COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 14.02.1996
COM(96) 42 final

Interim report according to Article 8 of the Council Decision (94/78/CE, Euratom) establishing a multiannual programme for the development of Community statistics on research, development and innovation

(presented by the Commission)

Lists of Contents

0. Summary

On 24 January 1994 a Council Decision establishing a multiannual programme for the development of Community statistics on research, development and innovation (94/78/EC, Euratom) was adopted. Article 8(a) of this Decision stipulates that an interim report must be presented by the Commission during 1995.

The Commission holds the view that in 1995 an overall positive assessment can be made. The Commission has either already completed or at least begun all the tasks listed in Article 4. The analysis and evaluation of user demand has already been carried out for the main, although not all, user groups. Great efforts have been made to improve the existing methodological framework, some of which have already been successfully completed (manual on human resources for science and technology (HRST), manual on the regional dimension of R&D and innovation indicators). The statistical information available in the Member States has also been identified, as required by the Decision. The setting-up of a European statistical information system is relatively far advanced. Data are currently available on public R&D financing, R&D personnel, R&D expenditure, patents and innovation. These data are further sub-divided according to specific characteristics, whereby particular importance is attached to the regional aspect. In the field of innovation statistics, pilot surveys have been used to test new data collection measures. Lastly, various parts of a set of basic statistical tools have already been developed and practically applied, e.g. for the processing of transmitted information. In carrying out all these activities, the Commission has complied strictly with general (e.g. subsidiarity) and programme-specific conditions (e.g. close cooperation with the OECD, the Member States and other users). The Commission, and particularly Eurostat, can now be regarded as one of the world's leading institutions in the field of statistics on R&D and innovation.

The positive overall assessment about two years into the programme should not conceal the fact that many problems remain unsolved and there is still a long way to go before all the tasks imposed by the Decision are completed. There are still gaps particularly in the analysis of the needs of main user groups such as the European Parliament, in the acquisition of data on, for example, private R&D funding, output and regional indicators and HRST, or in the use of registers and electronic interchange techniques. More weight should also be attached to the analysis of the existing data, and the efforts to further harmonize the available data should be stepped up.

In the second half of the programme, the Commission will concentrate on specific areas in order to eliminate these gaps. New activities are only planned if they conclude or supplement work already under way. Among such new activities are the development and provision of indicators to describe the R&D and innovation programmes set up by the Commission.

Work has been going on in some fields of R&D and innovation statistics for more than 20 years. Despite all efforts, large discrepancies in the national methodologies remain which make comparisons of figures at least sometimes difficult if not impossible. Therefore, the Commission is very much in favour of a new legislation to strengthen the process of harmonization in the field of R&D and innovation statistics.

The Commission asks the Council to take positive note of this interim report.

1. Introduction

1.1 Aim and structure of this report

In order to develop and implement a European statistical information system for research, development and innovation, the Council adopted Decision 94/78/EC, Euratom, establishing a multiannual programme for the development of Community statistics on these fields on 24 January 1994 (the text of the Council Decision is reproduced in annex I).

The objectives of the programme, which are contained in Article 3 of the Decision, are as follows:

a) to set out a Community reference framework for statistics on research, development and innovation defining the most appropriate concepts and methods for supporting the corresponding Community policies, and for satisfying the needs of national, regional and local administrations, international organizations, economic operators, professional associations and the general public;

b) to establish a Community statistical information system for research, development and innovation;

c) to promote and support harmonization of statistics on research, development and innovation in the Member States;

d) to facilitate the dissemination of comparable information.

Article 8 (a) of the Decision states: "The Commission shall present an interim report to the Council in 1995, accompanied if necessary by proposals it considers appropriate, particularly on the methodological framework referred to in Article 4 (b) and on the implementation of a system based on that methodology, for the regular collection of harmonized statistics on research, development and innovation, as well as to cover the requirements of Community policy on RTD and innovation and the requirement for regional data to aid structural policies".

The present document constitutes the interim report referred to above. It is structured as follows. After this introduction, which outlines the objective of the report and describes the political, legal and constitutional background to the programme and the organizational structure of its implementation, the report sets out the achievements of the two years which have passed since the Decision was adopted. This main chapter 2 is structured according to the tasks as described in the Council Decision. It tackles the topics "analysis and evaluation of user demand", "improvement of the existing methodological framework", "identification of the existing statistical information", "setting up of a European statistical information system", "pilot surveys" and "development of basic statistical tools". The Commission formulates a number of proposals in Chapter 3. The report ends with some general conclusions.

1.2 Brief summary of the political background and the programme's statistical antecedents

The Treaty on European Union states that the Community shall have the objective of strengthening the competitiveness of its industry and encouraging research and technological development. In order to design, implement, monitor and evaluate policies in this field, the European Union must have statistical information at its disposal. The 4th framework programme of Community activities in the field of research and technological development (1994-98), the management of the structural funds, the promotion of technological innovation and the coordination of national R&D policies are examples of programmes which require statistical information providing a sound basis for comparison between Member States, their regions and between the European Union and its trading partners.

On 22 July 1993, the Council adopted Decision 93/464/EEC on the framework programme for priority actions in the field of statistical information 1993 to 1997, which it intended as a response to the demand for statistical information in general. Decision 94/78/EC, Euratom focuses more particularly on statistics relating to research, development and innovation, and is part of the overall framework defined in Decision 93/464.

The Commission has a long history of compiling statistics on research, development and innovation. It has been collecting information on the public funding of research in the EU for more than 25 years. At the end of the 1980s, the Scientific and Technical Research Committee (CREST) drew the Commission's attention to certain weaknesses in Community R&D statistics. Eurostat responded by taking measures in a number of areas:

- revision of the Nomenclature for the analysis and comparison of science budgets and programmes (NABS);

- the regionalisation of certain indicators;

- information on human resources in the field of science and technology;

- information on technological innovation.

Since the adoption of Decision 94/78, other improvements (described later on in this document) have been made to the Community information system on research, development and innovation. These include new methodological developments, new analyses, and the publication of a European report on science and technology indicators (1994).

In the light of the results of the above measures and a systematic analysis of user needs, the present document formulates new proposals which it is hoped will help to strengthen the existing system.

1.3 Organization of work

The programme can only be implemented successfully if the Commission department responsible for carrying it out cooperates extremely closely with all the parties involved inside and outside the Commission. So far this principle has been strictly adhered to. All the activities to date have been carried out in close cooperation with the Member States of the European Economic Area, other countries, international organizations and other Commission departments.

- The Member States of the European Economic Area have been kept permanently up to date on the Commission's activities. The organisational framework for this is the Working Party on R&D and Innovation Statistics of the Statistical Office of the European Communities (Eurostat), which meets at least once a year. The discussions in the working party meetings are supplemented by bilateral contacts, not least in the context of meetings of international organisations attended by Eurostat (see below). On the whole, the relationship with the (representatives of the) Member States, in official and non-official statistical circles alike, can only be described as excellent. The success of the programme so far is also due to the extremely successful cooperation with the Member States. In all activities, the principle of subsidiarity has been respected.

- One of the main aspects of the programme is the provision of comparable data not only for the Member States of the European Economic Area but also for other countries, particularly the main trading partners of the European Union such as the United States of America and Canada and other European countries such as Switzerland or the countries of Central and Eastern Europe, including those of the former USSR. This means that the activities also have to be coordinated with these countries, whether under the aegis of international organisations like the OECD or bilaterally. Remarkable successes have been achieved in this connection also. Agreement has been reached with major OECD countries outside the European Economic Area (United States, Canada and Australia) on a regular exchange of documents of meetings such as Eurostat working party meetings. Switzerland and some of the countries of Central and Eastern Europe, including Russia, attend the working party meetings more or less regularly as observers. In addition, a joint project has been launched with Russia under the Commission's TACIS Programme. Its aim is to align the system of R&D and innovation statistics inherited from the USSR with Western standards without, however, completely disregarding the special features of the Russian system. This project has so far proved very successful. In addition to intensive discussions on methodology, several pilot surveys have already been carried out by Russia with the Commission's assistance, e.g. with regard to public R&D funding or innovation, on the basis of the Western methodology, in particular that developed by Eurostat.

- During the preparation of the programme some Member States expressed the concern that it might in practice overlap certain activities of international organisations, particularly the OECD, one of the results of which would be additional burdens on the Member States. Experience so far has no doubt shown that these misgivings were unfounded - on the contrary, relations between the Commission and the OECD and other international organisations like UNESCO, the Nordic Council or the EFTA Secretariat in the field of statistics on R&D and innovation have never been better, and

the activities have never been better coordinated than now. This is evidenced by hard facts. The Commission's activities basically relate either to areas in which organisations like the OECD are not (at present) interested (e.g. regional indicators) or to areas in which the Commission cooperates practically with these organisations (e.g. human resources for science and technology, innovation). This gives rise to joint actions, for example between the OECD and Eurostat, such as the drafting of the methodological manual for measuring HRST, which has been published jointly by the OECD and Eurostat and is thus the first ever joint publication in the history of international R&D statistics. International organisations also actively participate in the meetings of Eurostat working parties, just as Eurostat plays an active role in meetings of these organisations, e.g. meetings of the OECD's Group of National Experts on Science and Technology Indicators (NESTI).

- The fourth group of partners in the implementation of the programme is made up of the other Commission departments for which statistics on R&D and innovation are important in one way or another. Directorates-General XII, XIII and XVI are obvious cases in point, but the analysis of user needs (see section 2.2.1 below) has shown that there is demand for statistics on R&D and innovation in quite a number of other Directorates-General. Furthermore, an aspect which has always been and still is particularly important is cooperation within Eurostat, whether in business, regional or education statistics, classifications or other fields. As has already been done with the Member States of the European Economic Area, relations with users within the Commission have also been formalised. To this end, regular meetings of the group of users of R&D and innovation statistics in the Commission (GUS-REDIS as a sub-group of the CDIS) are held, usually in the context of working party meetings with the Member States. The agendas of both groups are largely the same, so that the other Commission departments are as well informed as the Member States. It goes without saying that interested colleagues from other departments can attend working party meetings with the Member States at any time, and many of them avail themselves of this opportunity.

2. Implementation of the action plan

2.1 Objectives and conditions

The objectives of the programme and the work to be carried out by the Commission to achieve them are clearly laid down in the Council Decision in Articles 3 (objectives; see section 1.1 of this interim report for details) and 4 (tasks). The specific work to be "carried out by the Commission, in cooperation with the Member States" (Article 4, first sentence) is as follows:

"a) analysis and evaluation of user demand, subject to its feasibility and based on cost efficiency, in order to define actions and priorities, for statistics on research, development and innovation;

b) improvement, where necessary, of the existing methodological framework;

c) identification of existing statistical information on research, development and innovation;

d) setting up the organisational and technical components of a Community statistical information system for research, development and innovation, including statistics of Community-funded research and development activities;

e) carrying out pilot surveys;

f) developing basic statistical tools." (Article 4, first sentence).

Details of this work are given in an action plan contained in the annex to the Council Decision.

The individual actions carried out so far are described in detail in section 2.2 of this interim report below. It should be borne in mind that, although originally intended to cover the period 1993 to 1997, the programme did not come into effect until 24 January 1994, so that it has been running for only just under two years. Since it has taken a few months to draft this interim report itself, it can only describe the situation after the first one and a half years. It should also be mentioned, however, that all the Member States, in anticipation of the Council Decision, cooperated actively in the Commission's preliminary work even before the Council formally adopted the Decision, and the results achieved at that preliminary stage are covered in this report.

All the activities have been carried out subject to specific overall conditions, some of which are specified in the Council Decision itself and some of which are implicit in the system. The second sentence of Article 4 of Council Decision 94/78/EC stipulates that "the Commission shall make use of existing sources of information, instruments and procedures, including the work and existing data of the OECD, UNESCO and other international organisations". This condition means that existing instruments and procedures are not to be developed again and that data already available elsewhere are not to be collected again. In its activities so far, Eurostat has adhered strictly to this requirement. Wherever the necessary methodology was already available at international level, it was used as a basis for all the actions. Examples of this are the Frascati and Oslo Manuals drawn up by the OECD, which were used as a basis for both developing the regional indicators and carrying out the pilot survey on technological innovation. Nor were the Member States asked to provide any data that were already available. All the data requested from the Member States in recent years were not internationally available in this form.

In addition to these conditions specific to this programme, all the activities carried out so far under this programme have been based on other, general conditions like the principle of subsidiarity, the principle of minimising the burden on respondents and the principle of catering for the user. All actions so far have been coordinated with the Member States. Each year, during the working party meetings, Eurostat has presented the Member States with, for example, a detailed work programme for statistics on R&D and innovation, on which the Member States were able to give their opinion in the ensuing discussion. In addition, the programme of work was coordinated at the ECE level. The few pilot surveys carried out so far have also complied strictly with the principle of subsidiarity. For example, the national innovation surveys carried out by the Member States on their own account were preceded by detailed methodological consultations in order not only to ensure the comparability of most of

the subsequent results but also to allow sufficient scope for specific national features, e.g. regarding the traditional survey procedures used.

With regard to the burden on respondents in pilot surveys, it should be stated at the outset that the only major pilot study to be proposed and carried out was the study on technological innovation. It is not disputed that both the size of the questionnaire and the number of survey units placed to some extent a considerable burden on the respondents. At the same time, however, it should be pointed out that in some cases specific national factors (inclusion of additional questions in the harmonised questionnaire, conducting of full surveys) further increased this burden. All the other actions so far have not led to any excessive burdens on the survey units such as enterprises.

The main concern in all the activities so far has been to meet as far as possible the existing needs of users. It fairly soon became apparent that in some cases the users themselves were not completely clear about what their actual requirements were. As a result of the analysis and evaluation of user demand (see the next section of this interim report), which is stipulated in the programme and has already been carried out, this situation has improved considerably.

2.2 Present situation

2.2.1 Analysis and evaluation of user demand

Article 4, first sentence (a) of the Council Decision stipulates that the Commission is to carry out an analysis and evaluation of user demand. This requirement is described in further detail in section (a) of the Annex to the Council Decision (see Annex 1), which states that the Commission is to collect and analyse information on the short- and long-term requirements "of the main users, i.e. the Community institutions, Crest, the national, regional and local administrations, international organisations and economic operators". So far the necessary information on the main, although not all, users has been collected and evaluated. The remarks below refer to the requirements in the Member States and the Commission itself.

Further instructions for ascertaining user demand for statistics on R&D and innovation in the Member States are given in Article 6 of the Council Decision: "The Member States shall ascertain ~~and~~ analyse the needs of the national users for Community data on research, technological development and innovation statistics and transmit appropriate information, where available, to the Commission within eight months of the adoption of this Decision. The Commission shall coordinate these activities."[1] In accordance with these instructions, the Member States and the Commission decided that the Member States should inform the Commission of their requirements within the specified time limit by means of identically structured reports. There was no agreement on how the necessary information was to be collected in the Member States. This meant that widely differing approaches were adopted. Some Member States, for example, carried out surveys of the main national users, while others drew up the reports on the basis of existing data. All the Member States of the European Economic Area, with the exception of Iceland, Liechtenstein and Luxembourg, have fulfilled their obligation and have sent reports of varying length (i.e. between five lines and

1 The concept of "Community data" was very broadly interpreted in this case. Community data are taken to mean all the date in this field which are used for comparisons between the Member States or with non-Community countries, irrespective of who produces these data.

somewhat over 20 pages), although they did not always adhere to the recommendations on the layout.

A different method was chosen to ascertain user demand in the Commission. Eurostat developed a special questionnaire for this purpose and sent it to all the Directorates-General, of which a total of 20 (including the Joint Research Centre) replied including all main users of R&D and innovation statistics in the Commission.

Annex II contains a detailed description and analysis of user needs in the Commission and the Member States. The results of the analysis can be divided into two groups: those relating to R&D and innovation statistics in general and those related to specific indicators.

The following general conclusions can be drawn from the replies of the Member States and the Commission:

- General recognition of the work which has been carried out, and of the results achieved, but there is still soon for improvement.

- Awareness of the Commission's products in the field of R&D and innovation statistics should be increased.

- The comparability of data must be further improved by further efforts to harmonise approaches, classifications and survey methods. In this connection, the close cooperation which has been pursued, particularly with the OECD, is regarded as indispensable.

- For the purposes of meaningful analysis, it must be possible to combine the existing data on R&D and innovation activities with other data, particularly economic data. The technical conditions for this must be created, e.g. by creating suitable data banks.

- R&D and innovation data should be regionalised more than they have been hitherto.

- International statistics on R&D and innovation should take more account of the increasing internationalisation of R&D and innovation activities, particularly by multinational companies (concept of "globalisation").

- There is a considerable need for information on R&D and innovation projects with international funding. The programmes funded by the Commission are particularly important in this connection.

- In the long term, a catalogue of indicators should be drawn up which is able to describe all the important aspects of R&D and innovation activities. Some of these indicators should be surveyed annually (basic indicators), while others should be surveyed at longer or irregular intervals (supplementary indicators). This catalogue of indicators should cover both quantitative and qualitative characteristics.

- The dissemination of existing information should be considerably improved, e.g. by using computer networks.

- The available data are often not sufficiently up-to-date. For important indicators, therefore, there should at least be estimates up to the present and, for some of them, short-term forecasts.

In addition to these general suggestions, the replies from the Member States and the Commission departments also contain a number of specific suggestions on individual (groups of) indicators:

- The level of detail of the available information on input factors such as R&D expenditure and R&D personnel is generally regarded as inadequate. In particular, there are proposals for additional breakdowns by economic branch, scientific branch and special fields such as civil research, environment, information technology, telecommunications and biotechnology. Information on R&D input factors should also be available annually. Lastly, the quality of this data, particularly in the higher education sector, should be improved.

- The present range of data on R&D cooperation should be considerably extended.

- Some Member States have reservations about the usefulness of an over-detailed breakdown by socio-economic objective of the public funds granted for R&D purposes. In their view, it would be sufficient to supply these data at the highest level of the NABS classification.

- There is a basic lack of information on the number of units engaged in R&D and their structures. This also applies to indicators on the dissemination of innovation and information technologies and to indicators on alternatives to patents.

- The collection and dissemination of R&D output indicators (data on patents, bibliometric indicators) should be improved at international level. Consideration should be given to further output indicators.

- Further harmonisation of methods is suggested with regard to indicators on trade in high-technology products and to technological balance of payments, so that better use can be made of these data internationally. Some services of the Commission need further indicators for measuring the impact of R&D and innovation.

- There is considerable general interest in innovation indicators, which ideally should be combined in one way or another with the collection of R&D indicators so that they can be jointly analysed. Innovation indicators should also be provided for the service sector.

- Data on human resources for science and technology are also regarded as important, particularly data on mobility and career patterns, as well as detailed information on staff with doctorates and on the training of scientists.

- Lastly, it was suggested that data should be collected on "Intangible Investments" as a whole.

2.2.2 Improvement of the existing methodological framework

The only way of obtaining comparable data at international level is to use a generally recognised methodology. The methodological framework currently used for R&D and innovation statistics was almost totally developed by the OECD (Frascati Manual, Oslo Manual, Manuals on the use of data on patents and technological balance of payments). However, this methodological framework is not at all complete, and even the existing manuals must be constantly revised so that the methods take account of current developments.

In line with this argument, one of the Commission's tasks set out in the Council Decision is to improve, where necessary, the existing methodological framework (see Article 4(b)). This task is described in greater detail in the Annex to the Council Decision, which states that "further development of the methodology will take place in close collaboration with the OECD and within the framework provided by it, in order to take advantage of what has already been done by that institution ..." (Annex to the Council Decision, third sentence of section (b)). Only "where an adequate or adoptable methodology does not already exist, the Commission shall take the lead and initiative in developing the framework to cater for the special needs of the Community" (idem, fourth sentence). "The further methodology development will be formulated in manuals which will be adopted at Community level." (idem, sixth sentence).

The Commission has devoted special attention to this task in the past two years. The following work has been done on the methodological reference framework:

- The Commission was involved in the revision of the OECD's Frascati Manual, the fifth edition of which has now been published by the OECD.

- For the first time in the history of international R&D and innovation statistics, the OECD and the Commission developed a joint methodological manual. The Canberra Manual contains recommendations on the collection and analysis of data on human resources for science and technology.[2] The first edition was published jointly by the OECD and Eurostat in July 1995.

- The Oslo Manual is currently being revised as the basis of modern innovation statistics. Since the cooperation between the OECD and Eurostat in the production of the Canberra Manual proved very fruitful and successful, and because the Commission has acquired considerable international experience in the field of innovation statistics as the result of the first harmonised innovation survey (see 2.2.5 below), the Oslo Manual is also being jointly revised. In practice, the OECD is responsible for leading the project, whereby the Commission is, however, kept constantly informed of all the actions. Of the five working parties set up, the one on statistical methodology is headed by Eurostat. According to the current plans, the second edition of the Oslo Manual just as the Canberra Manual will be published jointly by the OECD and Eurostat.

---

2 It goes without saying that the specific requirements of the Commission were taken into account in the development of the methodological framework.

- In addition to these joint activities with the OECD, the Commission has drawn up a methodological manual on the "Regional Dimension of R&D and Innovation Statistics". Parts of this manual could become an annex to the Frascati manual. In the working party meeting of 8 to 10 November 1995, this manual was submitted to the EU Member States for a formal decision. The first version should be available in all eleven languages at the beginning of 1996.

- Analyses have revealed that the international comparability of the data currently available in the EU Member States on public R&D funding is limited. National presentations in working party meetings have confirmed this. It was consequently agreed that Eurostat should submit proposals for methodological improvements in order to increase comparability. Initial proposals were presented to the Member States at the working party meeting of 8 to 10 November 1995. These proposals are based on the methodological recommendations in Chapter 8 of the OECD's Frascati Manual, which are, however, relatively vague on some points. It is perfectly conceivable that at least some of the recommendations currently being prepared might be included in the next version of the Frascati Manual.

2.2.3 Identification of the existing statistical information

Article 4, first sentence (c) of the Council Decision stipulates that the Commission is to identify "existing statistical information on research, development and innovation". The supplementary notes in the annex to the Council Decision specify that "this investigation is aimed at showing the extent of accessible data in the Member States and the differences between the Member States" (Annex to the Council Decision, second sentence of section (c)).

Of all the main tasks imposed on the Commission in connection with this Council Decision, this was the first to be completed. As long ago as March 1994 the Commission presented to the Member States the final report of a study, which was unanimously accepted in September of the same year. In this study, the Commission sought to collect and analyse data on the national R&D and innovation systems, on the availability and quality of data, broken down by subsectors[3], their periodicity and the data users. The study was based on a uniform questionnaire which was used by the Commission's contractor, the Greek company Orco, in all the participating countries. A total of 17 Member States of the European Economic Area and Switzerland took part in this study, and it was only Liechtenstein for which no data could be obtained.

Annex III to this interim report contains a summary of this study. Detailed information may be taken from the study itself, which may be requested from Eurostat's Unit D3. It should, however, be pointed out that this study no longer describes the present situation. Since it was completed, there has been a marked improvement in the data situation, as can be seen, *inter alia*, from the following section.

---

3 Data were collected on the subsectors public R&D funding, R&D input factors, broken down by sector (economic sector, government, higher education, private non-profit organisations), innovation, technological balance of payments, patents, high technology, competitiveness and bibliometry

2.2.4 Setting up a European statistical information system[4]

The Commission's long-term objective is to set up a European statistical information system for research, development and innovation. Under the programme described in the Council Decision, the Commission has the task of carrying out the necessary organisational and technical preliminary work for achieving this objective. The relevant details are contained in section (d) of the Annex to the Council Decision, which states that the information system is to contain data on various input factors (public and private R&D funding, R&D personnel, R&D expenditure), and output factors (innovation, trade in high-technology goods and services) of the R&D and innovation process, and these are to be further broken down by a number of variables (sector, branch of economic activity, region, socio-economic objective). If necessary, data on patents and bibliometric indicators are to be added to this system. All available data are to be stored in data banks, irrespective of whether or not they are fully harmonised. These databanks are also to contain all the data directly collected by the Commission.

The Commission has already gone a long way towards completing this task. The following information is already available to Eurostat:

- Data on public R&D funding for the period to 1994, classified by socio-economic objectives. In addition to the data supplied to the Commission by the Member States and Directorate-General XII, Eurostat also calculates derived indicators such as public R&D funding as a percentage of gross domestic product at market prices or as a percentage of the total budget of general government[5]. The breakdown of the data on public R&D funding by socio-economic objectives is based on the "Nomenclature for the analysis and comparison of scientific programmes and budgets" (NABS), compiled by the Commission in the 1960s. In 1994 the Member States adopted the 1993 revision of this classification. Classifications must be revised every few years to bring them into line with current developments. The main differences between the present NABS and the 1983 version are amendments to sub-chapters in Chapter 1 (Exploration and exploitation of the Earth), 3 (Control and care of the environment), 5 (Production, distribution and rational utilization of energy), 7 (Industrial production and technology), 10 (Research financed from General University Funds) and 11 (Non-oriented research), in which the branches of science used for the more detailed breakdown are more differentiated than in the 1983 version.

  Not all the Member States are able to supply data on public R&D funding at NABS sub-chapter level. This is the case for the new Member States Austria, Finland and Sweden and for Norway, since these countries have for many years used an OECD classification which does not provide for any further differentiation. The transition from one classification to another, even if they are largely identical at the highest level, requires time and resources. Other Member States do not have the necessary resources for the further differentiation of existing data or they fundamentally question the purpose of a detailed breakdown by socio-economic objectives.

---

4 The following considerations are restricted to the Commission's part of the system.

5 The data for the reference variables are obtained from other Eurostat databanks.

- Data on R&D personnel for the period 1985 to 1993, broken down by sector and, within the business enterprise sector, by branch of economic activity[6], in each case according to the recommendations of the Frascati Manual, and by type of personnel and by region. All data at national level are based on OECD data, while regional data have been supplied directly to Eurostat by the Member States. Since Eurostat is keen to provide data both in numbers and in full-time equivalents, it estimates any missing data in this field.

  Eurostat attaches special importance to regional data, but their comparability is still limited. Further efforts at harmonization will be necessary to improve the comparability of regional data on R&D personnel. Eurostat's manual entitled "The Regional Dimension of R&D and Innovation Indicators" (see 2.2.2 above) provides the basis for this. In addition to the original data, Eurostat continues to publish derived indicators such as R&D personnel as a percentage of the labour force.[7]

- Data on R&D expenditure for the period 1985 to 1993, broken down by sector and, within the business enterprise sector, by branch of economic activity[8], in each case according to the recommendations of the Frascati Manual, and by regions. All data at national level were obtained from OECD databanks. The above comments on derived indicators and data quality in connection with regional R&D personnel data also apply here.

- Data on patent applications to the European Patent Office for the period from 1989, broken down by region and sub-class of the International Patent Classification (IPC). These data are based on a special analysis of the databanks of the European Patent Office, whereby patent applications were allocated to the individual regions on the basis of the inventor's private address. In order to make this allocation, it was first necessary to provide a key for converting between national post codes and the regional classification of the European Union, NUTS. The Commission has developed appropriate software for this purpose for all EU Member States except Denmark[9], Ireland[10], Luxembourg[11] and Finland[12].

  The breakdown of patent applications by sub-section of the International Patent Classification is not at all the best solution from the point of view of economic analysis. It would be far better to allocate them to the branches of economic activity in which the patents are ultimately used. There are, however, fundamental problems in

---

6 Data for the business enterprise sector broken down by branch of economic activity are only available for selected years.

7 Cf. footnote 5.

8 Data for the business enterprise sector broken down by branch of economic activity are only available for selected years.

9 This conversion key cannot be obtained without a key for converting between postcodes and the national regional classification, which does not exist for Denmark.

10 Ireland only has postcodes for the Dublin and Cork areas.

11 Since the data are recorded at NUTS-3 level and Luxembourg itself is a NUTS-3 region, no conversion key was necessary for this Member State.

12 Finland has not yet signed the Munich Convention, which is the international legal basis for European patents. Since Finnish patents cannot, therefore, be included in the European Patent Office's databank, it was not necessary to devise a conversion key for Finland.

breaking down patent applications by the branches of economic activity which will ultimately benefit from them, since at the time of application to the patent office it is possible only in rare cases to predict with certainty the branch in which the patents will ultimately be put to economic use. Despite these fundamental difficulties, Eurostat has launched a joint project with the European Patent Office in order to develop a key for converting between the International Patent Classification and NACE.

- Data from the first pilot survey on innovation (see 2.2.5 below). This survey has supplied Eurostat with more than 40 000 individual sets of data from enterprises giving information on information sources, objectives, inhibiting factors, costs and effects of innovations, R&D activities, and purchase and sale of technologies, and general information on the enterprises concerned. Since these data are confidential, only a few members of Eurostat's staff have direct access to the results of this pilot survey, in accordance with Council Regulation (Euratom, EEC) No 1588/90. So that this voluminous body of data can nevertheless be made available to other users, further databanks have been and are being set up with more highly aggregated results. The individual databanks differ in the degree of aggregation and in the user groups which are granted access to them[13].

The above-mentioned data, except the results of the pilot survey on innovation, are available in various databanks, some of which are accessible to Eurostat staff only but most of which, e.g. the REGIO databank, are generally accessible. The main R&D data from these databanks are also made available in paper form in the annual publication "Research and Development - Annual Statistics" and in summarising Eurostat publications. Eurostat also publishes once a year, in connection with "Research and Development - Annual Statistics", an edition of "Statistics in Brief" containing the main results from this publication, twice a year data on the progress of the programme in the form of REDIS-NEWS, and at irregular intervals brief information on special projects such as the innovation survey.

In addition to special Eurostat publications, the data available at Eurostat on R&D and innovation are an important input for further Commission publications. The main case in point is the "European Report on Science and Technology Indicators", which was first issued by Directorate-General XII in 1994, Eurostat being a major contributor to its statistical annex.

In addition to the above-mentioned activities involving the collection and to a certain extent harmonization of data, Eurostat has already launched other projects in order to fill existing gaps in the data. One of these projects seeks to collect information on HRST at European level. On the basis of the methodological recommendations of the Canberra Manual (see 2.2.2 above) and a special survey, carried out jointly with the OECD, of the data available in the Member States, basic indicators have so far been developed which will measure the total volume of such data, broken down into various groups such as unemployed or inactive HRST, and the Member States have been requested to send the data they already have available in this area. Another project seeks to develop indicators on the various aspects of the R&D and innovation programmes funded by the Commission and later to collect data for these indicators within and, where necessary, outside the Commission. However, this project is

13 The evaluation of this pilot survey has also begun. Preliminary results on the implement- action of the national surveys are already available (see Archibugi, D./Cohendet, P./Kristensen, A./Schäffer, K.-A., "Evaluation of the Community Innovation Survey - Phase I, EIMS project N° 93/40, Internal report, Luxembourg, 1994).

currently in its initial phase. Apart from a basic framework, only desirable indicators for one area of this framework, the financing of the projects, have so far been developed.

2.2.5 Pilot surveys

When new or supplementary surveys are being prepared, their feasibility must be checked by means of pilot surveys. In its Decision, the Council referred expressly to the need for pilot studies "in order to test the feasibility of some data collection exercises" (first sentence of section (e) of the Annex to the Council Decision).

The Commission has so far taken advantage of the opportunity to carry out pilot studies chiefly in the field of innovation statistics. Jointly with Directorate-General XIII, formerly SPRINT Programme, Eurostat decided at the end of 1991/beginning of 1992 to carry out pilot innovation surveys in a small number of Member States. At that time the basis was the new methodology developed by the OECD on the statistical measurement of technological innovation (OSLO Manual). This project was so favourably received that finally all the old EU Member States and Norway took part in the harmonized Community Innovation Survey (CIS). Since then, directly comparable surveys have been held in other countries. The methodology used for them is either the same (e.g. Iceland) or largely the same (e.g. United States, Russia).

A total of 15 independent surveys were carried out in the 13 EEA Member States which took part in the CIS.[14] The principle of subsidiarity was strictly adhered to. The responsibility for carrying out all the surveys lay with national institutions, which were financially assisted by the Commission in all the participating countries except France and Norway. All the national surveys were based on a harmonized questionnaire[15] drawn up by the Commission in cooperation with the OECD and the Member States, methodological recommendations for conducting the national surveys, and other technical documents. Despite enormous efforts by all the participants, it did not prove possible to achieve the degree of harmonization aimed at in this large-scale pilot survey. There are a number of reasons for this, most of which are described in greater detail in the first evaluation report already submitted.[16] The main reasons were the respondents' unfamiliarity with the new subject, the length of the questionnaire, which was a compromise between different interests and to which many Member States even added extra questions, and the methodological recommendations drawn up by Eurostat, which were not detailed enough and yet, because they were merely recommendations, were not followed in every respect by all the participating countries. Based on these observations, the evaluators of the first part of the CIS evaluation strongly recommended to set up a legal basis for future innovation surveys.

Another area in which pilot surveys are an important tool is that of regional indicators. The currently available regional R&D data are far from adequate for providing even a rough description of the regional R&D and innovation systems. Methodologies must be developed for further indicators, and these should then be tested in practice. The methodological development of these indicators has been begun in connection with the manual on the regional dimension of R&D and innovation indicators; the feasibility test has not yet been carried out. However, current knowledge is not yet sufficient to carry out pilot surveys in this field, in which Eurostat, with the financial support of Directorate-General XVI, has therefore confined

---

14 Owing to its federal structure, Belgium carried out three surveys.

15 See section 2.2.4 for a description of the content of the questionnaire.

16 A copy of this report may be obtained on request.

itself so far to carrying out feasibility studies of potential indicators such as those on regional technological balance of payments or on technology infrastructure. With the financial assistance of Directorate-General I, data have also been collected on the regional indicator system in Canada.

2.2.6 Development of basic statistical tools

Under Article 4, first sentence (f) of the Council Decision, developing basic statistical tools is given as the last group of tasks to be carried out by the Commission under this programme. According to the Annex to the Council Decision (see section (f), second sentence), these include registers, electronic data interchange (EDI) techniques, classification systems, sampling, questionnaires, survey processing tools and data analysis systems, in order "to simplify as far as possible data collection procedures for suppliers..." (*idem*, first sentence).

There are differences in the extent to which the above-mentioned tools have so far been developed/used:

- The compilation of uniform registers both in the EU Member States and in the other Member States of the EEA is currently under way (see also Council Regulation (EEC) No 2186/93 of 22 July 1993 on Community coordination in drawing up business registers for statistical purposes, OJ No L 196 of 5.8.1993, p.1). It has therefore not yet been possible to use the registers for the purposes of R&D and innovation statistics in all Member States.

- Nor has much progress been made in the use of EDI techniques. Trials have been carried out with the CUB.X software developed by Eurostat, but they did not prove very successful. At present data are generally transmitted by the exchange of diskettes.

- All the classifications needed for carrying out the activities are available in usable form. However, not all of the classifications are fully up-to-date, owing to the long time it takes to revise them at international level. The NABS classification developed by the Commission (see 2.2.2 above) has recently been amended to take account of the changes in socio-economic objectives. In addition, first actions have been started to revise the COFOG (Classification of Functions of Government) with respect to public funding of R&D activities.

- Although sampling is a suitable means of keeping the burden on respondents to a minimum, there are nevertheless exceptions to this general rule, e.g. when a relatively rare phenomenon, possibly further differentiated according to variables such as size or economic branch, is to be surveyed in a small country. Furthermore, legal difficulties hamper the development and use of uniform sampling procedures in the Member States. A sensible approach at the moment would seem to be to stipulate accuracy requirements which the Member States must meet, irrespective of the methods they use.

- So far it has only been possible to use a uniform survey questionnaire in the pilot survey on innovation. It goes without saying, however, that harmonized questionnaires are also used for enquiries to the Member States regarding data available there.

- Relatively great efforts have already been made to develop suitable tools for processing the data sent to Eurostat by the Member States. These include standard routines for checking the data on public R&D funding, regional R&D expenditure and regional R&D personnel, but also specially developed programmes for checking the results of the pilot surveys on innovation. Additional work was necessary to process the results of these pilot surveys. This involved the use and to some extent also the development of methods for estimating missing values and for micro-aggregation, a set of procedures to make it impossible to re-identify the results of individual survey units, in this case enterprises, although the individual results generally undergo only very minor changes.

- In contrast to this, there have so far been no major activities in the field of data analysis systems. Mainly descriptive statistical analyses of the information on public R&D funding, R&D personnel, R&D expenditure and innovation have been carried out so far.

The thinking behind the tasks mentioned in (f) in the first sentence of Article 4 of the Council Decision is to provide as much information as possible without placing an excessive burden on data suppliers. In the Commission's view, there are ways of achieving this aim which, although not mentioned in the Council Decision, seem very promising, and so the Commission has already begun activities in this field. Among them is the development of methods for filling gaps in current data ("nowcasting"). Data users are particularly interested in up-to-date information, e.g. in 1995 they are interested in R&D expenditure in 1994 or at least in 1993. Current data survey practice in many Member States makes it impossible to provide such up-to-date information for all the Member States. Additional surveys would have to be carried out, but this would run counter to the above-mentioned principle. The solution might be short-term forecasts for these most recent years ("nowcasts"). Eurostat has already started initial work on the systematic analysis of suitable procedures in the field of R&D statistics.

Another field became apparent during the planning of the collection of HRST data. After the methodology developed (Canberra Manual, see 2.2.2. above), the resulting need for data and the information actually available at present had been thoroughly analysed, the conclusion was drawn that the gaps in the data can only be filled by large-scale additional surveys, unless it proves possible to estimate at least a proportion of the requisite data. The thinking here is based on the idea that it might be sufficient to survey only the data for basic information (e.g. marginal distributions) and to estimate all the other information on the basis of incomplete data from a wide range of sources by means of suitable methods which may still have to be developed. Eurostat will pursue this idea in connection with the need for HRST data.

Besides these activities specific to R&D and innovation statistics, other initiatives of the Commission to better coordinate and articulate R&D and general economic data are worthwhile being mentioned:

- Council Regulation (EEC) No. 696/93 of 15 March 1993 on the statistical units for the observation and analysis of the production system in the Community;
- Council Regulation (EEC) No. 3037/90 of 9 October 1990 on the statistical classification of economic activities in the European Community;
- The projects SERT ("Statistiques des Entreprises et Réseaux Télématiques") and DSIS (Distributed Statistical Information Systems) to facilitate data collection and distribution.

2.3 Successes and gaps

Analysis of the results achieved by the Commission so far in its activities relating to R&D and innovation statistics shows that great progress has been made in recent years. Successes achieved thus far in the field of statistics on public R&D funding, innovation, and HRST and that of regional indicators should be particularly highlighted. It is also important that all the activities have been carried out according to the international methodology and in close cooperation with the Member States and international organizations, particularly the OECD. On the whole, it seems justified to conclude that the Commission, in particular Eurostat, is today one of the world leaders in the field of R&D and innovation statistics.

The successes so far should not, however, conceal the fact that many problems remain unsolved and also that there is still a long way to go before all the tasks imposed on the Commission by the Council in its Decision are completed. The following are the main areas in which more needs to be done:

- analysis of the needs of other major users such as the European Parliament, CREST or international organizations;
- data on private R&D funding;
- indicators on trade in goods and services in the high-tech sector;
- data on HRST numbers and any changes in them;
- additional information for portraying regional R&D and innovation systems;
- use of EDI techniques in order to keep the burden on data suppliers to a minimum and possibly even to reduce it;
- greater concentration on data analyses;
- further harmonization of existing and new data.

These areas will represent the core of the Commission's activities in addition to the maintenance of the existing system, in the second half of the programme (see 3.1. below) assuming that the necessary resources will be available.

2.4 Human Resources

A necessary condition for carrying out all the activities described so far has been adequate human resources. The table below gives an overview of the statutory personnel provided by the Commission for this programme between 1993 and 1995. In addition, the Member States had to deploy large numbers of officials in order to implement the programme on the required scale.

Table 1: Eurostat personnel involved in the programme
(in full-time equivalents)

Year	Number
1993	4
1994	4
1995	3.5

Table 1 shows that since 1993 four person-years of in-house personnel have been available for this programme. The 0.5 man-year reduction between 1994 and 1995 is exclusively due to temporarily vacant posts during 1995. On the basis of present staff planning, it may be assumed that there will be an increase in the number of staff in 1996.

3. Proposals for future actions

3.1 Proposals for the second half of the programme

The Commission's activities in the field of R&D and innovation statistics in the coming years will dovetail with the work of recent years, whereby the accent will be placed on consolidating activities already started. Any new work planned is merely intended to complete or supplement activities which are already under way. The results of the analysis of user needs (see section 2.2.1) were taken sufficiently into account. As in the past, all actions will be closely coordinated with all the participating institutions, like the OECD Secretariat, UNESCO, the Member States and the (other) users both in and outside the Commission. The IPTS (Institute for Prospective Studies) in Seville will be joining the others as a new partner.

In the second half of the programme, i.e. in 1996 and 1997, the Commission will concentrate initially on performing those tasks of the Council Decision which it did not or did not fully complete in the first half. The main cases in point are (see also 2.3 above):

- the analysis of the need for R&D and innovation statistics on the part of major users who have not so far been included in the analysis of needs (see 2.2.1 above), such as the European Parliament, CREST and international organizations;

- the provision of data on private R&D funding. Since some of these data are already available at OECD level, this task will be carried out again in direct cooperation with the OECD Secretariat;

- the provision of impact and output indicators, including the development of the necessary methodology in cases where it is not available at international level. This task goes beyond the requirements, described in the Annex to the Council Decision, for indicators on trade in goods and services in the high-tech sector, but this extension seems necessary and justified in view of the growing importance of this group of indicators;

- the provision of data on HRST;

- the provision of further regional indicators;

- the use of EDI techniques. The completion of this task is largely dependent on the continuation of projects like SERT or DSIS;

- greater concentration on the analysis of existing data. Consideration should also be given in particular to the combination of available data on R&D and innovation with existing general economic and demographic data;

- further efforts to harmonize the data. This horizontal task is necessary for practically all groups of indicators.

Recent developments, whether at international level or within the Commission, make it necessary to launch further projects, to step up existing ones or to participate more actively in them. One of these projects relates to the keyword "globalization". Eurostat has launched a project to analyse the effects on official statistics of the increasing internationalization of economic activities and finding as far as possible solutions to the problems involved. An important aspect in this regard is the field of R&D and innovation. Another project refers to intangible investments. Eurostat will increase its activities in this field, based on the work already done by the OECD secretariat and other institutions.

In order to better respond to the growing request for S&T indicators expressed by the political and economic decisionmakers and to contribute to the coordination of national research policies by putting at the disposal of users of S&T data a common basis of information and knowledge, General Directorate XII published the "European Report on S&T indicators" (EUR 15897 FR) for the first time in 1994. This report contains a substantial statistical annex which for the first time, from the 1996 edition, will be prepared under the responsibility of Eurostat. For this purpose, Eurostat will set up a special databank containing all the data in this annex. It will also undertake great efforts to further harmonize the data already available both in and outside the European Union and will also coordinate all the additional activities relating to surveys.

3.2 Proposals for the period after completion of the programme

In view of the results achieved so far, it can be expected that by the end of 1997 the Commission will have successfully completed at least most of the tasks imposed on it by the Council in this programme. This does not mean, however, that anything like all the problems in the field of (European) R&D and innovation statistics will be solved, so that even after the completion of this programme great efforts will be necessary, especially with regard to the comparability and completeness of data.

Despite all the efforts, the comparability of the available data has not yet reached a satisfactory level. Even by the end of 1997 the fundamental problems in this field will not be solved. One of the main reasons why data are still not sufficiently comparable at European level is that there are differences in the national systems of R&D and innovation statistics, whether in survey methods, classifications or other areas. It would not be sensible from the point of view of content, to aim at complete harmonization of all the national systems, but it seems absolutely necessary to modify the national systems so that there is an overall improvement in the comparability of the data collected by them. Such improvements would, in addition, increase the comparability of R&D and innovation data with general economic statistics. The Commission has been encouraged in this view by the experience with the pilot

surveys on innovation, in which the Member States have already some efforts to improve the harmonization of innovation data. On the other hand, these pilot surveys have themselves shown that harmonization efforts based exclusively on "gentlemen's agreements" fail. The comparability of the data of some Member States could be much better if they had followed Eurostat's recommendations. A legal basis for future surveys might provide at least a partial solution to this problem (cf. the recommendations of the evaluators of the Innovation Survey, set out on p. 127 of their first report). For this reason, the Commission has already conducted initial informal talks on the attitude of the Member States towards a legal basis for future regular R&D and innovation surveys in the European Union based on the principle of subsidiarity. Since the overwhelming majority of Member States agrees with this idea in principle, the Commission will be following it up in the coming months with a view to submitting, before the end of 1997, the draft of a legal basis for regular R&D and innovation surveys in the European Union. A summary of first ideas already presented to the Member States is given in Annex IV.

Another fundamental problem relates to the volume of available data. It is not difficult to predict that, even after the completion of the programme, by no means all the data needed by users will be available at European level. Thus, even after 1997, the Commission and particularly Eurostat will be faced with the task of filling in the gaps in the data. Thus, R&D sectorial statistics which would correspond to specific programmes of the framework programme would constitute a valuable contribution for the strategic follow-up of these programmes (e.g. for energy-environment). It should be borne in mind in this connection that any additional request to the Member States for data involves additional financial burdens and additional burdens for the respondents at a time when less and less money is available for statistical purposes and the respondents are less and less willing to provide information. One way out of this dilemma might be to limit additional surveys to the most crucial variables ("core variables") and to use other information which is already available in order to estimate all the other information required, eg. by means of models. The Commission will follow up this idea in the coming years and test it in practice in a project. The HRST project is currently regarded as a possible candidate. Work done within some specific programmes could also contribute to improving the data collection envisaged. Another way could be to use existing administrative data as far as they are available.

A last general problem might be the challenges of the emerging information society. Knowledge is more and more seen as a new factor of production, in addition to the traditional ones like labour and capital. This development might require a new or at least changed methodological framework including, amongst others, terms like "information technology" or related issues.

4. General conclusions

This report shows that the Commission has already achieved some successes in carrying out the programme for the development of Community statistics on research, development and innovation adopted by the Council. At the same time there remains a number of gaps which will have to be filled in the two remaining years. In addition, in the years since the adoption of the programme new requirements have emerged which the Commission must also meet as far as it possibly can. The Commission requests the Council to take positive note of this Interim Report pursuant to Article 8(a) of the Council Decision.

ANNEX I

Council Decision of 24 January 1994 establishing a multiannual programme for the development of Community statistics on research, development and innovation

II

(Acts whose publication is not obligatory)

COUNCIL

COUNCIL DECISION

of 24 January 1994

establishing a multiannual programme for the development of Community statistics on research, development and innovation

(94/78/CE, Euratom)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 213 thereof,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 187 thereof,

Having regard to the proposal from the Commission [1],

Having regard to the opinion of the European Parliament [2],

Having regard to the opinion of the Economic and Social Committee [3],

Whereas statistics on research, development and innovation need to be reinforced in order to compare and analyse national policies;

Whereas the Council resolution of 19 June 1989 on the implementation of a plan of priority actions in the field of statistical information: statistical programme of the European Communities (1989 to 1992) [4] highlighted the need for a comprehensive and coherent framework that will satisfy Community statistical information requirements by ensuring the approximation of methods and a common basis for concepts, definitions and standards;

Whereas Decision 93/464/EEC [5] establishes a framework programme for priority actions in the field of statistical information 1993 to 1997;

Whereas the conception of policies aimed at encouraging progress requires accurate and factual knowledge of trends in science and technology endeavours;

Whereas statistical indicators are devised in order to support the management of science and technology policies in the Member States and the Community as a whole;

Whereas these statistical indicators are complementary and essential to other priority areas and programmes of the Community, e.g. the Sprint programme [6] concerning innovation and technology transfer and the regional Stride programme [7];

Whereas the specific programmes needed for the implementation of the framework programmes for Community research and technological development, and the framework programmes themselves, need the report of a statistical information system on research and technological development;

Whereas the amount of existing statistical information varies in each Member State and the data that exist are not always comparable;

[1] OJ No C 122, 14. 5. 1992, p. 14.
[2] OJ No C 115, 26. 4. 1993, p. 213.
[3] OJ No C 332, 16. 12. 1992, p. 77.
[4] OJ No C 161, 28. 6. 1989, p. 1.
[5] OJ No L 219, 28. 8. 1993, p. 1.
[6] OJ No L 112, 25. 4. 1989, p. 12.
[7] OJ No C 196, 4. 8. 1990, p. 18.

Whereas the implementation of a statistical information system for research, development and innovation necessitates a sequence of interrelated actions starting from the assessment of the needs up to the dissemination of information, and whereas this action should be organized in a coherent framework;

Whereas, in order to ensure their usefulness and comparability, the details of data to be provided by the Member States to the Commission should be established by the Commission taking into account work carried out by OECD, Unesco and other international organizations;

Whereas the data collection procedure for industry and administrations should be simplified as much as possible, while still maintaining at the same the quality of the data, which is made possible by the development of appropriate basic statistical tools;

Whereas it is essential that developments in official research, development and innovation statistics are coordinated to meet essential international, Community, national and regional needs at minimum public and private cost; whereas this coordination can most conveniently and effectively be done within the established procedures;

Whereas the Scientific and Technological Research Committee (Crest) has given its opinion,

HAS ADOPTED THIS DECISION:

Article 1

The multiannual programme (1993 to 1997) for the development of Community statistics on research, development and innovation (hereinafter referred to as 'the programme') is hereby established.

Article 2

1. The programme shall end on 31 December 1997.

2. The Community financial resources estimated as necessary for the implementation of the programme to ECU 2,9 million in the framework of the 1993 to 1997 financial perspectives.

3. The budget authority shall determine the appropriations available for each financial year, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities (1).

(1) OJ No L 356, 31. 12. 1977, p. 1 (Updated text: OJ No C 80, 25. 3. 1991, p. 1).

Article 3

The objectives of the programme are as follows:

(a) to set out a Community reference framework for statistics on research, development and innovation defining the most appropriate concepts and methods for supporting the corresponding Community policies, and for satisfying the needs of national, regional and local administrations, international organizations, economic operators, professional associations and the general public;

(b) to establish a Community statistical information system for research, development and innovation;

(c) to promote and support harmonization of statistics on research, development and innovation in the Member States;

(d) to facilitate the dissemination of comparable information.

Article 4

With a view to achieving the objectives referred to in Article 3, the following work shall be carried out by the Commission, in cooperation with the Member States, in line with the action plan set out in the Annex:

(a) analysis and evaluation of user demand, subject to its feasibility and based on cost efficiency, in order to define actions and priorities, for statistics on research, development and innovation;

(b) improvement, where necessary, of the existing methodological framework;

(c) identification of existing statistical information on research development and innovation;

(d) setting up the organizational and technical components of a Community statistical information system for research, development and innovation, including statistics of Community funded research and development activities;

(e) carrying out pilot surveys;

(f) developing basic statistical tools.

The Commission shall make use of existing sources of information, instruments and procedures, including the work and existing data of OECD, Unesco and other international organizations, to carry out these tasks.

The specific actions of this programme shall be implemented in accordance with Decision No 93/464/EEC.

Article 5

The specific actions of the Commission in connection with the collection and submission of statistical data by the Member States shall be adopted pursuant to the procedure laid down in Article 6 of Decision No 93/464/EEC.

The Commission shall draw on the expertise of national experts, in particular in the field of research and technological development (RTD), for the purposes of implementation of the programme.

Article 6

The Member States shall ascertain and analyse the needs of the national users for Community data on research, technological development and innovation statistics and transmit appropriate information, where available, to the Commission within eight months of the adoption of this Decision. The Commission shall coordinate these activities.

Article 7

For the work referred to in Article 4, Member States shall transmit existing statistics on research, development and innovation and information concerning the methodology used for collecting such statistics, including the data declared confidential by the Member States pursuant to domestic legislation or practice concerning statistical confidentiality, in accordance with the provisions of Council Regulation (Euratom, EEC) No 1588/90 of 11 June 1990 on the transmission of data subject to statistical confidentiality to the Statistical Office of the European Communities [1].

Article 8

(a) The Commission shall present an interim report to the Council in 1995, accompanied if necessary by proposals it considers appropriate, particularly on the methodological framework referred to in Article 4 (b) and on the implementation of a system based on that methodology, for the regular collection of harmonized statistics on research, development and innovation, as well as to cover the requirements of Community policy on RTD and innovation and the requirement for regional data to aid structural policies.

(b) The Commission shall present a final report in 1998 to evaluate the implementation of the programme.

Article 9

This Decision is addressed to the Member States.

Done at Brussels, 24 January 1994.

For the Council

The President

G. MORAITIS

[1] OJ No L 151, 15. 6. 1990, p. 1.

ANNEX

PLAN OF ACTION FOR THE DEVELOPMENT OF COMMUNITY STATISTICS ON RESEARCH, DEVELOPMENT AND INNOVATION

(a) Analysis and evaluation of user demand for statistics on research, development and innovation

The aim is to collect information on, and analyse the requirements of, the main users, i.e. the Community institutions, Crest, the national, regional and local administrations, international organizations and economic operators.

In order to facilitate long-term planning and a convergence of statistical actions at international, Community, national and regional levels, the analysis will take into account long-term requirements.

(b) Improvement, where necessary, of the existing methodological framework

The aim will be a reference framework for statistics on research, development and innovation, both for existing data at national level and for additional data collection at Community level. This reference framework will increase the comparability of data between the various Member States.

Further development of the methodology will take place in close collaboration with the OECD and within the framework provided by it, in order to take advantage of what has already been done by that institution in the field and to guarantee comparability with third countries. Where an adequate or adoptable methodology does not already exist, the Commission shall take the lead and initiative in developing the framework to cater for the special needs of the Community.

The methodology will be used as the basic harmonization tool for the development of official Community statistics on research, development and innovation and as a recommended framework for non-official statistics.

The further methodology development will be formulated in manuals which will be adopted at Community level.

(c) Identification of the existing statistical information on research, development and innovation

In order to develop the methodology and the information system, examinations must be made to reveal the amount of existing information on research, development and innovation. This investigation is aimed at showing the extent of accessible data in the Member States and the differences between the Member States. This knowledge is necessary for the collection of identical and comparable data. It stresses and highlights where to make special effort to promote and support the harmonization of statistics on research and development and innovation.

(d) Setting up the organizational and technical components of a European statistical information system for research, development and innovation

Priorities will be given to the following:

Resources:

— Modes of financing research and development activities (both private and public)

— Research and development (R&D) personnel

— R&D expenditure by sector (of enterprises, the State, higher education)

Results:

— Technological innovation in the enterprises

— Exchange of goods and services of high technology

On a circumstantial basis, work will also be undertaken on the direct repercussions of the research on patents and bibliography.

Data will be classified according to European nomenclatures (NABS, NACE REV 1 ...). Special attention will be given to the regional dimension.

Data will be stored in data bases which will contain:

1. harmonized data on R&D and innovation;
2. national data collected according to national practices not yet fully harmonized;
3. data collected by the Commission.

(e) Carrying out pilot surveys

Improving the availability of data on research, development and innovation sometimes requires the carrying out of pilot surveys in order to test the feasibility of some data collection exercises. The pilot surveys will prepare the way for regular data collection based on the methodology. These pilot surveys will be carried out in accordance with the concepts and methods developed in the methodology.

(f) Developing the basic statistical tools

Basic statistical tools must be developed in order to simplify as fas as possible data collection procedures for suppliers and, in particular, to minimize the burden placed on enterprises, whilst maintaining data quality. These statistical tools will include registers, Electronic Data Interchange (EDI) techniques, classification systems, sampling, questionnaires, survey processing tools, data analysis systems.

ANNEX II

Detailed Analyses of User Needs for Community Statistics on Research, Development and Innovation

1. SUMMARY OF FINDINGS FROM NATIONAL REPORTS

1.1 Background

After discussions with the Member States it was agreed that Eurostat should not give Member States very specific guidelines for the structure of the national reports. A general paper was prepared as a background[17]. The Member States could base the reports on a special survey of users or other available information. As a result the national reports were very different in scope. The length varied between half a page and some 20 pages. All current Member States (except Luxembourg) and Norway submitted their reports to Eurostat.

1.2 General findings

The main users of R&D and innovation statistics are more or less the same in all the countries:

- science and technology policy analysts
- decision-makers
- researchers

The users in institutional terms are for instance enterprises, industrial organisations, public administration, research institutes, universities, international organisations like the OECD and the European Commission.

In the analysis of user needs, it must be borne in mind that the needs are not static but change over time. The demands expressed here represent the current needs or the needs within the next few years.

A substantial demand for comparable information on R&D and innovation was expressed, not only for comparisons within the EU but also with non-EU OECD member countries and some other European and Asian countries. Therefore continued co-operation with the OECD in the production and development of the statistics was regarded as very important. A stronger co-ordination of concepts, classifications and survey methodologies is needed in the future in order to further improve the comparability of both R&D and innovation indicators.

Users often want to evaluate the results and impact of investments in R&D and innovation. They are therefore interested in being able to link R&D and innovation indicators with other indicators. Data bases like the OECD STAN data base, where information on R&D, industrial production, foreign trade and input/output is presented according to a common classification, are useful tools for this purpose. Several countries have also built micro-level data bases, where data for a single company are linked together from various data bases in order to be able to analyse the relationship between science and technology and economic performance.

There is a need for almost all R&D and innovation indicators broken down by region.

Almost all countries expressed a demand for more detailed information on Community- funded research. This relates to indicators on flows of funding, statistics on participation in projects under Framework Programmes, etc. A corresponding demand also

17 This paper is available from unit D3 of Eurostat on request.

exists for information on R&D funding by other international organisations like the UN and its subsidiary bodies, the World Bank, the OECD, etc.

A general request was made for defining a set of core indicators, which could be produced annually, and complementary indicators, which could be produced less frequently. The quantitative indicators could also be supplemented with some qualitative data.

The dissemination of statistics is too slow for many users and efforts should be made to speed up the process. The ways of disseminating the data should be improved by a more extensive use of computer networks.

The more detailed needs for R&D and innovation indicators are presented under the following headings:

- indicators on R&D inputs
- indicators on R&D outputs
- indicators on R&D impact
- innovation indicators
- other R&D and innovation indicators
- other related indicators

1.2.1 Indicators on R&D inputs

The most generally available international indicators are:

- R&D statistics based on the Frascati Manual (published mainly by the OECD)
- Statistics on Government R&D appropriations (published mainly by Eurostat)

As R&D statistics have been produced in most countries for a fairly long time, information based on R&D statistics is rather extensively used. For some needs the existing R&D statistics are not detailed enough. More detailed industrial breakdowns are needed as well as more detailed information by other breakdowns such as field of science, socio-economic objectives (at least information on environmental and civil R&D), and special fields like biotechnology. At least some data on R&D are needed annually. For the moment performer-based detailed R&D data are for many countries only available for every second year. Statistics of a better quality on R&D in the higher education sector were requested. In spite of efforts by the OECD and other organizations, the comparability of the information is still rather limited. Extended data collection on acquired R&D from outside the R&D performing organisations was also demanded as well as information on R&D co-operation. This would give a more complete picture of R&D flows between various sectors of the economy.

An explicit need for statistics on government R&D appropriations by detailed NABS breakdowns were mentioned by only a few countries. This does not necessarily mean that these data are not needed by other countries. Several countries expressed doubts about the usefulness of NABS at a more detailed level than 1 digit. One of the main ideas of the analysis of government R&D appropriations is to provide policy-makers with information on the R&D trends in the government budget very quickly, preferably immediately after the budget is adopted. Provisional data on the 1-digit level could therefore be provided to Eurostat by a majority of Member States and published much more rapidly than at present.

Several users expressed the need to have comparable data on the number of R&D performing units. This indicator is not included in the Frascati Manual and therefore no internationally comparable data are available. Further harmonisation of populations and survey methods is also needed in this context.

Multinational companies operating in several countries often significantly influence the R&D activities in a single country. A more systematic collection of information on the R&D activities of these companies broken down by country of performance is needed as a complement to the traditional nation-based statistics on performers of R&D. Various national studies have shown that such a data collection is possible.

1.2.2 Indicators on R&D outputs

These indicators include patent applications, patents granted and bibliometric indicators (numbers of articles, citations, co-citations, etc.). Patent statistics are published by various international organisations (SEPO, WIPO, the OECD, etc.). Bibliometric indicators are not regularly published. They are usually extracted from various data bases for specific research purposes by researchers.

The need for and use of these data has until now been rather limited. The main users of these indicators have probably been researchers. In order to increase the use of these data and improve possibilities for international comparisons, the OECD has published a Manual on the use of patent data as technology indicators. More systematic compilation and publishing of these data is needed. In order to improve the possibilities for comparing patent data with other economic data, a concordance key on the European level between the International Patent Classification (IPC) and NACE is needed. Such a key is already under preparation in EPO in co-operation with Eurostat.

1.2.3 Indicators on R&D impact

These indicators include technological balance of payments and statistics on trade in high-technology products. Even if a methodological manual on the technological balance of payments exists, published by the OECD, data are available only from a few countries. The comparability of these data is uncertain as the sources of the data are partly enterprise surveys and partly elements from the general balance of payments statistics. Data on trade in high-technology products are more and more requested by users. Until now they have been produced by Eurostat, the OECD and some other organisations using rather different definitions.

There seems to be a clear need for these indicators, which however need methodological refinement in order to be used more extensively. The data on technological balance of payments should be more based on enterprise surveys. The effects of the internal market on this indicator should be evaluated as part of the development work. A generally acceptable definition of high-technology products is needed to facilitate wider international use of this indicator.

1.2.4 Innovation indicators

These indicators are derived from a new type of survey being developed. Innovation surveys include information on sources of innovation, objectives of innovation, barriers to innovation, innovation expenditure, R&D co-operation, acquisition and selling of technology, patent protection and effects of innovation. The methodological basis is given by the OECD in the Oslo Manual, applied by Eurostat in the common questionnaire used as the basis for innovation surveys in all the old Member States of the European Union and Norway (the Community Innovation Survey, CIS). National results of these surveys are already available and the results of various comparative studies using the CIS data base will be available during 1995. On the basis of all experience gained, the innovation indicator system will be further developed during 1995 and 1996 in order to be able to launch a new round of surveys.

Great interest in these surveys has been shown in the national reports, even if a very explicit need for data from these surveys has not been presented. Core questions on R&D and innovation, which might be needed every year or at least every second year, and other information, which might be needed less frequently, have to be identified. An enlargement of the scope of innovation surveys to service industries is needed. Some interest was also shown for innovation indicators based on new product announcements.

1.2.5 Other R&D and innovation indicators

Indicators on human resources for science and technology (HRST) are being developed on the basis of a methodological manual compiled jointly by the OECD and Eurostat (Canberra manual).

As no results of international comparisons are yet available, it is natural that the needs expressed are not very specific. Several countries were interested in the subject. The most urgent need in this field seems to be some internationally comparable indicators on the mobility of researchers. This refers both to mobility between various sectors within countries and mobility between countries. Longitudinal studies of career paths of researchers were also needed. Interest was also expressed to have information on PhD students and more detailed information on the training of researchers. Information on the unemployed by sex and level of education was also requested.

1.2.6 Other related indicators

Knowledge accumulation of firms is one of the key factors leading to innovation. One of the indicators related to this is training expenditure by firm. Needs were expressed for information on this expenditure. Some internationally comparable information will be shortly available from the Community 'Continuing Vocational Training Survey'.

A need was expressed for indicators on the use of new technologies.

Training expenditure is a part of the wider concept of intangible investments. The other elements of intangible investments are R&D expenditure, marketing expenditure and some other elements such as software expenditure. Information on these was also requested. Surveys of intangible investments have been made in some countries and guidelines for the compilation of this information are being drawn up by the OECD.
Plans for the production of internationally comparable statistics are not known.

1.3 Details from national reports

In the following, details of the national reports are presented arranged according to six groups of indicators: R&D input, R&D output and impact, innovation, HRST, regional and other indicators.

1.3.1 R&D input indicators

Austria:
- Need for a reduction of R&D survey intervals to two years for all sectors. Surveys are currently carried out at four-year intervals owing to limited resources.
- Need for a breakdown of Chapter 10 of NABS by main scientific disciplines.

Belgium:
The level of breakdown by sector should be more disaggregated and focused on strategic sectors (electronics industry, chemistry, etc.) and services (telecommunications, health, etc.).

Denmark:
- Indicators on private-sector R&D expenditure, employment and industry are regarded as "important" or even as "very important".
- For the NABS indicator the impression from the survey is that the 1-digit level of detail is a suitable and important indicator, which should be produced rapidly.

Finland:
- The main need for the future is a shorter production span for these statistics.
- R&D input indicators should be produced annually in order to get more up to date figures.

Germany:
- Need for data on expenditure on basic research (Federal spending and spending at operational level) and for data on third-tier spending by universities and research institutes.
For the future:
- There is a growing interest in international data on "basic expenditure" and in cross-sectoral information (cross-sectoral data in specific fields such as health and biotechnology, but also environment, etc.).
- Request also for data on R&D employment, broken down by sex.

Greece:
Need for statistics on public R&D funding; collection should be on an annual basis, intramural expenditure on a two-year basis.

Ireland:
- Need for statistics on extra-mural payments for R&D to third parties within the country, e.g. to the higher education sector, government laboratories or other companies.
- Need for data on the number of companies (however they are defined) engaging in R&D.
- Need for data on government funding of basic research.
- Need for more transparent data on funding by objectives (this is a reflection of a national rather than an international requirement).
- Need for data on funding of other S&T activities and not just R&D (this information is collected at national level but is hampered by the lack of internationally comparable data).
- Need for data on research objectives of funds going to the higher education sector for research.

Netherlands:
- Need for more detailed data on R&D and innovation expenditure (broken down for instance by type of research, sources of funds, sectors involved, disciplines, policy area, socio-economic fields, etc.).
- Need for more detailed data on government funding (by sector).

Norway:
- Need for aggregate R&D data (total R&D personnel in FTE, total R&D expenditure as percentage of GDP, sources of finance, and sectors involved, type of research activity and field of science).
- Need for data on medical sciences/health research and social sciences and also biotechnology and environmental sciences across sectors.
- Need for government budget appropriations at NABS 1-digit level, which should be published rapidly.
- Need for data on R&D institutes in the business enterprise sector (non-integrated R&D).
- Need for disaggregated data (branch-/micro level) linked to other technological indicators and economic variables. Data for both manufacturing and service industries and small enterprises are needed.

Spain:
- Need for indicators on resources allocated to R&D:
  i) for the business sector, by sector of economic activity (at NACE two-digit level),
  ii) for other sectors (government, PNP) by field of science,
  iii) by origin of funds: financing from abroad. Users are interested in knowing total funds originating from the EU, by country, sector, project, field of science, programme (these data are requested annually).
- Need for more quantitative information (on research centres, enterprises with R&D departments or laboratories, existing research centres in the European Union, S&T parks, R&D co-operation projects, participation in R&D programmes, technical exchanges and exchanges of staff, joint ventures, organisation of R&D departments.

Sweden:
Need to maintain and intensify the methodological work on R&D in the higher education sector.

United Kingdom:
- Need for consistent definitions of sectors in the various countries (for instance, treatment of CNRS in France).
- Need for statistics on funding showing EU programmes separately.

1.3.2 R&D output and impact indicators

Austria:
There is a recurrent need expressed by users for an internationally standardised list of high-tech sectors and products.

Belgium:
- Need for statistics on patents.
- New needs relating to the development of the innovation process, e.g. dissemination and application of new knowledge, qualitative information on research and innovation and new technologies, role of SMEs and a better integration of R&D statistics in other statistics.
- Need for suitable indicators on technology transfer.

Denmark:
- Output indicators are less important.
- Bibliometric analysis is expected to gain increasing importance, provided the quality and comparability of data are improved.

Finland:
- Need for more exact definitions of bibliometric and patent indicators, and more organised collection and processing of the related data.
- New indicators on output of R&D activities should be developed and the connection between R&D efforts and scientific/economic success should be better covered in the future.

Germany:
- Need for statistics on patents and in particularly for regional data on patents.
- There is currently a demand for national and international data on trends in cross-border trade in technological services.
- Bibliometric indicators are of importance particularly for international comparisons of research activities in Germany. The future level of demand for and use of these data will depend on further research and the adoption of internationally accepted methodological guidelines.

Greece:
- Need for indicators on technology transfer.
- Need for bibliometric indicators and indicators on patents and high technology.

Ireland:
- Need for information on the outputs of investments in R&D.
- Need to develop indicators which measure the output of R&D in smaller economies.
- Need for TBP data.
- Need to develop bibliometric indicators to measure, for instance, the outputs of higher education research.

Italy:
Need for information on foreign R&D investments, particularly with regard to industrial groups.

Netherlands:
- Need for statistics on the impact of R&D: on the labour market, the mobility of researchers, exchange of knowledge.
- Need for output indicators (bibliometric, patents, etc.).

Norway:
- Need for bibliometric data, data on R&D cooperation.
- Need for statistics/analysis of the impact of R&D on profitability and growth, at aggregated and disaggregated levels.
- Need for statistics on the impact on the quality of life (environment, life expectancy etc.).
- Need for analysis on research institutes (economic framework conditions).

Spain:
- Need for more information on patents than is provided by the OECD.
- Priority should be given to constructing a basic Community system of output indicators which could be connected with other indicators on input and economic impact. But there is also a need for equivalence between the IPC[18], the ISIC[19], the SITC[20] and the NACE to allow comparisons between technology on the one hand and production and trade in goods on the other.

Sweden:
Bibliometric indicators and data on patents are not yet widely used; users expressed an increased need for these kinds of international indicators.

United Kingdom:
The development of output indicators was strongly supported to measure the effectiveness of R&D in wealth creation and improving the quality of life. Example of indicators needed: monitoring new products announcements, measures of the volume of collaborative research with industrial users. Impact indicators of interest are: high-tech trade data, patents, measures of private/public R&D cooperation, measures of quality of life such as infant mortality, air quality, water purity, life expectancy.

1.3.3 Innovation indicators

Austria:
Austrian users need internationally comparable innovation data based on the recommendations in the Oslo manual and want to see the results of the first CIS evaluation.

Denmark:
Information is required on barriers to and objectives of innovation, statistics on the sources of innovation and expenditure on innovation, need to include information on environmental issues connected with innovation.

---

18 IPC: International Patent Classification.

19 ISIC: International Standard Industrial Classification.

20 SITC: Standard International Trade Classification.

Finland:
Need for the further development and international co-ordination of innovation indicators in the future in order to produce consistent figures.

Germany:
Need for internationally comparable data in the industrial and services sectors.

Ireland:
- Need to expand the scope of future innovation surveys beyond technological innovation and include the services sector.
- Need to capture performance data about the firm in order to allow discriminatory analysis of innovators and non innovators.
- Need for a reliable and valid means of quantifying a firm's "innovative capacity".

Italy:
Need for indicators on technological innovation.

Netherlands:
- Need for statistics on the dissemination of process innovations by sector of activity.
- Need for alternative indicators for the renewal processes in SMEs.

Norway:
- Need for input indicators on process innovation, i.e. cost of activities.
- Need for input indicators other than technological innovation; i.e. cost of organisational, competence and market development.
- Need for output indicators on the process of R&D and Innovation.

Spain:
- Need for regular innovation surveys every second year.
- Need for better harmonised innovation surveys than CIS.

1.3.4 HRST indicators

Austria:
Need for data on highly skilled labour force (ISCED level 6 and 7) in all scientific disciplines (including humanities).

Denmark:
- Need for data on PhD students.
- Employment should be specified according to, for example, educational background (academic or otherwise).
- Need for statistics on education and mobility of researchers.

Ireland:
- Need for statistics on mobility of HRST, need to know how technology is transferred by the employment of HRST in industry and movements of HRST between different sectors of the economy. The issue of the "brain drain" is also of concern.
- Need for information on employment and utilisation of HRST with ISCED levels greater than 5 analysed by ISCED levels, the number of HRST who qualify as such by virtue of their occupation rather than education, the employment of different skills and disciplines in industry.

Italy:
Need for data on researchers by country of origin and age.

Netherlands:
Need for comparable overviews of staff quality and training.

Norway:
- Need for statistics on the mobility of researchers.
- Need for data on numbers and flows of different types of academics.
- Need for statistics on PhD degrees and PhD students by field of science.
- Need for statistics on ISCED levels 6 and 7 by field of science.
- Need for statistics on researchers by sector of performance, sex and field of science.

Portugal:
Need for data on scientists and engineers by field of science.

Spain:
Need for HRST data broken down by sector, type of employment, age, sex, field of science, as well as inflows from the education system, from abroad, and outflows.

Sweden:
Need for data on exchange of researchers between countries.

United Kingdom:
- Need for data on the flow of people from higher education and research council institutions into industry.
- Need for data on recruitment and retention of S&T graduates.

1.3.5 Regional indicators

Austria:
Austrian user requirements for regional R&D data at NUTS levels 1 and 2 will increase.

Belgium:
Need for more comparable statistics, i.e. for similar concepts and methods in data collection and disaggregated statistics at sectoral level and by regions according to standard classifications.

Denmark:
Regional data both for the private and public sector are not seen as very important. Roughly half of the users never use regional data or use it only for general information.

Netherlands:
Need for regional R&D statistics of research projects.

Norway:
- Need for data by funding agencies/sources of finance.
- Need for data on R&D centres.
- Need for data on mobility both inside a country and between countries.

Portugal:
Need for data on R&D centres and enterprises by technology sector at regional level (NUTS 2, 3).

Spain:
All data available at national level should also be made available at regional level.

Sweden:
Increasing interest in regional statistics and globalisation of R&D.

1.3.6 Other indicators

Austria:
- Need for nowcasting and forecasting figures on R&D expenditure.
- Need for information on the funding of EU research framework programmes ("flowback"), broken down by Member State and field (scientific discipline, technological objective etc.).

Belgium:
- Nowcasting and forecasting figures on R&D expenditure.
- Need for a specific deflator for R&D investment.

Denmark:
- Need for information on R&D cooperation.
- With respect to R&D appropriations from international organisations, detailed information on recipient countries, type of organisations and supported projects.

Finland:
Need for statistics on the internationalisation of R&D activities such as participation in international R&D programmes within the EU and other organisations.

France:
- Need for nowcasting figures on R&D trends.
- Need for information on the main organizations involved in R&D: enterprises, public institutes.
- Need for information on policy priorities and actions taken in the various domains relating to employment policy and support.
- Need for information on programmes and support from different public institutes, co-ordination with international programmes.
- Need to develop techniques of information, like databases on R&D actors, in all countries.

Germany:
- Need for data on flowback from EU support programmes.
- Need for comparable time series on the core variables.

Ireland:
- Need for data on research collaboration in terms of the contributions of partners in terms of time and money, the characteristics and affiliations of partners and initiators, the number of linkages established, the monetary values of the collaboration, and further outputs from the collaboration.
- Need for data on the diffusion and use of technology in companies to try and assess the uptake and use of advanced technological procedures in industry.

Italy:
- Need for rapid and more comprehensive information, both through the usual media and publication in financial and business periodicals and/or meetings and ad hoc promotional events.
- Need for data on EU projects (research and financial support, indicators on participation, impact, quality, efficiency).

Netherlands:
- Need for annual indicators on training programmes and on-the-job training, relating to R&D activities by sector of activity.
- Need for data on the exchange of university staff and students.
- Need for data on foreign students.
- Need for data on national and international research programmes by funding organisation, co-ordinating mechanism, participating organisation and type of research.
- Need for data on EU R&D funding to universities by type of programme.

Norway:
- Need for data on globalisation, expenditure on international R&D cooperation projects by source of finance.
- Need for a definition of the information technology (IT) industry, by industrial activity classification (NACE/ISIC).
- Need for nowcasting figures.
- Need for statistics on funding EU framework programmes, Norwegian participation, etc.

Portugal:
Need for input and output indicators on the EC framework programme.

Spain:
Need for indicators on training and other expenditure classified under "intangible investments".

Sweden:
- Need for figures on Swedish participation in projects and programmes under the Framework programme, and comparisons of participation and financial support with other European countries.
- Need for studies on R&D done abroad by multinational companies.

United Kingdom:
- Need for systematic information for the analysis and dissemination of technology and the application of particular technologies in different countries. A technology input/output database would be a useful addition to OECD's STAN database.
- Need for R&D deflators.

2. RESULTS OF THE SURVEY ON NEEDS FOR R&D AND INNOVATION STATISTICS IN COMMISSION DEPARTMENTS

The aim of the survey has been to evaluate the current and future needs for statistics on R&D and Innovation amongst all users in the Commission. It has also sought to identify the technical barriers the users encounter when using such statistics.

2.1 Approach

A questionnaire[21] was sent to all Directorates-General and some other units which covered three main areas:

- Current needs
- Future needs
- Technical matters related to the use of statistics

Questions dealt with the importance attributed to the various groups of indicators proposed, with the types of breakdown required, the appropriate level of detail, possible new indicators, data updating and forecasts, etc.

2.2 Analysis of the responses

Three types of reaction could be identified:

- Type I: Respondents who completed the questionnaire
- Type II: Respondents who stated that they were not concerned by this evaluation, or that they had no opinion to offer;
- Type III: No reaction

21 The questionnaire is available from unit D3 of Eurostat on request.

In the following table, units are distributed according to these types.

Type I	Type II	Type III
DG I	DG V	Forward Studies Unit
DG I-A	DG VIII	DG VI
DG II	DG IX	DG X
DG III	DG XI	DG XVIII
DG IV	DG XIV	DG XIX
DG VII	DG XX	DG XXII
DG XII		
JRC-IPTS		
DG XIII		
DG XV		
DG XVI		
DG XVII		
DG XXI[22]		
DG XXIII		

Each unit had the option of completing as many questionnaires as it wished for various subunits or individual users. Therefore, the numbers of completed questionnaires per unit varied from one to seven.

Number of questionnaires completed by responding units:

DG I and DG I-A	7
DG II	1
DG III	3
DG IV	1
DG VII	1
DG XII	1
JRC	6
DG XIII	1
DG XV	2
DG XVI	1
DG XVII	1
DG XXIII	1

2.3 Analysis of results

2.3.1 Groups of indicators deemed essential for the present

From the data now available, users regard six sets as essential for their current work. In order of importance, these are:

- statistics on innovation

22 This DG didn't fill in exactly the questionnaire but expressed its needs in a detailed letter.

- statistics on trade in high-technology products
- statistics on EC funding of RTD & Innovation programmes
- statistics on R&D expenditure and R&D personnel
- statistics on technology balance of payments
- statistics on government R&D appropriations

Generally speaking, all users are satisfied with the level of detail and frequency of the data available.

2.3.2 The level of disaggregation required by the Commission's users

For most indicators, a breakdown by year, region and sector is required. All users stated the need for regional indicators. Some specific interests are mentioned below:

DG I is interested in having indicators on cross-border flows of patents by main trade partner.

DG II stated that indicators on innovation should be broken down according to radical and incremental innovations.

DG III stressed the need to get indicators broken down by specific sectors like information technology (software, hardware) and telecommunications, and by continent.

DG IV would like to get indicators on government R&D appropriations broken down by aid programme, and by type of recipient.

DG XV indicated that patent indicators should be broken down by size of enterprises.

2.3.3 Groups of indicators deemed essential for the future

This is nearly the same set of indicators as for current needs:

- statistics on trade in high-technology products
- statistics on innovation
- statistics on EC funding of RTD & I programmes
- statistics on R&D expenditure and R&D personnel
- statistics on technology balance of payments
- statistics on government R&D appropriations

2.3.4 Need for new indicators

For some Commission departments, new indicators should be considered by Eurostat in the future, in the following areas:

a) Output and impact indicators

- patent indicators relating to the origin of the owner,
- indicators on different forms of protection other than patenting,
- bibliometric indicators like citations of Commission-funded research property,
- TBP indicators as measures for globalisation,
- indicators on effectiveness or productivity of R&D,
- indicators on performance of innovative energy technologies.

b) Innovation indicators

- indicators on links between innovation and dissemination and technology infrastructure.

c) Other indicators

- indicators on globalisation of R&D and innovation,
- penetration indicators for specific technologies,
- indicators on Commission-funded RTD activities,
- indicators on mobility and absorption of researchers.

2.3.5 Updated data and forecasts

They are required for all sets of indicators listed in the questionnaires. The most frequent period proposed for forecasts is 5-10 years.

2.3.6 Technical facilities

The most frequent supports used are publications and databases. The main barrier encountered by users when trying to get information on R&D and innovation is that existing information is not complete.

3. CONCLUSIONS FOR DEVELOPMENT OF R&D AND INNOVATION INDICATORS IN THE COMMISSION

The national reports on user needs and the survey of the Commission's needs did not come up with something completely new which has not been considered in current Eurostat plans. One general conclusion might be that Eurostat's work in the field is not sufficiently well known, either in the Member States or in the different Commission departments. Nevertheless some conclusions and suggestions for further work could be drawn from the reports and survey.

In the development of a methodological framework for statistics on government R&D appropriations a clear distinction could be made between production of rapid results from analysis of provisional government R&D appropriations at NABS 1-digit level, based on an analysis of the budget itself and more detailed survey-based analysis of use of appropriations at NABS 2 or 3-digit level, which would be available at a later stage.

Priority should be given to improving the quality of regional breakdowns of the main R&D variables. A more long-term objective is the regionalisation of other R&D and innovation indicators.

Priority should also be given to the development of the system of statistics on Community-funded research.

A revised CIS questionnaire should be developed in close interaction with the OECD and the next revision of the Oslo Manual.

An integrated concept of R&D and innovation surveys should be developed leading to a legal framework for R&D and innovation surveys. This could also cover some recommendations for revision of the methodology for R&D surveys. These should be discussed with the OECD in connection with the next revision of the Frascati Manual.

In connection with the development of the statistical system on HRST, attention should be paid to include as soon as possible some indicators on the mobility of researchers.

A feasibility study should be made on the possibilities for collecting internationally comparable data on the R&D activities of multinational companies in different countries.

Inclusion of some data on patents and trade in high-technology products in future Eurostat publications.

Marketing of Eurostat's work and products in the field of R&D and innovation statistics should be improved.

ANNEX III

Statistical Information on R&D and Innovation Available in the Member States of the European Economic Area (and Switzerland)

Executive Summary of the Final Report

During recent decades, a considerable increase in the contribution of Research and Technology to the socio-economic development of the countries has become apparent. This trend is expected to continue in the future. As a result, the interest of the various countries in the measurement of Research and Technology activities is also increasing, with more and more human and financial resources being allocated for this purpose. The need for quantification of the research and development effort has lead to the creation of special systems producing quantitative data and to the assignment of the necessary data collection to specific institutions.

The present study attempts to thoroughly investigate and present the different systems used by the European Community and EFTA Member States for the measurement and data collection of their research and technology activities. More precisely, the study concentrates on the common data collection systems, the common R&D data collected and the users for different data/information collected.

In order to carry out the study, eleven questionnaires were designed for each of the following R&D subjects:

* public financing,
* the government sector,
* the higher education sector,
* the private non-profit sector,
* the business enterprise sector,
* innovation,
* technological balance of payments,
* patents,
* high technology,
* competitiveness,
* bibliometrics.

All the necessary parameters were included in the questionnaires (which were produced in French and English) in order to cover the scope of the study described above. After a thorough investigation, which started with a first contact with the national statistical institutes and the Ministries of Research and Technology of all the Member States, the experts in each of the above subjects were identified. The questionnaires were addressed to them and responses were received by R&D subject and member-state. One hundred and eighty six (186) answers were received out of the one hundred and ninety eight (198) expected, representing a response rate of 94%.

The analysis of the data collected was carried out in the first instance vertically, i.e. within each subject. The responses of all the Member States were analysed, compared and presented. This part of the analysis contains most of the information received including any details worth mentioning.

Secondly, a horizontal analysis was performed, where the complete system for R&D data collection of each member state is presented. This second part of the analysis is much more concise to avoid having to repeat information already given.

Owing to the great variety of information included in the questionnaires and the complexity of the subject as a whole, it was decided to present each subject following the general structure of each questionnaire and analysing groups of questions investigating the specific parts of each subject. Tables referring to one or more questions were used to summarise the responses by member state.

The general impression obtained from the analysis of the information received is positive for all the Member States. Almost all the countries have a central body responsible for coordinating R&D data collection. They more or less follow the international methodology and practice as described in the relevant manuals.

The subject of innovation in enterprises is fairly new. As a result, the necessary infrastructure for measuring the subject does not always exist. However, in general all Member States are oriented positively towards applying the appropriate methodology developed recently by the OECD.

The two subjects of technology, TBP and Patents, are not usually covered by a special data collection. The countries rely on the data provided by the usual responsible bodies, i.e. the Central Banks and the Patents Offices. Ireland and the United Kingdom are the only Member States that have special data collection for the coverage of these two subjects.

The two levels of coverage for the TBP subject result from the fact that some countries record only the payments and not the revenue from technological transactions. Also, Ireland reports some concern at the quality of the data produced from the survey which they have to conduct in order to measure TBP, as these data are not provided by the Central Bank since they are confidential. Generally the fact that the TBP data are usually a by-product of an authority not dedicated to such a collection of data explains the discrepancies from the suggested OECD approach.

Finally, it must be noted that no member state seems to consider any changes with respect to the TBP following the establishment of the Single Internal Market in 1993.

The Patents data are very similar for all the Member States and are published by the relevant international organisations (EPO, WIPO etc.) basically analysed. No system seems to exist for evaluating patents in the Member States except a descriptive one in Belgium.

The High Technology subject seems to involve a number of the countries which have research teams actively studying it and producing quite advanced papers. Obviously some of the Member States are not involved at all with the measurement of High Technology as they are still too involved in developing the subject as such. Germany is the only country producing a regular HT report, while Italy is considering starting the regular production of an HT report from the beginning of 1992.

A situation similar to that of High Technology applies to the subject of Competitiveness. About half of the Member States are actively involved with the measurement of Competitiveness, while others are considering starting work on the subject.

Finally, as regards Bibliometrics, which is a subject only very recently developed, most Member States do not possess the necessary infrastructure to produce regular statistical data. However, a lot of research work is carried out on the methodology of the subject, and quite a few specific studies have been produced by some of the countries. It must be noted that no country has developed a national bibliometrics database, and all the work carried out is based on data extracted from the well-known international databases. France is the only member state in the EC that plans to produce a regular bibliometrics report every six months.

ANNEX IV

First considerations about a future legal basis for regular R&D and innovation surveys in the European Union

1. Reasoning for a legal framework

There are several arguments for a legal framework:

A legal framework would give the whole field of R&D and innovation statistics a higher status and a priority in the allocation of money both at the national level and at the Community level;

Users need consistent and comparable information on R&D and non-R&D factors in the innovation process. This requires that R&D and innovation surveys are harmonised as far as possible;

Separate systems for R&D and innovation surveys increase the response burden for enterprises, which in the long run will hamper the development of both surveys;

The draft Regulation on structural business statistics, in particular the module for structural statistics in industry, already includes an obligation to supply annual information by NACE Rev.1 4-digit classes in mining, manufacturing, electricity and gas supply and construction on total R&D expenditure and total R&D personnel. The Regulation also gives the authority to collect other information on R&D and innovation. These variables could be defined in more detail in a separate module which could be an annex to the Regulation.

2. Extension of the scope

One could of course discuss if the framework should have a still larger scope, i.e. should cover the whole range of science and technology indicators, not only business surveys on R&D and innovation. These other indicators include patents, bibliometrics, technological balance of payments and trade in high tech products. Even if the Council Decision on the establishment of a multiannual program for the development of Community statistics on research, development and innovation covers the whole range of indicators, it seems to be difficult to include them all in a single legal framework, at least in the short run. The indicators are rather heterogeneous in terms of sources, degree of development or harmonisation. The need for such a broad framework does not seem to be very obvious for the moment. Therefore it is proposed, that the legal framework in the short run should cover only business surveys on R&D and innovation. The regulation on structural business statistics covers in principle also sections M to O of NACE Rev.1 (education, health and social work, other community and social service activities), which in some Member States are partly or wholly run by Government bodies and financed by the Government budget. Data collection from units of these sections might follow later. The proposed legal framework for R&D and innovation surveys could therefore in principle also cover activities in these sections. To achieve conformity with the sectors in the Frascati manual and existing practise, general administration (section L) has to be included as well.

3. Problems to be solved

To decide which variables should be covered by the legislation and what should be the frequency of harmonised data collection at the Community level.

In many Member States detailed data on R&D have until now only been made available for every second year. Data on innovation have until now been collected at an ad hoc basis at even longer intervals. In the future, there seems to be a need for annual data by industry on some core variables on R&D and innovation, both on the Community level and on the national level. The regulation on structural business statistics already includes a request for annual data on R&D personnel and R&D expenditure. This core could be extended to some general innovation indicators.

It is suggested that the more detailed R&D indicators such as expenditure by type and source of funds and R&D personnel by occupation or qualification as well as the regional breakdowns still are collected for every second year. Thus, present practise concerning detailed R&D surveys in many Member States would not change. Assuming that the efforts to make the question on innovation expenditure work in the future succeed, it is suggested that information on innovation expenditure should be collected for every second year in the future.

The Oslo manual includes a lot of other variables on innovation such as objectives of innovation, sources of information for innovation, barriers of innovation, R&D co-operation, technology transfer, patents, etc. As distributions according to these variables are not expected to change quickly, it is probably enough to have information on these on an ad hoc basis or at least not more frequently than with four years' intervals. As the field of innovation surveys is new and not yet fully established, flexibility is suggested for Member States to include these or other variables in innovation surveys according to their own needs and recommendations in international standards.

Finding an appropriate survey structure in the Member States

When the variables required and the frequency of data collection has been determined, an appropriate survey structure has to be found in Member States. The legal framework will not propose anything on that, but these practical aspects have to be considered in the preparation process.

Harmonisation of surveys

Innovation surveys have developed rather independently from R&D surveys which might be due to the fact that in many countries these surveys have been made by different institutions. Even if the methodological frameworks are intended to be rather consistent a legal framework for R&D and innovation statistics requires a closer integration of the two types of surveys than now.

4. Implications of the legal framework for the Member States

R&D surveys

- necessity to perform them in all countries at least every second year
- adjustment to recommended target population
- probably addition of some few questions on innovation
- development of the regional aspect of R&D surveys

Innovation surveys

- necessity to perform them in all countries at least every second year
- adjustment to recommended target population
- make R&D information from innovation surveys consistent with the information from R&D surveys, if necessary include questions on R&D expenditure and personnel
- adjust survey contents to revisions of international standards

5. Some other questions

The transmission of data to Eurostat has to be co-ordinated with the already existing reporting scheme to the OECD to avoid separate reporting to both organisations by Member States. The time delay of data transfer could be 18 months after the end of the reference year as in the module for structural statistics in industry. The same module also asks for a quality measure related to a confidence level of 95%. Such a measure could might be applicable also for R&D and innovation statistics.

ISSN 0254-1475

COM(96) 42 final

DOCUMENTS

EN 17

Catalogue number : CB-CO-96-055-EN-C

ISBN 92-78-00236-4

Office for Official Publications of the European Communities

L-2985 Luxembourg