

STI OUTLOOK 2002 – COUNTRY RESPONSE TO POLICY QUESTIONNAIRE**PORTUGAL****1. General framework and trends in science, technology, and industry policy****1.1. Overview and assessment of policies for science, technology, and industry**

Since the creation of an autonomous Ministry for Science and Technology in 1995, as a sign of the Government's interest in this area, the main guidelines for Science and Technology policy have been:

- To overcome the backwardness and strengthening the scientific institutions.
- To improve research quality by fostering internationalisation and diversifying partnerships.
- To support technological ability and business innovation.
- To root science in the country and to strengthen scientific and technological culture.
- To promote the Information Society.

The overall growth of the science base and of research capacities, in order to overcome structural backwardness, was set as a political priority by the Portuguese government in 1995. All indicators clearly show the gap in R&D investment still separating Portugal from the European average, let alone the more developed countries. Growth rates, on the other hand, generally show Portugal as one of the fastest growing countries in R&D.

In the past decade, the Portuguese Scientific and Technological System has experienced remarkable growth. In 1999 the weight of R&D expenditure in the GDP reached 0,80%, from 0,43% in 1988. The proportion of researchers in the active population was 3,1‰ (FTE) in 1999, while in 1988 it was only 1,4%. Relevant also is the 10% annual increase in the number of new PhDs in Portugal and the rise in Portuguese scientific publication in refereed journals and citations, which has doubled in the last five years, almost half of which in collaboration with teams from other countries (16% annual growth rate from 1995 to 1999).

Portugal is currently facing two related challenges that must be dealt with through a co-ordinated approach. These are to sustain the growth rate of investment and scientific productivity in basic research in all R&D domains, while at the same time promoting knowledge absorption and innovative procedures in order to maximise spillovers from the growing knowledge potential into the economic system.

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Maintaining Portuguese scientific development requires the extension of consistent policies of new human resources training, internationalisation and increasing quality of research institutions and the diffusion of science and mechanisms for public understanding of science throughout the Portuguese social and economic structure. Public understanding of science is considered essential in order to sustain Portuguese scientific growth in all domains. Maximising allocations to human resources training and the capability to absorb knowledge into all Portuguese society hinges on public image of science and on public esteem of research careers.

Among the first measures taken to strengthen S&T in Portugal since 1995 was to change the institutional framework, creating a functional specialisation necessary to adequately co-ordinate and support the expansion, diversification and networking of the S&T and Innovation System. The Ministry generated three new public agencies:

1. The Foundation for Science and Technology (FCT) which is in charge of promoting, financing, following-up and evaluating institutions, programmes and projects in the area of S&T, as well as education and human resources training.
2. The Observatory of Science and Technology (OCT) which is responsible for collecting, processing and diffusing information on the S&T System.
3. The Institute for International Scientific and Technological Co-operation (ICCTI) which co-ordinates the international collaboration activities.

The Innovation Agency (AdI) was restructured and its action was co-ordinated with S&T policy, implementing support for consortia of business and R&D institutions, for innovative research and the promotion of R&D results for economic use.

In 2001 a Co-ordinating Board for S&T Policy held its first meetings. This Board includes delegates from the highest R&D performing firms, Government Laboratories, Higher Education and R&D institutions. Also, after evaluation assessments, the National Institute for Biomedical Research is being created and will assume co-ordinating, funding and evaluation functions in this research area.

The Lisbon European Council's general recommendations towards a knowledge-based society point out three complementary axes: to stimulate R&D and innovation; to promote access to IT and stimulate their use; to increase efforts on education and training.

These three axes have oriented Portuguese policies respecting R&D and Innovation and Information Society. These orientations have been defined in programmatic documents and their accomplishment is currently foreseen through several funding instruments, namely POCTI (Operational Program for Science, Technology and Innovation) and POSI (Operational Program for Information Society).

In order to increase business R&D and innovation, three guidelines have been established:

- Strengthening the R&D institutions that provide the framework for a knowledge basis and the training of human resources.
- Promoting advanced training of human resources on C&T.
- Promoting co-operation between business and R&D systems, as well as enhancing mobility towards the entrepreneurial sector.

The promotion of Strategic Areas for Development is established within the framework of the Operational Plan for the Economy (POE – Axis 2), namely:

- The definition of key areas in which productive activities and projects with strategic importance shall be supported, such as e-commerce and digital economy, information and communication technologies, multimedia and audiovisual contents industry, biotechnology, environmental technologies and energy technologies, as well as investment projects in traditional sectors, whose activities may incorporate innovations related to ICT, new materials, biotechnologies, renewable energies and environment protection.
- An incentive for the creation of new firms in strategic areas with strong development potential and innovative character. Priority goes to highly skilled entrepreneurs in scientific, technological and managing domains and to the promotion of liaisons between firms and Scientific and Technological System entities, namely through consortia.
- Reinforcement of training within firms in order to develop scientific and technological skills in the business sector.
- Promotion of entrepreneurial innovation through the creation or modernisation of institutions providing consultancy and applied research results to firms.

The Portuguese government has also recently approved the guidelines of a strategic, inter-ministerial Integrated Program for the Support to Innovations (PROINOV), whose ultimate aims are to increase the coherence of the national system of innovation and to foster productivity growth without loss of social cohesion. This program, directly dependent of the Prime Minister, aims to co-ordinate the action plans of all relevant ministries for the promotion of:

- The qualification, intermediate and advanced training of the population and life-long learning.
- Promotion of entrepreneurship through the education system.
- Availability of knowledge intensive services to firms.
- Networking and clustering firms and R&D centres.
- Information Society related productivity gains.
- Lowering administrative entry-costs for start-ups and innovating firms.
- Innovative firm endeavours through organisational and financial facilities (incubators, business angels and venture capital firms).

1.2. Features and changes in the nature and process of policy evaluation

The development of monitoring skills was set as a priority. The criteria defined within the evaluation system institutionalised by the Ministry of Science and Technology are set to be instruments for control and monitoring of the quality and performance of the S&T system.

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After independent evaluation of scientific institutions, legislation on R&D activities and on S&T/State relations has been revised. This legislative reform, which has already been performed, has produced three new decisive diplomas:

- The new Legal Framework for Research Institutions diversifies and promotes the flexibility of institutional models. This diploma applies both to public institutions and to private institutions that benefit from public funding.
- The Status of the Scientific Research Career is a managing device of human resources that envisages the reinforcement of institutions, qualification and internationalisation, inter-career mobility and researchers' IPR.
- A new framework for Research Scholarships establishes better conditions for young researchers in advanced training and regulates their adhesion to the social security system.

Other major changes in the Portuguese scientific system include:

- A reform program of government laboratories which is being implemented, following the recommendations of the international panels that evaluated them back in 1996-1998. Its guidelines are: to reinforce public utility R&D activities; to make better use of existing competencies and assimilate new competencies into the government laboratories, through the incorporation of post-doc and PhD scholarship students, tighter collaboration with university teams, and opening of new research posts for young PhDs.
- A network is being built of associate laboratories, through contracting with existing R&D institutions of strategic orientations and missions of public utility. The status of associated laboratory is conferred by the Ministry of Science and Technology for a period of up to ten years, through a contract that specifies the amount of public funding of the laboratory and the missions that it is committed.
- Multi-annual funding programme of R&D institutions, which was first put in place in 1996, has been subject to a second evaluation process in 1999. Beneficiaries are R&D units in universities and private non-profit R&D institutions. It rests now on independent evaluation by international expert panels every three years;
- The creation of a National Institute for Biomedical Research, currently in the making, which will assume co-ordinating, financing and evaluation functions in this area.

Constant monitoring performed by OCT, mainly through IPCTN (National R&D Survey, every two years), clearly shows that the gap on funding, especially by the private sector and on skilled human resources, is yet to be definitely closed-up. This reinforces the option made upon new human resources training and underlying the decisiveness of new programmes on human resources mobility, business R&D and consortia research and other related measures on this same issue (see Government support for private sector).

The EU benchmarking of national R&D Policies, of which the first results were published in June 2001, confirms a convergent growth with the EU average, both in input and output indicators. It has also allowed to identify areas requiring special policy attention: the diffusion of S&T through the economic and social system, incentives for collaborative R&D and innovation activity in firms, mainly in SMEs, encouraging patent filing and stimulating a dynamic venture capital market for early-stage investments.

2. Public Sector research and public research organisations

2.1 Policy changes and background/rationale related to public sector R&D

It is clear from all available indicators that the growth in R&D intensity is still largely tributary to public investment. Both national and EU structural funds have been increasingly allocated to R&D enhancement programmes¹, as visible in the growth of the R&D budget and of its weight in the general government budget and in the GDP.

The main guidelines for scientific and technological policies have been reinforced in the government's Major Program Choices (*Grandes Opções do Plano*) for 2001 and 2002. GBAORDs were increased by 9% between 2000 and 2001 and by 15% between 2001 and 2002 at current prices, resulting in an overall increase of 26% and growing from 0,62% of GDP in 2000 to an estimated 0,69% in 2002.

Public funding is being used to increase R&D potential by investing in advanced training of human resources, in project funding, in strengthening R&D institutions and their internationalisation.

- R&D programs integrate scholarship grants for initial (graduate) and advanced (post-graduate: MA, PhD and Post-doc) training and start of scientific careers; and funding of research projects across all scientific domains on a competitive basis by international quality standards. Similar measures are contemplated for advanced human resource training and research targeted to ICT.
- Project funding is dependent on team and project quality assessment by independent evaluation panels including a majority of international experts. Application for funding is opened yearly by the FCT for all areas of knowledge. Beneficiaries are research teams in public or private institutions with R&D activities, namely and business enterprises in consortia with R&D institutions or engaging in integrated R&D programs. Since the aim is to develop the general science base, there is no thematic prioritisation in the general programme, project selection being based on project and team quality assessment.
- Dedicated thematic programmes are also opened on public interest issues (e.g. research on forest fires, marine science, ethnic minorities, protection of natural environments, drug addiction...) and for participation in international R&D institutions to which Portugal adhered (EMBL, ESO, ESRF, ESA, CERN, ESO). Evaluation parameters and procedures are similar to those of the general programme. In the context of Information Society policy, new R&D programs are being set up under POSI (2000-2006), targeted at ICT and their use in social and economic context, and computational processing in Portuguese language.
- Following a first assessment in 1996, the multi-annual funding programme of R&D institutions led to a second evaluation process carried out in 1999. Beneficiaries are R&D units in universities and private non-profit R&D institutions. International expert panels rated candidate institutions in a five degrees scale ranking from 'poor' to 'excellent', and made recommendations for strategic orientation and future investments and activity plans. Quality assessment takes into account research performance by international standards, including publications in international journals and patenting activity, where appropriate. Subsequent evaluations take into account the compliance to the recommendations and the good use of the

¹ *CIENCIA 1990-1993; Praxis XXI 1994-1999; POCTI 2000-2006; POSI 2000-2006*, the latter having specific measures for R&D dedicated to ICT and Information Society.

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previous funding, besides R&D performance, publications, etc. The total amount of funding rose fourfold, from c. EUR 7.5 million in 1996 to c. EUR 30 million in 2000.

2.2 Initiatives to reform the organisation and governance of universities and public research organisations

After independent evaluation of all scientific institutions, as noted in chapter 1.2, legislation on R&D activities and on S&T/State relations has been revised. This legislative reform, which has already been performed, has produced three new decisive diplomas:

- Legal Framework for Research Institutions.
- Status of the Scientific Research Career.
- New Framework for Research Scholarships.

A reform program of government laboratories is being implemented, following the recommendations of the international panels that evaluated them back in 1996-1998. Its guidelines are: to reinforce public utility R&D activities; to make better use of existing competencies and assimilate new competencies into the government laboratories, through the incorporation of post-doc and PhD scholarship students, tighter collaboration with university teams, and opening of new research posts for young PhDs. The reform program follows a principle of double funding. This means that a laboratory's funding has two components: 1) a base funding from the Ministry from which it depends; and 2) a contract funding dependent on R&D programs negotiated between each government laboratory and the Ministry of Science and Technology, on the basis of specific R&D mission projects performed by research teams under a responsible researcher, and subject to regular evaluation.

A network is being built of associate laboratories, namely through contracting with existing R&D institutions of strategic orientations and missions of public utility. The status of associated laboratory is conferred by the Ministry of Science and Technology for a period of up to ten years, through a contract that specifies the amount of public funding of the laboratory and the missions that it is committed. The performance in the fulfilment of the contracted missions is subject to evaluation in the middle and in the end of the contracted period, by international expert panels. These laboratories are being funded for five years and their status of associate lasts for up to ten years. They are evaluated in the meantime and in the end of the contract period, which can be renewed after positive evaluation. There are nowadays 10 associate laboratories involving 18 R&D institutions in five scientific areas: Physics (2 laboratories), Chemistry (1), Health Sciences (5), Chemical and Biotechnological Engineering (2) and Electrotechnical and Computational Engineering (2).

An important infrastructure investment in the networking of R&D institutions has been the creation of a network (**RCTS**), linking universities and research centres, libraries and elementary and secondary schools by broadband. All linked institutions were provided sub-domains, e-mail accounts and space for web pages. The R&D network is to be developed under POSI 2000-2006. One of its developments currently under implementation, is the creation of a Network Science and Technology Library connecting all adherent institutions to common library resources online and to international databases. The first step towards the creation of this Science and Technology Library has already been taken through an agreement with the Institute for Scientific Information, making ISIs' databases available online to all Portuguese research institutions.

Another important infrastructure investment refers to the National Program for Scientific Re-equipment, which was launched in 2001, with applications by R&D institutions currently under evaluation.

3. Government Support for Private Sector

3.1 Changes to enhance the effectiveness of policy instruments used to provide public support for private sector R&D and innovation

R&D performance by the enterprise sector is still low by European standards (BERD=22,7% of GERD in 1999), but it is the fastest growing performing sector in Portugal (15,3% average annual growth of BERD 1997-1999). This growth is largely self-financed (83% of BERD was financed by enterprises in 1997, 84% in 1999), not a direct effect of public investment in enterprise R&D. It is, however, highly correlated with public investment in the overall science system and with general R&D expenditure. This fact suggests that it is a systemic effect combining general growth in R&D capacity with gradual modernisation of the entrepreneurial structure, and that the growth of the R&D resource base together with indirect support measures may be expected to yield the best results. However, direct support to R&D performed in collaboration between enterprises and R&D institutions may be instrumental in promoting research/industry networking for partnerships.

The fact that R&D intensive sectors have small weight in the industrial structure indicates that these signs must be seen as a positive trend, but will have limited scope unless changes are produced within the specialisation structure. Horizontal policies and efforts towards infrastructure creation are decisive but human resources training and technology policies will be more effective as promoters of structural change.

Technology policy devices common to other countries, such as tax incentives or mobility enhancement programmes, only recently were established in Portugal. Support policies for R&D in firms, traditionally centred on funding of occasional projects will be revised after evaluation. Tax credits are considered the basis to promote everyday research capacities in firms, on which structural supports for specific programmes and projects will lay its foundations.

It is also worth noting that public support for private sector comprises a set of measures that are not included here (see chapter 4) referring to networking and co-operation programmes between different sectors focusing on systemic development.

Tax Treatment

A tax incentive system is at work since 1997 for enterprises' R&D expenditure, (whether in-house or outsourcing), managed by a board presided by the Foundation for Science and Technology (FCT) and including the Innovation Agency (AdI) and the Observatory for Science and Technology (OCT). It allowed for the deduction from taxable income of 8% of eligible R&D expenditure (net of direct state funding), plus a 30% tax deduction on incremental expenditure above the average of the previous two years, up to PTE 50 million (c. € 249.4 thousand). The incentive regime has just been updated (from the 2001 exercise on) to 20% deduction of eligible taxable income and 50% of incremental expenditure, up to PTE 100 million (c. € 498.8 thousand), in order to support and foster the growth trend. A little more than 180 enterprises have applied to the program, over 60% of which are SMEs. The most represented industries are electrical and electronics, telecommunications and software development, chemical and pharmaceuticals, but some traditional sectors are also significant (e.g. machinery, paper manufacturing, textile).

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Direct Public Funding and Other Forms of Public Support

Technological R&D is promoted through support programmes for research projects in consortia between scientific and higher education institutions and firms. A new programme was launched in 2001. The contesting projects are subject to evaluation and selection by external expert panels. These aids may be granted through direct support mixed with loans. Interest rates vary according to the innovative potential and the expected strategic impact, level of risk, degree of pre-competitiveness, level of internationalisation.

Public funding to consortia projects by firms with R&D institutions varies according to the nature of R&D (industrial or pre-competitive). In both cases the funding rate may be increased depending on firm dimension (SME) and region. A new contest has been opened in 2001, following assessment of the previous contests' results.

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- Entrepreneurship through the education system.
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- Information Society related productivity gains.
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- Innovative firm endeavours through organisational and financial facilities (incubators, business angels and venture capital firms).

Policy measures promoting venture capital for SMEs so far have mostly privileged the commerce sector, for which a fund was created in 1998. There is now a project to create a new public venture capital fund for new technology based SMEs. The improvement of conditions of access to venture capital, namely by reducing the administrative burdens and the reorganisation of public sources of venture capital, is among the key actions of PROINOV.

The promotion of Strategic Areas for Development is established within the framework of the Operational Plan for the Economy (POE – Axis 2), namely:

- The definition of key areas in which productive activities and projects with strategic importance shall be supported, such as e-commerce and digital economy, information and communication technologies, multimedia and audiovisual contents industry, biotechnology, environmental technologies and energy technologies, as well as investment projects in traditional sectors, whose activities may incorporate innovations related to ICT, new materials, biotechnologies, renewable energies and environment protection.

- An incentive for the creation of new firms in strategic areas with strong development potential and innovative character. Priority goes to highly skilled entrepreneurs in scientific, technological and managing domains and to the promotion of liaisons between firms and Scientific and Technological System entities, namely through consortia.
- Reinforcement of training within firms in order to develop scientific and technological skills in the business sector.
- Promotion of entrepreneurial innovation through the creation or modernisation of institutions providing consultancy and applied research results to firms.

3.2. *Changes in the balance and/or priority of public support of business R&D and innovation*

The main policy guidelines, as defined above: strengthening R&D institutions, improving research quality and internationalisation, implementing a demanding evaluation, supporting technological ability and business innovation, strengthening scientific and technological culture and promoting the Information Society, have been set as the main priorities and their targets are being met. The overall growth rate in R&D investment, and particularly in firms, the increase in the share of trained S&T human resources in the labour force, the internationalisation of research teams and projects and the fast growth in the number of publications in international journals demonstrate the ongoing process of take-off in Portuguese R&D.

In what concerns thematic priorities, these are not the core of the scientific policy, which at the present phase has to be geared to overall growth in all scientific domains. However, thematic R&D programmes have been opened on public interest issues (*e.g.* research on forest fires, marine science, ethnic minorities, protection of natural environments, drug addiction...) and for participation in international R&D institutions to which Portugal adhered (EMBL, ESO, ESRF, ESA, CERN, ESO). In the context of Information Society policy, new R&D programs are being set up under POSI (2000-2006), targeted at ICT and their use in social and economic context, and computational processing in Portuguese language.

The ongoing reform process of government laboratories, following their external evaluation, clarifies their strategic orientations to research and development missions of public utility, namely in the fields of marine sciences and technologies; management of agrarian systems and environment protection; climate, biophysical and environmental monitoring and forecast; risk prevention and reduction; food quality and safety.

The network of associate laboratories that is being built through contracting with existing R&D institutions also embodies strategic orientations and missions of public utility in scientific and technological areas where the necessary capacities have been identified. They cover areas such as neuroscience, health biotechnology, toxicology, molecular biology and medicine, biological risk, genetic disease, development biology, ageing biology, oncology, controlled nuclear fusion, plasma technologies and lasers, particle physics and medical physics, plant and forest improvement, environment systems and sustainable technologies, ocean exploration technologies, robotics, multimedia networks, mobile and optical communications.

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3.3. *Assessments of the relative effectiveness of different policy measures*

Indicators on human resources for R&D, of new PhDs in the system, of R&D investment in both public and private sectors show that the system is growing consistently. Evaluation processes carried out in the public R&D system evidence an overall improvement of performance and strategic orientation, and output indicators of publication statistics and citations show that its scientific effectiveness is growing at a comparatively fast pace.

Technological projects developed by consortia of firms and public research centres also show encouraging results. Indicators on patents, however, show very low values for Portugal, even though the growth rate of Portuguese patents filed in the US is high. This can mean that the transfer of knowledge into inventions of potential economic use is still comparatively weak (in keeping with the relatively low rates of firms participation in R&D activities), and that such as there are may not be protected by patents for various reasons. On the other hand, R&D is mainly performed in an academic background, and the incentive structure in universities and public research centres doesn't yet put a high prize on patenting as compared with other evaluation parameters.

To promote the use of IPR mechanisms for the outputs of industry-related R&D is one among the priorities set in the recently approved guidelines of the Government's Integrated Program for the Support of Innovation (PROINOV) but no specific policy measures have yet been put forth to achieve this goal. A new Legal Framework for Intellectual Property is being devised, adapted to new realities induced by recent changes in supranational norms and regulations (Communitarian, European and international). The creation of a network for information dissemination on intellectual property, set up after the establishment of a strategic action-plan developed late in 1999 and in the beginning of 2000, is currently being launched. The creation of an Incentive System for Intellectual Property Diffusion (whose diploma has already been published) may also constitute an important tool to improve and deepen an Internal Market for the use of IPR.

Policy measures promoting venture capital for SMEs so far have mostly privileged the commerce sector, for which a fund was created in 1998. There is now a project to create a new public venture capital fund for new technology based SMEs. The improvement of conditions of access to venture capital, namely by reducing the administrative burdens and the reorganisation of public sources of venture capital, is among the key actions of the strategic inter-ministerial program PROINOV. The Government has recently approved its guidelines.

4. Enhancing collaboration and networking among innovation organisations

There are still some diffusion barriers or market obstacles hindering the translation of knowledge growth into competitive innovation in the high-tech sector. Innovation policies have to face critical issues such as increasing the absorptive capacity of firms for new knowledge and technology, creating interface structures between the R&D and the enterprise sector, IPR and innovation finance, in order to integrate the different actors and function of the national system of innovation.

Researchers' mobility enhancing programmes between universities and R&D institutions and firms are being reinforced through new measures:

- Support for insertion of MAs and PhDs in enterprises through decreasing participation in wage costs for a maximum of three years.

- Scholarships for mobility between R&D system and enterprises.
- Support for enterprise oriented MA and PhD programs.
- Following the Cabinet Resolution 24/2001, the Foundation for Science and Technology created a site in the internet open to free advertisement of scientific and technological employment. This site publishes all scientific and technological employment offers available in public institutions or private ones that benefit from public support, and may also be used by private entities that wish to do so.

Supporting R&D projects in consortia between Universities and other R&D institutions has promoted co-operation, has reinforced the firms' own capacity for research and has also encouraged incorporation of new technologies in the economic structure.

Opportunities opened up by public procurement under the main programmes for public investment have been identified in the civil construction and public works sector, harbours, transportation and also in investment sub-sectors concerning education and health. Other public policies are expected to receive the contribution of scientific and technological innovation.

Developing innovation clusters in key areas (programmed in PROINOV) both in internationalised traditional sectors and in activities that have diversified the specialisation (auto and transportation components, construction/habitat/environment, health/special cares), as well as in emerging activities (software and contents) aims to improve networking within Portuguese entrepreneurial sector and facilitate its internationalisation. This reinforcement is expected to promote co-operation between firms, entrepreneurial associations, educational, innovation, R&D, interface and financial institutions on a territorial/activity basis. Its main goals are:

- Diagnosis and prospective for common approaches.
- Identifying priorities.
- Improving innovative interface systems.
- Stimulating co-operation between participant entities at various levels.
- Stimulating the development of products and services of greater surplus value.

The creation of a diffused network for information dissemination on intellectual property, set up after the establishment of a strategic action-plan developed late in 1999 and in the beginning of 2000, which is currently being launched, is also worth noting. The creation of an Incentive System for Intellectual Property Diffusion (whose diploma has already been published) may also constitute an important tool to improve and deepen an Internal Market for the use of IPR.

5. S&T Human Resources

Portugal suffers from a long term scarcity of S&T Human Resources. As stated above, the main orientations of S&T policies in Portugal comprise measures for the allocation of massive investments for new human resources training. This effort is considered essential not only to overcome shortages in this specific domain but also to promote the development of the Portuguese science basis and the diffusion of innovative procedures, enhancing mobility of human resources between R&D institutions and firms.

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As already mentioned, the attribution of scholarships within Advanced Training Programmes in Portugal or abroad has been the main policy instrument to overcome this perceived shortage.

R&D programs integrate scholarship grants for initial (graduate) and advanced (post-graduate: MA, PhD and Post-doc) training and start of scientific careers; and funding of research projects across all scientific domains (including Humanities and Social Sciences) on a competitive basis by international quality standards (see chapter on Public Funding). Similar measures for advanced human resource training and research targeted to ICT are contemplated.

- MA, PhD and Post-doc scholarships are granted twice a year by the Foundation for Science and Technology (FCT) after evaluation by expert panels, taking into account prior performance by the candidates, quality of training and research project, and the host institution and research team, national or foreign. A new legal framework was put in place for scholarship holders in 1999, defining their statutory rights and obligations and providing better social conditions (*e.g.* extension of social security rights). Scholarships may be granted for initial and advanced training associated with the funded research projects. A priority of human resources policy is to internationalise the Portuguese R&D system, through scholarships for advanced training for Portuguese researchers abroad (mostly PhD and post-docs) and for foreigners in Portuguese R&D institutions. There are at present 3536 scholarships of all kinds in course, of which 1666 abroad.²

Advanced Training Programmes have been revised in order to stimulate professional insertion of PhD' researchers in Associated Laboratories, Research Units, State Laboratories and firms, envisaging the promotion of mobility between institutions, the development of research careers and the attraction of researchers living abroad.

A supporting structure for the insertion of Portuguese PhDs living abroad has been created, within the FCT, in order to promote their insertion into the scientific and technological Portuguese system. This structure diffuses information about Portuguese research institutions and professional insertion opportunities, mediate contacts with these institutions and finance travelling and installation costs.

The attractiveness of scientific careers depends to a large extent of the public understanding and esteem of science. The promotion of scientific and technological culture among the Portuguese population has been one of the priorities of the Ministry of Science and Technology since its creation in 1995. The *Ciência Viva* Programme, launched in 1996, elected the school and the experimental scientific education as its intervention priority to root science in the country. This Programme involves three main action tools:

- A support programme for the promotion of experimental teaching of science and renewing technological education in elementary and secondary schools. Among the activities included in this programme are:
 1. The funding of projects for experimental teaching of sciences in schools involving scientific and school communities for an exchange of knowledge and resources.
 2. The fostering of partnerships between elementary and secondary schools and scientific institutions.

² Data for all scientific areas, including social sciences, humanities and health sciences, according to the last update of the FCT database on scholarships.

3. The promotion of the scientific occupation of secondary students in laboratories, research centres, and science information centres.
 - A network of *Ciência Viva* Centres designed as interactive spaces for scientific diffusion.

National campaigns for scientific diffusion, fostering the creation of scientific associations and providing the population with the opportunity to make scientific observations and to establish a direct and personal contact with experts in different fields of knowledge.

6. International co-operation and globalisation

International co-operation has been developed and reinforced. In the first semester of 2000 various measures were taken according to the programme established by the Portuguese Presidency, namely, the development of European Science and Technology and its reinforcement as a political priority and, in what refers to Information Society, the promotion of a co-ordinated and global policy in order to make Europe the most advanced region of world economy respecting to knowledge and information. Portugal has since actively participated in the creation of the European Research Area and in preparing discussions of the 6th FP for RDT, as well as in the implementation of eEurope Action Plan.

Bilateral co-operation has been reinforced and intensified not only at the European level but also with India, Macao and Morocco. In the multilateral co-operation domain, it is worth noting Portugal's adhesion to ESO and the reinforcement of its participation in International Scientific Institutions, namely in ESA, as well as Portugal's participation in CERN's "Computing Grid" Project, considered decisive for this sector.

The political foundations for the attraction of technological foreign investment were laid down. The elaboration of an Action Plan for this purpose was determined by Cabinet Resolution 56/2001, 25 May 2001.