462.8			66.7	192.9			73.8	11.5		14.0	1.7	962.1	12.9
Engineering and Technological Sciences	2.0	1.4	2.1	85.3	120.2		490.0	19.3		74.8	494.0	0.4		761.3	1.8		32.6		2085.2	28.0
Health Sciences				0.2			513.6	1.2	375.3	2.5	31.8			7.9	1.2				932.8	12.5
Agriculture, Fishing and Hunting Sciences		0.4		11.3			300.0			883.7	9.8				4.9	330.1	102.0		1642.2	22.2
Social Sciences	38.7	7.7		9.6	2.1	108.6	507.7	38.1	22.7	23.7	18.1		10.2	49.3					836.5	11.2
Human Sciences							103.3						2.9						106.2	1.4
Interdisciplinary Areas	3.8	1.7	0.8	4.5		1.0	16.3			2.1	8.7		0.7	66.0					105.6	1.4
TOTAL	44.5	11.2	3.8	267.9	122.3	109.6	2991.9	58.6	398.0	1064.5	885.8	1.9	13.8	973.0	21.2	330.1	148.6	1.7	7448.4	100.0
Social and Economical Objectives of the Government for the R&D Expenses																				
Production of Knowledge	5.2	1.7	0.9	8.1	2.1	0.9	1326.2	9.4		37.4	76.9		11.7	266.5	1.2		7.0		1755.2	23.6
Exploitation of Natural Resources		0.9	0.6	162.2			244.0			87.7	228.3	1.0		233.8	15.2		49.3	1.7	1024.7	13.8
Promotion of Production and Technol. in Agricult. and Fish		0.4		8.9			261.0			795.3		0.9		5.0	1.6	330.1	89.5		1492.7	20.0
Promotion of Production in Industry and Technology		0.4	2.1	15.7			194.6			124.7	302.5			86.8	1.0				727.8	9.8
Urban Development and Infrastructure		1.6		12.7		26.0	50.6							291.9					382.8	5.1
Protection of Health	3.4			18.7			449.3	32.1	375.0	6.3	40.6				2.2				927.6	12.4
Advanced Technology			0.2	27.4	120.2		198.0		0.3	3.2	215.0			86.8			1.9		653.0	8.8
Organization and Social Progress	35.9	6.2		14.2		82.7	268.2	17.1	22.7	9.9	22.5		2.1	2.2			0.9		484.6	6.5
TOTAL	44.5	11.2	3.8	267.9	122.3	109.6	2991.9	58.6	398.0	1064.5	885.8	1.9	13.8	973.0	21.2	330.1	148.6	1.7	7448.4	100.0
R&D Expenses by Type of Expenditure																				
Personnel Expense	37.4	8.0	1.9	139.3	61.0	68.0	2318.1	45.5	288.8	783.1	344.7	1.9	9.3	667.4	11.1	186.9	69.3	1.7	5043.4	67.7
Overhead	7.1	3.2	0.7	88.2	60.1	41.2	368.1	9.9	90.2	186.5	201.7		1.3	157.8	7.3	96.4	45.1		1364.8	18.3
Land and Construction				7.5			24.2	1.3		49.4			2.5	58.1		34.5	24.5		202.0	2.7
Equipment			1.2	32.9	1.2	0.4	281.5	1.9	19.0	45.5	339.4		0.7	89.7	2.8	12.3	9.7		838.2	11.3
TOTAL	44.5	11.2	3.8	267.9	122.3	109.6	2991.9	58.6	398.0	1064.5	885.8	1.9	13.8	973.0	21.2	330.1	148.6	1.7	7448.4	100.0
Origin of Funds spent by Public R&D																				
Operating Budget	43.4	11.2	3.8	194.2	122.3	94.5	2677.5	53.1	375.8	807.5	420.6		13.8	370.8	12.2	251.7	48.8	1.7	5499.1	73.8
PIDDAC (1)				4.5		13.3	155.7		19.1	123.0	359.2			364.1	9.0	77.0	99.8		1234.7	16.5
Funds from Source				69.2		1.8	92.7	4.5	1.5	102.3	25.6	1.9				1.4			304.7	4.1
IPS/IFL Funds (2)							19.1												19.1	0.3
Companies							12.7	1.0	1.6	2.8				238.1					256.2	3.4
Foreign	1.1						34.2			28.9	80.4								144.6	1.9
TOTAL	44.5	11.2	3.8	267.9	122.3	109.6	2991.9	58.6	398.0	1064.5	885.8	1.9	13.8	973.0	21.2	330.1	148.6	1.7	7448.4	100.0

(1) PIDDAC: Programme of Investments and Expenses for the Development of the Central Administration.

(2) IPS/IFL: Private Institutions, Non Profit.

Figure P.2. R&D Expenses, at current prices, in the Public Sector, by Ministry and Autonomous Region. 1984

IMPLEMENTATION	COMPANIES	GOVERNMENT	UNIVERSITY SYSTEM	I.P.S./F.L. NON PROFIT PRIVATE INSTITUTIONS	TOTAL FINANCING	%
Companies	3155.8	243.5	12.7	75.4	3487.4	30.8
Government	72.5	4313.6	2714.9	9.3	7110.6	62.9
I.P.S./ F.L.	–	–	19.1	419.9	438.1	3.9
Foreign	119.1	110.4	34.2	7.8	271.5	2.4
Total Implementation	3347.7	4667.5	2780.9	511.5	11.307.6	100
1984 %	29.6	41.3	24.6	4.5	100	
1982 %	31.2	43.6	20.6	4.6	100	

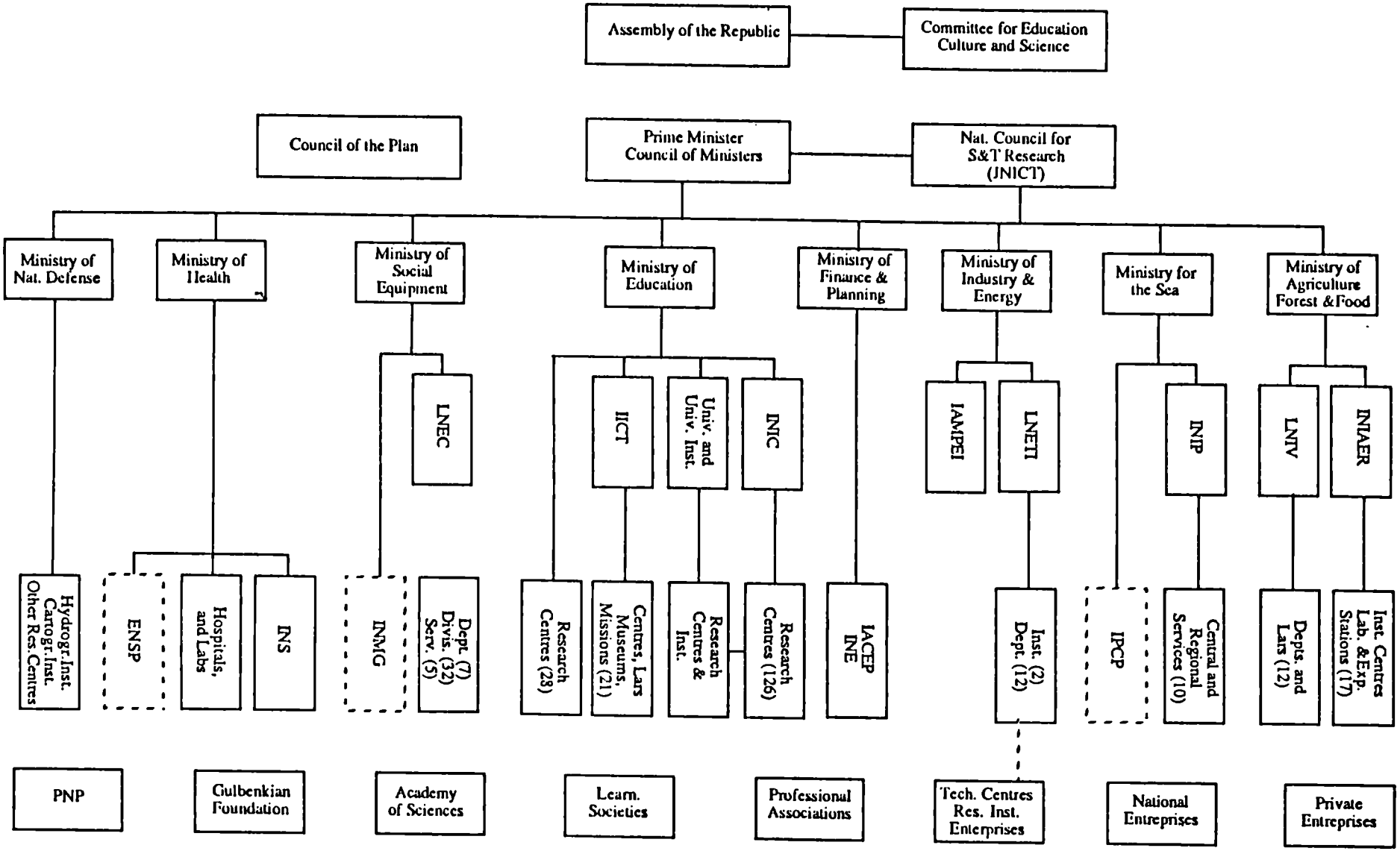
Figure P.3. Implementation and financing of R & D expenditures at current prices (1984)

Figure P.4 shows the organization chart of this system. The most relevant institutions, late in 1986, were, according to the sources interviewed the Ministry of Education with its laboratories and institutions, particularly the Instituto Nacional de Investigaçao Cientifica (National Institute for Scientific Research, INIC); the Ministry of Industry, with the LNETI and the IAMPEI; and the National Council for Scientific and Technological Research, JNICT.

1. The Portuguese Scientific and Technological System; the JNICT.

A summarized description of this system and the Portuguese science and technology policy can be found in a previous study made by the Department of Research of IESE (13). A key institution in this system is the Junta Nacional de Investigaçao Cientifica e Technologica (JNICT). The JNICT is the executive body of the "Secretaría de Estado da Investigaçao Cientifica" and its functions are to coordinate and promote scientific and technological research in Portugal. With the recent changes introduced by the new government, delegating to the Ministry of Territorial Administration the management and coordination of the research activities, the JNICT has been encharged with stimulating applied research. It is hoped that the JNICT will play a much more active role in the scientific and technological scene. As a result, the budget for project financing has been increased from 100 million escudos in 1985 to 900 million in 1986.

The research projects are presented by companies, universities, research centres or state laboratories. The subsidy is not given to individuals but to institutions. The JNICT has an advisory council which covers the different scientific areas and



Source: OECD 1984

Figure P.4. Organisation Chart of the Scientific and Technological System

which gives an opinion on the projects' scientific merit. Preference is given to applied research and experimental development projects which establish a "link" between companies and the research centres of the universities or state laboratories. The subsidies are granted "à fonds perdu". A check is kept on the progress of the projects by means of the analysis of regular reports. Any non-fulfilment of the deadlines or project phases could mean the withdrawal of the support the JNICT gives to the institution; in other words, the JNICT expects the institution to supervise the activity of its researchers.

2. University research in Portugal.

Who makes it.– In Portugal, like in Spain, the research controlled by the Ministry of Education is done in two types of organizations:

a) The Departments of the different universities

b) The Research Centers or Laboratories of the National Institute of Scientific Research (Instituto Nacional de Investigaçao Cientifica, INIC). This Institute would be similar to the CSIC of Spain.

In the university departments, research is done by faculty members as a complement of their teaching task. Every year, each faculty member must inform the director of his department about the projects in which he is working, the projects he plans for the following academic year, and the results of the projects finished. These results include papers, reports, publications, presentations in conferences or, utilization of the research output by another institution. It is important to establish how much time was spent in research and how much in teaching for accounting purposes.

In the Research Centers (Centros de Investigación CIs) of the INIC research is done by: a) university professors who complement their teaching activities at the university doing research at INIC; b) full-time researchers working exclusively for INIC; c) technical personnel working full-time for INIC. The CIs are located in the universities and the salaries of their employees are paid by the universities. The INIC researchers must also submit an annual report indicating current, finished and next research projects.The reports and the results are evaluated by the INIC's councils.

The advantage of being a member of a CI is that the INIC provides the budget to cover the research expenses with less problems than university departments. In 1986 the INIC had 126 CIs with 3418 researchers, equivalent to 1425 on a full-time basis. The CIs are distributed by scientific or technological areas. Figure P.5 offers some data about the CIs.

SCIENTIFIC AREA	RESEARCH CENTERS	RESEARCHERS	
		TOTAL	IN FULL TIME EQ
Exact Sciences	29	1013	470.33
Natural Sciences	32	533	262.22
Sciences of Engineering	18	638	305.18
Medical Sciences	26	733	207.95
Human Sciences	16	389	141.27
Social Sciences	5	112	38.50
TOTAL	126	3418	1425.45

Figure P.5. Data about the CIs of the INIC.

The JNICT informed that, in 1984, there were a total of 2799 full-time equivalent researchers in the University system (University Departments plus INIC laboratories) representing 80.5 per cent of all the researchers of the country.

3. Financing.

The research expenditures can be divided in four chapters: researchers compensation, current expenses, land and buildings, and equipment. The total expenditures of university research in 1984 were 2991.9 million escudos, equivalent to 40 per cent of public research and 24.6 per cent of the total R&D expenditures of Portugal that year. In 1982, university research represented four points less, or 20 per cent of the country's R&D expenses. As can be seen, 75 per cent of the expenses are salaries which are paid by the Ministry of Education.

Figure P.6 shows the sources of financing for University Research in 1984 (According to data of JNICT which differ slightly from those of the Ministry of Education).

Enterprises	12.7
Government	2714.9
Private foundations	19.1
Foreign	34.2
TOTAL	2780.9

Figure P.6. Sources of financing of University R&D in 1984. (Millions Escudos)

The information of this figure is very important. Portuguese enterprises finance only 0.45 per cent of University R&D. This is done through contracts. This extremely poor result is a good index of the lack of trust of Portuguese enterprise in the potential contribution of University R&D to commercial success. Or, as JNICT authorities see, an example of the lack of convergence between the R&D objectives of the University system and the needs of industry. Private foundations –where the Gulbenkian Foundation plays a key role– and the foreign sources finance a negligible 1.9 per cent of University research.

In 1984 the total contribution of public and private Portuguese companies to research done in public laboratories of INCI was 243.5 million escudos. This was done through contracts and represents 7 per cent of the total R&D done by enterprises and 2 per cent of the country's R&D. Combining this figure with data shown above, it is possible to say that 80.5 per cent of the country's researchers produce 7.5 per cent of the R&D done by enterprises. This is a measure of the divorce between the Portuguese public R&D system and Portuguese public and private enterprise.

The government finances thus most of the research done my universities and public Laboratories. The Channels of financing are INIC, JNICT (in 1986 had a budget of 900 million escudos), and other government institutions like LNETI (Laboratorio Nacional de Engenharía e Tehcnología Industrial), the LNEC (Laboratorio Nacional de Engenharía Civil), and the IICT (Instituto de Investigaçâo das Ciências Tropicais).

Portuguese authorities are aware of the problems and corrective measures will be taken. JNICT, for instance tries to give priority to projects that could improve the links between university and enterprise.

4. Types of research.

As shown above the R&D implemented within the university system is composed of University research and research performed at INIC's CIs. In 1984, the expenditures of these two subsystems were similar, although the number of university departments is much higher than the number of CIs. Figure P.7 shows the breakdown by type of institution and Figure P.8 by type of research.

	Expenditures	%
University Departments	1,548.3	55.7
Research Centres of INIC (C.I.s)	1,232.6	44.3
	2,780.9	100.0

Figure P.7. Breakdown of expenditures in 1984 for research performed within the university system. Millions of escudos.

	University Departments		C.I.s of INIC		TOTAL	
	Expend.	%	Expend.	%	Expend.	%
Basic Research	579.9	48.6	612.5	51.4	1192.4	42.9
Applied Research	734.0	62.0	450.4	38.0	1184.4	42.6
Development	234.4	58.0	169.7	42.0	404.1	14.5
TOTAL	1548.3	55.7	1232.6	44.3	2780.9	100

Figure P.8. Breakdown of expenditures in 1984 for research performed within the university system. Millions of escudos.

It can be seen that the CIs of the INIC are more focused on basic research. The directors of INIC interviewed indicated that they plan to increase the amount of applied research and development, but that to a great extent funds for this additional research will have to come from other institutions through contracted research or other type of collaboration. Development takes only 14.5 per cent of the total resources.

Another view of the Portuguese university research effort can be obtained looking at the breakdown by field of specialization. This is shown in Figure P.9. It is possible to see the importance of exact sciences and social sciences. Neither of these areas has an easy exit towards commercial exploitation of results. One third of all the INIC researchers work in the exact sciences field.

	University Departments		C.I.s of INIC		TOTALS	
	Expend.	%	Expend.	%	Expend.	%
Exact Sciences	135.0	23.1	449.4	76.9	584.4	21.0
Natural Sciences	244.5	58.9	170.7	41.1	415.2	14.9
Engineering and Technology	224.5	47.0	252.8	53.0	477.3	17.2
Health Sciences	323.6	63.1	189.4	36.9	513.0	18.5
Agricult. and Fishing S.	180.9	78.3	50.1	21.7	231.1	16.6
Social Sciences	382.4	82.9	78.7	17.1	461.1	16.6
Human Sciences	47.8	54.7	39.5	45.3	87.3	3.1
Interdisciplinary Fields	9.6	82.8	2.0	17.4	11.6	0.4
TOTALES	1548.3	55.7	1232.6	44.3	2780.9	100.0

Figure P.9. Breakdown of expenditures in 1984 for research performed within the university system by field of interest. Millions of escudos.

5. Diffusion of results of university research.

The effort of diffusion of research results is not visible. Directors of INIC indicated that the researchers working in this center tried to publish their papers in international journals and magazines. The INIC itself published also some magazines. INIC usually finances professional meetings in Portugal and pays the expenses of bringing foreign speakers.

The INIC, which has now computerized its information, has one department –the Centro de Documentaçao Cientifica e Technica, CDCT– that centralized information about research going on in the institute. Researchers over the whole country can have access to this source of information.

Finally, INIC publishes, every 5 years, a five-volume report (one volume for each of the research fields according to the OECD classification: Exact and Natural Sciences; Engineering Sciences; Medical Sciences; Agriculture, Fishing and Forestry Sciences; and Social Sciences). This report describes the activity of the CIs. It is possible to find, in this elaborated report, the results of each research project completed within the period: papers published, conferences attended by the researchers, research results, expenditures, etc. The last report available corresponds to the period 1976-80. The 1981-85 report is being prepared and will be available later, in 1987.

Another institution concerned with the difussion of research results is the JNICT. According to the law, the JNICT is the institution responsible for keeping the inventory of the National Potential of Science and Technology.

In 1981, the JNICT published the "Anuario de Ciencia e Technologia" (Annual Report of Science and Technology) with information about the research units and their resources, the projects going on, and the scientific publications produced in the period 1979-80. This is an extensive publication and was the result of a collaboration between the JNICT and a major computer manufacturer. The computer company developed a specific programme to process all the information.This computer manufacturer refused however to continue to collaborate in this project and therefore the Annual Report has not been published again. These publications are in Portuguese.

The researchers had access to the publications referred above and commented them with researchers working in private companies. According to the sources interviewed the practical use of these publications is very low because they come usually late and most of the research listed is very theoretical work: "it is academic work for the academics".

In 1987 a project is going on to publish a second Annual report with information regarding research performed in Portugal between 1981 and 1986. It is an ambitious project considered very important by the JNICT.

OTHER MAJOR INSTITUTIONS IN THE PORTUGUESE R&D SYSTEM (14).

Three other institutions must be considered because their importance as catalyzers or performers of publicly financed R&D. These are the LNETI, the IAMPEI and the INPI.

1. The LNETI.

The "Laboratorio Nacional de Engenharia e Technología Industrial" (LNETI) is a body attached to the Ministry of Industry and Trade. It has three activities related with production of technology:

- Applied technological research activities for industry, especially in the field of new technologies.

- Activities related with the application of the Ministry of Industry and Trade's technology policy, in terms of the creation of new support infrastructures for certain industrial sectors and in terms of the management of programmes for financing technological innovation projects.

- Technical training activities for industry through the Industrial Technical Training Centre, which is maintained and operated by the LNETI.

350 scientists work at LNETI. The research activities of this institution are industry-oriented, that is to say, the users of these activities are industrial companies. The LNETI signs research contracts with the companies and in these contracts there is a provision that states that the Laboratory will have a share in the commercial application of the technologies developed. The researchers of LNETI must try to "sell" their research capabilities, identifying companies that might be interested in an idea that the laboratory plans to research or is currently researching with its own resources. The philosophy of LNETI is to make the researcher aware that his work must have industrial or commercial interest, in other words, he will not be given funds to finance his project unless he can find a business partner who is interested in the result of that project.

When he finds a "partner", the contract is signed between the LNETI and the interested company. The researcher earns nothing on the value of the contract as he receives a regular salary from the Laboratory.

Unfortunately, no statistics are available on the number of contracts signed, and, more importantly, on the results in terms of technological innovations introduced into the Portuguese industrial system by means of these contracts. What does exist is a list of companies with which contracts were signed and a reference/title of the project done or being done. The LNETI has never been concerned to find a numerical indicator which could define the degree of research activity. The number of projects, for example, is meaningless because it includes projects of different size and complexity, thereby precluding any attempt at comparison. Neither is the number of companies with which agreements are or were made meaningful as several projects may be performed in one company.

There exists a generalized opinion amongst the persons interviewed on the relatively low efficiency of this institution and its high level of bureaucratization. As regards the role played by the LNETI as agent for the Ministry of Industry's technological policy, a distinction must be made between two types of activity:

- The first is the participation of the laboratory as a partner, alongside private companies, industrial associations and the IAPMEI, in the creation of a group of specialized and decentralized Technology Centres, in order to improve the support infrastructure for certain sectors such as footwear, wood, cork, etc. This initiative forms part of the industrial policy being implemented by the Government and which is based on a development model which gives

preference to maximum use of natural resources, restructuring and modernization of industrial sectors, regional development and technological autonomy.

- The second is the participation of the LNETI as a manager of technical and financial programmes to support technological innovation promoted by the Ministry of Industry.

These programmes, known as Industrial Development Contracts (CDI), are the formalization of experimental support measures for industrial innovation projects, begun in 1983, and whose goal is to create a favourable climate for business initiatives aimed at developing new products and processes and at introducing new technologies in the production processes.

The CDI's are contracts involving the LNETI, industrial companies, universities and research institutions and which consider projects whose aims are as follows:

- develop new products or processes, including the construction of prototypes or experimental plants;

- produce pre-series and construct pilot plants for market testing new products or processes;

- introduce new technologies in production processes;

- R&D projects to be developed by industrial companies, using its own resources or through contracts signed between these companies and Portuguese research institutions.

Financial support may amount to up to 60 per cent of the expected project cost, with a ceiling of 45 million escudos. These costs do not include the investments to be made in buildings, land or other physical infrastructures. This support is interest-free and will be repaid in 6 equal half-yearly instalments starting from the beginning of the third year after receiving the final grant payment.

The contracts are signed between the LNETI and the company or groups of companies who will work on the project.

As contract administrator, the LNETI's task is to evaluate and select the projects and then back up the implementation of the project by constant support from its technical personnel. The LNETI is thus able to release funds according to a timetable established at the time of entering into the contract. The funds are transferred form the Ministry of Industry to the LNETI, which then transfers them to the contractors. The LNETI retains 3 per cent of the amount of each project as remuneration for its services.

These contracts do not exclude the participation of the LNETI as a research institution.

In the first 18 months of existence of these CDI's, finance worth 3,462 million escudos was given to a total of 104 projects. Figure P.10 shows a breakdown of the number of projects and the amount of financing given.

NUMBER OF PROJECTS			
PROGRAMME	1984	1985	TOTAL
Acquisition and assimilation of new technologies	22	17	39
Industrial innovation aid programme	40	25*	65*
	62	42*	104*

FINANCIAL RESOURCES (Millions of Escudos)			
PROGRAMME	1984	1985	TOTAL
Acquisition and assimilation of new technologies	599	348	947
Industrial innovation aid programme	1958	557*	2515*
	2557	905*	3462*

* Up to June 1985

Source: LNETI

Figure P.10. Projects financed by the LNETI.

By way of information, one of the projects financed through the CDI system was later expanded in cooperation with a French company and is one of the first ten projects approved in the Eureka programme.

In parallel with the CDI's, the Ministry and the LNETI set up support programmes for university research. Through these programmes, the Laboratory can finance research projects in new technology which prove to have clear industrial interest. These projects may be carried out within a period of two or three years and financing is "à fonds perdu". However, if some time in the future the results should be put to commercial use, the company so doing must pay a royalty on sales.

2. The IAPMEI.

The "Instituto de Apoio às Pequenas e Médias Empresas Industriais" (IAPMEI), is a public body, linked to the Ministry of Industry and Energy. In collaboration with other institutions, its task is to study, promote, and coordinate the application of the measures that comprise the SME assistance policy. In Portugal a SME is a company that employs between 5 and 400 people and has an annual income of not more than 500 million escudos. 16.000 companies are registered with the IAPMEI of which at least ten thousand had benefited from action by the Institute in 1985. Companies must register with the IAPMEI to be eligible for support. The IAPMEI grants the registered companies both technical assistance (business management counselling, personnel training, guidance in matters of organisation, marketing research, etc.), and financial aid by means of programmes in which both its own technicians (approximately 150 engineers and economists) and people on contract from outside the Institute take part. In order to finance its operations, the IAPMEI has its own budget which, for the year 1985, amounted to 4000 million escudos.

IAPMEI programmes of assistance for the creation of companies and for introduction of new technology were first started in 1985, when aid programmes for small and medium-sized companies were approved to create or expand businesses based

on new technology or natural resources and to promote the industrial development of the interior of the country.

The objectives of the programme for the creation and expansion of new technology-based companies are:

- to encourage and strenghten investment in new industries and new technologies;

- to increase technological innovation;

- to encourage innovative projects with high development potential;

- to provide employment opportunities for the highly qualified.

The financial assistance provisions include:

- up to 45 per cent of the fixed capital investment, which must not exceed 60 million escudos, excluding land;

- no interest charged;

- maximum term of five years, with a maximum waiting period of two years;

- prearranged half-yearly payments to number not less than six.

For companies that are to be created for a greater and more rational use of natural resources, the provisions for financing are the following:

- up to 35 per cent of the total fixed capital investment and research costs, up to a maximum of 45 million escudos per company;

- no interest charged;

- a pay-back period of three years in six half-yearly instalments.

Finally, the aims of the aid programme for the industrial development of the interior are:

- to contribute to the balancing of regional industrial inequalities;

- to create and develop small companies which would help to increase employment and the stabilization of the population in the interior and improve their living conditions;

- to give impetus to the transformation of the industrial system so that it will be able to deal with the greater demands that entry in the EEC will impose on the country.

Financial assistance for these projects will be on conditions similar to those already mentioned, namely:

- up to 60 per cent of the total investment costs to a maximum of 35 million escudos;

- no interest charged;

- maximum term of five years, with a waiting period no greater than two years.

On a international level, the IAPMEI is the equivalent of the "Bureau de Approchement d'Entreprises", a body attached to the European Commission. Thus, the IAPMEI serves as a link between Portuguese companies and foreign companies that wish to establish some sort of joint venture.

3. The INPI. Protection of Innovation - The Instituto Nacional dà Propriedade Industrial.

The "Instituto Nacional dà Propriedade Industrial" (INPI) is a public body created in 1976 and whose function is to implement national legislation on industrial property and the conventions, treaties and international agreements signed by Portugal.

Although the INPI is a recently formed body, industrial property rights have been recognised in Portugal since 1837 when the first Industrial Property Act was passed. Since then, the legislation has evolved and undergone succesive adaptations, the last time being in January 1984. However, there still exists some important omissions in present legislation such as, for example, no mention is made of microelectronics and microbiology patents.

The sphere of action of the INPI is the attribution, registration and protection of industrial property rights, which include: patents of inventions, models and industrial drawings, trademarks, names and devices of establishments, and denominations of origin.

In the last five years, the INPI has received an annual average of 2000 patent applications. The number of patents granted is approximately one third.

According to the statistics of the World Intellectual Property Organization, the 1984 data show:

	Residents	Non-residents	Total
Patents applied for	96	1756	1852
Patents granted	60	577	637

It will be observed that the number of patents applied for and granted to non-residents is clearly higher than that of residents. These are individuals or companies who registered their invention in another country and have one year to exercise their exclusivity right in Portugal. If they do not do so, the patent is not granted to anyone and any company or person can use the technology because it is considered to be public property.

The INPI does not consider itself to be sufficiently computerised to be able to systematically reject patent applications that are copies of inventions registered in other countries and which did not exercise their right in Portugal. However, their technical personnel assert that their years of experience have enabled them to develop a certain skill in identifying such cases. Furthermore, the interchange of documentation

between countries is growing all the time, as is the development and incorporation of computer equipment to reduce or even rule out entirely any possiblity of copying.

With its entry in the EEC, Portugal will be compelled to join the "European Patent" in 1992. This means that the system currently applying will have to be adjusted to the EEC rules as regards documentations, criteria as to what constitutes a novelty, etc. The idea prevailing in the INPI is to gradually add on to current legislation the necessary changes until the European code is adopted.

Another service provided by the INPI is the publicising to industries, inventors and researchers of the summaries of the patents granted and contentions, if any. This is done through the "Boletin dà Propriedade Industrial" which is published every month.

The INPI also makes available to the public its documentation centre where it is possible to make all types of inquiries concerning national and foreign patents. It holds Portuguese, French, German, American, and English patent documents and summaries from the European patent. The INPI also has bibliographical data and information on the legal status of all types of industrial property processes.

TRANSFER OF TECHNOLOGY

The subject of technology transfer in Portugal is governed by two contradictions:

- On the one hand, there are many talks about modernizing the industrial system buy introducing new technologies in the production processes. However, it is a well-know fact that Portugal's capacity for innovation is fairly limited for several reasons, but especially for reasons of a historic nature: in the past, there has never existed a concern for research and, at the same time, the country became used to seeking abroad raw materials, equipment and technology for its industry. In addition, the R&D performed with public funds has a very theoretical orientation and this situation is also difficult to change. Consequently, in spite of the efforts made in the field of research, Portugal will still depende on the importation of technology for several years.

- On the other hand, technological authonomy and the reduction of the balance of trade deficit have become government goals and therefore go against the importation of technology.

However, these two extremes never come into conflict. During the field research conducted in Portugal several situations were observed in which government institutions pledged to promote technological development included in its credit lines the coverage of technology importation expenses. Thus, perhaps it is exaggerating a little to talk of instruments for stimulating the transfer of technology but neither can it be said that these do not exist.

The activity of the Banco de Fomento Nacional offers a good example. The bank officials we spoke to stated that the bank provides a major link for the incorporation of new technologies in Portuguese production processes. This is because the BFN implements measures designed to attract foreign investment and, consequently, the technologies that this investment will bring. These activities can be considered as an indirect stimulation for the transfer of technology and include:

- Organization and participation in promotional missions in other countries or in welcoming foreign industrial missions to Portugal.

- Technical support to analyse and study investment projects.

- The search for foreign entrepreneurs to associate with them in any class of joint venture.

- The publicising abroad of investment opportunities in Portugal.

As regards the technology importation process, this must of necessity pass through the "Instituto do Investimento Estrangeiro", whether the importer is a Portuguese company or a foreign company.

PORTUGUESE COMPANY.– When a Portuguese company plans to introduce a technology developed in another country, the first step it takes is to consult the INPI to ascertain whether the owner of the patent exercised his right in Portugal. If he did not, that company or any other may freely use that technology without having to pay royalties.

If the owner of the patent is registered in the INPI, the entrepreneur who desires to use the patent must negotiate with its owner. The contract they sign must be sent to the "Instituto do Investimento Estrangeiro" who then requests authorization for the corresponding payments, should they involve the egress of foreign exchange, from the Bank of Portugal.

FOREIGN COMPANY.– If the company is already established in Portugal, the process is exactly the same as that described for a Portuguese company.

If the company wishes to establish itself in Portugal, it will present an investment project to the "Instituto do Investimento Estrangeiro". If it owns the technology to be used, the company will be able to gain greater benefit from fiscal and financial incentives than will a company that must pay royalties abroad. In the latter case, the contracts signed between the company and the owner of the patents must be registered in the IEE.

The data available in the IEE reveal that in the last three years, the number of licensing contracts and also the number of technical assistance contracts related with the tecnologies transferred are decreasing. The IEE has no data on the value of these contracts. Figure P.11 shows the available data.

Countries	1982		1983		1984	
	Licence	Service	Licence	Service	Licence	Service
EEC	144	404	107	327	86	311
West Germany	28	119	17	90	27	97
France	48	127	39	92	21	80
United Kingdon	17	92	21	84	14	72
Belgium	15	16	11	22	9	13
Others	36	50	19	39	15	49
EFTA	27	129	27	137	19	106
Switzerland	22	66	20	76	13	53
Sweden	4	42	3	43	5	37
Others	1	21	4	18	1	16
Spain	14	63	12	38	15	49
USA	24	54	17	31	27	42
Others	5	13	13	20	4	12
TOTAL	214	663	176	553	151	520

Figure P.11. Number of Transfer of Technology Contracts Established Between Portugal and Foreign Countries.

SUGGESTIONS FOR IMPROVEMENT

As the quantitative and qualitative data supplied in this report indicate, in the case of Portugal practically everything remains to be done in the area of improving the utilization of the results of public or publicly funded research. It is difficult therefore to make specific recommendations because general policies must be formulated first in order to improve the efficiency and effectiveness of the whole Portuguese R&D system.

a) A general observation is that the system is plagned with bureaucracy. Bureaucratic objectives receive priority. Filling forms and accounting for everything seem to be more important than producing results. Reports are processed late and it is difficult to get up-dated information although very detailed information is somewhere within the system. The administrations of most institutions are over staffed and under equiped. A change in philosophy is needed. Following the example of the Spanish CDTI (established by a suggestion of the World Bank), perhaps Portugal should launch a new institution to its R&D system, an institution called to play a major role and designed free of bureaucracy and bureaucracy-proof. A new institution which could play a leadership or an example role and catalyze a process of change in the other institutions.

b) Portugal must set up R&D priorities with relationship to the real needs of the Portuguese society. The low level of utilization of R&D results is undoubtedly related to the fact that the R&D effort of the country does not take into account the immediate needs of companies, consumers, or other societal clients. This means that an assessment of technological needs is important as a first stept to provide direction to the Portuguese R&D system.

c) The R&D budgets should quickly take into consideration the priorities detected. New programmes of research must be established releasing the bureaucratic barriers of entry into the priority areas.

d) The different institutions, but particularly the INIC and the LNETI, must get closer to industry and "descend" to development research. It is important to find ways to offer incentives to researches so they become interested in being effective. It is also important to find easy ways for establishing contracts with industry. The amount of contracted research should increase: perhaps a certain fiscal incentive for companies contracting research with LNETI and INIC would help.

e) It is important to strengthen the evaluation capabilities both at entry level (application), and at exit level (results) of all the institutions in the priority fields.

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(13) Department of Research of IESE, *Supporting Infrastructure for Innovation, Technology Transfer and Enterprise Creation in Spain and Portugal.* Unpublished report prepared for the Commission of the European Communities (Barcelona, IESE, July, 1986).

(14) This part benefits also from the IESE study referred above, *Supporting Infrastructure for Innovation Technology Transfer and Enterprise Creation in Spain and Portugal.*

ANNEX 1

Detailed Breakdown

A. Introduction

1. Brief outline of the problem and definition of the issues.

2. Initial indications of the problem's importance and the lack of attention it has received so far in technology policy.

B. Basic principles

I. Definition, phases and classifcation criteria of public or publicly funded R&D.

1. Definition of the term "R&D".

2. Definition of and distinction between the following phases:

- basic research
- applied research
- development and testing
- marketing

II. Definition and classification criteria of R&D results.

1. How can one distinguish between the results of the various phases? (cf. B.I.2).

2. Differentiation of approach in line with the form assumed by the results.

For example, the following forms are possible:

- intangible
- tangible
  - model
  - prototype

3. Differentiation of approach in line with the possible commercial exploitability of the R&D results, e.g.:

   – can the results be exploited directly?

   – can the results be exploited after modification?

   What differences emerge during these processes?

4. What consequences and problems are associated with the protectability fo the results? For example:

   - patent
   - utility model
   - organizational measures (e.g. secrecy).

5. What problems arise in passing on protected and unprotected results?

III. Definition, phases and classification criteria of utilization

1. How is the term "utilization" to be understood?

   Definition: the overall process of pinpointing, disseminating and comercially exploiting R&D results, especially on the basis of licences.

2. What are the sub-phases of utilization?

   For example:

   – sub-phase 1: identification of results.

   – sub-phase 2: identification of results which it might be possible to exploit commercially (evaluation problems!).

– sub-phase 3: checking on protectability and possibly patenting.

– sub-phase 4: granting of licence (differentiation, cf. Annex 1).

– sub-phase 5: commercial exploitation by licensee (cf. Annex 1).

– sub-phase 6: dissemination (cf. Annex 2).

C. Vectors and legal bases, objectives and principles of utilization

I. Vectors and legal bases governing the utilization of results

1. How are the results pinpointed?

   Are there phase-related differences? (cf. B.I.2).

2. Which institutions disseminate the results?

   Are there phase-related differences? (cf. B.I.2).

3. Who is primarily involved in the commercial utilization?

   • Are there differences in size among the users?
   • Are there differences between branches?

II. Objectives of utilization

1. Which objectives are pursued at national policy level?

2. What are the users' objectives?

3. Are there any discrepancies between objectives?

   If so, how can they be overcome?

III. Principles of utilization

1. Is it possible to discern phase-related differences?

2. Is it possible to discern differences related to those taking part in the transfer process (Cf. Annex 3).

IV. The place of utilization policy, with reference to institutions and overall approaches, in the general fabric of national policies on R&D and economic affairs.

1. What are the general objetives behind national R&D policy?

2. What are the specific objetives behind the utilization policy for public and poblicly funded research?

   - Are there phase-related differences?
   - Are there sector-related differences?

3. Which objectives are assigned to specific institutions?

D. Instruments, methods, results and experience of using R&D results, with particular reference to the R&D sector producing the results and the nature of the results

I. Evaluation and pinpointing of results

1. What methods are used for this?

2. Are the methods used selectively or globally?

II. Protection of results

1. What kind of protective measures are taken (cf. Annex 1).

2. Is it possible to discern phase-related differences? (cf.B.I.2).

3. Is it possible to discern vector-related differences? (cf. Annex 3).

III. Dissemination of results

1. What are the general dissemination instruments?

   - Are there phase-related differences? (cf. B.I.2).
   - Are there vector-related differences? (cf. Annex 3).
   - Are there size-related differences?

2. What are the general obstacles to dissemination? (cf. Annex 4).

   - Are there phase-related differences? (cf. B.I.2).
   - Are there vector-related differences? (cf. Annex 3).
   - Are there size-related differences?

3. Which transfer bodies (cf. Annex 5) are involved in dissemination?

   - Are there phase-related differences? (cf. Annex 4).
   - Are there size-related differences?

IV. Commercial exploitation of the results

1. Are there branch-related differences?

2. Are there phase-related differences? (cf. B.I.2).

3. Are there size-related differences?

E. Problems of using R&D results from the point of view of the user

1. Are the problems phase-related? (cf. Annex B.I.2).

2. Are there differences related to the size of the user's enterprise?

3. Are there differences related to legal from? (cf. Annex 1).

4. Are there differences related to the stage of development of the technology involved?

F. Suggestions for improvement at national level, in each case with particular reference to the nature of the R&D results and to the R&D sector producing these results:

1. Should specific methods be recommended for evaluating or pinpointing the results?

2. Should changes in the legal framework be recomended?

3. Should the financial promotion measures be altered? (cf. Annex 6).

4. What proposals can be made for creating an infrastructure to disseminate R&D results?

5. To what extent can the existing bodies take on this task?

6. How could national coordination be achieved?

G. Suggestions for improvements with reference to the European dimension, in each case with particular reference to the nature of the results and to the R&D sector producing these results.

1. What proposals can be made for creating a European infrastructure to disseminate R&D results?

2. How can coordination on a European basis be achieved?

3. How can transnational coordination between national structures be initiated and maintained?

4. What kind of general European framework shoud be created?

H. Summary and general conclusions

1. List of weaknesses revealed by the study

2. List of proposals for improvements, broken down into

   - national measures and
   - European measures

LEGAL BASIS FOR COMMERCIAL EXPLOITATION, ESPECIALLY BY GRANTING LICENCES:

- individual licences
  - know-how licences
    - ordinary
    - exclusive
  - patent licences
    - ordinary
    - exclusive
- mixed licences
  - ordinary
  - exclusive
- licence exchange contracts
  - bilateral
  - multilateral
- purchase/sale of technologies.

POSSIBLE WAYS OF DISSEMINATING R&D RESULTS

- in writing
  - officially
    - confidentially
    - publicly
  - unofficialy
    - confindentially
    - publicly

- orally
  - officially
    - confidentially
      - conversation
      - movements of staff
    - publicly
      - conversations lectures/conferences etc.
      - movements of staff
  - unofficially
    - confidentially
      - conversation
      - movements of staff
    - publicly
      - conversations/lectures/conferences etc.
      - movements of staff

- via objects
  - parts
  - complete units

POSSIBLE FEATURES OF PARTICIPANTS

Givers

- research establishments
  - European Community Joint Research Centre
  - universities
    - at national level
      - civilian projects
      - military projects
    - at international level (international cooperation projects)
      - civilian projects
      - military projects
  - non-university research establishments
    - at national level
      - civilian projects
      - military projects
    - at international level (international cooperation projects)
      - civilian projects
      - military projects
  - private enterprises
    - at national level
      - civilian projects
      - military projects
    - at international level
      - civilian projects
      - military projects

Takers

- small and medium-sized enterprises
- large enterprises

Transfer agents

- transfer bodies open to the general public
- in-house transfer bodies
  - belonging to the giver
  - belonging to the taker

POSSIBLE SYSTEMATIZATION OF OBSTACLES

- inherent in the object of the transfer
  - complexity
  - compatibility
  - relative advantageousness
  - divisibility/testability
- inherent in technology giver, taker or transfer agent
  - organization
    - size of enterprise
    - enterprise's technological level
      - level of know-how
      - lead time required
    - financial resources
    - administrative factors
  - personal factors
    - ability
    - willingness

- environmental factors
  - economic environment
    - market size
    - market structure
    - competitive situation
    - economic situation
  - technological environment
    - level reached by competitors
    - technological developments
  - sociocultural environment
  - ecological environment
  - legal and political environment
    - patent system
    - environmental protection
    - safety regulation/standards

INSTITUTIONAL FORMS OF TRANSFER BODIES

- public transfer and advisory bodies (e.g. belonging to associations)
- in-house transfer and advisory bodies belonging to technology giver or taker
  - in public research establishments
  - in private enterprises
    - belonging to the technology taker
    - belonging to the technology giver.

POSSIBLE SYSTEMATIZATION OF FINANCIAL INSTRUMENTS

- institutional funding

  - global funding
    - one backer
    - several backers

- programme funding
  - one backer
  - several backers

project-related funding

- financial contribution
  - grants
- public contracts
  - R&D contracts
  - procurement contracts
- fiscal measures

ANNEX 2

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ANNEX 3

THE SCIENTIFIC AND TECHNICAL RESEARCH PROMOTION AND COORDINATION ACT OF SPAIN

(The Government's Official Gazette; Friday, April 18th, 1986)

I. Disposiciones generales

JEFATURA DEL ESTADO

9479 *LEY 13/1986, de 14 de abril, de Fomento y Coordinación General de la Investigación Científica y Técnica.*

JUAN CARLOS I,
REY DE ESPAÑA

A todos los que la presente vieren y entendieren.

Sabed: Que las Cortes Generales han aprobado y Yo vengo en sancionar la siguiente Ley:

EXPOSICION DE MOTIVOS

La investigacion científica y el desarrollo tecnológico se han desenvuelto tradicionalmente en España en un clima de atonia y falta de estímulos sociales, de ausencia de instrumentos que garantizasen la eficaz intervención de los poderes públicos en orden a la programación y coordinación de los escasos medios con que se contaba, falta de conexión entre los objetivos de la investigación y las políticas de los sectores relacionados con ella, así como, en general, entre los centros de investigadores y los sectores productivos. No es de extrañar, por ello, que la contribución española al progreso científico y tecnológico haya sido, por lo general, escasa e impropia del lugar que en otros órdenes nos ha correspondido, y que, cuando ello no ha sido así, como en algunos períodos del siglo actual, las mas valiosas aportaciones hayan procedido del esfuerzo aislado de relevantes personalidades.

Si conocidos son los males que esta situación ha acarreado para las posibilidades de progreso técnico, modernización y racionalización de los hábitos y actitudes de la sociedad española, en el pasado, los riesgos que en el inmediato futuro derivaran de la persistencia de un estado de cosas semejante apenas precisan ponderación. En efecto, los nexos que unen la investigación y el desarrollo socio-económico, asumidos de antiguo en los países avanzados, resultan en nuestra época, caracterizada por una sostenida crisis económica y una intensa competencia industrial, más evidentes que nunca. El reto de la llamada tercera revolución industrial exige, y de hecho está produciendo en aquellos países, un aumento constante de inversiones en investigación e innovación a fin de mantenerse en la vanguardia del cambio tecnológico.

La necesidad de corregir los apuntados males tradicionales de nuestra producción científica y técnica, básicamente centrados en la insuficiente dotación de recursos y desordenada coordinación y gestión de los programas investigadores, así como la de asegurar que España participe plenamente en el proceso en que están inmersos los países industrializados de nuestro entorno, justifican ampliamente la promulgación de una normativa que, dentro de los objetivos ya marcados por la Constitución, establezca los necesarios instrumentos para definir las líneas prioritarias de actuacion en materia de investigación científica y desarrollo tecnológico, programar los recursos y coordinar las actuaciones entre los sectores productivos, centros de investigación y Universidades. Son estos los grandes principios que inspiran la presente Ley, como garantía de una política científica integral, coherente y rigurosa en sus distintos niveles de planificación, programación, ejecución y seguimiento, con el fin de obtener del necesario incremento de recursos para la investigación la rentabilidad científico-cultura, social y económica mas adecuada a nuestras exigencias y necesidades.

Se da cumplimiento de este modo al mandato constitucional que atribuye a la Administracion del Estado la competencia sobre el fomento y la coordinación general de la investigacion científica y técnica (artículo 149, 1.15, de la Constitución) y en conformidad con el «interes general» que obliga a todos los poderes públicos (artículo 44, 2, de la Constitución). Por otra parte, los distintos Estatutos de Autonomía han ido estableciendo las competencias que en esta materia posee cada Comunidad Autónoma. Surge así la necesidad de coordinar la actuación, en el campo de la investigación, de las diferentes Comunidades Autonomas entre sí, y de éstas con la Administración del Estado. A tal exigencia responde la creación por esta Ley de un Consejo General de la Ciencia y la Tecnología en el que participaran representantes de la Administración del Estado y de las Comunidades Autónomas.

La Ley encomienda a una Comisión Interministerial de Ciencia y Tecnología, la programación de las actividades de investigacion de los organismos dependientes de la Administración del Estado, mediante el Plan Nacional de Investigación Científica y Desarrollo Tecnológico. Se establece así un nuevo e integrador mecanismo, de programación ágil y eficaz, y, conjuntamente, una metodología adecuada y moderna para hacer frente al complejo proceso de planificación, coordinación y gestión. El Plan Nacional, cuya aprobación corresponde al Gobierno y cuyo seguimiento y valoración llevará a cabo el Parlamento sobre la base de las comunicaciones que le sean remitidas periódicamente por el Ejecutivo, establecerá los grandes objetivos en investigación científica y tecnológica para períodos plurianuales, y ordenara las actividades dirigidas a su consecución en programas nacionales, programas sectoriales, a realizar por los distintos Ministerios con responsabilidades en esta materia y programas de Comunidades Autónomas, que sean financiados en todo o en parte por fondos estatales.

La previsible, a la vez que imperativa, expansión de la investigación científica y técnica española en los próximos años exige un aumento correlativo en el numero de nuevos investigadores, así como un aprovechamiento intensivo de la experiencia de los maestros de investigación. Al consiguiente esfuerzo formativo, que de ello se desprende, contribuirán los programas de formacion, cuya inclusión está prevista en el Plan Nacional, y que atenderan a las exigencias generales de la investigación científica y el desarrollo tecnológico, y, en particular, a aquellas áreas científicas y técnicas en las que sea mayor la necesidad de personal especializado. La Ley contempla asimismo las medidas oportunas para el fomento de la productividad del personal investigador.

Elemento clave de la eficacia programadora del Plan Nacional es la inclusión en el mismo de evaluaciones presupuestarias plurianuales que integren las de los distintos organismos públicos de investigación, tanto de gastos corrientes como de inversion, superando de este modo la tradicional separación de unos y otros y las frecuentes distorsiones que de ella se derivan.

La necesidad de promover un clima social estimulante para la investigación científica motiva la creacion por la Ley de un Consejo Asesor para la Ciencia y la Tecnología, que constituirá el vínculo efectivo entre la comunidad científica, los agentes sociales y los responsables de programar la actividad científico/investigadora, garantizando así que los objetivos de esta programación se adecuen a los distintos intereses y necesidades sociales. Tal vinculación aspira a superar el tradicional aislamiento de la ciencia española, y facilitar, al mismo tiempo, la incorporación de los sectores privados a la tarea de planificar y ejecutar actividades de investigación científica y técnica.

La Ley establece, por último, un marco común para los organismos públicos con funciones de investigación, complementándolo con una mayor integración de cada organismo en la política sectorial del Departamento al que se encuentra adscrito, lo que permitirá una mejor coordinación y, en consecuencia, una mas adecuada ejecución del Plan Nacional. Asimismo, la Ley introduce importantes reformas en el funcionamiento de estos organismos -flexibilizando sus estructuras de gestión y abriendo la participación en sus órganos de gobierno a representantes de otros organismos con intereses en el campo de la ciencia y la tecnología-, con el fin de posibilitar una gestión más ágil y adaptada a sus respectivas atribuciones. En cuanto a las funciones específicas, no afectadas por la presente Ley, que los organismos tienen o puedan tener, serán recogidas en sus respectivos reglamentos de funcionamiento. De esta forma, se establecen por primera vez una estructura homogénea mínima y una vinculación funcional entre ellos, congruentes con el principio de coordinación que inspira la presente Ley. Sin duda, ambas condiciones constituyen la garantía de un funcionamiento mas integrado y, por tanto, más eficaz de nuestro centros públicos de investigación.

CAPITULO PRIMERO

Del Plan Nacional de Investigación Científica y Desarrollo Tecnológico

Artículo primero.

Para el fomento y la coordinación general de la investigación científica y técnica que el artículo 149, 1.15, de la Constitución encomienda al Estado y, en cumplimiento de lo establecido en el artículo 44, 2, de la misma, se establece el Plan Nacional de Investigación Científica y Desarrollo Tecnológico, que se regirá por la presente Ley.

Artículo segundo.

El Plan Nacional se orientará fundamentalmente a la realización de los siguientes objetivos de interés general:

a) El progreso del conocimiento y el avance de la innovación y desarrollo tecnológicos.
b) La conservación, enriquecimiento y aprovechamiento óptimo de los recursos naturales.
c) El crecimiento económico, el fomento del empleo y la mejora de las condiciones de trabajo.
d) El desarrollo y el fortalecimiento de la capacidad competitiva de la industria, el comercio, la agricultura y la pesca.
e) El desarrollo de los servicios públicos y, en especial, de los de vivienda, comunicaciones y transportes.
f) El fomento de la salud, del bienestar social y la calidad de vida.
g) El fortalecimiento de la defensa nacional.
h) La defensa y conservación del Patrimonio Artístico e Histórico.
i) El fomento de la creación artística y el progreso y difusión de la cultura en todos sus ámbitos.
j) La mejora de la calidad de la enseñanza.
k) La adecuación de la sociedad española a los cambios que conlleva el desarrollo científico y las nuevas tecnologías.

Artículo tercero.

En la definición de los programas que integran el Plan Nacional de Investigación Científica y Desarrollo Tecnológico, así como en la determinación de los instrumentos necesarios para su aplicación, se tendrá en cuenta:

a) Las necesidades sociales y económicas de España.
b) Los recursos humanos y materiales existentes en la comunidad científica y tecnológica española y sus necesidades de futuro.
c) Los recursos económicos y presupuestarios disponibles, así como la necesidad de una financiación regular para el mantenimiento y la promoción de una investigación científica y técnica de calidad.
d) La necesidad de alcanzar una elevada capacidad propia en ciencia y tecnología.
e) La conveniencia de acceder a tecnologías externas de calidad mediante procesos de incorporación selectivos adecuados, en cada caso, al desarrollo de la capacidad científica y tecnológica española.
f) Las repercusiones humanas, sociales y económicas que pudieran resultar de la investigación científica o de su aplicación tecnológica.

Artículo cuarto.

El Plan Nacional fomentará la investigación básica en los distintos campos del conocimiento a través de una financiación regular de la misma que haga posible el mantenimiento y la promoción de equipos de investigación de calidad, tanto en las Universidades como en los demás centros públicos de investigación.

A tal fin se incorporará la función investigadora en la expresión del gasto público.

Artículo quinto.

1. El Plan Nacional contendrá previsiones para el fomento de la investigación científica y del desarrollo tecnológico en las Empresas, así como para la promoción de las Entidades que éstas constituyan a tal fin.

2. El Plan Nacional promoverá, en todo caso:

a) La necesaria comunicación entre los centros públicos y privados de investigación y las Empresas.
b) La inclusión en los proyectos y programas de investigación de previsiones relativas a la utilización de los resultados de la misma.
c) Actuaciones concertadas de las Universidades y los centros públicos de investigación con las Empresas.

3. A partir de la entrada en vigor de esta Ley, los Presupuestos Generales del Estado contendrán medidas de carácter financiero y fiscal que apoyen y favorezcan las actividades de investigación científica y desarrollo tecnológico en las empresas y entidades ya referidas en el número 1 de este artículo.

Artículo sexto.

1. El Plan Nacional comprenderá las actividades a desarrollar por los Organismos de investigación de titularidad estatal, en materia de investigación científica y desarrollo tecnológico, y las análogas de aquellos otros Organismos y Entidades, públicas y privadas, que así se acuerden. En él se incluirán las previsiones presupuestarias plurianuales de los mencionados Organismos de investigación para actividades de investigación científica y desarrollo tecnológico.

La Comisión Interministerial de Ciencia y Tecnología, en coordinación con los órganos de planificación económica de la Administración del Estado elaborará el Plan Nacional, lo someterá al informe de los órganos asesores previstos en la presente Ley y lo elevará al Gobierno para su aprobación y posterior remisión a las Cortes Generales.

El Plan Nacional será revisable anualmente y, en todo caso, con esa misma periodicidad, será objeto de ampliación en nuevas anualidades y de informe respecto de su desarrollo mediante Memoria elevada por el Gobierno a las Cortes Generales.

2. El Plan Nacional, en función de los recursos y de las necesidades en materia de dichas actividades previsibles durante el período de su vigencia, definirá los objetivos que deba alcanzar el sector público y los que, mediante acuerdo, deban cumplirse por el sector privado.

A estos efectos, el Plan Nacional comprenderá, al menos, los siguientes capítulos:

a) Programas Nacionales de Investigación Científica y Desarrollo Tecnológico, que serán elaborados por la Comisión Interministerial de Ciencia y Tecnología y podrán integrar, en su caso, las correspondientes iniciativas sectoriales, cualquiera que sea el Organismo o Entidad pública o privada que las proponga. Esta Comisión determinará, asimismo, a quien corresponde la gestión y ejecución de los mismos y su duración.

b) Programas Sectoriales en materia de Investigación Científica y Desarrollo Tecnológico propios de los distintos Departamentos ministeriales y de otros organismos públicos de titularidad estatal que serán elaborados, gestionados, financiados parcial o totalmente y, en su caso, ejecutados por éstos, y propuestos a la Comisión Interministerial de Ciencia y Tecnología por los propios Departamentos a los que estuvieran adscritos los Organismos correspondientes. La Comisión Interministerial procederá a la integración de estos Programas Sectoriales en el Plan Nacional, previa coordinación y armonización de los mismos entre sí y con los Programas Nacionales a que alude el apartado anterior.

c) Programas de las Comunidades Autónomas que en razón de su interés puedan ser incluidos en el Plan Nacional y acordada su financiación, en todo o en parte, con fondos estatales. Estos programas serán presentados para su inclusión en el Plan Nacional a la Comisión Interministerial de Ciencia y Tecnología por el Gobierno de la correspondiente Comunidad Autónoma, y los criterios para su financiación, gestión y ejecución serán establecidos por acuerdo entre ambos.

d) Programas Nacionales de Formación de Personal Investigador, que serán elaborados por la Comisión Interministerial de Ciencia y Tecnología, atendiendo a las necesidades generales de la Investigación Científica y el Desarrollo Tecnológico, así como de las derivadas de los Programas establecidos en los apartados anteriores y ejecutados fundamentalmente por las Universidades.

3. El Plan Nacional incluirá una valoración precisa de los gastos de personal, operaciones corrientes y de capital necesarios para la elaboración, evaluación, gestión, ejecución y seguimiento de los Programas establecidos en el número anterior.

4. El Plan Nacional se financiará con fondos procedentes de los Presupuestos Generales del Estado y de otras Administraciones Públicas, así como con aportaciones de Entidades públicas y privadas, y con fondos procedentes de tarifas fijadas por el Gobierno.

Artículo séptimo.

1. La Comisión Interministerial de Ciencia y Tecnología, órgano de planificación, coordinación y seguimiento del Plan Nacional, estará formada por los representantes de los Departamentos ministeriales que nombre el Gobierno, que asimismo designará el Ministro que haya de presidirla.

2. Asimismo, el Gobierno nombrará, de entre los miembros de la Comisión Interministerial, una Comisión Permanente, cuyas funciones serán establecidas por aquella, y que dispondrá de la estructura orgánica, personal y medios necesarios que estarán adscritos al Ministerio del que sea titular el Presidente de la Comisión Interministerial. Para colaborar en la elaboración, evaluación y seguimiento del Plan Nacional, así como para gestionar aquellos Programas Nacionales que la Comisión Interministerial le encomiende, esta Comisión Permanente, previa autorización del organismo correspondiente, podrá adscribir temporalmente a tiempo completo o parcial y con reserva del puesto de trabajo, personal científico, expertos en desarrollo tecnológico y otros especialistas relacionados con los objetivos del Plan, que presten servicios en Departamentos ministeriales, Comunidades Autónomas, Universidades, organismos públicos de investigación y Entidades o Empresas de carácter público. La adscripción a tiempo parcial del personal mencionado anteriormente será compatible con el desempeño, igualmente en régimen de prestación a tiempo parcial, del puesto de trabajo que vinieran ocupando.

Asimismo, esta Comisión Permanente podrá contratar, por tiempo no superior a la duración del Programa, a cualquier otro tipo de personal no adscrito al sector público, conforme a lo establecido en el artículo 15, 1, párrafo a), del Estatuto de los Trabajadores. La Comisión podrá solicitar el asesoramiento de los órganos de planificación, coordinación y seguimiento de investigación de las Administraciones Públicas.

3. A la Comisión Interministerial de Ciencia y Tecnología corresponden, además de la elaboración del Plan Nacional, las siguientes funciones:

a) Proponer la asignación de los fondos públicos y de aquellos privados acordados, destinados a los diferentes programas que integren el Plan Nacional, y atribuir, cuando proceda, la gestión y ejecución de los mismos, así como determinar su duración.

b) Coordinar las actividades de investigación que los distintos Departamentos ministeriales y organismos de titularidad estatal realicen en cumplimiento del Plan Nacional, así como conocer las actuaciones de apoyo y asistencia técnica de aquéllos que tengan relación con las mencionadas actividades.

c) Coordinar e integrar en el Plan Nacional los proyectos de investigación científica y desarrollo tecnológico, financiados con fondos procedentes de tarifas fijadas por el Gobierno.

d) Evaluar el cumplimiento del Plan Nacional y de los programas presupuestarios correspondientes al mismo, sin perjuicio de las competencias propias de los demás órganos de la Administración.

e) Coordinar con el Plan Nacional las transferencias tecnológicas que se deriven del programa de adquisiciones del Ministerio de Defensa y de cualquier otro Departamento ministerial.

f) Presentar al Gobierno para su elevación a las Cortes Generales una Memoria anual relativa al cumplimiento del Plan Nacional, que comprenda, en su caso, las propuestas de rectificación que estime necesario introducir en los mismos.

g) Orientar la política de formación de investigadores en todos sus niveles, proponer medidas para el fomento del empleo de los mismos y facilitar su movilidad en los ámbitos investigador y productivo.

h) Recabar, coordinar y suministrar la información científica y tecnológica necesaria para el cumplimiento del Plan Nacional.

i) Elevar al Gobierno las propuestas que estime necesarias para asegurar el desarrollo y cumplimiento del Plan Nacional.

Artículo octavo.

1. A la Comisión Interministerial de Ciencia y Tecnología le corresponderá definir las exigencias del Plan Nacional en materia de relaciones internacionales y establecer previsiones para su ejecución, todo ello en colaboración con los órganos competentes de la acción exterior del Estado.

2. Corresponde, asimismo, a la Comisión Interministerial de Ciencia y Tecnología la coordinación y el seguimiento de los programas internacionales de investigación científica y desarrollo tecnológico, con participación española, para lo que asumirá las siguientes funciones:

a) Distribuir los créditos presupuestarios derivados del correspondiente programa internacional, así como atribuir la gestión y ejecución, en todo o en parte, de dichos programas.

b) Incorporar al Plan Nacional proyectos de investigación recogidos en programas internacionales.

c) Asegurar los adecuados retornos científicos, tecnológicos e industriales en colaboración con el Centro para el Desarrollo Tecnológico e Industrial.

d) Proponer al Gobierno o designar, en su caso, a quien haya de representar a España en los Organismos Internacionales responsables de los correspondientes programas.

Artículo noveno.

1. A los efectos de promover la participación de la comunidad científica y de los agentes económicos y sociales en la elaboración, seguimiento y evaluación del Plan Nacional a los que se refiere la presente Ley, se constituye un Consejo Asesor para la Ciencia y la Tecnología cuya composición se establecerá reglamentariamente y que será presidido por el Ministro que designe el Gobierno.

2. Al Consejo Asesor para la Ciencia y la Tecnología le corresponden las siguientes funciones:

a) Proponer objetivos para su incorporación al Plan Nacional.

b) Asesorar a la Comisión Interministerial de Ciencia y Tecnología en la elaboración del Plan Nacional.

c) Informar, previamente a su remisión al Gobierno, el Plan Nacional elaborado por la Comisión Interministerial de Ciencia y Tecnología, así como sobre el grado de su cumplimiento, especialmente en lo que se refiere a su repercusión social y económica.

d) Elevar a la Comisión Interministerial de Ciencia y Tecnología propuestas de modificación del Plan Nacional a las que se hace referencia en la letra f) del apartado tercero del artículo séptimo.

e) Emitir cuantos informes y dictámenes le sean solicitados por la Comisión Interministerial de Ciencia y Tecnología o por los Organismos responsables de la política científica en las Comunidades Autónomas.

Artículo décimo.

1. A los efectos de promover la implantación de nuevas tecnologías y sin perjuicio de las competencias que legalmente le correspondan, el Centro para el Desarrollo Tecnológico e Industrial ejercerá, en relación con el Plan Nacional, las siguientes funciones:

a) Evaluar el contenido tecnológico y económico-financiero de los proyectos en los que intervengan Empresas.

b) Contratar con las Universidades, Organismos públicos de investigación y Empresas la promoción de la explotación comercial de las tecnologías desarrolladas por ellas.

c) Colaborar con la Comisión Interministerial de Ciencia y Tecnología en la obtención de los adecuados retornos científicos, tecnológicos e industriales de los Programas Internacionales con participación española y gestionar los que, de acuerdo con lo establecido en el artículo 8, aquella le encomiende.

2. El Centro para el Desarrollo Tecnológico e Industrial gestionará sus recursos de acuerdo con las orientaciones y criterios que se determinen en el Plan Nacional.

Artículo undécimo.

1. En la ejecución del Plan Nacional podrán participar Organismos públicos dependientes de la Administración del Estado y de las Comunidades Autónomas, Universidades y Empresas e Instituciones de carácter público o privado que realicen actividades de investigación y desarrollo tecnológico. Los programas incluidos en el Plan Nacional podrán ser ejecutados, asimismo, en colaboración con instituciones extranjeras o de carácter internacional.

2. Los Organismos, Empresas e Instituciones a las que se refiere el apartado anterior podrán contratar personal científico y técnico para la ejecución de las actividades de investigación y desarrollo tecnológico correspondientes al Plan Nacional, por un período máximo idéntico al del programa con cargo al cual se satisfagan los salarios y cargas sociales correspondientes, conforme a lo establecido en el artículo 15, 1, a), del Estatuto de los Trabajadores.

Artículo duodécimo.

1. Con el fin de promover la coordinación general de la investigación científica y técnica, se crea el Consejo General de la Ciencia y la Tecnología que, presidido por el Presidente de la Comisión Interministerial de Ciencia y Tecnología, estará integrado por un representante de cada Comunidad Autónoma y por los miembros que designe el Gobierno, a propuesta del Presidente del Consejo, de entre los de la Comisión Interministerial, en número no superior al de aquéllos. En todo caso, la representación de la Administración del Estado tendrá atribuido un número de votos igual al de la representación de las Comunidades Autónomas.

2. El Consejo General de la Ciencia y la Tecnología podrá funcionar en Pleno y en Comisión Permanente, de acuerdo con el Reglamento elaborado por el propio Consejo y aprobado por mayoría absoluta de sus miembros.

3. Serán funciones del Consejo General de la Ciencia y la Tecnología:

a) Informar previamente el Plan Nacional, especialmente en lo que se refiere al mejor uso de la totalidad de los recursos y medios de investigación disponibles.

b) Proponer la inclusión de objetivos en el Plan Nacional.

c) Proponer, en función de su interés, programas y proyectos de investigación de las Comunidades Autónomas, tras su correspondiente presentación por los Gobiernos de las mismas.

d) Promover el intercambio de información entre la Administración del Estado y la de las Comunidades Autónomas acerca de sus respectivos programas de investigación, con el fin de facilitar la coordinación general de la investigación científica y técnica.

e) Promover acciones conjuntas entre Comunidades Autónomas, o entre estas y la Administración del Estado, para el desarrollo y ejecución de programas de investigación.

f) Emitir los informes y dictámenes, referidos a la coordinación de las investigaciones desarrolladas por las Administraciones Públicas, que le sean solicitados por la Comisión Interministerial de Ciencia y Tecnología o por los Organismos responsables de la Política Científica en las Comunidades Autónomas, o por el Consejo Asesor para la Ciencia y la Tecnología.

g) Constituir un fondo de documentación sobre los diferentes planes y programas de investigación promovidos por los poderes públicos.

CAPITULO II

De los Organismos públicos de Investigación

Artículo decimotercero.

El Consejo Superior de Investigaciones Científicas, la Junta de Energía Nuclear, que pasa a denominarse Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, el Instituto Geológico y Minero de España, el Instituto Nacional de técnica Aeroespacial y el Instituto Español de Oceanografía, se regirán por la presente Ley, por su legislación específica en cuanto no se oponga a ésta y por la legislación vigente sobre régimen jurídico de las Entidades estatales autónomas que les sea de aplicación.

Artículo decimocuarto.

Son funciones de los Organismos a los que se refiere el artículo anterior:

a) Gestionar y ejecutar los Programas Nacionales y Sectoriales que les sean asignados en el Plan Nacional y, en su caso, los derivados de convenios firmados con Comunidades Autónomas al amparo de lo establecido en el artículo 15, así como desarrollar los programas de formación de investigadores que en dicho Plan les sean encomendados.

b) Contribuir a la definición de los objetivos del Plan Nacional y colaborar en las tareas de evaluación y seguimiento de los mismos.

c) Asesorar en materia de investigación científica e innovación tecnológica a los Organismos dependientes de la Administración del Estado o de las Comunidades Autónomas que lo soliciten.

d) Cualquier otra que les sea encomendada por la Administración competente.

Artículo decimoquinto.

1. Los Organismos autónomos a que se refiere el artículo 13 podrán establecer convenios de cooperación con las Comunidades Autónomas para la ejecución o colaboración en programas y proyectos de investigación científica y desarrollo tecnológico, formación de especialistas, creación de centros o unidades de investigación y, asimismo, para la dirección, gestión y financiación de centros o unidades de investigación ya existentes. De los referidos convenios se dará cuenta al Consejo General para la Ciencia y la Tecnología.

2. Los mencionados Organismos podrán, asimismo, participar en proyectos internacionales, estableciendo los oportunos acuerdos y convenios, previo conocimiento de la Comisión Interministerial de Ciencia y Tecnología. Reglamentariamente, se desarrollará el régimen financiero para el cumplimiento de las obligaciones que se asuman en los mencionados convenios y acuerdos.

Artículo decimosexto.

Los Organismos a los que se refiere el artículo 13 contarán al menos, como órganos de gobierno, con un Presidente, que será nombrado por el Gobierno, a propuesta del Ministerio al que esté adscrito el Organismo, y un Consejo Rector, presidido por aquél. La composición del Consejo Rector se establecerá reglamentariamente en función de las características específicas de cada Organismo.

Artículo decimoséptimo.

Los Organismos a que se refiere el artículo 13, dentro de sus disponibilidades presupuestarias y en las condiciones que se fijen en el reglamento de organización, funcionamiento y personal de cada uno de ellos, podrán contratar en régimen laboral:

a) Personal científico y técnico para la ejecución de proyectos determinados sin que, en ningún caso, estos contratos puedan tener una duración superior a la del proyecto de que se trate, conforme a lo dispuesto en el artículo 15, 1, a), del Estatuto de los Trabajadores.

b) Personal para su formación científica y técnica, en la modalidad de trabajo en prácticas regulada en el número 1 del artículo 11 del Estatuto de los Trabajadores, sin que sea de aplicación el límite de los cuatro años a que se refiere el citado precepto, y con una duración máxima, incluidas, en su caso, las prórrogas, de cinco años.

Artículo decimoctavo.

1. A los efectos de su gestión económico-financiera los Organismos a que se refiere el artículo 13 de la presente Ley se entenderán incluidos en el apartado b) del párrafo primero del artículo 4 de la Ley 11/1977, General Presupuestaria, de 4 de enero.

2. Los titulares de los Departamentales ministeriales a los que estén adscritos cada uno de los Organismos autónomos a que se refiere el artículo 13 de esta Ley, podrán autorizar, respecto de los mismos, y previo informe de la Intervención Delegada, generaciones de crédito en los estados de gastos de sus presupuestos cuando se financien con los ingresos derivados de los contratos celebrados por los citados Organismos con Entidades públicas y privadas o con personas físicas, para la realización de trabajos de carácter científico o de asesoramiento técnico, para la cesión de derechos de la propiedad industrial o intelectual o para el desarrollo de cursos de especialización, así como con los recursos aportados por el sector público dentro del Plan Nacional a los que se refiere la presente Ley.

No obstante lo señalado en el párrafo anterior, cuando la generación de crédito se pretenda que afecte a la dotación del complemento de productividad a que se refiere el apartado c), del número 3, del artículo 23 de la Ley 30/1984, de 2 de agosto, se requerirá informe favorable del Ministerio de Economía y Hacienda.

Artículo decimonoveno.

1. El Gobierno podrá autorizar a los Organismos a que se refiere el artículo 13 de la presente Ley la creación o participación en el capital de sociedades mercantiles, cuyo objetivo sea la realización de actividades de investigación científica o desarrollo tecnológico o la prestación de servicios técnicos relacionados con los fines de las mismas.

El personal funcionario de dichos Organismos que pase a prestar servicio en las citadas Entidades quedará en la situación administrativa de excedencia voluntaria prevista en el artículo 29, 3, a), de la Ley 30/1984, de 2 de agosto.

2. Los contratos de prestación de servicios de investigación que realicen los Organismos a que se ha hecho referencia en el número anterior, quedan exceptuados en el ámbito de aplicación de la Ley de Contratos del Estado y se regirán por las normas de Derecho Civil y Mercantil que les sean de aplicación.

3. Los contratos que realicen tales Organismos relativos a obras de tecnología especialmente avanzada o cuya ejecución sea particularmente compleja se adjudicarán, en todo caso, por el procedimiento de concurso.

4. Los Organismos a que se refiere el artículo 13 de la presente Ley podrán adquirir, por el sistema de adjudicación directa, previa autorización de su Consejo Rector, los bienes de equipo necesarios para el desarrollo de las tareas de investigación.

DISPOSICIONES ADICIONALES

Primera.–A los efectos de lo previsto en el artículo 6, 1, y sin perjuicio de lo que disponga el Reglamento de las Cortes Generales, se constituirá una Comisión Mixta del Congreso y el Senado para conocer del Plan Nacional de Investigación Científica y Desarrollo Tecnológico, y de la memoria anual sobre su desarrollo.

Segunda.–1. El Gobierno, en un plazo no superior a seis meses a partir de la entrada en vigor de la presente Ley, procederá a la definición de la estructura orgánica de la Comisión Permanente a que se refiere el artículo 7, 2, de ésta, ordenará la extinción de la Comisión Asesora de Investigación Científica y Técnica y traspasará sus medios materiales y personales a dicha Comisión Permanente.

2. Desde la entrada en vigor del Plan Nacional, el Fondo Nacional para el Desarrollo de la Investigación Científica y Técnica se destinará a la financiación de los programas nacionales a que se refiere la letra a), del artículo 6, 2, de la presente Ley, así como de los programas sectoriales que, conforme a lo previsto en la letra b) del mismo, correspondan al Ministerio de Educación y Ciencia.

Tercera.–El Gobierno, a iniciativa, respectivamente, de los Ministerios de Educación y Ciencia, Industria y Energía, Defensa y Agricultura, Pesca y Alimentación, y a propuesta del de la Presidencia, aprobará el reglamento de organización, funcionamiento y personal del Consejo Superior de Investigaciones Científicas, del Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, del Instituto Geológico y Minero de España, del Instituto Nacional de Técnica Aeroespacial y del Instituto Español de Oceanografía.

Cuarta.–El Gobierno, a iniciativa de los Ministerios de Industria y Energía, Educación y Ciencia, Defensa y Agricultura, Pesca y Alimentación, y a propuesta del de la Presidencia, en el plazo de seis meses a partir de la entrada en vigor de la presente Ley, dictará las normas necesarias para facilitar e incentivar la movilidad del personal investigador al servicio de los Organismos públicos de investigación dependientes de la Administración del Estado. Asimismo, y de acuerdo con las Comunidades Autónomas y las Corporaciones Locales, en su caso, se establecerán medidas para facilitar e incentivar la movilidad de este personal entre las respectivas Administraciones públicas.

Quinta.–Se faculta al Ministerio de Educación y Ciencia para regular la participación y representación de los científicos españoles agrupados en Sociedades Científicas en el Consejo Internacional de Uniones Científicas y en sus Uniones, así como en aquellas otras Uniones o Comisiones Científicas internacionales que, por su carácter, exigieran tal regulación.

Sexta.–A la entrada en vigor de la presente Ley, quedará extinguida la Comisión Nacional de Investigación del Espacio. Las funciones de dicha Comisión serán asumidas por la Comisión Interministerial de Ciencia y Tecnología, de acuerdo con lo previsto en el artículo 8 de la presente Ley, correspondiendo al Centro para el Desarrollo Tecnológico e Industrial la colaboración con esta en la obtención de los adecuados retornos científicos, tecnológicos e industriales de los Programas de la Agencia Europea del Espacio con participación española, así como la gestión de aquéllos que, de acuerdo con lo establecido en el mencionado artículo 8 de la presente Ley, le encomiende la Comisión Interministerial de Ciencia y Tecnología.

El Gobierno, en el plazo de tres meses, decidirá el destino de los medios materiales y personales de la extinguida Comisión Nacional de Investigación del Espacio.

Séptima.–1. El actual «Plan Nacional de Investigación Agraria» se incorporará al Plan Nacional como Programa Sectorial, cuya gestión corresponderá al Ministerio de Agricultura, Pesca y Alimentación.

2. El Instituto Nacional de Investigaciones Agrarias, Organismo autónomo adscrito al Ministerio de Agricultura, Pesca y Alimentación, pasará a regirse por lo establecido en la presente Ley para los Organismos autónomos que se recogen en el anterior artículo 13. Por el Gobierno, se procederá a aprobar su régimen de organización, funcionamiento y personal.

Octava.–La presente Ley se aplicará, sin perjuicio de la competencia de la Ley Orgánica 6/1980, de 1 de julio, por la que se regulan los criterios básicos de la Defensa Nacional y la Organización Militar atribuye al Ministro de Defensa, de fomento y coordinación de la investigación científica y técnica en materias que afecten a la Defensa Nacional. En ejercicio de dichas competencias, el Ministro de Defensa podrá adaptar al Plan Nacional y, en su caso, integrar en él proyectos de investigación científica y desarrollo tecnológico en materias que afecten a la Defensa Nacional, para su financiación, en todo o en parte, con cargo a dicho Plan, así como financiar proyectos integrados en los mismos.

Novena.–1. Por el Gobierno se dictarán las disposiciones oportunas para adaptar la estructura y organización del Centro para el Desarrollo Tecnológico e Industrial a las funciones que se le encomiendan en el artículo 10 de la presente Ley.

2. Los créditos presupuestarios adscritos a los programas y proyectos a los que hace referencia el artículo 10, 1, c), y cuya gestión y ejecución asuma el Centro para el Desarrollo Tecnológico e Industrial, se transferirán al Ministerio de Industria y Energía.

Décima.–Las Universidades y otros centros públicos de investigación podrán contratar personal para la ejecución de proyectos determinados en los términos previstos en la letra A del artículo 17 de esta Ley y dentro de sus disponibilidades presupuestarias.

Undécima.–1. Quedan modificados los artículo 1.º, 4.º y 8.º del Real Decreto-ley 7/1982, de 30 de abril, que quedarán redactados en la forma siguiente:

«Artículo 1.º Con la denominación de Instituto de Astrofísica de Canarias se crea un Consorcio Público de Gestión, cuya finalidad es la investigación astrofísica.

El Instituto de Astrofísica de Canarias estará integrado por la Administración del Estado, la Comunidad Autónoma de Canarias, la Universidad de La Laguna y el Consejo Superior de Investigaciones Científicas.»

«Art. 4.º El Consejo Rector estará integrado por el Ministro de Educación y Ciencia, que actuará como Presidente; un Vocal en representación de la Administración del Estado, que será nombrado a propuesta del Ministerio de la Presidencia, y tres Vocales más en representación de cada una de las restantes Administraciones públicas y Organismos que se relacionan en el artículo 1.º

Formará parte del Consejo Rector, asimismo, el Director del Instituto, que será miembro nato.»

«Art. 8.º Los medios personales al servicio del Instituto para el cumplimiento de sus fines, todos ellos bajo la dependencia funcional del Director de aquel, podrán comprender:

a) Personal propio del Consorcio, de carácter laboral, para funciones que no sean de investigación.

b) Personal propio de las Administraciones consorciadas y personal docente universitario. Dicho personal, cuando sea funcionario, quedará adscrito al Instituto de Astrofísica de Canarias en la situación administrativa que corresponda en cada caso.

c) Personal al servicio de otras entidades públicas o privadas, con las cuales el Instituto celebre contratos administrativos o civiles, o convenios de cooperación.»

2. Se declaran a extinguir la Escalas de Astrofísicos y Astrofísicos adjuntos creados, por Real Decreto 2678/1982, de 15 de octubre. El Gobierno, a propuesta del Consejo Rector, establecerá los criterios, requisitos y condiciones para que los funcionarios de las referidas Escalas puedan integrarse en los Cuerpos o Escalas equivalentes de las Administraciones consorciadas.

3. Por Real Decreto, a propuesta del Consejo Rector, se regulará la organización y funcionamiento del Instituto de Astrofísica de Canarias.

DISPOSICIONES TRANSITORIAS

Primera.–A efectos de la elaboración del Plan Nacional, de su presentación a las Cortes Generales prevista en el artículo 6.º, 1, y de su puesta en marcha, la Comisión Interministerial a que se refiere el artículo 7.º de esta Ley será presidida por el Ministro de Educación y Ciencia y estará integrada por dos representantes del Ministerio de Educación y Ciencia, dos del Ministerio de Industria y Energía y uno de cada uno de los siguientes Ministerios: Defensa, Economía y Hacienda, Agricultura, Pesca y Alimentación, Obras Públicas y Urbanismo, Transportes, Turismo y Comunicaciones, Cultura y Sanidad y Consumo. La Comisión Permanente de la misma será presidida por el Secretario de Estado de Universidades e Investigación y estará constituida por los Directores generales de Política Científica y de Innovación Industrial y Tecnología y por el Director general de Planificación del Ministerio de Economía y Hacienda.

Segunda.–El Gobierno, en el plazo de tres meses a partir de la entrada en vigor de la presente Ley, establecerá la composición del Consejo Asesor para la Ciencia y la Tecnología, que, a los efectos previstos en la disposición transitoria anterior, estará presidido por el Ministro de Industria y Energía.

Tercera.–El Fondo de Investigaciones Sanitarias de la Seguridad Social se destinará a financiar programas sectoriales elaborados y gestionados por el Ministerio de Sanidad y Consumo, pudiendo, asimismo, contribuir a la financiación de programas nacionales o sectoriales de interés para la política sanitaria.

DISPOSICION DEROGATORIA

Quedan derogadas cuantas disposiciones se opongan a lo dispuesto en la presente Ley.

DISPOSICION FINAL

Se autoriza al Gobierno para dictar cuantas disposiciones sean necesarias para el desarrollo y aplicación de la presente Ley.

Por tanto,

Mando a todos los españoles, particulares y autoridades, que guarden y hagan guardar esta Ley.

Palacio de la Zarzuela, Madrid, a 14 de abril de 1986.

JUAN CARLOS R.

El Presidente del Gobierno,
FELIPE GONZALEZ MARQUEZ

ANNEX 4

Institutional Bodies Configuring Scientific
and Technological Research
Of Spain

1. **Bodies which carry out Planning, Promotion and Coordination functions:**

- Comisión Asesora de Investigación Científica y Técnica – CAICYT, Scientific and Technical Research Advisory Committee (Ministry of Education and Science).

- Centro para el Desarrollo Tecnológico Industrial – CDTI, Industrial Technological Development Centre (Ministry of Industry and Energy).

- Consejo Superior de Investigaciones Científicas – CSIC, Scientific Research Council (Ministry of Education and Science).

- Dirección General de Política Científica – Department of Scientific Policy (Ministry of Education and Science).

- Dirección General de Innovación Industrial y Tecnológica – Department of Industrial and Technological Innovation (Ministry of Industry and Energy).

- Comisión Delegada del Gobierno de Política Educativa, Cultural y Científica – Government Committee for Educational, Cultural and Scientific Policy (Interministry).

Bodies that carry out International Cooperation Functions:

- Dirección General de Cooperación Técnica Internacional – Department of International Technical Cooperation (Foreign Office).

- Instituto de Cooperación Iberoamericana – ICI, Institute for Hispano-American Cooperation (Foreign Office).

- Ministerial bodies encharged with international cooperation (several Ministries).

2. Bodies that carry out Fund Administration and Management Functions for Research and Technological Development:

- Comisión Asesora de Investigación Científica y Técnica – CAICYT, Scientific and Technical Research Advisory Committee (Ministry of Education and Science).

- Centro para el Desarrollo Tecnológico Industrial – CDTI, Industrial Technological Development Centre (Ministry of Industry and Energy).

- Fondo de Investigaciones Sanitarias del INSALUD – FIS, INSALUD Health Research Fund (Ministry of Health and Consumption).

3. Bodies that carry out Research Execution and Result Application Functions:

3.1 General:

- Consejo Superior de Investigaciones Científicas – CSIC, Scientific Research Council (Ministry of Education and Science).

- Universities (Ministry of Education and Science).

3.2 Sectorial:

- Instituto Geográfico Nacional – National Geographic Institute (Ministry of the Presidency of the Government).

- Junta de Energía Nuclear – JEN, Atomic Energy Board (Ministry of Industry and Energy).

- Instituto Geológico y Minero – Institute of Geology and Mining (Ministry of Industry and Energy).

- Instituto para la Diversificación y Ahorro de la Energía – IDAE, Institute for the Energy Diversification and Saving (Ministry of Industry and Energy).

- Instituto Nacional de Investigaciones Agrarias – INIA, National Institute of Agricultural Research (Ministry of Agriculture, Fisheries and Food).

- Instituto Español de Oceanografía – Spanish Oceanographic Institute (Ministry of Agriculture, Fisheries and Food).

- Instituto de Tecnología de Obras Públicas y Edificación – ITOPE, Institute of Public Works and Building Technologies (Ministry of Public Works and Town Planning).

- Instituto Nacional de Meteorología – National Meteorologic Institute (Ministry of Transport, Tourism and Communications).

- Instituto de Estudios de Transportes y Comunicaciones – Institute of Transport and Communication Studies (Ministry of Transport, Tourism and Communications).

- Instituto Nacional de la Salud – INSALUD, National Institute for Health (Ministry of Health and Consumption).

I.3 Defense research:

- Dirección General de Armamento y Material – DGAM, Department of Arms and Material (Ministry of Defense).

- Instituto Nacional de Técnicas Aerospaciales – INTA, National Institute of Aerospatial Techniques (Ministry of Defense).

- Centro de Investigaciones de la Armada – CIDA, Navy Research Centre (Ministry of Defense).

3.4 Public sector companies:

- Instituto Nacional de Industria – INI, National Institute of Industry (Ministry of Industry and Energy).

- Instituto Nacional de Hidrocarburos – National Hydrocarbon Institute.

- Nationalized companies (CTNE, etc.).

- RENFE, FEVE.

3.5 Private sector organizations:

- Companies

- Association

- Foundations

3.6 Specialised centres in the Autonomous Communities.

ANNEX 5

Selected Aspects from an Interview with the Vice-Rector of one of the largest Polytechnic Univertsities (Spain)

There is no established norm for the difussion of the R&D performed in the centre. The agents of the difussion are the faculty members themselves through the contacts they establish with companies. The University, the Industry-University foundations, or other foundations help in some cases in establishing the contacts. In some cases these contacts between companies and the University are formalized in a research contract. The typical terms of these contracts are:

- The intellectual property is owned by the researcher.
- The industrial property (prototype, for instance) is owned by the company.
- The patent, if any, is owned by the company.
- The researcher can not publish the output of his project without the authorization of the company.

In 1986, this polytechnic university established contracts for a total value of 800 million pesetas. These contracts involved public and private companies and institutions. Some of the companies that established contracts were: IBM, NCR, ITT, SIEMENS; small and medium size companies were also involved. The volume of contracted research places this university center amongst the top two or three in Spain.

It is important to observe that this unviersity does not publish any annual report, follow up document, or inventory of research projects going on or finished. There is a project to publish the first R&D report in 1987. The academic authorities accept that there is little control over the exact application of funds or the real figures involved.

The most important source of financing for this polytechnic university is the CAICYT, but the amount received in 1986 was equivalent to the full cost of 20 man-years equivalent. In 1987, under the new "Law of Science" this amount will increase four times (1). The vice-rector indicated that practically all research funds came from outside sources either companies or government institutions.

There is a growing sensitivity towards the R&D programmes of the CEE. The researchers of this polytechnic university hope that they will have access to the R&D funds of the Community and the vice-rector indicated that 90 per cent of the R&D projects going on had been designed following criteria consistent with the priorities established by the CEE programmes. Researchers of the centre are involved in 2 ESPRIT projects. The level of patenting in this university is very low. Only three professors have made a request to the university for patenting their research. Other professors might have patented their research themselves. There is no list or record of patents resulting from research performed within the centre.

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(1) According to this important academic authority, the estimates of the Ministry of Science and Education with regard to the percentage of the budget of the university spent in R&D are inaccurate. This source indicated that practically nothing goes to R&D.

The rather successful results, in terms of contracts with industry, of this university originate in the interest of the rector and the vice-rectors. They have stimulated the faculty and have reduced red tape. In some cases they have allowed the researchers to receive part of the revenues generated by the contracts (this is not the case of other institutions where all the revenues go to the institution and the researchers do not participate at all).

The vice-rector indicated that commercial exploitation of the results of research done by the faculty is considered a success and is often included in the press releases of industrial partners. In some cases, industrial partners, particularly multinational companies, get involved in contract research with universities as part of their "Good Corporate Citizenship Programme" and, in these cases, they are interested in making public their involvement and the results if any.

ANNEX 6

Interview with the Director of one of the Departments of a Major Public Laboratory

The directors of departments of the laboratory received a clear indication that it would be important to "sell as many things as possible" from the inventory of research activities being implemented in the laboratory. The selling effort could involve hours or researchers, utilization of equipment, selling of products manufactured in the laboratory, etc.

The laboratory was doing research in the development of certain products which were currently being imported in Spain since there was not domestic manufacturing. The research involved a family of related products. The laboratory had succeeded developing some of the products of the family but was still working on other. The director of the laboratory found a Spanish company that would be interested in selling the products already developed by the laboratory. The director of the laboratory considered that producing certain quantities of these products in the laboratory would be possible, combining this task with the research work going on.

Nevertheless, the project did not succeed for a variety of administrative reasons:

- It was not clear the legal framework that could be applied to establish the joint-venture.

- The system of costing of the laboratory would not allow to establish the cost of the products if they were produced in the laboratory. The only items that could be sorted out would be the raw materials going exclusively to that type of products. Other materials, overheads, etc. would be impossible to allocate. Even known items would be known with a tremendous delay.

- It was impossible to establish a system of billing that could relate the goods sold to the department. Only the laboratory would be able to bill and the revenues would go to the laboratory, not to the department. The incentive for the researchers to make an extra effort getting involved in production would not exist.

Manufacturing the products outside the laboratory was impossible because the investment in equipment necessary could have not been justified, considering the size of the market. The joint venture was abandoned and the products continued to be imported from abroad.

ANNEX 7

Major Institutions of the Spanish R&D System

Summarized Description and Explicit Objectives (1)

1. Institutions of the Ministry of Science and Education

1.1 The CAICYT

This is a government advisory body for research promotion and development attached to the Ministry of Education and Science. Through its Interministerial Programming Committee, all the industrial departments concerned with scientific and technological research and development are represented. The plenum of the CAICYT is chaired by the Minister of Education and Science and its Secretary is the Ministry's Director of Scientific and Technological Policy.

The CAICYT's mission is to promote scientific and technical research, setting priorities in scientific policy and proposing the financing of programmes that would enable these priorities to be achieved, instituting joint basic and applied research plans to be implemented in companies. In 1986, the resources of the CAICYT amounted to 11.943 million pesetas.

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(1) The information of this Annex has been taken, to a great extent, from the study "Supporting Infrastructure for Innovation, Technology Transfer and Enterprise Creation in Spain and Portugal". Study conducted by the Department of Research of IESE under the direction of Professor Pedro Nueno; Barcelona, July 1986.

1.2 The Spanish University System

The Spanish University System is 90 por cent controlled by the government and consists of 34 universities. The legal framework of the University System is relatively new since the University Reform Act (Ley de Reforma Universitaria, know as L.R.U.) was passed in November, 1983. Before that, the laws did not provide any incentive –and as a matter of fact produced a practical effect of disencentive– for university R&D.

The L.R.U. aims at structuring a democratic university system where universities have a wide degree of autonomy and the whole system is coherent with the process of regional political autonomy going on in Spain. The law has two articles directly related to university R&D: one of the articles allows faculty members and departments to sign contract on a part–time basis well-known specialists from outside the university. Together with the Science Act the L.R.U. sets the foundations for the updating and further development of R&D within the public sector. The Spanish university education has traditionally had a theoretical orientation.

1.3 The CSIC

The other important R&D arm of the Ministry of Science and Education is the Superior Council for Scientific Research (Consejo Superior de Investigaciones Científicas). This institution is one of the oldest and most reputed research institutes in Spain; it has its own laboratories. The total budget of CSIC in 1986 was 18.233 million pesetas. The CSIC performs basic research. Lately it has launched "stimulating" programs in high technology areas aiming to catalyze the incorporation of researchers and laboratories to research in areas with promising potential; in some

cases, CSIC makes contributions of 50 per cent or more to the budget of other institutions working in research areas considered important. CSIC publishes detailed and updated information on its research activities as well as that of the centers involved in the "stimulating" programs.

2. Institutions of the Ministry of Industry and Energy

2.1. The IMPI

The Institute of the Small and Medium-sized Industrial Enterprise (Instituto de la Mediana y Pequeña Empresa Industrial, IMPI), however is the main government agency that specializes in supporting the promotion and development of small and medium size enterprise (SME's). The IMPI is an autonomous body of the Ministry of Industry and Energy and operates by cooperation agreements with the Autonomous Communities. One of the aims of IMPI is to stimulate technological innovation by participating in groups of companies so that a collective solution can be found for technological problems that are common to an industrial subsector; in some cases, the IMPI will secure the cooperation of other government agencies such as CDTI, for instance.

2.2 The CDTI

The Centre for Industrial and Technological Development (CDTI). This is a public law institution, attached to the Ministry of Industry and Energy, which is bound by private law in its dealings with third parties. Its basic goal is to act as an instrument for the execution and development of the technological innovation policy defined by the Department of Technological Innovation of the Ministry of Industry.

The basic functions of the CDTI are to: identify priority areas of technology; promote cooperation between industry and research and technological development institutions and bodies; promote the industrial implementation of the technologies developed by the centre or by other public or private centres, and support the manufacture and marketing of new products and processes, especially on foreign markets.

2.3 The Nuclear Energy Committee (JEN)

This is the major laboratory under the direct control of the Ministry of the Industry. Its research activity, concerned primarily with nuclear energy and radioactive materials has traditionally had, like in other public laboratories, a theoretical orientation. This situation is changing in the eighties and the JEN is opening to cooperation with industry, to joint-ventures and to research in aspects closer to the industrial needs for the country. The budget of the JEN is expected to grow 30 per cent from 1985 to 1986 with 50 per cent of the total budget spent in personnel and 12 per cent being investments.

3. Institution of the Ministry of Defense

3.1 The INTA

With close to 15 per cent of the public R&D budget, expected to grow substantially in the near future, the Ministry of Defense is becoming a relevant force in the process of development of technology in Spain. Most of the Ministry's budget goes to the National Institute of Aeronautical Technology (INTA). The technology strategy of this Ministry is related to the general strategy of arms supply of the country. This strategy has three phases: the first phase consisted of buying most of

the needs of armament of the country abroad, particularly all needs of sophisticated weapons and weapons systems; the second phase still contemplates importas of weapons but using a countertrade approach, this is to say, the foreign suppliers of weapons must purchase Spanish products and/or technology for an amount equal to the cost of the arms imported by Spain; the third phase, that is now starting, consists of co-producing and co-developing weapons systems with foreign suppliers and hence the increase in the R&D budget. The budget of INIA in 1986 was 2,891 million of pesetas.

4. Institutions of the Autonomous Governments

4.1 Laboratories of the Department of Education of the Basque Government

The Basque Government subsidizes up to a 50 per cent the budget of 5 private laboratories located in the Basque Country. Theseare LABEIN, INASMET, IKERLAN, TEKNIKER and CEIT. These laboratories perform Applied and Development Research. IKERLAN is involved in the ESPRIT Programme of the European Community. CEIT is working in a research project for the European Space Agency.

4.2 The CIDEM of the Department of Industry of the Autonomous Government of Catalonia

The main objectives of the CIDEM are to stimulate industrial development in Catalonia and to make available the information and means necessary to improve the technological level, competitiveness and productivity of Catalan businesses. Among its declared functions are the following: Stimulate the creation of new

business. Stimulate cooperation between business, universities, laboratories and research centres. Coordinate the functions of those bodies specialising in industrial promotion and technological development. Perform structural studies of Catalan industrial sectors. Rationalise aids directed at industrial firms, whether of a public or private nature. Contribute to the dissemination of information concerning supranational economic organisations, especially the EEC.

4.3 The CIRIT of the Autonomous Government of Catalonia

The CIRIT, Commissió Interdepartamental d'Investigació i Innovació Tecnológica (Interdepartmental Committee for Research and Technological Development), is the body officially created by the Generalitat to draw up an appropriate scientific policy for Catalonia and to support and stimulate technological research. The main formal tasks of the CIRIT are to coordinate the various activities and projects of the different departments of the Generalitat in order to achieve the greatest efficiency, to propose the most rational distribution or resources devoted to research in Catalonia, and to promote the implementation of research projects, improve the scientific level of Catalonia, and give general support to scientific activities within the community.

IMPROVING THE UTILISATION OF PUBLIC AND PUBLICLY FUNDED R&D-RESULTS

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