

Analysis of the different European systems for producing indicators

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Abbreviations used

CEST: Centre for studies on Science and technology

CINDOC: Centre for information and scientific documentation

CSI: Community Survey of innovation

ENIP: European network of indicator producers

FhG-ISI: Fraunhofer ISI

HERD: Higher education and research and development

IFO: Institute for Economic research

KOF: Institute for Business Cycle Research

NIFU-STEP: Norwegian Institute for Studies of Research and Education and the Studies in Technology, innovation, and Economic Policy

NPO: National patent office

NSO: National statistical office

NESTI: National experts on science and technology indicators

OST: Observatory for science and technology

OCES: Observatory of science and higher education

OECD: Organisation for Economic co-operation and development

R&D: Research and development

SCI: Science citation index

S&T: Science and technology

ZEW: Center for European Economy research

Introduction

The production of S&T indicators is an essential act of the R&D policy. It allows giving views on the national S&T position in the European and international contexts, measuring the performance of the different actors of the R&D national system, and finally analysing the different components of the systems. In other words, it gives reality and objectivity to the national policy (i.e. see Porter, 1995). This is the reason why the industrial countries have measured S&T for more than 80 years (Godin, 2005) and why the success of these tools is still on-going. The role of intergovernmental institution such as OECD has been major for accompanying and even directing these national efforts by producing methodological manuals (Frascati, Canberra and Oslo manuals) but also by constituting a network of national correspondents. This resulted in the building of statistical competences in S&T, often embedded in the national statistical offices, and the capacity of performing surveys on R&D at the national level.

But the times and the needs have changed. Aside the continuous needs of national ('macro') indicators on S&T, the demand for indicators of follow-through and effectiveness in research originates for the most part from the ends of the system, which are mainly institutions or programmes. In parallel, the better understanding of the R&D and innovation system appeals for more developed and detailed methods to

analyse it. For answering these demands, some countries implement new structures, more specialized in the collection of non OECD data and the building of non OECD indicators. One of the objectives of the ENIP¹ project has been to perform an inter-country comparison of the structures involved in the collection of S&T data² and the production of S&T indicators. This allows ENIP performing a benchmarking of the practises and identifying tracks for building a European platform of indicators.

During the first phase of ENIP project, ten national reports³ have been produced presenting the synthetic characterization of the national R&D system, the overall description of S&T data produced and available, and the description of the main data and indicator producers in each country.

Built on these national reports, the paper analyses here the different systems for producing indicators.

In its first part, it emphasizes on the following points:

- the persisting central role of national statistical offices (NSO) for producing input data of 'Frascati' type and the relative government dependency of related indicators;
- the multiplicity of the sources of 'non Frascati' input data but the lack of structure collecting and aggregating such other data;
- the diversity of institutions in charge of innovation surveys
- when existing, the relative independence of institutions producing output indicators.

In the second part, the paper appreciates the capacity of the countries to design, build and produce indicators on two criteria:

- the realization of a national report of S&T indicators which is not limited to the supply of statistics tables but gives a comprehensible analysis of the research system;
- the proximity of the producers of indicators with activities in science policy research and economy of innovation, which is an essential condition for designing new indicators answering to the R&D policy related topics.

Lastly, it describes and compares three original European structures which are specifically dedicated to produce S&T indicators.

In the conclusion, we make proposals allowing the systems of production of indicators to evolve and to satisfy better the request of indicators displayed by the decision makers and the actors of R&D.

Results

¹ ENIP : European Network of indicator producers, project developed in the European Prime network of excellence

² We distinguish 'input data' concerning mainly financial and human resources, and 'output data' concerning S&T production such as patents, scientific publications...

³ see ENIP country reports on ENIP web site (<http://www.enip-europe.org/>)

1. The general organization of the production of indicators in ten Member States and Associated members of the European Union

Within the framework of the project 'ENIP' of the network of excellence Prime, a national survey was carried out in seven member states of the European union (Austria, France, Germany, Hungary, Italy, Portugal, Spain) and in three associated states (Norway, Switzerland, Israel) for :

- 1) Identifying and characterizing the S&T data available
- 2) Describing the structures which are responsible for data-gathering and production of indicators on R&D.

These national reports were used as a basis for our analysis of the structural organization of the production of S&T indicators. More precisely, we used 5 types of data which make it possible to build indicators recognized as characterizing the systems of R&D and which present different characteristics.

The first are what we called the data of the 'Frascati type', i.e. data of input (expenditure and human resources) collected according to standards' of the Frascati Manual (OECD, 1963, 2002). This first type thus relates to typical OECD products, and the data are obtained by means of national surveys carried out preferentially every year and whose results are communicated to OECD. In other words, these data have a quasi obligatory status and their production is mainly due to the will of international comparisons (Godin, 2005).

We distinguished a 2nd group that we call the 'non Frascati' input data. This second type relates to a multitude of data on the research funding and human resources which do not enter within the framework of the national surveys. These data are subject to specific collection which can be exhaustive or not. One can estimate that the existence of such structured bases reflects a voluntary investment in tools for strategic monitoring. We also looked more precisely which are the organisations responsible for data collection on public research project funding and if a specific institution is responsible for gathering this type of data. This choice was also made in order to propose new tracks of strategic indicators. That gave place, within the framework of ENIP, to another project whose results are published elsewhere (Lepori, 2005).

The 3rd group includes the indicators on the innovation produced precisely by the CIS survey (community innovation survey) which are extremely widespread today in the European Union (European commission and Eurostat, 2004). The CIS which follows the recommendations of the Oslo manual (OCDE, 1992, 1997) was implemented by the European Union and Eurostat.

These investigations are carried out every four years, the third and last published having been realized in 2000/2001. It thus acts as a major tool for production of statistics and indicators on innovation in Europe, which like the national surveys, tends to institutionalize itself but more recently. These indicators are subject to recurring debates, and not very clear definitions (Tether, 2001; Godin, 2005).

The 4th group concerns output data. It relates to the data on the patents, whose corresponding indicators constitute a proxi to measure the technological performances of a country and the output of the innovation (Griliches, 1992, Narin,

1994).) The levels of analysis are quite different according to whether one considers the national patents or the European or American patents, even triadic families of patents. The corresponding databases are initially held by the offices of patents; the database of triadic families of patents⁴ is a product of OECD.

Finally the scientific publications make it possible to build indicators on the science produced by the actors of a country. Many studies showed the importance and the advantages of the science bibliometry to characterize the scientific production (see the 'historical' papers, De Sola Price, 1978, Elkana et al., 1978, Narin, 1976, 1978, and also Van Ran, 2004). For these indicators, we deliberately chose to identify the organisations having the international Science citation index (SCI) base of reference, - which is produced by the private company Thomson scientific-ISI – instead of other international or national bases which can be of various interests, in particular with regard to the social sciences. SCI database is acquired by financial transaction with the private company which holds it. Thus we estimated that the use - and the expensive acquisition – of the SCI database is reflecting the will of a State to provide itself with tools to produce indicators of scientific performance and also to develop a capacity of interpretation of these indicators.

Table 1: Main producers of S&T data and indicators according to the type of data

Countries	Input data		Innovation data (CIS)	Output data	
	Frascati type (national surveys)	non Frascati type		Patents	Scientific publications (SCI database)
Austria	NSO	Ministries Austrian national Bank Research actors	NSO	NPO	
France	Statistic unit and delegated body of NSO in the Ministry of HERD	Ministry of HERD Research actors	Ministry of industry	NPO Specialised public institute (OST)	Specialised public institute (OST)
Germany	NSO Private organisation (Stifterverband)	Ministries (Education, Research, Labour, Economics...) Funding agencies Private institute	Public institutes (FhG-ISI, ZEW, IFO...)	NPO Public institute (FhG-ISI)	Public institute (FhG-ISI)

⁴ Triadic families of patents are sets of patents taken at the European Patent Office (EPO), the Japanese Patent Office (JPO), and the US Patent and Trademark Office (USPTO) that share one or more priorities.

Hungary	NSO	Ministry of education Various institutions	NSO	NPO	
Israel	NSO	Ministry of finance Research actors	(No regularly)	NPO	
Italy	NSO and statistic unit of ministry of Education, university and research	NSO Research actors Ministries Dedicated consortia	NSO	NPO Ministry of industry	
Norway	NSO Specialised public institute (NIFU/STEP)	Public dedicated institutes (included NIFU-STEP) Research actors	NSO	NPO	
Portugal	Dedicated department and delegated body of NSO in the Ministry of science, innovation and HE (OCES)	OCES Research actors	OCES	NPO	
Spain	NSO	Ministries	NSO	NPO	Dedicated public institute (CINDOC)
Switzerland	NSO	NSO Ministries Research actors	Public research institute (KOF)	NPO	Dedicated public institute (CEST)

Note: this table shows only the main producers of regularly collected data and the main producers of S&T indicators

If we look at the producers of S&T data and indicators, we observe great differences depending both on the type of data produced or gathered and on the country (table 1).

With regard to the Frascati input data, all countries except Norway, entrust their collection to the national statistical office (NSO) or, in two cases (France and Portugal) to ministerial delegation of the NSO. This result is not unexpected and is confirming what B Godin (2005) indicates elsewhere: "In S&T statistics, officials have won over academics". As just mentioned, France and Portugal present an alternative to this organization. In these two countries, structures dedicated to the S&T statistics have been established as a department of the ministries concerned. These structures (called Observatory of science and higher education - OCES - in

Portugal and department of evaluation and foresight in France) received delegation of the national office of statistics to produce these data. In other words, they are products of these national offices. Norway is displaying an original system since the collection and the processing of input data of the Frascati type are shared between the national office of statistics (with regard to the industrial sector) and a public institute of research, NIFU-STEP (with regard to the public sector).

In all but one country, the national offices of statistics or their ministerial counterparts represent the States at OECD and take part in the group of National experts on science and technology indicators (NESTI) and in the corresponding ones of Eurostat. In Norway, this role is played by NIFU-STEP.

For non Frascati input data, the situation is much more complex. There we can see a large variety of data producers: statistical offices still but also ministries, funding agencies, research operators (universities, research organisations), and public institutes such as NIFU-STEP in Norway.

For a better characterization of the producers of this type of data, we concentrated on the data of public research project funding by considering that their knowledge and their analysis currently constitute a new essential strategic tool for the decision makers and the funding agencies. Table 2 shows the structures responsible for data acquisition and if ever the organization centralizes, harmonizes and organizes these data.

Table 2: Organizations collecting the data of public research project funding

Countries	Organisations collecting data	Organisations assembling data	Comments¹
Austria	Research organisations Funding agencies Ministries	No	Incomplete information about direct project funding by government
France	Research organisations Funding agencies Ministries	No	Incomplete information about direct project funding by government Lack of data on Higher education
Germany	Ministries Funding agencies	Partly yes (Ministries)	Existing database on project funding by ministries
Hungary	Research organisations Funding	No	Incomplete information

	agencies		
Israel	Funding agency, Ministries	No	Incomplete and irregular information
Italy	Research organisations, ministries, NSO	No	Scattered and fragmented information
Norway	Funding agencies Ministries Research organisations	No	Data not always suitable Lack of data on Higher education sector
Portugal	Delegated body of NSO (OCES) Funding agencies	No	Many existing databases
Spain	Research organisations Ministries	No	Fragmented information for detailed data
Switzerland	Funding agencies NSO Ministries	Yes (Swiss science council)	Good project funding data Lack of data on Cantonal funding

¹ Comments are issued from the national reports

Even if the national surveys on R&D make it possible to have knowledge on the project funding of the public research institutions, this one is largely partial. Table 2 shows that many actors hold data on the project funding. They are generally the funding organisations (science councils, agencies, charities...), but also the research organisations. But the large majority of the ENIP national reports indicate that these data are often incomplete, that they cannot be aggregated and that there is not database centralizing them. Aside, it must be noted that the knowledge of the regional research funding scheme is very often incomplete.

As a consequence, the States have no possibility to establish exactly the importance of the funding on research contract - however strategic in term of research policy (Guston, 1996) - and are therefore unable to characterize them in terms of sources (government, public agencies, NGO, regional, international etc.) or of allocation (by disciplines, themes, sectors, actors, etc.). All occurs as if the States were paying attention in their own finances whereas for a long time they are not any more the exclusive provider of public research.

The Community innovation survey is relevant for various operators according to the countries. The majority of the European states (Israel does not carry out its equivalent survey regularly) entrusts it to their statistical office. Two countries

(Portugal and France) have it realized by ministerial statistical structures. In Portugal, the OCES attached to the ministry of science and higher education and which centralises the S&T statistics is also in charge of the CIS. France has it realized by a unit of the ministry for industry - whereas it is the specialized department of the ministry of research and the higher education which has the responsibility for the national R&D survey on the business sector. Lastly, in two countries, Switzerland (which carries out a survey comparable with the CIS) and Germany, specialized research institutes are responsible for the innovation survey (respectively KOF - Institute for Business Cycle Research - and ZEW - Center for European economic research). These two countries thus constitute an exception by delegating to research organisation a survey of national range. The case of Germany is coherent with the realization of national reports (see hereinafter) delegated to research institutes.

With regard to the patents, the table is simpler. In all the countries of the sample, the national office of patents holds the corresponding patent database. The great majority uses readily indicators of OECD on the international patents (European, American, Japanese, or on the triadic families of patents). Two exceptions must be noted, France and Germany. Indeed, in France, a nongovernmental public institute, the OST (Observatory of sciences and technology), possesses the French and European patent databases and has the capacity to build indicators starting from these bases. In Germany, a research institute, Fraunhofer-ISI, uses the available sources of patent data and possesses some in-house selected databases (i.e. for selected technological fields) for producing indicators.

The capacity of the countries of the sample to build bibliometric indicators is more moderate. Some of them (i.e. Norway, Austria) call upon the SCI database producing company (Thomson scientific-ISI) to buy national reports. Only four countries out of ten developed more or less internal capacities of production of bibliometric indicators : France, Germany, Spain and Switzerland. In these cases, the competence is held by nongovernmental institutes and in no case by the national offices of statistics which, like OECD, do not make a positive assessment on the bibliometry. This characteristic is mainly related to the non statistical nature of the data collected by a private firm. It leads to a couple of remarks. On the one hand, very few countries of the study made a – true - financial and technical effort to develop such a tool. On the second hand, it is seen still there that only the field of non OCDE data is accessible at institutions which do not depend on the statistical offices and which are not always directly dependent on the government. This remark is very important to consider in the scenarios aiming at some evolution of the system.

2. The capacity to build indicators

The capacity for an administration to use indicators will depend not only on its capacity to produce data, but also to put these data in an interpretable form. Beyond simple statistical series, even if those for certain authors can constitute already indicators (Godin, 2005), the production of indicators requires to build and interpret the data in the national context of the R&D system and beyond taking into account the nature of the science policy.

In order to evaluate if such capacities are available in the studied countries, we used two criteria: on the one hand, the capacity to regularly publish a national report of

indicators of S&T which is beyond the compilation of statistics on the S&T. In other words, that means report which allows the quantitative and comparative analysis of the national R&D system in the European and international contexts. One can suppose that the production of such a report requires a certain distance with the administrations concerned. The second criterion used relates to the proximity of the indicators producing institutions with the scientific community involved in science policy and innovation. Indeed, this criterion makes it possible to measure indirectly the capacity to interpret the indicators, to make them evolve while developing some new ones, and finally to carry out strategic analyses using them.

Table 3 indicates for each country if a national and periodic report is produced and, if necessary, gives indications on the contributors, the editor, the periodicity, the language and its Internet access.

Table 3: Production of periodic and comprehensive national report on S&T indicators

	Report	Contributors	Editor	Periodicity	Date of creation	Language	Available on web site
Austria	National report on science and technology	Consortium of research institutes (tip)	Public (Ministry)	Yearly	2001	Austrian English (2004)	Yes
France	Indicateurs de science et de technologie-rapport de l'OST	Independent public institute (OST)	Private (Economic)	Every two years	1992	French	No
Germany	Germany's technological performance	Consortium of research institutes (Tip working group)	Public (Ministry)	Yearly from 1999-2002, then 2005	1999	German, English	Yes
Hungary	No	-	-	-	-	-	-
Israel	No	-	-	-	-	-	-
Italy	No	-	-	-	-	-	-
Norway	Report on S&T indicators for Norway	Independent public institute (NIFU-STEP) National statistical office	Public (research council of Norway)	Every two years	1999	Norwegian, English	Yes
Portugal	No	-	-	-	-	-	-
Spain	No	-	-	-	-	-	-
Switzerland	No	-	-	-	-	-	-

Among the ten studied countries, less than one half regularly publish a report which corresponds to the established criteria (periodicity, analyzes, production of original indicators, international comparisons) : Austria, France, Germany and Norway. The point common to these four countries is that the report is carried out by one or more structures independent of the government.

In Austria, the production of the report (Österreichischer Forschungs und Technologiebericht, 2004) is delegated by the public authorities to a consortium of qualified laboratories (TIP working group). The contents of the report - and its conclusions – are made under their sole responsibility even if the report is published by the government.

It is also the case of Germany which beside the official report presenting statistic table on research and innovation (Federal Ministry of research and education, 2005) publishes an analytical report on the technological performances of the country (Federal Ministry of research and education, 2001). This last report is carried out under the full responsibility of some research institutes.

In the case of Norway and France, the national report is produced by an institute dedicated to and specialized in the indicators.

In France, the OST, a public but non governmental institute, produces every two years a report under its own responsibility (Esterle and Filliatreau, 2004). This report is directed and signed by the director of the OST, and it is published by a private editor. It is not translated in English language and is not accessible on line, which is partly related to the fact that it is published by a private editor.

In Norway, the NIFU-STEP has the responsibility to produce the national report in collaboration with the statistical National office concerning the indicators relating to the private sector. This report is published by the Research council of Norway (Research council of Norway, 2003).

In these four cases, the producers have the theoretical and probably real capacity to be autonomous and can assume their own analysis of the results. In other words, in the sample observed, less than one half of the countries set up a device which allows the production of a fully independent report.

With regard to the proximity of the S&T indicators producers, several situations can be met.

In France and Norway, the specialized agencies in the production of indicators have the mission of developing activities of R&D on indicators (NIFU-STEP in Norway, OST in France) and have internal capacities in science policy (NIFU-STEP).

In other countries, a number of research organisations can be involved in the analysis and the production of more specific indicators. This is possible thanks to the existence of a quite official network of research institutions (Fraunhofer- ISI, IFO, ZEW... for Germany, TIP working group for Austria) to research groups or groups

strongly related to the research which are specialized on a certain type of indicators (IKU in Hungary, SNI in Israel, CINDOC-CSIC in Spain, KOF in Switzerland).

Elsewhere finally (i.e. in Portugal), the intervention of research groups seems less obvious.

Two remarks are essential. First of all, there is a national specialization of the research laboratories which intervene. Thus in Germany, the network of institutes is strongly directed towards the innovation and technology. France puts the accent on bibliometry. Then, the intervention of the research groups or groups related to research concerns output indicators (scientific publications in particular, patents, data on innovation) or of non OECD input ones. The existence of official and perennial links between the national offices of statistics and the scientific community of science policy seems much more difficult, in so far as the ENIP survey made it possible to identify them.

Finally, one can thus distinguish two groups of countries:

- For six countries, the production of indicators is mainly the fact of the statistical offices or their equivalent. In these countries, the link with research is (still) weak and it does not exist national report which authorizes a thorough analysis of the results.

- In four countries, a real effort has been made to diversify the production of the indicators, to autonomies regarding the State and to bring it closer to the scientific community.

These two categories are probably relevant of the different uses of the indicators and of the importance that one grants to them. Either they constitute simple management tools and answer mainly the international requests, and in particular those of OECD; or they are regarded as an important part of the strategic tool box and require special means to be developed.

3. Case figures

In the last part of this article, we describe and compare three structures dedicated to produce S&T indicators in the European countries: the Portuguese OCES, the Norwegian NIFU-STEP and the French OST. These structures make it possible to define organisational models which can be useful to put forth recommendations at the level of the European countries and European union.

The following table summarizes the main characteristics of these organisations.

Table 4: characteristics of three S&T indicator producers

	OCES	NIFU-STEP	OST
Country	Portugal	Norway	France
Date of creation	2002	2004	1990
Administrative statut	General directorate of Ministry of science and higher	Public research institute	Public institute

	education		
Links with national statistical office	Delegated body	Sharing of competencies and co-operation	Cooperation
Links with administration	Yes, functional and structural	Not specially	No, only cooperation
Databases available	R&D funding and human resources, HE, PhD, innovation, project funding...	Total R&D resources, R&D resources for universities and non universities research institutions, PhD, innovation...	National and international input database, SCI, national and European patents
OECD member	Yes	Yes ?	No
Research activities	No	Yes, on indicators and science policy	Yes, On indicators
National report	Yes but statistical tables only	Yes with comprehensive interpretation of the results	Yes, with comprehensive interpretation of the results
Website	www.oecs.mies.pt	www.nifustep.no	www.obs-ost.fr

HE : higher education

3.1. OCES, a specialized department of the ministry for science and higher education

OCES was created in 2003 by the government like one of the general directions of the Ministry for science and higher education. OCES is also the organization delegated by the national office of the statistics to produce the statistics on S&T. In fact, OCES is a very dedicated body which holds the quasi exclusiveness in the data on science and technology in Portugal. OCES is thus responsible for the realization of the national surveys of R&D for the public and for the private sector as well. It also holds many data on higher education (on higher education personnel, students, PhD...) and has a database on the research projects financed by the public sector. OCES is also responsible for the surveys on innovation, even if the 3rd CSI was outsourced in a research centre. Lastly, this observatory carries out the surveys on public understanding of science.

In fact, the OCES is in a situation of quasi monopoly with regard to the statistics of S&T in Portugal.

The OCES produces a national report (OCES, 2003) but this one is presented in the form of a traditional compilation of statistics tables without real interpretation, nor analyzes.

Even if it has autonomy, the OCES is a full member of the ministry for science and higher education, and does not have any activity of research by itself. It represents Portugal at OECD and Eurostat. In comparison with the other countries of the study, the OCES is close to the direction of evaluation and foresight of the ministry for research and higher education in France but with widened activities, in particular with regard to the innovation. However, France has another instrument to produce indicators on S&T (OST, see hereinafter). OCES has the advantage of gathering in the same place the competences on S&T indicators and has a good visibility. However its relationship to the governmental authorities deprives it of autonomy as regards interpretation, as it is illustrated by the report it publishes.

One can say that the OCES is the successful model of a delegated statistical system but which remains official and depends on the governmental structures.

3.2. NIFU-STEP, the alliance of the statistics and research

Research institute in innovation, research and education, NIFU-STEP resulted in 2004 from the merger of the Norwegian Institute for Studies of Research and Education and the Studies in Technology, Innovation, and Economic Policy. NIFU-STEP has the responsibility for collection, development, maintenance, processing, interpretation and dissemination of statistics and indicators to provide the basis for understanding of the overall R&D system in Norway and Norwegian participation in international European and research co-operation. NIFU-STEP has also the responsibility for preparing official statistics on R&D resources in universities, colleges and research institutions in Norway. In a complementary way, the national statistical agency provides the R&D statistics for the industry.

NIFU-STEP has the responsibility to compound the sets of sector statistics into comprehensive R&D statistics for Norway, and to deliver R&D statistics to the different international organisations (included OECD and Eurostat) and agencies. Every 2 years since 1997, NIFU-STEP produced a complete report on S&T situation in Norway with international comparisons. This report published by the Research Council of Norway includes comprehensive interpretation of the figures.

NIFU-STEP thus has the monopoly of the production of indicators and studies on the S&T in partnership with the statistical office. It is independent of the governmental structures and very near to the activities of research since NIFU-STEP is a research institute directly involved in science policy and in innovation.

The Norwegian model is thus presented in the form of an independent and quasi monopolistic deputy system, with the inherent disadvantages.

3.3 OST, an independent producer of indicators

OST was created in 1990 with the mission of producing S&T indicators. It has the status of 'group of public interest': it is thus an organization independent of the administration but associating the main French research actors. It has the characteristic not to be a producer of data. In other words, it acquires the national and international databases it may need. OST has developed specific competences

in the knowledge of a broad range of data, in methods and the knowledge to design and calculate indicators while combining given and original nomenclatures and finally in studies based on a set of indicators designed in coherence.

However it does not have any impact (or a very limited impact with regard to the national surveys) on the construction of the databases which it uses. Generally, it is markedly specialized on the output indicators and is one of the rare European organizations to possess a complete SCI database for bibliometric analysis.

It has intrinsic activities of research on the indicators and works in co-operation with the French and European community of science policy.

Every two years, it produces a bulky report which describes R&D not only in France but also in the European Union, European regions and the rest of the world. The report consists of tables of indicators - of which some are original- with accompanying notes in a comprehensible way. This report is published by a private editor under the sole responsibility of OST (Esterle and Filliatreau, 2005).

OST constitutes the model of the independent producer of indicators, but it is dependent of existing databases, and therefore without any impact on them.

Proposals for the future

Since 2000 and within the framework of the strategy of Lisbon to promote the European research area (ERA) and to become the most competitive and dynamic knowledge - based economy of the world⁵, an important need for comparable indicators on R&D was acknowledged by all Member States. Many benchmarking works undertaken then by the European Commission⁶ confirmed this request and contributed to identify the requirements for new indicators making it possible to clarify current aspects of the R&D such as the human resources, the public and private investments in the R&D, the scientific and technological productivity and the effects of the R&D on employment and economic competitiveness. But these works were also useful of revealing that the existing indicators were not ready to answer the new concerns and that the States were seldom able to ensure the supply of data which do not concern official statistics. By way of example, among the list of the 20 basic indicators established to allow a broad comparative overview of the performance of the member states, the data of the five new indicators never could be completed. The study that we carried out with ENIP on seven member states and three associates countries of the European Union makes it possible to bring some explanations.

⁵ Communication from the commission: investing in research: an action plan for Europe (SEC(2003) 489

Communication from the Commission to the council, the European parliament, the economic and social committee and the committee of the regions: towards a European research area, COM(2000) 6

⁶ see website of Cordis on Science and technology indicators for the European research area (www.cordis.lu/indicators/projects_era_benchind.htm) and the website of the European commission on STI indicators ([//europa.eu.int/comm/research/era/sti_en.html](http://europa.eu.int/comm/research/era/sti_en.html))

Indeed, in the majority of the countries studied, the production of S&T data and indicators concern mainly the national office of statistics or a delegation of this office attached to the Ministry concerned. In this last case, one can estimate that the production of the statistics is closer to the request of the decision makers.

In four countries out of ten, a significant investment was made to install a structure or to establish partnerships making it possible to develop non OCDE indicators - and in particular output indicators - and to invest in research in this field. The most original cases are probably represented by those of Norway and France. In the first case, an institute of public research has the mission of collecting the data and to build indicators on R&D; in the other case, a public institute has the role of building indicators, with a real investment on those of output, starting from existing databases. These two institutes have the capacity to develop R&D activities on indicators and to innovate in the field. But the case of Germany is also interesting because it shows how research institutions can come to complete the role of the official bodies.

At last, one can thus see that 1) as described elsewhere (Godin, 2005), the investment gives priority to the input data to the detriment of output data, in particular of the bibliometry, thus following the OCED line; 2) the investment in the production of strategic indicators seems generally weak. Thus the produced indicators remain very macro-economic and can give only one very general overview, whereas the States but also the actors need indicators which contribute to enlighten them in a dynamic and analytical way. All happens as if the States were equipped only with tools for management and international positioning but not for strategic analysis and decision-making aid.

In this direction, the example that we have chosen concerning the relevant question of the project funding is enlightening because it shows that with rare exceptions, there is neither possible centralization nor aggregation of the data which are collected mainly by the funding bodies and the actors concerned.

There is here a true paradox: on one side the expression of a need for indicators like strategic tools and on other side a lack of political good-will to obtain the means to build these tools. In a way, these finding are also true for the European Union. Besides Eurostat which is the European equivalent of the statistical offices and which builds the indicators of R&D in close cooperation with OECD, the European Union does not have common means to produce indicators. Thus the realization of the very complete European report of indicators on the S&T (European commission, 2003) consists each time of a unique enterprise calling upon punctual partnerships without dedicated tools being developed for the long term.

How to make this organisation evolve for the States and the European Union if it is estimated that other data than OECD standards and new indicators are necessary for the follow-up and the evaluation of the R&D policies? We make two proposals here. In both cases, they are based on the creation of a 'European agency'⁷ which would be independent of the administrations and of the national and European statistical offices. In both cases, one of the objectives would be to draw up a full and periodic

⁷ This agency could be located within an existing establishment. Thus, the IPTS could be a good candidate to host it.

report on the S&T in Europe and to enable all Member States to develop a similar product whose structuring role is essential.

In the first scenario, the agency would not set up databases and its principal role would be to encourage the Member States 1) to develop structures and means to improve the national systems of indicator production 2) to work out specific tools for interpretation of their national R&D system and 3) to put them in prospect within the European framework. The agency would function then while being based on an established network of national bodies some of which would be entrusted permanent missions: to deliver output indicators because such or such structure possesses the corresponding databases and methods, and also to provide non OECD and new input indicators starting from data provided by the Member States or even directly by their organisations. Along this line, this agency would function like a cooperative structure, and it would associate the Member States and their organisations in the coordinated production of indicators with regard to them.

It would also establish partnerships and contacts with the scientific community of science policy and the economy of the innovation⁸. This agency would also have the role of facilitating the exchanges of knowledge and methodologies in the field of the indicators.

The second proposal would be more centralizing since this agency would have then the capacities and the means to constitute or acquire databases and to produce the European indicators directly. As the European platform of indicators, it should obtain important means to acquire existing bases, in particular those of output (patents, publications). Such an agency should have in-house capacities of R&D on the indicators while developing a narrow partnership with the scientific community of science policy.

In the two proposals and in particular in the second, the financial investment is important. In our opinion, the first proposal has the advantage of helping the States to develop their own means. In both cases, the distance from the agency with the official and administrative structures is the *sine qua none* condition of its independence and, in fact, of its capacity of analysis. Obviously, it would be in narrow partnership with Eurostat but the roles would be quite distinct.

In addition, this agency will have to pay much attention to the needs expressed not only by the decision makers but also by other users: funding agencies and research actors.

Indeed, a point to be taken into account is the increasing need to equip the European Union with capacities of evaluation at the infra national (regional and organisational in particular) level. For this reason the work completed within the framework of Prime on the Observatory for the European universities is particularly enlightening (Schoen, 2005). It shows that it is the responsibility of the universities themselves to have their own instruments but that a coordinated methodological

⁸ This one is currently well represented by the European Networks of Excellence Prime (Policies for Research and Innovation in the Move towards the European Research Area) and Dime (Dynamics of Institution and Markets in Europe).

effort is essential. That could be the role of such an agency to be at the service of the European organisations by organising working groups implying the actors and by working out methodologies and common protocols authorizing intra European comparisons.

Other solutions are probably possible, whatever that may be, the "paradox of the indicators" will end only when the Member States and the European Union itself give signs that the investment is necessary. It is at this price that the demand for indicators informing and enlightening the decision makers and also the actors on the R&D main issues will cease being a political claim and start to be satisfied.

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