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LEGAL AND INSTITUTIONAL ASPECTS OF THE INNOVATION SYSTEM OF THE EUROPEAN INTEGRATION

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Abstract

The Community has had a research and technology policy since its establishment, however, in the first period it was not a typical 'system of innovation' and was characterised by *ad hoc* political decisions and the incoherence of the institutions. The Community demand on the promotion of the innovation capacity has been entered the primary legislation of the Community by the Single Europe Act. Introducing the rules of research and technology development into the Treaty of Rome, starting the framework programmes and focusing on the technology policy, have been presented the renewal of the post-national institutional building and led to mutual co-operation between the fragmented and *ad hoc* institutions, the increase of the efficiency of research and production, growth of the cost effectiveness and the competitiveness of the Community. The Sixth Framework Programme outlines the mid-term future directions of the Community technology policy. In order to perform these objectives few priorities must be determined which significantly enhance the competitiveness, have a structuring effect, increase the extent of the co-operation and involve small and medium size enterprises. At the same time, attention is to be given to the global changes and the known and unforeseen impacts of the enlargement of the European Union. On the other hand, the impacts of the developing European system of innovation on the Member States cannot be ignored either. Member States with strong and independent innovation policy are also affected by the impacts of the Community policy. The adjusting of the national priorities to Community priorities, the 'reverse institutional borrowing' and other practices, however, can be seen more intensively in the less developed Member States, and might be especially expected in countries whose accession is under way.

Keywords: Post-national system of innovation; Single European Act; SRINT; ESPRIT; EUREKA; White Paper on Growth, Competitiveness, Employment; Green Paper on Innovation; First Action Plan for Innovation in Europe; Innovation Tomorrow; framework programmes, Sixth Framework Programme; RDG; JRC; impact study.

1. General Outline of the Community Post-National Innovation System

The development of the European integration from the European Coal and Steal Community to the European Union has led to the establishing of several post-national institutions which have contributed significantly to shaping the innovation

process in the Member States.

The European institutions combine the elements of federalism (where sovereignity and the regulation of human interaction has been replaced at a supranational level) with the elements of intergovernmental co-operation (where the national institutions are interlinked while remaining autonomous). Thus in Europe the institution building process has been the result of very diverse social, political and economic processes which explains its heterogenity.

GREGERSEN et al., (1994) define the European integration as '*a process towards a coherent institutional set up for production, trade and innovation within Europe*' which may result in several simultaneous or lagging convergence processes, creating a post-national 'layer' of activities for national firms and governments.

BADIE (1995) sees the European post-national institutional building as an ensemble of interdependent units which are agglomerated to degrees variating according to different domains, and which find themselves more and more deprived from their authority but without a symmetrically displacing it into a central authority. This decoupling of territory and sovereignity may be analysed from the perspective of a deregulation and disorganisation process in which formal national institutions are destructed. In his research BADIE defines the European post-national institution building as a flexible response to what already happens at global level.

Here we note that the term '*institutions*' may be defined differently, thus in wider sense they are '*humanly devised constraints that shape human interactions' (North)* or, as we use it in our present study, '*sets of common habits, routines, established practices, rules or laws that regulate the relations and interactions between individuals and groups*' (EDQUIST and JOHNSON).

Concerning the presentation of the legal aspects, from practical reasons, we consider as 'law' all written documents with normative content according to which legal relationships concerning innovation have been or might have established regardless whether they are laws in the sense of rules establishing the criteria of a source of law.

According to CARACOSTAS and SUETE innovation policy institutions, if conceived in a restrictive manner as specific formal rules influencing the innovation capacity of firms beyond R & D and technological demonstration, do not exist at the EU level. Support programmes for innovation and technology transfer, however, can be considered as quasi-institutions in so far as they have influenced the behaviour of specific actors in the innovation process. SPRINT (Strategic Programme for Innovation and Technology Transfer) may be considered as the embryo of such innovation policy institutions. From 1989 to 1994 it contributed to the development of innovation support services for SMEs, to the demonstration of intra-Community technology transfer and technology acquisition, and to the improvement of a common European knowledge of the innovation process.

Most of the institutions set up within the framework of the European integration can be related directly to the three essential components of the knowledge infrastructure: research and technological development, innovation transfer, training and education.

GREGERSEN et al. (1994) have described the rationale behind a European

integration process for research innovation: the 'single market' may be seen as an extended home market, where greater diversity in potential demand may spur product and process innovation (leading to further diversity among firms and countries) and lead to convergence between firms, consumers and countries to the extent that it may stimulate diffusion of best practice across countries. Growth of multinational corporations through mergers and acquisitions across borders is supposed to lead to better innovation performance since, in Schumpeterian terms, bigger firms in bigger and more specialised markets are better innovators. But the authors add their own critical point of view: '*On the other hand growing integration might also hamper innovation processes and interactive learning in the long run, if established domestic linkages are broken.*'

As to the definition of the term '*institutions*', EDQUIST and JOHNSON drew distinction between formal and informal, basic and supporting, soft and hard, designed and self-grown institutions. Basic institutions are the treaties since they determine what can be done and what decision-making procedure is to be followed. These are, of course, 'hard' institutions, which are very difficult to modify (in the field of research, thirty years separate the Euratom treaty from the Single European Act). Supporting institutions can also be broken down to various constituents: in the European research policy context, for example, the sequence of rules such as the framework programme, the specific programmes, committee rules, work-programmes, and calls for proposals and research contracts have increasing 'softness' due to more general rules governing legislative and executive powers and the equilibria between them.

At the end of our introduction we think it to be necessary to draw up the line between the terms 'innovation policy' and 'research and technology policy'. Discussions on innovation systems typically relate both to innovation policy and research and technology policy. The main difference between these kinds of policies is in their normative. The innovation policy is often regarded by political actors as a part of economic development programme, but it is rarely furnished by an independent and exclusive normative and institutional background due to its multidisciplinary character which penetrates the whole institutional set-up. The research and technology policy can be treated much easier as separated by the decision-makers, e.g. in a separate chapter in the annual budget. Further, the universities and independent research institutes can be easily identified as fundamental elements of the research and technology policy institutions. Its discrete position in the set-up of the society and its structural stability makes the research and technology policy easier to deal with for the law- and policy-makers. However, both of these policies form integrated parts of the innovation systems, and from the point of our topic it has little importance which policy's product is a given legal regulation or institution. For instance in the EU a tight practical interlocking has been emerged between the innovation policy and the research and technology policy in the course of the development of the framework programmes, and the new framework programmes adopted in accordance with Title '*Research and Technological Development*' of the Treaty of Rome contain appropriations explicitly intended for the exploitation of the innovation policy.

2. Historical Review

The history of the European countries goes back to long cultural and scientific traditions. At the end of the 1950s for groups believing in a federal Europe was the nuclear energy considered as a subject of a radically new area for supranational co-operation; an area where there were no vested interests of partnering nations. Thus, some analysts (GUZETTI) consider that the Treaty of Rome is a by-product of the Euratom Treaty.

The period 1957–1967 in the European institution building in the field of research was characterized by a very strong federal approach. Joint research laboratories were set up by "europeanizing" existing national facilities. After two Euratom research programmes, however, the conflicts between France and Germany made it impossible to advance further the co-operation.

The period 1968-1979 is the period of crisis and transition. However, during these years one could trace the first elements of that the new European institutional set-up will become in the field of research. In 1966 the vice-president of the European Economic Community called the attention of the European Parliament to the importance of the development of technology. He suggested that the scientific research should be regarded as an integral part of the economic policy.

The executive bodies responsible for the performance of the Treaty on the European Coal and Steal Community, the Treaty Establishing, the European Community and the Euratom Treaty were unified under the name of Commission of European Communities in 1967. In the declaration following the European Summit in December 1969 the need to initiate Community programmes was highlighted. The (still existing) European Science Foundation (ESF) was established in 1974.

The Scientific and Technical Research Committee (CREST) was established as an advisory board at the European Commission in order to co-ordinate the national innovation policies. It consists of the representatives of the national authorities responsible for the science and technology policy of Member States. The Industrial Research and Development Advisory Committee (IRDAC) was an advisory body of the Commission. The IRDAC was established by the European Economic Community in 1984 in order to provide support from the industrial side for the Community research and technology policy. Its members were appointed by the Commission among the representatives of the trade unions and the industry. The European Science and Technology Assembly (ESTA) was set up in 1994 as a successor of Committee for the European Development of Science and Technology (CODEST). This body consisted of 100 scientists appointed by the Commission. and it was an advisory body in the field research and technology policy of the European Union. ESTA and IRDAC were replaced in 1998 by European Research Forum (ERF) which has been succeeded in 2001 by European Research Advisory Board (ERAB) an independent, highly qualified advisory body to increase the efficiency of the European research and technology development policy.

The tension between the Community approach (integration) and the intergovernmental approach (interdependency) led to establishing of COST Committee in

October, 1970. The COST elaborated an *á la carte* programme involving non-EEC countries but still embedded partially in the Community system. In this period policy-makers recognised, that the European Economic Community should create an own specific science and technology policy. However, until the end of this second period the technology policy remained inconsistent and there were no visible results.

During the period 1980–2002 significant institutional changes occurred. First of all the the EC treaties as 'hard' institutions were revised by signing of the Single European Act and the Treaty on the European Union (the Treaty of Maastricht). Under title '*Research and Technological Development*' the Single European Act introduced in the text of the Treaty of Rome the policy demands to increase the Community's innovation capacity. The Single European Act constitutes the first institutional innovation in terms of comprehensive post-national institutional set up in Europe. It formulates the rules governing joint research and development at the European level by stipulating:

(i) the objectives (industrial competitiveness)
(ii) four types of common actions (research, development and demonstration, international co-operation, diffusion and exploitation, training and mobility of researchers)
(iii) a planning approach (the framework programme, the specific programme, supplementary programmes, forms of participation)
(iv) means for co-ordinating national policies.

This gave a push to the development of a clearer and more coherent technology policy. Implementation of the above changes, however, have been preceded by intensive institutional and organisational experiments.

The European Programme for Research and Development in Information Technologies (ESPRIT) was set up by a Council Decision for a period of five years from January 1, 1984. This programme has played an important role as a model for successive European research and development co-operation programmes, in particular through its experimentation with the 'shared cost' approach to collaboration between companies, universities and research institutes coming from at least two different Member States.

EUREKA has been a pan-European network for market-oriented, industrial research and development. It was established in 1985 by seventeen countries and the European Community to encourage a bottom-up to technological development and to strengthen the competitive position of European companies on the world market.

The COMETT programmes (Programme on Co-operation between Universities and Enterprises Regarding Training in Field of Technology) aimed at promoting the co-operation between the universities and the enterprises in the Community concerning the training in the field of technology. COMETT-I was established for a four-year-period from 1986, and COMETT-II for another four years as from 1990.

The Research and Technological Development Programme in the Field of Industrial Manufacturing Technologies and Advanced Materials Application

(BRITE/EURAM) was established in 1989 for four years to promote the development of certain manufacturing and materials application technologies.

The Programme Plan to Stimulate the International Co-operation and Interchange Needed by European Research Scientist (SCIENCE) was effected between 1988 and 1992 and it aimed at increasing the mobility of European research scientists.

The Strategic Programme for Innovation and Technology Transfer (SPRINT) was established in 1989 for a period of five years. The goal of this programme was the execution of the main phases of the strategic innovation and technology transfer plans at the Community level.

The first phase of the Specific Programme of Research and Technological Development in the Field of Industrial and Materials Technologies (CRAFT) has been effected between 1990 and 1994, and the programme is still existing.

The Action Programme to Promote Innovation in the Field of Vocational Training Resulting from Technological Change in the European Community (EUROTECHNET) was established in 1990. The Commission ensured the accord between the EUROTECHNET programme and the other Community measures concerning vocational training and technology development.

The basis laid down in the Single European Act has been confirmed and extended by the Treaty on the European Union (Treaty of Maastricht) and further changes affecting research and innovation were introduced at the level of primary legislation. Five elements need to be underlined:

(i) Article 2 gives the European Community the new mission to promote '*a sustainable and non-inflationary growth respecting the environment*' and '*a high level of employment and social protection*',
(ii) Article 3B codifies the 'principle of subsidiarity' limiting the scope of action of the Community,
(iii) new Title XV concerning research and technological development defines the objectives of the European Community not only in relation to the international competitiveness of its industry but also '*to promote research activities deemed necessary*' to support other European Community policies,
(iv) new Article 130 H focuses on co-ordination between the Community and its Member States to ensure mutual coherence between their policies,
(v) finally, by the new co-decision procedure, the European Parliament is made fully responsible for the decisions at strategic level, i.e. for the framework programme.

In 1994 the European Commission issued the White Paper on '*Growth, Competitiveness, Employment. The Challenges and Ways Forward into the 21*st *Century*' (hereinafter: the White Paper). Pursuant to the White Paper, Europe's research and industrial base suffers from a series of weaknesses. The first weakness is financial: the Community invests proportionately less than its competitors in the field of research and technological development. A second weakness is the lack of co-ordination at various levels of the research and technological development activities,

programmes and strategies in Europe. The greatest weakness, however, is the comparatively limited capacity to convert scientific breakthroughs and technological achievements into industrial and commercial success.

One year later the Commission presented the Green Paper on Innovation (hereinafter: the Green Paper). The Green Paper is repeating the statements of the White Paper established that the situation of the European Union in terms of innovation appears to be unsatisfactory, despite some first-rate scientific achievements. The Green Paper, among others, identified the following weaknesses:

(i) disparate and fragmented research and development,
(ii) insufficient capacity to innovate, especially to react rapidly to changes in demand.

The Green Paper came to the conclusion that there are not enough new businesses, the methods for making the organisations and the management open and participative are not widely enough known, and there is a widespread reluctance to seek information.

The public debate launched by the Green Paper has largely confirmed the basic principles of the Commission's diagnosis of the reasons for the innovation deficit plaguing the European Union. At the Florence Summit (1996) the European Council requested the Commission to establish a plan of action for measures to be undertaken in the field of innovation. The First Action Plan for Innovation in Europe has been prepared by ESTA in the same year. Surprisingly, the First Action Plan came to the conclusion, that '*the main effort for innovation must nevertheless be made at local, regional or national level*'.

The document titled '*Innovation Tomorrow*' issued by the European Commission in 2002 as a part of the Fifth Framework Programme (hereinafter: Report) has been one of the latest analytical-evaluating publications of the Commission. The Report defines the term 'third generation innovation policy' and declares its realization as a first range objective. The Report shortly summarized the changes between the generations of the innovation policy and compared the main features of the third generation innovation policy with the two previous ones.

The first generation innovation policy was based on the idea of a linear process for the development of innovations. This process begins with laboratory science and moves through successive stages until the new knowledge is built into commercial applications that diffuse in the economic system. The emphasis of policy was on fostering critical directions of scientific and technological advance. The second generation policy recognises the complexity of the innovation system, with many feedback loops between the different stages and seeks to enhance two-way communication across different points in the innovation chain.

The third generation innovation policy would place innovation at the center of each policy area. The Report outlines the case for doing this, in each of a set of policy areas considered. There are of course many differences of detail from one policy area to another. The common aim is to maximise the chances that regulatory reform will support innovation objectives. But to accomplish this means fusing two

sorts of knowledge. First is knowledge about innovation processes and innovation policy. Second is knowledge about the specific policy areas.

The Report considers two general approaches to policy reform that are currently underway – regulatory and institutional reform and the reform of governance. The regulatory and institutional reform is an opportunity for efficient policy design processes to be introduced, and this is also an opportunity to take into account the implications of policies for innovation. It will often be appropriate for efficiency and effectiveness reasons to design measures across policy interfaces, in order to policies work in the same direction. Governance is also important for innovation. As a key element of this informed public opinion about broad classes of innovation must be nurtured. Ways to achieve greater public involvement in decision-making as to priorities, ethics etc. should continue to be developed and extended. Thus openness and participation are important, and multiple methods to achieve these ends will be needed.

In addition to these two broad themes, the Report addressed a series of policy areas. In the following we shall discuss briefly three major fields of the policy making.

In the field of research policy the report establishes that the private sphere will sponsor research and development where it is most effective and where its access is easy and secure. So Europe needs to ensure that it is at the frontiers of knowledge and it offers the highest value added cost effectively. Firstly, high level research requests a constantly increasing 'critical mass', and needs good connections with intermediaries that can relate it to commercialisation. Additionally, new research management tools may also be important in increasing the productivity of research. However, it is important not to assume a linear, technology push-like relationship between the two. Not all research is directed to the stimulation of innovation, and innovation is not the sole justification for research. The development of modern research in a global environment needs institutional flexibility, co-operation at different levels, co-ordination of national or European policies, networking teams and increasing the mobility of individuals and ideas.

As to the intellectual property protection policy, the strategies of companies with respect to patent acquisition, and, latterly, the use of copyright rules to limit the behaviour of other agents, requires careful appraisal in terms of impacts on innovation. Renewed efforts to establish common European patents are required. However, the revisions to patent law that are under discussion require extended consultation that explicitly considers the innovation impacts of retaining or changing existing frameworks. Similar consultations are also needed to examine ways in which copyright and other rules should be adapted to stimulate innovation. Improved advice and support should be provided to the small- and medium-size enterprises for their development and implementation of IP-strategies. Finally, intellectual property rights regulations and competition policy need to be jointly examined.

In the field of financial services and risk capital policy there is a continued need for the development of instruments providing finance for early-stage innovation and smaller firms. Financial support for various activities (e.g. licensing, patent

investigations etc.) also need to be fostered. Further development of web-based financial services for the small- and medium-size enterprises is also recommended, together with appropriate awareness campaign and support services. The financial community should be helped to acquire better intelligence about emerging areas of technological opportunity. It also needs support in better understanding the general dynamics of innovation (e.g. time required to reach profitability, complementary assets that may be required for commercialisation). Better tools and standards are needed for accounting for innovation-related intangible assets and intellectual capacity in firms. According to the Report the above means may largely contribute to the implementation of the third generation innovation policy.

3. The Legal Background of the Present Regulation

As we mentioned in the historical review, the Treaty of Rome originally did not contain explicit regulation concerning the research and technology policy. In the first phase of the Community's research policy only eight articles from the Euratom Treaty were devoted to the promotion of research activities. This treaty did not provide a framework for a general research policy. During the period from 1953 to 1974 there was thus no clear framework for the Community's research policy. The Community's research programmes for this period concentrated mainly on the nuclear, steel and agricultural sectors. Only the Single European Act extended the Commission's competence to the technology area and strengthened the Commission's role in these fields. Thus, the Single European Act created the first institutional innovation in terms of the post-national innovation set-up. Title XVIII '*Research and Technological Development*' of the Treaty establishing the European Union[1] provides for the specific rules regarding to the innovation. These rules define the Community's objectives concerning the international competitiveness of its industry, declare a co-operation between the Community and its Member States in order to ensure the coherence among their policy.

4. Evolution of the Framework Programmes and the Sixth Framework Programme

The research framework programmes are consecutive, multi-annual strategic programmes which aim at promoting the international competitiveness of the European industry (first of all in relation to the USA and Japan) in the advanced technology sectors. The common science and technology strategy developed by the framework programmes is to be co-ordinated with the other strategies ad policies of the Community. The common science and technology strategy defines the scientific and technical aims to be followed at Community level, the selection criteria of the

[1] Consolidated version incorporating the changes made by the Single European Act, by the Treaty of Maastricht and by the Treaty of Amsterdam, as effective from May 1, 1999.

Community activities, the priorities and the financials. The role of the framework programmes in the field of the Community technology policy is highlighted by the fact that the general issues concerning the framework programmes are regulated at primary legislation level in Title XVIII of the Treaty of Rome. In the following we shall shortly summarise the aforementioned rules.

A Council of the European Community after consulting the Economic and Social Committee shall adopt a multi-annual framework programme, setting out all Community activities concerning research and technology development. The framework programme shall:

(i) establish the scientific and technological objectives to be achieved by the activities and fix the relevant priorities,

(ii) indicate the broad lines of such activities,

(iii) fix the maximum overall amount and the detailed rules for Community financial participation in the framework programme and the respective shares in each of the activities provided for[2]. The framework programme shall be implemented through specific programmes developed within each activity. Each specific programme shall define the detailed rules for implementing it, fix its duration and provide for the means deemed necessary[3]. The basic method for the implementation of the special programmes is the share of costs, where the Community's financial participation ranges between 35 and 100 percent, very often 50 per cent, depending on the other features of the programme. The Council, acting by a qualified majority on a proposal from the Commission and after consulting the European Parliament and the Economic and Social Committee, shall adopt the specific programmes[4].

The framework programmes consist of three major parts. These are the preamble, the operative clauses and the annexes. The preamble, among others, presents the main reasons and circumstances which have led to the elaboration of the programme, the former decisions which are to be considered and the organisations and bodies whose opinion played significant role while preparing the programme, further, the general outline of the objectives to be achieved by the programme.

The operative clauses contain the duration of the programme, refer to its objectives, contain the general budget of the programme, the obligations concerning the controlling, evaluating and reporting activities and their proceeding, the method of funding (i.e. the share of costs) and the implementation rules.

The Commission shall continually and systematically monitor the implementation of the framework programmes whether they are in compliance with the aims stipulated in the framework programme. During the implementation of the programme the Commission is to prepare a report to the European Parliament and the

[2]Treaty of Rome Art. 166(1)

[3]Treaty of Rome Art. 166(3)

[4]Treaty of Rome Art. 166(4)

Council on the activities of the previous year and the plans for the next year periodically. At the end of each programme the Commission shall prepare the evaluating report of the programme.

The operative clauses are followed by the annexes, which, among others, define the specific objectives and the appropriations called for them (sometimes broken down into yearly figures), detailed description of the priorities within the objectives (these will identify the directions into which the Community intends to influence the science and technology development), the participation rules in the programmes and the selection criteria. (It shall be kept in view that separate framework programmes have been adopted concerning the technology policy within the competence of the Euratom Treaty.

In the following, we shall shortly outline the changes of the objectives and priorities. The first step in the 1980's of creating a common research policy was the adoption of the First Science and Technology Framework Programme (hereinafter: First Framework Programme). It has introduced the mid-term planning of research activities at Community level. The First Framework Programme which started in 1984 has doubled the proportion of the expenses on research and development in the budget of the European Community. However, at that time the largest share was devoted to the research in connection with energy. The preamble presented the objectives of the programme: the Community shall promote a harmonious development of economic activities, a continuous and balanced expansion and an accelerated raising of the standard of living. Further, research, development and demonstration activities must be accompanied by adequate dissemination of the knowledge acquired by means of these activities and by effective use of the results obtained.

The most significant thematic priorities of the First Framework Programme were the promotion of the (traditional) industrial competitiveness and the management of energy resources. A less favoured priority was the development of agricultural productivity. Among the priorities of the First Framework Programme information technology and biotechnology were not mentioned by name.

About 60 percent of the resources of the Second Framework Programme was devoted to industrial research. The majority of the funds still aimed at introducing of new technologies into the industrial sectors. However, it was the first time at the adoption of the Second Framework Programme that a demand to develop information arised. Still enormous support was ensured for the energy sector and for the modernisation of the traditional industry. Biotechnology was given a less significant support, but the Community has acknowledged the impact of this priority to enhance competitiveness.

The general objective of the Third Framework Programme was to strengthen the scientific and technological basis of the European industry and to encourage it to become more competitive at international level. The greatest attention was paid to the information and communications technologies. Further priorities were industrial and materials technologies, and environment. The support of the biotechnology has increased by 50 per cent as compared with the Second Framework Programme. The role of the human capital in the Community innovation has been recognized.

The Fourth Framework Programme was adopted after the Treaty of Maastricht had been entered into force and it involves the whole scale of research and demonstration activities. The international scientific co-operation became the part of the programme. Further measures of the Fourth Framework Programme aimed at enhancing the competitiveness of the European industry and the quality of life, at promoting the sustainable growth and at ensuring scientific and technical basis for the environment and other Community policies. From the resources of the programme the innovation technology and the industrial and materials technologies received the most significant support. The funds ensured for biotechnology has been increased by 200 per cent as compared with the Third Framework Programme.

The priorities of research, technology development and demonstration activities of the European Union for the period between 1998 and 2002 were set out in the Fifth Framework Programme. In order to maximise its impact, the programme focused on a limited number of research area combining technological, industrial, economic, social and cultural aspects. A major innovation of the Fifth Framework Programme is the concept of 'key actions'. Implemented within the specific programmes, these flexible instruments are targeted at achieving solutions to topics of great concern in Europe. The key actions mobilised a wide range of scientific and technological disciplines required to address a specific problem so as to overcome the barriers that exist. The Fifth Framework Programme comprises four Community activities. The first Community activity relates to the following four thematic programmes: quality of life and management of living resources, user-friendly information society, competitive and sustainable growth and energy, environment and sustainable development. The funds concerning the strenghtening of the international role of the Community research, the participation of small and medium size enterprises, and the improvement of the human research potential were allocated in the so-called horizontal programmes.

In March 2000, at the Summit of the European Council in Lisbon, the Union set itself the goal becoming the most competitive and dynamic knowledge-based economy in the world. In July 2000 an independent expert panel entrusted by the European Commission evaluated the research and technology development programmes of the European Union in a report.

The Sixth Framework Programme for the period 2002 to 2006 has been adopted in light of the report of the above expert panel. The programme became fully operational as of January 1, 2003. The total budget of the Sixth Framework Programme amounts to EUR 17.5 billion, from which EUR 1,230 million shall be spent on nuclear research within the Euratom framework programme. This figure represents close to 4 percent of the European Union's overall budget for the year 2001, and 5.4 percent of all non-military research spending in Europe.

The budget allocated to achieve the objectives of the Sixth Framework Programme more effectively and to contribute to the creation of the European Research Area is structured around three headings:

(i) focusing and integrating Community research,
(ii) structuring the European Research Area and

(iii) strengthening the foundations of the European research Area.

From the budget available for the thematic priorities of the Sixth Framework Programme (total amount of EUR 11,285 million) the biggest part (EUR 3,625 million) is allocated to the development of information society technologies, EUR 2,255 million is set aside for life sciences, EUR 2,120 million for research concerning sustainable development, global change and ecosystems, EUR 1,300 million for nanotechnologies, multifunctional

materials and new production processes and EUR 1,075 million for aeronautics and space. The role of the information technology and life sciences has remarkably increased, and significant support has been given to the concept of sustainable development. The Sixth Framework Programme ensures an international participation in its activities. All countries which concluded an association agreement with the Community may participate in the programmes. Other countries can do the same under bilateral contracts. The programme and all the research activities carried out under the programme shall be effectuated in compliance with fundamental ethical principles.

There are differences in their approach between the Sixth Framework Programme and the previous framework programmes. The previous framework programmes have promoted the development of the culture of science and technology co-operation, and could be regarded as means to achieve their research goals. However, according to the reports these had no durable impact on the development of a greater coherence at European level. Therefore, the Sixth Framework Programme has been set up in accordance with new objectives. These are, *inter alia*, as below:

(i) concentrating European efforts on fewer priorities – in particular on areas where co-operation at European level presents clear added value.
(ii) promoting research activities designed to have a lasting, 'structuring' impact,
(iii) using the scientific potential of candidate countries to prepare and assist their accession to the European Union.

The Sixth Framework Programme shall be implemented through specific programmes (in the same way as the previous framework programmes). The Commission is to continue the monitoring, with the help of independent qualified experts, the implementation of the Sixth Framework Programme and its specific programmes in the future.

5. Important, Presently Operating Institutions Promoting the Science and Technology Innovation

As we established above, several institutions promoting the innovation are operating either as an advisory board beside the European Commission or formally independently from it. As examples of the first group of institutions the Research Directorate General (RDG), the Scientific and Technical Research Committee (CREST)

and the European Research Advisory Board (ERAB) can be mentioned. The European Science Foundation (ESF) and the European Private Equity and Venture Capital Association (EVCA) belong to the second group.

The programmes may be classified according to their duration (short term programmes and continued programmes for prolonged period), and according to their territorial extent (restricted to the Community or for a larger territory). The geographical scope of COST and EUREKA extends beyond the European Union and have been operating for a longer time, while E-CONTENT may be an example of the short-term and more specialised programmes.

The RDG's mission is the development of the European Research Area. One of the instruments used for the implementation of this policy is the supervision of the framework programmes. In carrying out the various tasks the RDG works closely with other Commission departments such as the Joint Research Centre (JRC), and other directorates-general.

JRC was established in 1957 and operates as the European Union's scientific and technical research laboratory, providing scientific advice and technical know-how to support Community policies. Its status as a Commission service guarantees its independence from private and national interests. Its work is split between institutional research in support of Commission policy-making, direct support for specific directorates-general and competitive activities in strategic relationships with the scientific and business communities. The structure is based on seven specialised institutes. In December 2002 the JRC employed a staff about 2000 and spends a budget of over 300 million Euro per year coming from the European Commission's research budget and from competitive income. The Directorate of Science Strategy resides also in Brussels and serves as a link between the institutes of JRC and European policy-makers. This Directorate co-ordinates the research performed by the above institutes and helps to ensure its quality by interacting with the international scientific community and industry. An important role of the Directorate is to promote technology transfer of the JRC's own research results both to create industrial added value and to support the Community's policies in innovation.

The European Science Foundation (ESF) is an association of 70 member organisations devoted to scientific research in 27 European countries. ESF was established in 1974, and has been co-ordinating a wide range of pan-European scientific initiatives, and its flexible organisation structure means that it can respond quickly to new developments. ESF's core purpose is to promote high quality science at a European level. This cross-border activity combines both top-down and bottom-up approaches in the long-term development of science.

EVCA has been representing the European private equity and venture capital industry since 1983 and promoting private equity investment to investors, policy-makers, entrepreneurs and industry. EVCA is a non-profit organisation governed by an Executive Committee and a Board of Directors. The daily management of the association's activities is carried out by a Brussels-based secretariat of 22 people. It has about 900 members internationally. The members can be classified into two groups: full members (organisations actively raising and investing in private

equity and venture capital funds carried out in Europe) and associate members (organisations investing in private equity funds such as banks, insurance companies or pension funds and organisations providing services to the private equity sector such as law firms, consultancy groups, research institutes and universities).

Founded in 1971, COST is an intergovernmental framework for European co-operation in the field of Scientific and Technical Research, allowing the co-ordination of nationally funded research on a European level. COST Actions cover basic and pre-competitive research as well as activities of public utility. The goal of COST is to ensure that Europe holds a strong position in the field of scientific and technical research for peaceful purposes, by increasing European co-operation and interaction in this field. COST has clearly shown its strength in non-competitive research, in pre-normative co-operation and in solving environmental and cross-border problems and problems of public utility.

The member countries participate on an *à la carte* principle and activities are launched on a bottom-up approach. One of its main features is its built-in flexibility. COST has a geographical scope beyond the EU and most of the Central and Eastern European countries are its members. COST has developed into one of the largest frameworks for research co-operation in Europe and is a valuable mechanism co-ordinating national research activities in Europe. Today it has almost 200 actions and involves nearly 30,000 scientists from 32 European member countries and more than 46 participating institutions from 11 non-member countries and non-governmental organisations.

COST is based on actions. These are networks of co-ordinated national research projects in fields, which are of interest to a minimum number of participants (at least 5) from different member states. The duration of an action is generally 4 years. COST covers a wide range of scientific and technological domains. An average of EUR 60,000 per action is available for co-ordination depending on size and activity of the action. This expenditure represents on average 0.5% of the overall national funding.

Other programmes and initiatives which have an impact on the Community system of innovation are e.g. as follows: CRAFT, E-CONTENT, COST-Transport, LIFE (Financial Instrument for the Environment), SAVE, ALTENER.

6. Impact of the Community Innovation System on the National Innovation Systems of the Member States

As it could be observed in the foregoing, the innovation systems do not operate separately. The development and the increasing complexity of the national innovation system results in a demand to exceed the national frameworks and to create a post-national co-operation. The community system of innovation which has arisen from the national systems of innovation a powerful impact may be inspected but with opposite direction: the post-national institutional set-up is forming the national innovation systems co-operating with it. This phenomenon cannot be regarded as

new, as several impact studies have been prepared on this topic in the beginning of the 1990's. These impact studies analysed the impact of the programmes on the participating organisations, often focusing directly on the innovation systems of the enterprises and not on the national innovation systems. Based on the above studies, however, interesting conclusions can be drawn concerning the national innovation systems.

In 1994 the Axion report issued by the European Commission (hereinafter: Report) has presented the impact of the Second Framework Programme on the national systems of innovation. The Report declares that specific Community programmes have had varying relative impacts and influences on national policies, and this impact depended on the technology sector funded by the programme and on the state of development of the national technology policy concerned. In the field of environmental and IT-related research, Community activities are either the main source for national research or influence the design of complementary national policies, even in the biggest Member States. The agro-food domain seems to be experiencing the same situation. In the countries where the infrastructure financing is mainly channelled through the Community Structural Funds, and these are the less developed countries in research, the interaction between the framework programmes, specific actions, Structural Funds and national policies is more important. In other words, the Report stresses that Community policy generally has at least a slight influence on the structuring of national policy of the most advanced countries while its impact is often very perceptible in the less developed ones. In the latter, Community programmes have inspired the design and the adoption of similar national programmes and procedures.

Further, the networking effects of the European Committee and advisory structures are also remarkable. The national experts participating in these structures meet regularly, get to know one another, and learn through these contacts of the major stakes and technological trends. Finally, some worries concerning the possible negative impacts of European policies on national policies are quoted in the Report:

(i) Community institutions may lead to a certain alignment of national policies with European policy, resulting in a growing distance of national programmes from national priorities,

(ii) the promotion of European partnerships, can lead to a certain international sharing of tasks in the major technological fields. Countries with large companies would lead the way by using the small companies of less favoured countries as subcontractors, the larger countries would therefore benefit more from the economic repercussions, notably in terms of high-skilled research jobs.

In connection with the impact on national innovation systems MULLER (1994) establishes that, although the national set-ups are stabile over time and in its structure, the European post-national institution building process has been argued to create structural uncertainty and instability for firms and governments. Since the

process of selecting institutions is very open, the outcome of this process, such as the establishment of '*institutional hybrids*', may strongly affect the national institutions.

TSIPOURI and XANTHAKIS (1993) in their national impact study concerning Greece point out that the substitution of Community for national priorities rather than the complementarity of priorities does not seem to be the result of a deliberate attempt of the Community to harmonise national science and technology policies. It is rather the result of '*the inherent inadequacies of the national structures*' and the fact that '*the public sector does not have its own policy to fight for*'. Further, the authors have identified the creation of a new subsystem in the local scientific community. This is the so-called excellence system regularly benefiting from and being based on European Community support. This subsystem works in fact for the more demanding research and technology development users in Europe and only marginally for the economy of the home country. '*Whether the excellence part integrated into the European systems will diffuse to the local systems depends on the absorptive capacity of the average and low performing actors, as well as the industrial and research and technology development policies that the Greek state will adopt in the future*'. If knowledge and know-how created by this '*excellence subsystem are adequately protected, they become products that can be exported and traded. However, this requires a national institutional setting capable of reaping the benefits and of exploiting newly created assets*'.

7. Conclusions

At the end of our review on the Community system of innovation we would like to highlight the following. The Community has had a research and technology policy since its establishment. However, the very first period can be characterised by *ad hoc* political decisions and the incoherence of the institutions. After thirty years of practical experience, the Community demand on the promotion of the innovation capacity has been entered the primary legislation of the Community. Introducing the rules of research and technology development into the Treaty of Rome, starting the framework programmes and focusing on the technology policy, have presented the renewal of the post-national institutional building and led to mutual co-operation between the fragmented and *ad hoc* institutions, approach of national policies and priorities to that of the Community, and practical benefits such as the increase of the efficiency of research and production, growth of the cost effectiveness and the competitiveness of the Community, advancing technology of the Member States. The Sixth Framework Programme outlines the mid-term future directions of the Community technology policy. There is a general demand to finance the economically usable research and reduce the support 'blue-sky research'. In order to perform these objectives few priorities must be determined which significantly enhance the competitiveness, have a structuring effect, increase the extent of the co-operation and involve small and medium size enterprises. At the same time, attention is to

be given to the global changes and the known and unforeseen impacts of the enlargement of the European Union. The impacts of the developing European system of innovation on the Member States cannot be ignored either. Member States with strong and independent innovation policy are also affected by the impacts of the Community policy. The adjusting of the national priorities to Community priorities, the 'reverse institutional borrowing' and other practices, however, can be seen more intensively in the less developed Member States, and might be especially expected in countries whose accession is underway. In the latter countries the negative impacts of the Community innovation policy on the national policy must also be taken into account.

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