Research Evaluation as a Policy Design Tool: Mapping Approaches across a Set of Case Studies

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Summary

This paper provides an overview of research evaluation practices across countries. The main aim is to investigate whether research assessment is implemented and to see to what extent its results are used to revise policy strategies, identify new research priorities, allocate financial resources or enhance public understanding of R&D. The paper addresses a set of cases studies, four within Europe (UK, Finland, Italy, and Spain) and two outside (US and Japan). Each case study provides an outline of the strategies devised to improve the domestic science system; offers a map of the main actors of science policy and introduces the main performers of research assessment. A short overview of how evaluation is approached at European level is also given. The study shows that approaches vary significantly from case to case and that it is not always possible to identify a clear research evaluation framework. In some cases, new strategies have been devised to improve the research system and the process of renovation has affected the structure and the role of research assessment. Overall, official documents across countries emphasise that research evaluation is not a means in itself, and call on its use as a policy design tool. However, very few cases of "management by results" can be identified. The success of research evaluation practice is always tied to strong cultural support and it is where research assessment meets with reluctance and mistrust that it yields no fruit. The absence of an "evaluative culture" is the main obstacle to an efficient research evaluation system.

Keywords: Research Evaluation Systems, Management by Results, Evaluative Culture, Research Policy, Policy Planning

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Introduction

The European Council held in Lisbon on 24th March 2000 set the strategic goal for the European Union "to become the most competitive and dynamic knowledge-based economy in the world". Amongst the measures envisaged to achieve this objective, is the boost on science and innovation, which contribute significantly to economic growth and social welfare. The Lisbon statement was reiterated at the European Council held in Barcelona on 15th-16th March 2002, when it was decided that "the overall spending on R&D should be increased with the aim of approaching 3% of GDP by 2010". These European objectives have brought national research policies in the spotlight. Over the last years, European Councils have urged a reform of domestic R&D systems, which in most cases proved unsatisfactory to meet the European targets. European Councils have also advocated reforms in the field of research evaluation. "Evaluation is important in a results-oriented environment because it provides feedback on the efficiency, effectiveness and performance of public policies and can be critical to policy improvement and innovation. In essence, it contributes to 'accountable governance'" (PUMA: 1998, p.1). Building on the significant progress made in implementing the Lisbon strategy, the European Council held in Brussels on 8th-9th March 2007 called on Member States and EU institutions to "create better framework conditions for innovation and greater investment in research and development".

The definition of an adequate research evaluation model is on the national political agenda both within and outside Europe. Within Europe, many member States pursue actions to restructure or reinforce their national research evaluation procedures. At European level, in 2000 the European Commission launched the vision of a European Research Area (ERA)[1] under which national research policies are assisted and co-ordinated in their renovation efforts. Outside Europe, the US and Japan no longer take their leadership in R&D performance for granted, and are engaged in similar processes of reconstruction.

This paper provides an overview of research evaluation practices across a set of case studies. The main aim is to investigate whether the results of evaluation are used as a policy design tool to identify research priorities, allocate financial resources, or enhance public understanding of R&D. The focus is on a set of cases studies, four within Europe (UK, Finland, Italy, and Spain) and two outside (US and Japan). Each case study provides insights into the national research system and offers a map of the main actors of science policy and of research evaluation. A short overview of how evaluation is addressed at European level is also given.

The case studies rely basically on the most recent literature and on information published on the Internet. In some cases, it has not been possible to carry out in-depth analyses because the information was only partially disclosed, not updated or not available in English. Limited data availability has been interpreted as reflecting the weak place that research evaluation plays in the science system. In other cases the national science system is informed by a policy of transparency. The information uploaded on the Internet and circulated to the public was in these cases comprehensive and sufficiently detailed.

[1] For further information see the ERA web site at http://ec.europa.eu/research/era/index_en.html.

The case studies: an overview

Over the last two decades, many OECD countries have taken actions to renovate their national science system. Some of them are decentralising responsibilities (e.g. Spain); some are privatising public agencies and setting up independent research bodies (e.g. the UK and Japan); others are engaged in reforms aimed at rendering the public research sector more independent (e.g. Italy and Finland).

Although the approaches vary a lot across countries, three common features can be identified: i) more autonomy to universities, ii) enhancement of central coordination; iii) increased cross-country and international benchmarking, including more attention to the recommendations made at European level (e.g. by the European Councils Presidency conclusions).

The re-organisation of national science systems affects the role and the use of research evaluation. Evidence shows a lot of variance in the level of sophistication of research assessment models. In some countries, the evaluation of scientific research is a relatively new experience (e.g. Italy and Spain). In some others, it represents a more consolidated feature of a broader approach that subjects future policy planning to research performance. To some extents, this is the case of the UK and Finland.

A study conducted on public research systems across Europe clustered research evaluation systems in three groups (Senker et al: 1999):

- High-level evaluation practices conducted throughout the national research system (UK, France);
- The evaluation of scientific research as a steady priority within national research planning since the 1980s (Scandinavian Countries, Germany and Ireland);
- Limited evaluation activities undergoing redefinition (Italy, Spain, Portugal, Hungary, and Iceland).

In the following pages, we provide an overview of research evaluation systems across a set of national cases. The analysis shows that approaches vary a lot from case to case and that it is not always possible to identify a clear research evaluation strategy. This applies also to the policy use of evaluation practices.

1. United Kingdom

The UK research system is quite decentralised. Each government Department has its own R&D budget and is in principle free to allocate it. In this respect, the UK structure is similar to the United States' one: there is no single government R&D budget as there is, for instance, in France and Germany. However, the UK Research Councils and the Higher Education Funding Councils provide for a high degree of co-ordination at central level.

Research evaluation in the UK is quite advanced. The widely collaborative research community acknowledges the importance of monitoring progress in research. First endeavours in this field draw back to 1980-85, when the Science and Technology Assessment Unit was established within the Department of Trade and Industry (DTI).

1.1 Evaluation at central government level

At central governmental level, a first actor in research evaluation is the Science and Technology Assessment Office (hereinafter, STAO). STAO was established in the Cabinet Office with the role of i) developing assessment methods, ii) encouraging the employment of evaluation tools in all Departments, and iii) making sure that the results of evaluation are adequately employed. The Cabinet Office supervises STAO's activities and draws up evaluation guidelines. Following the need for improved appraisal of science performance, the first national guidelines for evaluation were released in 1987.

The Cabinet Office publishes an annual review of government R&D spending[2], aimed to allocate the departmental R&D expenditures for the following 3 years and to identify major improvements in research. The 2002 Spending Review, released on 15th July 2002, sets out the government spending plans for the financial years 2003-2004 to 2005-2006. The 2002 Spending Review revises the budget destined to science with the aim to improve scientific excellence[3]. In particular, it links the allocation of R&D resources to research performance. The accompanying Public Service Agreements (hereinafter, PSA), through which the Cabinet Office recommends a set the key improvements, identifies the performance targets that all Departments must accomplish in exchange for the investments received. As Martin considers, "researchers receiving public funds recognise that they have a duty to identify users and to help address their research needs" (Martin: 1999). The 2004 Spending Review sets new spending plans for the financial years 2006-2007 and 2007-2008. The 2004 Spending Review confirms the spending plans which have been agreed for the years 2005-2006 in the 2002 Spending Review.

On 19th July 2005 the Government started working on a Comprehensive Spending Review to be released in 2007. The Comprehensive Review aims to set the spending plans for the years 2008-2009, 2009-2010 and 2010-2011 and will represent a long-term and fundamental review of government expenditure over the last years.

1.2 Evaluation and the higher education research sector

The higher education sector in the UK is the main performer of basic research. In 1992, polytechnics obtained university status. Since then, they are often referred to as "new" universities[4]. The Higher Education Institutes (hereinafter, HEIs) are autonomous bodies and are, in principle, free to seek funding from different sources. However in the UK science system, both teaching and research activities conducted in HEIs are funded by national government flows. Most of their financial resources come from the "dual support system":

- The UK Research Councils, providing funding for projects, salaries of contract researchers, research training and research centres on a competitive peer-reviewed basis.

[2] The annual reviews are downloadable from the web link http://www.hm-treasury.gov.uk/spending_review/spend_index.cfm.

[3] The UK Research Councils receive new funding (e.g. a contribution of £120 million a year over 2002-2003 levels by 2005-2006), which is expected to take forward up-front research lines (e.g. stem cells, sustainable energy, rural economy and land use).

[4] To date there are about 120 university institutions in the UK, counting separately the colleges of the federal universities of London and Wales.

- The Higher Education Funding Councils, providing funding that is used mainly for academic salaries and research infrastructure via the Research Assessment Exercise.

1.2.1 Evaluation by the UK Research Councils

The eight UK Research Councils[5] (hereinafter, UK RCs) play a fundamental role in the domestic science system. Their remit is to fund basic research on behalf of the Office of Science and Innovation (hereinafter, OSI), the government office placed within the administrative domain of DTI.

UK RCs select research projects via traditional ex ante evaluations. At the beginning of each funding period, UK RCs allocate their funding resources upon competitive peer-review assessments. Prominent academics meeting in committees compile evaluation reports that have an evident policy impact: the reports inform the distribution of funds.

Although the selection process is quite consolidated, the need is felt for more systematic research evaluation procedures. In particular, it is often pointed out that the selection procedure should be streamlined and should be accompanied by the empowerment of programme officers (Georghiou in Laredo: 2001, p.273). Some UK RCs have established their own strategies. In a few cases the evaluations are based on bibliometric analyses and performance indicators. Their policy relevance is evident, for example when evaluation reports highlight the necessity to restructure or close a research Institutes. The evaluations of the Research Institutes include also site visits by peers and extensive reports.

On 13th February 2001, the grant-awarding UK RCs and the Council for the Central Laboratory of the Research Council (CCLRC) were evaluated. The results of the quinquennial review were published on 19th July 2001. A more comprehensive review was released on 4th December 2001. The review provided a positive outlook of the performance of the UK RCs, particularly as concerns their capacity to be innovative and make scientific progress. It also made some recommendations to enhance the performance of the UK RCs, amongst which is the need for them "to act as a single virtual Council, adopting common outward interfaces (…) except where there is a justified need to be different". Building on the review, the UK RCs have undergone a thorough structural renovation directed at enhancing their flexibility.

On 1st May 2002, the UK RCs were regrouped under a strategic partnership named Research Councils UK (hereinafter, RCUK). RCUK networks the independent research activities of the previously separated UK RCs. It helps them work in close co-operation with each other in scientific, strategic and operational terms. The objective of this approach is to enable the different Councils to work more efficiently and to boost the impact and effectiveness of their research. If successful, this is likely to affect favourably the whole UK research system.

There are also some attempts directed to ameliorate peer-review techniques. Over the last years, RCUK have funded different joint research programmes and bodies, such as the UK Research Office in Brussels. In 2004, the Government's 10-year investment framework for science and innovation called "Science and Innovation Investment Framework for the years

[5] Namely : Biotechnology & Biological Science research Council (BBSRC); Council for the Central Laboratory of the research Councils (CCLRC); Engineering & Physical Sciences Research Council (EPSRC); Economic & Social Research Council (ESRC); Medical Research Council (MRC); Natural Environment Research Council (NERC); Particle Physics & Astronomy Research Council (PPARC), and Arts and Humanities Research Council (AHRC). For further details visit the web site: http://www.rcuk.ac.uk/aboutrcuk/efficiency/opperform/service.htm.

2004-2014"[6] asked the Research Councils to simplify their funding processes and to streamline bureaucratic procedures. As a consequence, the Research Councils upgraded their internal efficiency by, *inter alia*, improving their own operational performance. In terms of evaluation, this has direct impact. Each Research Council publishes its own service standards and, most importantly, reports its research performance against them. The results are published in annual reports, which are publicly available on the RCUK web site[7].

1.2.2 Evaluation by the Higher Education Funding Councils: the Research Assessment Exercise

Academic research in the UK is assessed regularly through the Research Assessment Exercise (hereinafter, RAE), an ex post peer-review assessment of clear policy impact. Its main objective is to review the quality of public research to allocate public resources for the next research term. RAE is implemented every few years by the four Higher Education Funding Councils for England, Scotland, Wales, and Northern Ireland (hereinafter, HEFCE, SHEFC, HEFCW, and DEL NI), which operate under the Department for Education and Employment (hereinafter, DfEE). RAE is operational since 1986 and has now come to the eighth edition.

At the end of each funding period, each publicly funded university and higher education college in the UK submits an extensive report on their research activity for the past financial term. Although RAE is in principle voluntary, all performers of basic research in the UK apply for it, because this is the only viable way to receive funds for research activities. The information provided covers a five-year research period, and gives details on each area of research (e.g. staff, income, postgraduates, and context, research areas, publications.). RAE is based on a rating system that ranges from 1 (minimum score) to 5 stars (maximum score). Public funding is granted to the research institutions that rank highest in terms of research excellence.

The policy impact of RAE is evident. First, it is the most sophisticated tool for future budgetary design. It directs the distribution of public funds across Higher Education Institutes (HEIs) on the basis of their research excellence.

Secondly, RAE monitors regularly the quality of the research carried out by HEIs and helps identify points of strengths and weaknesses. Since 1986, it has provided an overview of how public research evolves during the years. For example, the 2001 RAE showed that the profile and international quality of the research carried out in universities and colleges across the UK have consistently improved since 1996.

Thirdly, the results of RAE are posted on the Internet[8]. Publicity of results has neared society to R&D and in particular has enhanced public understanding of R&D activities. It has increased the visibility of research activities and has explained how public funds are spent. Within HEIs, publicity of results has also spurred universities on benchmarking their performance across the country.

Evidence shows that RAE influences scientific performance both at national and regional level. At national level, it encourages universities to improve their research standards if they want to be selected for public funding. At regional level, it addresses the design of research

[6] For more information, visit the web site: http://www.hm-treasury.gov.uk/spending_review/spend_sr04/associated_documents/spending_sr04_science.cfm .

[7] For more information on the annual reports, visit the web site: http://www.rcuk.ac.uk/aboutrcuk/efficiency/opperform/service.htm.

[8] For more information, visit the web site: http://www.rae.ac.uk/.

policies. By way of example, the 2001 RAE recommended to pay more attention to research areas that are essential to policy development and professional practice. It made explicit provision for "measures aimed at building capacity and capability, and at reconfiguring existing areas of the research base, with a focus on the application of the research". In Scotland, this led to the establishment of the Research Development Foundation Grant (RDFG) and the Strategic Research and Development Grant (SDFG). The former is an agency responsible for funding research in the most promising area of research. The SDFG funds research with the aim to support national strategies and meet economic, social, health care, educational or other priority needs in Scotland and the UK.

For many years, RAE has been considered an example of best practice within the range of available evaluation models. However, part of the literature has lately considered that this procedure does not respond adequately to the needs of the UK science system. In particular, criticisms have pointed to some RAE methodological weaknesses (e.g. lack of objectivity, allocation of funds to conventional research to the detriment of innovative lines of research.). As Georghiou points out, there is a need to improve the effects of RAE to the financial sustainability of research (Georghiou in Laredo: 2001, p.273). This would favour an "increased funding stream to reward improved performance" (OECD Country Report, the UK: 2003, p. 22).

Some shortcomings were already evident in the 2001 RAE and general doubts have not been left unanswered. In June 2002, the four Higher Education Funding Councils commissioned Sir Gareth Roberts to conduct a review into the means by which research in the UK HEIs is assessed. The purpose of this review was to come up with an alternative model ensuring a more valuable and consistent distribution of public funds to research. The review provided different approaches to research assessment. The proposed models were made available to the wider research community, the funding bodies and stakeholders for discussion. This open process allowed identifying one preferred model, which was then presented as an option for implementation. The consultation process was launched in May 2003 and lasted until September 2003. The report proposed the following set of recommendations:

- The burden of assessment for institutions and assessment panels should be linked to the amount of funds the institution is competing for;
- Separate assessment of competences (e.g. the development of young researchers);
- More transparency;
- More involvement of non-UK researchers;
- Credible structures to ensure consistency of practice between panels;
- Flexibility for assessors to develop methods appropriate to their subject;
- Grade bands abolished in favour of a profile of the research strength of each submission, providing for a continuous rating scale;
- Controls on the scores awarded;
- Clearer link between assessment outcomes and funding schemes;
- A properly resourced administration.

Most of the recommendations contained in the report address procedural aspects of the evaluation exercise. The report aims in fact at retaining the fundamentals of the traditional RAE (e.g. dependence upon peer review; the recruitment of panel members within the research community; transparency). Consultations closed on 30th September with 302 comments received from HEIs, stakeholder bodies and interested individuals. Following the results of the consultation, on 21st October 2003 the four funding bodies published a summary of the results. The purpose was to identify the main areas of consensus and to come up with

an agreed plan on the future of research assessment. The whole review procedure and the recommendations proposed were based on RAE 2001. Since then, however, RAEs have basically maintained the same main traditional principles of peer-review assessment.

A few significant changes have been introduced with RAE 2008 though:

- Clear and explicit criteria in each subject, to enable a proper assessment of applied, practice-based and interdisciplinary research;
- The "fixed seven-point scale" is abandoned and results are published as a "graded profile" (excellence). This approach reduces the "cliff edge effect", i.e. to reject funding to Institutes that are slightly beyond the funding threshold;
- A formal two-tiered panel structure, ensuring more consistency and international calibration.

The primary purpose of RAE 2008 is to produce a set of quality profiles for each submission of research activity made by each institution. The quality profile is used to determine the research grant allocated to the institution, with effect from 2009-2010. As a first step, a data collection system was released on 3rd January 2007 to help users submit their data. The whole procedure is computerised and accessible from the RAE web site.

Despite recent renovations, much debate still surrounds RAE. In April 2006, the UK government has announced its decision to abolish RAE after the completion of the last exercise scheduled for 2008. There is some possibility that RAE is replaced by a new "metrics-based" mechanism (for example using bibliometric approaches and indicators of external-research income generated) but information on what may come next is to date still very unclear.

1.3 Evaluation and the industrial research sector

The Department of Trade and Industry (hereinafter, DTI) is a main actor in the national research evaluation system. DTI's main remit is to provide programmes aimed at supporting UK industry and at making the most of UK's science, engineering and technology skills and resources. Each year it approves a programme on research evaluation, which details the activities that have to be implemented either by in-house staff or external examiners. DTI supervises all the evaluation activities that are conducted under its administrative domain through the Strategy Unit's Performance and Evaluation Team (hereinafter, PET). PET ensures that the information provided is robust and accurate, and guarantees co-ordination at central level.

The Science and Technology Assessment Unit (hereinafter, STAU) is a multi-disciplinary team responsible for evaluating the impacts of DTI's programmes that focus on science, technology and innovation. Evaluation activities are usually undertaken after a research programme has been completed and aim to assess whether the objectives have been accomplished. The assessment has immediate policy impact: the information collected by DTI is published (usually in publicly available reports or leaflets) and circulated among DTI's managers to make them more responsible of their role in the science system. The publications are also circulated to participants in DTI's programmes.

In 2003 DTI published "Forward Look 2003", a document aimed at improving industrial R&D performance. Enhancement of current standards in the industry sector is a government

priority and is at the core of the UK strategy to innovation and competitiveness. DTI is recently undergoing a review of business innovation that will help design an efficient industrial R&D strategy. The review also explores how to strengthen co-operation between industrial research and public research.

Another actor in evaluation is the Office of Science and Innovation (hereinafter OSI, former Office of Science and Technology, OST). OSI operates under DTI. Its mandate is to advice the government (and not only DTI) on science and technology issues and to finance basic research via the UK Research Councils, as outlined above. The latter is a unique task because it assigns OSI the role to mediate between industrial and university research.

In the field of evaluation, OSI is responsible for compiling a database on key science, engineering, and technology indicators (i.e. SET statistics). The database is prepared in collaboration with the Office for National Statistics and is publicly available on the Internet. It includes information on:

- The relationship between funders and performers of R&D at government, higher education, business enterprise, and charities levels;
- Research performance in the UK and outside;
- Business enterprise R&D expenditure;
- Key data on output and employment of science graduates and postgraduates;
- UK research performance compared with other Countries' performances.

1.3.1 The specific case of the ROAME(F) statement

Since early 1980s, the approval of new research programmes in DTI is subject to the drawing up of the ROAME(F) statement. The ROAME(F) is a simple appraisal document whose acronym stands for:

- Rationale: a clear statement of the overall purpose of the programme;
- Objectives: a detailed description of the objectives that the programmes aims to achieve, selected amongst DTI overall targets;
- Appraisal: a description of how single projects will be chosen for support, once the programme has been approved;
- Monitoring: a description of the procedures envisaged to monitor the progress of the programme;
- Evaluation: an indicative timetable of subsequent evaluation phases;
- Feedback (not always required): a description of possible feedback of the programme of future research undertakings.

ROAME(F) is a systematic evaluation exercise of research activities carried out at Department level. It asks all governmental Departments involved in industrial research to describe in details their proposals for new research programmes on science, technology and innovation. ROAME(F) aims to collect information on all the phases that characterise the proposed programme. It also requires an overview of how the programme is likely to be evaluated, and of how its results are likely to be employed. Since the 1990s, ROAME(F) is compulsory for all government R&D Departments that intends to propose new research programmes.

Following approval of the research programme by the Innovation Programme Committee (IPC), the research programme is launched. Its implementation is monitored throughout its lifetime. The managers of the programme are in particular responsible for drawing up reports that show how the programme was monitored. The reports are delivered to the Assessment Unit. The reports of each research programme are forwarded yearly to IPC, and are encoded in a database.

Although this procedure is very clear and usually implemented efficiently, the reports do not have a strong policy impact. In principle, they should provide feed back on the success of a research programme and should inform subsequent evaluation exercises. However, this does not seem to be the case. Evidence suggests that the reports are mainly used for information purposes, i.e. they are circulated amongst all DTI programme managers. Their impact is thus limited to reinforce the positive attitude to research evaluation (the so-called "evaluative culture") and to make the performers of research more accountable.

Some authors are uncertain about the policy relevance of the ROAME(F) statement. The main question is whether this is a truly efficient means to select research programmes or whether it is only a consolidated ritual without much policy effect (Martin: 1999). Part of the literature considers that the results of research evaluations in general are "rarely used to set research policy priorities, whereas they serve the purpose of validating or redefining the distribution of financial flows to research" (Georghiou in Laredo: 2001, p. 271).

Evaluation practices are in fact more employed as concerns the allocation of public resources to research. First, OSI allocates public funds to research via the UK Research Councils and through ex ante evaluation procedures. Secondly, the Research Assessment Exercise is long established ex post evaluation model with strong policy effect.

2. Finland

Research evaluation processes are a fundamental part of the Finnish science and technology system since early 1990s. First experiments in the field draw back to 1983, when the newly established Technology Development Agency (TEKES) and the Academy of Finland were expressly charged with research evaluation tasks. In 1987, the Science and Technology Policy Council (STPC) chaired by the Prime Minister, was empowered to expand national policies on science, technology, and innovation and to supervise all evaluation activities.

Finland shows a few good examples of systematic and sophisticated examinations as concerns both basic research carried out by public research sector and technological research performed by the industrial sector.

2.1 Evaluation at central government level

The Science and Technology Policy Council (hereinafter, STPC) is an advisory body to the central government that retains overall responsibility in the field of evaluation. STPC is responsible for the preparation of guidelines for the effective implementation of all the evaluations conducted in the national science system. In particular, it ensures that the results of the reviews are converted into effective policy actions.

The whole science system is informed by the so-called principle "management by results": the formulation of policies on science and technology must be based on the results of articulate and accurate research assessments. Its primary purpose is to provide "feedback on the quality and effectiveness of science and technology policy instruments and institutions" (Ormala in Laredo: 2001, p. 346). The principle "management by results" underpins most of the research activities carried out in the Finnish science system. Its implementation is a priority for all agencies charged with evaluation responsibilities.

A clear implementation of the principle "management by results" draws back to 1993, when the Ministry of Education gave policy action to the results of the evaluation of the activities conducted by the Academy of Finland[9]. The review was commissioned by the Ministry of Education itself, acting as supervisor of all assessment exercises on academic research. The committee in charge of the evaluation was composed of foreign experts of leading experience. The results of the evaluation recommended the Academy of Finland to develop new strategic initiatives, to decrease the number of its Research Councils, and to establish new centres of excellence. Following the results of the evaluation, the Academy embarked in a process of internal reorganisation. Its Research Councils were reduced from seven to four. The 1995 Law for the reorganisation of the Academy of Finland called on the Agency to initiate a phase of self-renovation and to set up a system of centres of excellence.

In 2004, STPC initiated an external evaluation of the Finnish research system. Based on the results of the review, the central government issued a resolution on 7th April 2005 aimed to strengthen the public research system. The actual impact of these policy actions is dealt with in the following pages.

A more recent example of evaluation as a policy design tool is the external assessment of the Finnish Employment and Economic Development Centres (T&E Centres)[10], which was completed in August 2004. In its 2004 annual report "Towards a more competitive business environment for enterprises", the Ministry of Trade and Industry acknowledges positively the recommendations made in the evaluation report. Building on them, it advocates for a re-launch of the Centres in 2005 and identifies the following priorities: streamlining of the management system; internal re-organisation and close collaboration and interactions with clients and stakeholders. The principle "management by results" is explicitly mentioned in the Annual Report as a principle that guides strategic planning in industrial research.

2.2 Evaluation and public-funded research: the Academy of Finland and its multiple tasks

The Academy of Finland is an expert organisation operative in the field of funding to public research. It is made up of the Academy Board, four public Research Councils[11] that stand in the administrative domain of the Ministry of Education, and an administrative office. It holds a pivotal role in the Finnish science system. The Academy represents in fact the main source

[9] The Academy of Finland is an expert organisation operative in the field of university research.

[10] The T&E Centres promote, in collaboration with MTI, the operating conditions of SMEs with financial support to high-standard investment and development projects. The aim is to improve SMEs' long-term competitiveness. Funding is granted on the basis of a company or project analysis of each project. It is directed at projects that are estimated to make a substantial contribution to economic development and innovation.

[11] The Councils are: 1) Research Council for Biosciences and Environment; 2) Research Council for Culture and Society; 3) Research Council for Health; and 4) Research Council for Natural Sciences and Engineering. The Councils and the Academy Board are appointed by the Council of State for a three-year term.

of R&D funding to universities and government research Institutes; it promotes scientific research through the implementation of specific research programmes, and also collects and updates regularly performance indicators.

The Academy's mandate in research evaluation is broad.

First, the flow of public funds to public research is distributed on the basis of assessments conducted by third-parties experts, preferably coming from foreign countries. This is clear example of "management by results" in the distribution of public funds. Financial funding to universities is in fact tied to their research performance, which is expressed in terms of performance indicators (e.g. the number of degrees and qualifications produced, the quality of research carried out.). Two-thirds or 65 % of the core funding is allocated on the basis of teaching performance, 35% on the basis of research performance (2000 review, p. 53). Results are delivered in individual statements, although there is currently a trend towards the establishment of panels of evaluators.

The resort to international panels is gaining wide consent in Finland because it ensures a broad-minded analysis of national research performance. On the other hand, a limit often associated with international panels is that foreign experts may not be familiar with the Finnish R&D policy. This is overcome by requiring that 1 or 2 members of the panel come from Finland. This practice is now mostly used to evaluate sectoral research. Research Councils make an explicit use of the results of evaluation to steer financial resources and plan their own scientific activities. However, the policy use of evaluation exercises is discretional: each Research Council is free to exploit the results of evaluation as it deems appropriate.

Second, the Academy conducts a wide range of internal assessments of the research activities performed by its Research Councils (e.g. assessments of individual disciplines and programmes, expert opinions, impact analyses of research programmes.). Internal funds are allocated on the basis of ex ante evaluations: the procedure is very transparent and all information is published on the Academy's web site. Researchers who receive funding submit intermediary and final reports on the state of their research via the Academy's online services. Furthermore, the Academy carries out yearly disciplinary evaluations, whose results are used to renovate the research profile of the disciplines themselves[12].

Third, the Academy evaluates ex post the operation of its own research programmes with the objective to assess whether they have been successful in attaining the initial targets in terms of output and impact. The assessment is carried out by foreign experts holding high competence in the field under assessment. Its results are delivered directly to the Research Councils for internal policy exploitation. They are often used to reformulate the research strategies of the Research Councils themselves and are overall taken in wide policy consideration.

Fourth, at national level the Academy compiles a comprehensive review on the state and quality of national research once every three years (basically when the three-year term of its Research Councils expires). The review provides a dynamic overview of research performance because it allows monitoring the trend of national scientific research on a regular basis. Its main objective is to support the work of national and international bodies responsible for science and technology policy and research funding. All Research Councils participate in this activity by evaluating their respective field of research. Results are employed at policy level to validate or refine R&D policies. Three reviews have been released so far, respectively in 1997, 2000 and 2003.

[12] Between 1983 and 2000, the Academy carried out a total of 21 disciplinary evaluations.

The 2000 review "Scientific Research and its Environment in the Late 1990s" offers an overview of achievements in the Finnish research system in late 1990s. The 2000 review differs greatly from the previous ones because it has a stronger international focus. There is wider attention to the research performance of other OECD countries and to cross-country benchmarking. The 2000 review recommends that Finnish R&D activities are more international-focused. The increasing employment of international evaluation panels is a first policy response to this request.

The 2000 review provides also inputs to reinforce the policy impact of research evaluations. As concerns the flow of funds to university research, "the main purpose is to tie funding to operative targets and results. (…) Control is exercised through operative targets with criteria used in defining and measuring the outcomes of universities assuming key significance" (2000 review, p. 52).

The 2003 review "Scientific Research in Finland: A Review of Its Quality and Impact in the Early 2000s" focuses on the developments achieved in research during the last few years. The review acknowledges the success of past evaluation practices: "even greater attention has been paid to the impacts and effectiveness of public funding, and the principle of management by results has been put into place" (2003 review, pg. 13). It highlights that the evaluation of research performance is a fundamental phase of policy planning; provides a comprehensive assessment of the impacts of research funding on R&D developments, appraise how science policy initiatives affect research development, and looks into the impact of R&D on society. Both the special theme reports and the reports of the national research councils, annexed to the 2003 review, focus on the scientific and social impact of research activities. The performance of Finnish research is benchmarked at international level through sets of indicators that are largely used across Europe.

Notwithstanding the efforts, the policy relevance of the reviews is limited. Although it is generally recognised that political strategies in the field on science and technology cannot proceed without checking back, evidence suggests that the recommendations made in the reports are still loosely given action. For example, most of the critical points listed in the 2000 review have been neglected, as Ormala states (Ormala in Laredo: 2001, p. 347). Evidence shows that only positive recommendations have been incorporated in decision-making. The process of sophistication of evaluation practices in not complete and the Academy is in fact developing further its assessment strategy. For example, the share of funding allocated to multidisciplinary or interdisciplinary projects is in fact increasing steadily and is now about 42% of the total funding.

The Academy plays an additional role in research evaluation because it is responsible of collecting and updating research and innovation indicators. The bulk of the activity concerns bibliometric indicators (e.g. the number of scientific publications, citation analyses.) [13].

It performs this task in close collaboration with other R&D national players, such as TEKES, the Higher Education Evaluation Council, and Finnish universities. The Finnish science and technology information service[14] contains on-line data and statistics on:

- Input measurements:
  - R&D expenditure, investments, funding, training, R&T programmes, centres of excellence, and co-operation activities with the business and industry sectors.
- Performance indicators:

[13] Finland is the only country that has canonised the journal impact factor in law.
[14] For more information, visit the web site: http://www.research.fi .

  - PhD degrees, scientific publications, and patents.

- Research Institutions:
  - Data are divided per type of research institution: universities and Polytechnics.

The Finnish science and technology information service gives also information on:
- Co-operation agreements between the public and the private sectors
- The quality of mixed structures between the public and the private sectors[15].

It also provides guidance to national agencies that perform evaluation activities across the country.

On 19th December 2006 the Academy released the report "Finnish Science in International Comparison: A Bibliometric Analysis". The report is a first response to the 2005 university Act, which underlines the role of assessment procedures in monitoring the (social) impact on research activities[16]. The report reaffirms that one of the Academy's objectives is to "develop the impact assessment of research and innovation in Finland" in close collaboration with TEKES.

The 2006 report analyses thoroughly the state of Finnish research and examines its impact from an international perspective. It examines research outputs and explores their scientific impacts, visibility and quality in comparison with the research carried out in other OECD countries from 1985 to 2005. The 2006 report concludes that "in Finland the fastest growth of scientific research was recorded in the early 1990s. In the early 2000s, strong growth has been seen in the smaller science countries of Southern Europe such as Portugal and Turkey, as well as in the Asian countries of China and South Korea. In the early 2000s, the geography of scientific research is changing and by all accounts it will continue to change significantly over the next decades" (2006 report, pg. 40). Future policy actions will tell whether the 2006 report has been employed as a policy design tool.

2.3 Evaluation and the higher education research sector

As in other OECD countries, universities in Finland enjoy wide autonomy. Recent reforms were designed to respond to changing needs and current challenges. In particular, they aimed at enhancing the content and quality of education and research in the public sector. However, autonomy is often seen as counterproductive in the way research performance is evaluated.

The 2000 review "Scientific Research and its Environment in the Late 1990s" reports that the university system is still reluctant to implement research evaluation activities. For example, "it has proved problematic to devise accurate measures and to use indicators of performance or output in the context of scientific research" (2000 review, pg. 53).

In April 2005, the government adopted a resolution to guide the steering and development of the university system in the next years. It focuses in particular on the structural developments of the public research system, with the aim to develop it into "a functional entity, to make research activities more international and to ensure constant quality enhancement". Immediate

[15] Collaboration between public research and private research is traditionally very consolidated in the Finnish science system.

[16] The 2005 University Act assigns a new task to universities: to have closer exchange and interaction with society and to promote the social impacts of research results and artistic activity (the so-called third function).

action was taken to implement the government resolution. In its annual report "University 2005", the Ministry for Education builds upon the government resolution to address changes in the future of university research (and education). A series of evaluations have been commissioned to the Academy of Finland to review the state of research in specific research programmes. The Chapter "steering and structural development" proposes a set of actions to enhance the productivity, quality and impact of university operations. It reports on the proposals made by the committee responsible for developing the performance management system and for the setting funding for the period 2007-2009. In the research sector, the committee proposes to "shift the focus of the funding model to respond more closely to the needs of research, researcher training and internationalisation. Quality and impact are also more to the fore". As concerns research evaluation, the impact of the recent structural renovation of the university system will be visible in the upcoming years. Current evidence suggests that positive actions are being taken at central level.

Over the years a limited number of positive good evaluation practices can be identified. The appraisal conducted on the public research sector in the early 1990s contributed to the establishment of Polytechnics, as the following paragraph shows.

2.3.1 Evaluation and the Higher Education Evaluation Council

A Higher Education Evaluation Council (FINHEEC) has been created within the Ministry of Education with the mandate to assist the 20 Finnish universities and 29 Finnish Polytechnics in issues related to evaluation. In its 2000-2003 Action Plan, FIHEEC stresses that "evaluations are not the objective as such (…), the main function to be in serving the development efforts of individual higher education institutions" (2000-2003 Action Plan, pg. 20).

Amongst FINHEEC's institutional activities is to undertake evaluations on the operation and policies of institutions of higher education; to assess professional courses proposed by single institutions, and to provide a databank enabling international comparisons. National-focused evaluations on education cover different training sectors, degree programmes, disciplines, and thematic groups. FINHEEC renovates its policy and operational targets regularly.

In its 2004-2007 Action Plan, FIHEEC states that the process of intense internationalisation of research in universities and polytechnics and international competition in the education system requires an upgrading of current evaluation practices. To this end, it aims towards "continuous improvement and evaluation of the higher education" system (2004-2007 Action Plan, pg. 12). The main objective of the evaluations timetabled in the 2004-2007 Action Plan is to provide both institutions of higher education and decision-makers with a means to reinforce research policies. This is done for example by comparing critically the results of evaluations, so as to identify examples of best practices and promote their replication in other settings.

2.4 Evaluation and the industrial research sector

The Technology Development Agency (hereinafter, TEKES) is an expert organisation operating under the Ministry of Trade and Industry (hereinafter, MTI). TEKES is the major

Finnish agency responsible for the allocation of public contributions to industrial R&D[17]. It has the mandate to promote industrial competitiveness through the implementation of technical programmes, to encourage networking activities between the public and the private sectors, and to undertake evaluations of technology research. TEKES contributes chiefly to the national evaluation process, both directly and indirectly.

First, it conducts technology impact assessments aimed to select technical R&D programmes and steer technology funding. The evaluation criteria are derived from the mission statement of the agency. The assessments are conducted by in-house independent evaluators that are not required to be experts in the field under examination. The impact of the evaluations is straightforward: R&D funds are allocated to projects that are gauged to generate the greatest long-term benefits to the national economy and society, to foster innovation, and to promote national economic competitiveness.

Second, external and foreign experts evaluate the R&D technical programmes implemented by TEKES. One evaluation can cover several programmes that belong to the same field of technology, or clusters of programmes. The evaluations aim to provide understanding on the development and dynamics of research and to identify the factors that contribute to its success or failure. In the case of ex post evaluations of TEKES' research programmes, the task of the examinations is to assess the research performance of the agency against the initial targets. At policy level, the evaluations provide feed back on how to support the strategic development of TEKES research programmes and how to improve innovation.

A series of appraisals of technical programmes was carried out in 2003. The objective was to provide insight into various kinds of technology programmes that have not been systematically revisited since 1990. The exercises provided a conceptual and detailed analysis of the programmes in terms of rationale, processes, planning phase, the challenges in execution, the results achieved against the goals and their relevance, and their role in the development of the business sector. The assessment is very policy-oriented: it identifies some examples of good practice, provides a checklist of strategies for the implementation of new technology programme concepts. It also includes an evaluation questionnaire administered to researchers to investigate the impact of the projects in their unit and how it was implemented.

TEKES is also evaluated externally. MTI has the mandate to commission the overall assessment of the agency. Further to a broad evaluation launched in 1995, the agency was recommended to enhance its innovative strength. This assessment had a strong impact on the redistribution of the following 1996-97 public R&D financing.

Sectoral research carried out by government research institutions is also regularly evaluated. An exercise was conducted in the early 1990s at the recommendation of the STPC. Its results were included in a broader strategy for advancements in R&D and recommended, *inter alia,* to enhance industrial competitiveness, particularly in the field of electronics, information technology, automation and chemical technologies. The evaluation triggered the re-organisation of the Technical Research Centre of Finland (VTT), the leading Research Institution of Finland subordinated to the Ministry of Trade and Industry. The evaluation has also contributed to enhance VTT's flexibility and transparency.

[17] Funding is granted from the State, and about 1/3 of all government R&D investments is distributed through TEKES.

3. Italy

Evaluation of scientific research in Italy is a relatively new experience. The research policy system has been reformed thoroughly in the last two decades. Part of the actions taken was directed at creating a robust national research evaluation structure. Existing agencies have been renewed and in some cases their remit has been extended to evaluation responsibilities at local, regional or central levels.

Evaluation processes in Italy are also almost entirely confined to the public sector. Almost 60% of national research is in fact performed by universities, whereas the private R&D sector still lags behind.

3.1 Evaluation at central government level

The Italian science system has put the basis for the implementation of a structured national research evaluation model only recently.

The co-ordination of the national evaluation system is entrusted to the Ministry for University and Research (hereinafter, MIUR). MIUR retains overall responsibility in the identification of priorities in the national science (and education) system, the definition of main national strategies and the publication of the National Research Plan[18], the supervision of national R&D policies and their implementation. The National Research Plan is a political document issued by MIUR to outline the state-of-the-art in scientific and technological research and to lay down a programme of future actions. In the following pages, we provide an outline of the main performers of research evaluation. Second, we provide an overview of the National Research Plan adopted in 2005 and covering the financial years 2005-2007.

3.1.1 The national committee for the co-ordination of research evaluation

The national committee for the co-ordination of research evaluation (hereinafter, CIVR) was established within MIUR in 1998. CIVR is a government body with the mandate to "promote research evaluation activities through support to quality and to best use of national scientific and technological research". Its main responsibilities include:

- To perform ex post assessments at national level;
- To define research evaluation guidelines and research evaluation criteria;
- To propose new methodological frameworks for research evaluation that may enhance the quality of national research;
- To provide performance indicators.

CIVR performs its institutional tasks with the main purpose of favouring a positive attitude to research evaluation processes among the performers of scientific research and the research community.

[18] The National Research Plan is released upon approval of the inter-ministerial committee for economic planning (Comitato Interministeriale per la Programmazione Economica, CIPE), whose main role is to define the national guidelines for economic-financial policy, including the national budget. CIVR was set up on 5th June 1998 with law no. 204.

The guidelines for research evaluation were issued in 2003[19] after a wide consultation process with stakeholders and researchers. Many events were sponsored by MIUR to create room for debate and to come up with an agreed proposal of guidelines. The overall aim is to "endow Italy with an objective and reliable system, capable of improving the institutional correlation among evaluation results, selection of projects and resource allocation". The evaluation guidelines emphasis the policy exploitation of assessment practices. CIVR states explicitly that the institutional purpose of the evaluation is to serve as a policy design, for example by tying the allocation of financial resources to research performance; fostering the circulation of research results; and compiling summary reports for assessment and dissemination purposes. Main evaluation criteria are (both as concerns the research itself and its outputs):

- Quality and relevance;
- Originality and innovation;
- International profile;
- Capacity to manage human, technological, and financial resources.

The evaluation guidelines provide for the submission of periodic and final reports on the activities carried out. The reports must be delivered to MIUR, to CIPE and to other Ministries involved in the activities under examination.

CIVR publishes regularly an annual report aimed to provide an overview of the state-of-the art in national research and to identify the points of strength and weakness of past evaluation processes. Based on the review of past achievements in the field of research, CIVR annual reports put forward a list of actions for improvement. The 2000-2001 annual report, the second one since CIVR was established in 1998, identifies some of the shortcomings of the Italian research evaluation system. In particular, the annual report points to the inadequate translation of the evaluation results into policy planning. Its main recommendations are:

- To increase human and financial resources working on research evaluation activities;
- To enhance nation-wide dissemination of the results of research activities;
- To improve the institutional link between evaluation results and policy orientation and/or funding distribution;
- To implement benchmarking activities at European and international levels.

CIVR also emphasises the use of qualitative indices (in particular bibliometric indicators) as a tool towards better evaluation strategies. Notwithstanding the policy strength of the annual report, evidence suggests that no policy action has been taken after its publication.

The annual report covering the financial years 2001-2003 (the latest one available on the Internet) devotes particular attention to one of CIVR's core objectives, i.e. to contribute to the creation or consolidation of the "evaluative culture". It reports that research performers are overall less reluctant to undergo research appraisals. They are learning to attach positive value to research assessment because they understand its possible beneficial impact at policy level. Although these policy results are positive, there are still many shortcomings in the national evaluation model, particularly at methodological level.

The report mentions:

[19] Linee guida per la valutazione della ricerca, adopted by CIVR in 20th May 2003.

- The need to introduce systematic procedures to benchmark research activities at national and international levels (as concerns human resources, financial resources and research outputs)[20];
- The need to increase the use of international performance indicators (e.g. the impact factor and the citation analysis);
- The need to enhance interaction with the private research sector.

The first evaluation conducted at national level covered research activities conducted in the years 2001 to 2003. It was targeted to 77 universities and 25 research centres (both public and private), clustered in disciplinary areas. It was a complex process that involved a large number of research performers, experts, support staff and stakeholders. The assessment was concluded earlier than expected thanks to the use of high IT facilities. It allowed showing the points of strength of current practices and main methodological shortcomings.

The 2001-2003 assessment had clear policy impact because it addressed the distribution of financial resources for the subsequent financial term. On 16th March 2004 CIVR published the list of criteria informing the share of funds allocated to the research institutes evaluated. A more detailed description of each criterion was circulated on 4th July 2006. In a nutshell, the parameters are the following:

- Indicator A – Quality of the research output (weight 4/9);
- Indicator B – Property of the research output (weight 2/9);
- Indicator C – International mobility (weight 1/9);
- Indicator D - Training capacity (PhD students, post doc researchers, university career) (weight 0,5/9);
- Indicator E – Fund raising capacity (from MIUR, EC, and other international funding sources) (weight 1/9);
- Indicator F – Capacity to invest the Institute's financial resources in research (weight 0,5/9).

The 2001-2003 evaluation report, including the executive summary, data and statistics, has been published on CIVR web site and is downloadable without charge.

3.2 Evaluation and the higher education research sector

The national committee for the evaluation of the university system (hereinafter, CNVSU[21]) is the main performer of evaluation exercises of university research.

CNVSU was established in 1993 under the administrative domain of MIUR. Until 2000 it was a technical body aimed at collecting data and statistics on research performance. Soon after the establishment of CIVR in 1998, CNVSU's mandate was enlarged. Nowadays CNVSU is a central governmental committee responsible for the evaluation of the research carried out by universities.

[20] The report indicates the National Council for Research (Consiglio Nazionale della Ricerca, CNR) as the only research institution that benchmarks its activity on a systematic basis.
[21] Comitato Nazionale di Valutazione del Sistema Universitario.

The tasks of the committee are:

- To identify the evaluation criteria for university research;
- To promote the definition and implementation of new methodologies and practices for research evaluation;
- To implement a programme of external evaluation of universities or single departments;
- To carry out ad hoc assessments on behalf on MIUR;
- To draw up an annual report on the state of research in the university system.

CNVSU performs its activities in close collaboration with universities and their internal committees of evaluation.

Each university is in fact required to establish an internal committee for evaluation (hereinafter, CIV[22]) to monitor the performance of research (and education) activities in the Ateneo. The first CIVs have been set up in 1993. Each CIV co-ordinates the collection of data, statistics and information related to university activities and compiles a report for delivery to CNVSU and MIUR. Delivery of the report is compulsory: incompliant universities are excluded outright from MIUR financing circuit. "This - for the first time - makes evaluation a key step in the MIUR decision-making process and shows that it is taken seriously" (Sirilli and Silvani in Laredo, pg. 424).

In principle, each CIV performs comparative cost-efficiency analyses to evaluate the management of public funds, the productivity of national university research, its quality and impact. Each CIV report must cover at a minimum the following features of university research:

- Points of strength and weakness;
- Recommendations and conclusions;
- Link between evaluation processes and internal decision-making.

Most universities base their cost-efficiency analyses on the data and information provided by SolWeb SIR 1.5 database[23]. SolWeb SIR 1.5 is an e-tool that supports CIVs (through an on line management and consultation system) to collect, manage, and elaborate data on university research. It simplifies the methods for the creation of performance indicators.

The evaluation guidelines call on each university to translate the results of CIV's evaluations into policy action. The ultimate objective is to foster the development of an "evaluative culture" within the university, to near researchers to research appraisal methods, and to make them more accountable for their activities.

Evidence shows that the whole evaluation system of university research is still very loosely implemented. In the years 1996-1997, the Observatory for the evaluation of research (latterly, CNVSU) mapped the number of CIVs that were fully operational in the national territory. Results proved that only few universities had set up their CIV. Most Atenei were not structurally equipped to collect data and information on their research performance. More recent data show a slow but still unsatisfactory increase in the number of CIVs established. In 2002 the total number of CIVs in the territory was 76.

[22] Comitati Interni di Valutazione.

[23] Launched by the CIV of the University of Pavia in 1998, the SolWeb SIR 1.5 dataabse has been soon after employed by an increasing number of Universities. For more information, visit the web site: http://130.251.190.202/

Table 1 below provides an overview of the distribution of CIVs from 1995 to 2002[24].

Table 1: Distribution of CIVs per year of implementation of their support offices.

Year of implementation	No. CIVs
1995	7
1996	13
1997	8
1998	4
1999	13
2000	21
2001	7
2002	3
Tot.	**76**

Source: MIUR, 2002

On average each CIV is composed of 6-7 members (the minimum is 5, the maximum 9). 67,5% of the members hold a teaching position in the same university that hosts the CIV. 61% are experts in the field of evaluation. The average mandate lasts 3 years.

The establishment of CIVs is administers closely at central level by CNSVU. In 2000 the national committee launched a cycle of annual surveys aimed to assess whether CIVs perform their activity efficiently and professionally. The surveys are posted on CNVSU's web site[25] and provide detailed information on both teaching and research performance.

The surveys have come now to the seventh edition. The latest one, published in October 2006, offers a more comprehensive overview of the national evaluation system. For example, the 2001 survey provided data on the average age of researchers, average age of students with a degree, recruitment procedures and geographical location of the university. The 2006 survey extends the analysis further and collects data on financial fluxes per sector and activity, fund raising opportunities at national and European levels, training offer per research disciplines and brain-drag capacity. It also investigates the interactions between universities and the private sector and observes how university staff (both teaching and researching) has evolved over the years.

CNSVU's surveys are helpful at two levels. First, they spur CIVs on monitoring systematically and regularly the research performance within the university both at qualitative quantitative levels; on comparing their performance across the national territory (e.g. at methodological level: type and level of sophistication of the data and statistics collected; comprehensiveness of the reports delivered to MIUR and CNSVU); and on identifying shortcomings in the provision of the requested information. Second, the time series of the surveys show how the national research evaluation system progresses over time and also provide a map of the CIVs across the territory, how they evolve and interact with each other.

Enhancement of cross-university benchmarking may be important. Evidence in fact suggests that a main limit in the implementation of research evaluation in the higher education sector is

[24] No data were available for the years up to 2007.
[25] For more information visit the web site: http://www.cnvsu.it.

the lack of collaboration across universities. The SolWeb SIR is indeed a first step towards harmonised procedures and interaction among CIVs, but it does not seem to be enough. The reports compiled by CIVs differ a lot both as concerns the methodology applied and completeness of the information provided. Some reports offer insufficient or incomplete information on fundamental aspects of university research activities; some others do not include all the data and statistics that are actually available, and select a priori the information that may be relevant for MIUR and CNVSU. The lack of commonly agreed methodological procedures and the increasing autonomy of universities risks hampering the quality and comprehensiveness of the Reports. Each Ateneo is in fact free to choose (within the institutional boundaries outlined above) the methodology for evaluation and the set of performance indicators,.

Such heterogeneity jeopardises the success of the review conducted at central level by MIUR and CNVSU. It is an obstacle to a clear understanding of research performance across universities and impedes benchmarking. Very often the central bodies have only a partial acquisition of knowledge and only a limited number of CIV's reports are accurate. Data and indicators are not comparable and often build upon different methodological approaches.

In light of the shortcomings in the way research evaluation is conducted in universities, recent actions have been taken at government level to set up a new agency with a strong co-ordination role in research assessment. Further details about the upcoming National Agency for Evaluation are given in the following pages. The next sub-paragraph provides some examples of how the results of evaluation practices are implementation at financial level.

3.2.1 The specific case of the Projects of National Relevance

A few examples of evaluations aimed expressly to guide policy planning show at the level of distribution of public financial resources to university research. Since 1997, ex ante assessments are implemented systematically to select the research projects of relevant national interest (hereinafter, PRIN)[26]. Proposals are submitted autonomously by the research team and no pre-defined disciplinary areas are given. Proposals are clustered in thematic areas only after their submission to facilitate the evaluation process. This relatively new experience in the Italian research scenario is slowly taking over the so-called "finanziamento a pioggia"[27]. In some areas, ex ante assessment represents currently the only viable way to receive public funds. This is the case of proposal in the humanities research field, where MIUR's contribution accounts for more than 50% of the total budget allocated. According the new assessment procedure, a committee of national and foreigner anonymous referees appraise the proposals on the basis of their capacity to integrate different competencies (e.g. inclusion of external contributions, social impact, and final outputs). The evaluators are qualified experts in the discipline under examination, and this ensures the high quality standard of the peer-review. Amongst the selection criteria are:

- Clarity of the proposal objectives;
- Originality and innovative strength of the proposal;
- Soundness and robustness of the methodology applied;

[26] PRIN stands for Progetti di Ricerca di rilevante Interesse Nazionale.

[27] The "finanziamento a pioggia" system envisages that funds are allocated on the basis of application forms sent in by proponents. The allocation of funds is decided discriminately within the University, usually by Professors that are selected by the researchers themselves (basically it is a close circuit). No particular (institutionally defined) criterion is applied.

- Resources availability;
- Congruity with the financial support requested;
- Competence, expertise and scientific track record of the co-ordinator
- Quality of the partnership.

The shift from the "finanziamento a pioggia" system towards a funding system based on the real capacity to produce innovative and impact-relevant research has different impacts.

First, the competitive assignment of public funds raises the quality of research proposals, because proponents formulate their proposals concentrating more on its scientific novelty and originality than they used to do in the past. Research programmes submitted for funding devise a more structured research plan that includes clear short-term, intermediary and final objectives and a coherent scientific, managerial and financial implementation plan. There is an increase in the number of national projects with an ambitious critical mass in terms of expertise, duration, and financial resources. Overall, the new procedure favours a systematic monitoring of public research trends and improves in the long-term the quality of the research carried out in the university.

Second, the ex ante evaluations make researchers more accountable for their research, and spur them on collaborating closely between themselves (e.g. to raise the scientific quality of their proposals). This may contributes to foster the development of an "evaluative culture".

Third, researchers start to make acquaintance with assessment procedures that are more common in other OECD Countries (e.g. the UK and Finland) and at EU level. This in turn makes them more equipped to compete for funding on the European and international set.

Evidence shows that ex ante assessment procedures have not yet superseded the traditional "finanziamento a pioggia" system. The process of modernisation of the national research system is still underway and requires further adjustments. For example, there is a need for better co-ordination among the research performers, expert evaluators, and the managerial staff involved at different levels in the process.

3.3 Evaluation in the National Research Plan (2005-2007)

The National Research Plan for the financial years 2005 to 2007, approved by CIPE on 18th March 2005, provides an official overview of national scientific and technological research during the last years. It frameworks the plan of future activities, identifies the opportunities for growth, and includes the proposals that the government has approved to valorise the research potential.

The PNR 2005-2007 marks a discontinuity with previous PRNs. First, it lays the ground on two official political documents that have substantially renovated the national research system: the 2002 government guidelines for scientific and technological research and the

guidelines for the evaluation of research[31]. Second, it gives a more comprehensive and analytical outlook of the many dimension of research and is more proactive than its predecessors.

The following strategic objectives are identified:

- To reinforce the national research potential, with a focus on both basic and mission-oriented research;
- To promote the human capital and valorise its excellence;
- To foster stronger collaboration between public and private research systems;
- To promote spin offs and start ups initiatives.

The NRP 2005-2007 aims to implement its strategic objectives by strengthening, *inter alia*, the national evaluation system.

Evaluation has a clear priority role. The NRP 2005-2007 highlights the positive results of past evaluations and identifies their shortcomings. In particular, it advocates for a larger use of ex ante assessments than of *in intinere* or ex post assessments. The former may be improved substantially by capitalising on the positive experiences of other Countries (e.g. RAE in the UK or site visits in the US). The latter are still too expensive and often rely on the availability of specific economic and scientific expertise that is difficult to recruit.

The NRP 2005-2007 gives some practical proposals for improvement. The focus is on the structures responsible for the evaluation, on the methodology applied in the assessment of mission-oriented research and on the assignment of funds to public research. In particular, it encourages the setting up of ad hoc committees that may collaborate closely with the CIVR. It supports MIUR's proposal of revising the evaluation criteria currently in use for the allocation of funds to universities (e.g. it calls for stronger emphasis of research performance rather than on the number of students). Last, it points out that these recommendations must be discussed and implemented under the central co-ordination of CIVR. To this end, it encourages the committee to lay down a detailed plan of action.

3.4 Evaluation and the Conference of Italian University Rectors

Government and other official documents emphasise a lot that evaluation is not a means in itself, but a tool to raise research performance standards. First evidence shows however that the results of evaluation are often left unspoken. Interim and Ex post assessments are often so poor that their results hardly give course to any reflection at policy level.

As the NRP 2005-2007 acknowledges, a main obstacle towards the implementation of an efficient evaluation system is the absence of an "evaluative culture". The lack of cultural support to evaluation practices hinders considerably both the success of appraisals and their exploitation for policy use. Evaluation is still largely perceived as a bureaucratic and time-consuming burden. In the public research sector, for instance, academics are often reluctant to judge the research performance of their colleagues. Only a minority of researchers consider it a valuable instrument for policy orientation. The process of renovation of the national research system suffers from a typically Italian feature: the greying of researchers. The

[31] Linee guida per la politica scientifica e tecnologica del Governo, adopted by CIPE on 19th April 2002. Linee Guida per la Valutazione della Ricerca, adopted by CIVR on 20 May 2003.

predominance of the elderly in universities favours conservative approaches and hinders the adoption of reforms. This has negative impact of the capacity of the Italian research system to be innovative and reduce the gap with other OECD countries.

Since 1991, the Conference of Italian University Rectors (hereinafter, CRUI) has been very active in the field of research evaluation. Its main objective is to spread favour understanding in the research community on the important role that evaluation may play in research performance. CRUI in very active as concerns the organisation of public events aimed to favour the consolidation on an "evaluative culture" in the country.

Its web site[32] has a web page dedicated to evaluation. The objective is:

- To provide a system of information on the evaluation of university research with academics, researchers, expert evaluators and other parties concerned;
- To promote projects and initiatives on evaluation;
- To share information and official documents on evaluation, including government laws;
- To spur research performers and evaluators on proposing new evaluation methodologies and approaches;

In 1999, CRUI launched an experimental project to develop a method for the evaluation of research per main scientific disciplinary areas[33]. A main result of the pilot project was the identification of a set of 22 performance indicators that measure both the efficiency and effectiveness of research activities. This method is now increasingly used by Italian universities because it is the basis of the SolWeb SIR database. CRUI's set of performance indicators may represent a first input towards the identification of common criteria for CIVs reports on research evaluation.

3.5 Looking forward: The National Agency for Evaluation

In the light of the shortcomings in the way research evaluation is conducted in universities and research centres, in 2006 the government asked MIUR to establish a National Agency for Evaluation (hereinafter, ANVUR)[34].

ANVUR should progressively take over the roles of CNVSU and CIVR. The agency has not yet been established and its rationale, objectives, and structure are still largely debated. On 12th March 2007, a set of guidelines were issued to inform the possible structure of the agency. The guidelines are not definitive but provide first insights into what ANVUR could look like.

According to the 2007 guidelines, the establishment of ANVUR responds to the following needs:

- To upgrade the procedures for the distribution of financial flows to the research carried out by universities and research centres;
- To near research to society, and to explain how public funds are allocated and spent;

[32] For more information, visit the web site: http://www.crui.it.

[33] Metodo di Valutazione della Ricerca. More details on this method can be found on CRUI web site: http://www.crui.it/valutazione/link/?ID=802.

[34] See the decree-law of 3rd October 2006, no. 262, and law of 24th November 2006, no. 286, paragraph 138-142, on the establishment of a National Agency for Evaluation.

- To increase the accountability and transparency of research activities;
- To inform the public about the quality of public research.

ANVUR should be governed by an Executive Committee composed of 7 (Italian or foreign) experts in the field of university research and evaluation practices. The Committee should hold a multidisciplinary profile and be jointly responsible for the successful implementation of the tasks assigned to the agency. A President should be appointed within the Committee to ensure co-ordination of the different actions; the Director should supervise the agency's internal organisation and management structure.

In principle, ANVUR's remit is to supervise the national evaluation system of the research carried out by universities and research centres. This comprises:

- To assess regularly the quality, efficiency, and effectiveness of research and educational activities carried out by universities and research centres.

ANVUR is envisaged to base this activity upon the analysis and benchmarking of quantitative and qualitative data and indicators. The results of the self-evaluations conducted by the universities and the reports stemming from in loco peer-reviews should also be employed, as recommended at European level.

- To supervise, guide, and monitor the evaluation activities conducted by single CIVs.

In particular, ANVUR is expected to provide CIVs with methodologies, criteria for evaluation, and data based on international standards. The agency is spurred on playing a leading role in the field of data collection. Free access should be granted to the databases maintained by MIUR, universities, and research centres. ANVUR's task is to provide central co-ordination and to ensure that databases are regularly updated and that the information provided is reliable and inter-operational. This activity is also seen as a means to assess ex post the procedures for recruitment of university professors. It may help MIUR monitor the national system of university *concurs*, thus contributing to establish a recruitment system based on performance rather than on procedures.

- To appraise the efficiency and effectiveness of the national financial plans and national incentives to research and innovation.

This task relies significantly on in itinere and ex post analyses. Expert Committees could be set up to support and advise ANVUR in the implementation of this specific task.

The agency may also be responsible for the "institutional evaluation" of both universities and research centres. The objective is to assess whether the core objectives of the institute have been successfully achieved and whether financial investments have yielded positive results. Other objectives could be to appraise the international profile of the research carried out by the institute and the (social and economic) impact of research.

According to the 2007 guidelines, ANVUR performs its tasks with impartiality and transparency. It enjoys organisational, administrative and accounting autonomy. The agency should also aim to give wide visibility to its activities (and the results of the evaluations). It is expected that every two years ANVUR draws up a Biannual Report on the state of national research in universities and research centres. The Report is delivered to MIUR, the government and the Parliament. At international level, ANVUR may act as the national agency office responsible for representing Italy in the European network on university research.

The 2007 guidelines highlight that the results of the activities conducted by the agency must be a criterion to allocate ministerial financial funds to public research. In this scenario, ANVUR is expected to define a set of indicators to help MIUR distribute the financial quotas to research institutes. To emphasise the role of the agency, a share of the yearly annual financial flow is envisaged to be allocated on the basis of the quality indicators defined by ANVUR.

The establishment of a national agency for evaluation along the lines provided in March 2007 could benefit the research evaluation system. ANVUR could help reverse the downward trend of Italian research by providing a framework for the implementation of research evaluation. The guidelines for the setting up of the agency address some of the weaknesses that hamper the efficiency of CIVR and CNVSU. ANVUR's roles in this respect (the identification of a methodological approach, the coordination of currently fragmented procedures and the provision of a set of data and indicators) could contribute to make up for the absence of a common methodological structure for evaluation. In this setting collaboration with CRUI could be relevant.

4. Spain

Research evaluation in Spain has been at a very low level for a long time. Only in the late 1980s the government has put forward a plan of reforms aimed at strengthening both the national science and technology system and evaluation mechanisms. With law 13/86[35], a whole programme of renovation was launched. Its core purpose was to set up governmental committees responsible for coordinating the research and evaluation and to devise the national plan for research and development.

The Ministry for Science and Technology (hereinafter, MIST) was established in April 2000 as the main government body exclusively responsible for co-ordinating all initiatives in R&D and for ensuring the attainment of the strategic objectives set out in the multi-annual National Plans for R&D. From April 2000 to April 2004, MIST funded both academic and industrial research (allocating about 85% of the government R&D budgets).As from March 2004, when a new government set in, separation of roles between the Ministry of Education and Science (hereinafter, MEC) and the renovated Ministry of Industry, Tourism and Commerce (hereinafter, MITYC) was introduced.

4.1 Evaluation at central government level

First evaluations in Spain date back to the late 1980s and early 1990s. They were mainly ad hoc experiments conducted on specific cases and did not fall under a systematic and regular methodological approach. The objective of these evaluations was to collect information on research performance. They were in no respect aimed at addressing policy planning or the reallocation of public funds. The national system of data collection was in most cases inaccurate, restricted to a limited number of measurable dimensions, and characterised by a lack of motivation or commitment. Performance databases excluded a priori quantitative

[35] Law for the promotion and general co-ordination of scientific and technical research, adopted on 14th April 1986 (B.O.E., 18th April 1986).

information and indicators on the effectiveness and policy impact of scientific research. Evaluators were often recruited within the administrative staff, and were concomitantly also responsible for collecting data and indicators.

The definition of a research evaluation system became a priority of the national strategic planning for economic growth only in the 1990s, with the adoption of the second National Plan for Research and Development for the financial years 1992 to 1995. This is the national framework for planning, implementation and co-ordination of national research. It monitors the trend of Spanish research over the years and provides an overview of its strengths and weaknesses. For the first time, the second NPRD lists the evaluation of research among its institutional objectives.

The Inter-ministerial committee for science and technology36 (hereinafter, CYCIT) is the official government body responsible for co-ordinating research activities between the State and the 17 autonomous regions of Spain. Its mandate is in particular to devise, plan and to monitor the implementation of the National Plans for R&D. CYCIT is structured as a strategic working group composed of the ministries with a role in R&D. Since 1988, the CYCIT performs its tasks with the assistance of the Office for Science and Technology (hereinafter, OCYT).

The National Agency for Evaluation[37] (hereinafter, ANEP) is an independent body established in 1987 under the Ministry of Science and Technology. It has the mandate to evaluate research projects and programmes, but became operational only in the middle of 1990s. The first National Plan for Research and Development for the financial years 1988-1991 did not in fact entrust it with any evaluation tasks.

4.2 Evaluation and the regional dimension

Over the years inadequate policy use of evaluation models is Spain has led to a limited understanding of research performance both at national and sub-national levels. As in the case of Italy, the inaccurate implementation of evaluation exercises underpins a lack of cultural support to assessment procedures.

The regional dimension in Spain is an additional obstacle towards an efficient national evaluation system. The administrative characterisation of Spain plays a major role in the way evaluation exercises are conducted. The wide autonomy that regions enjoy in many policy areas makes it difficult to define a national strategy for research evaluation. For example, regional autonomous approaches in research planning, management and implementation jeopardise co-ordination at central level.

The current scenario is one of different regional research approaches loosely overarched by a national system. The heterogeneous distribution of public funds to regional scientific research fragments national performance in this area. For instance, Madrid, Cataluna, Andalucia, the Comunida Valanciana and the Basque country account for about 80% of total national expenditures in R&D. There is a need for adequate co-ordination also as concerns performers of research evaluation. As part of the literature point out, “co-ordination between national objectives and regional ones will continue to experience difficulties in view of the existing heterogeneity among regional policies” (Muñoz in Laredo: 2001, p.396).

[36] The Comision Interministerial de Ciencia y Tecnologia was established soon after the adoption of Law 13/86.
[37] Agencia National de Evaluacion y Prospectiva.

4.3 Evaluation in the National Plans for Research and Development

The Spanish multi-annual National Plan for R&D is the government policy document that informs national research strategies. The first editions were clearly aimed at putting the basis of the state research system and at defining first research priorities. Research evaluation was touched upon as an aspect of the national science system but no in-depth implementation plan was envisaged.

4.3.1 The 4th National Plan and the legislative/cultural basis to research evaluation (2000-2003)

The 4th National Plan for the financial years 2000-2003, recently renamed National Plan for Scientific Research, Technological Development and Innovation, seems to mark a change from its predecessors. For the first time, the National Plan provides for the inclusion of evaluation procedures in the national science system and for the structural and methodological reinforcement of assessments at State and regional levels.

First, the 4th National Plan emphasises that the reinforcement of national scientific and technological policies cannot be dissociated from the implementation of a coherent evaluation framework. Second, a whole Chapter of the National Plan is dedicated to i) evaluation and ii) monitoring of the research activities.

In the wording of the 4th National Plan, "monitoring" is a tool aimed to improve the management of the technical, administrative and financial dimensions of research. Monitoring activities aims to simplify i) the mechanisms for the transfer of the assigned funds and ii) the technical control of financed actions. The National Plan distinguishes between:

- *Technical monitoring*, aimed at clearing the results of the financed activity. The performing actors submit the activity's results to a group made of experts and managers. A Monitoring Committee is established to oversee the co-ordination between activities.
- *Administrative monitoring*, which is based on regular audits and periodic checks aimed to verify the expenses incurred in each activity and assess the achievement of the planned objectives.

Monitoring procedures are based on criteria of rationality and quality of the instruments used for managing the National Plan.

As concerns "evaluation", the 4th National Plan distinguishes among ex ante, on going, ex post and strategic assessments. Ex ante assessments enshrine a clear policy objective, which is to select the research activities eligible for public funding. The 4th National Plan identifies four different models for participating in research activities (institutional support; call for tenders of the State administration; calls for proposals, and collaborative agreements). Ministerial departments issue periodically open calls for proposals to direct public finances. The proposals undergo a two-phased evaluation process. This approach corresponds to similar exercised employed in other OECD countries. For basic research and applied research projects, the agency that issues the call for proposal is also responsible of conducting the internal phase of the evaluation. The external phase is performed by ANEP on the basis of peer-review assessments. As concerns technological projects, the external phase is conducted by a panel placed under the Centre for Industrial and Technological Development (hereinafter, CDTI). The results of the evaluation are stored at central level and may represent a source of guidance for subsequent financing streams.

The 4th National Plan undergoes on going evaluations to determine whether its objectives (per research priority areas) have been successfully attained. This evaluation is conducted throughout the lifetime of the National Plan. A lot of co-ordination (also with the performers of monitoring activities) is required to avoid excessive work load.

The 4th National Plan provides for annual strategic evaluations of each research priority action. These evaluations are based on the results of integrated on going appraisals. In principle, the results of annual strategic evaluations supply information for decision-making in the elaboration of the annual work programmes.

Another priority of the 4th National Plan is to develop appropriate systems for data collection. The availability of qualitative and quantitative data on research performance is a sine qua non of any rational approach to evaluation. The 4th National Plan proposes to encode research performance indicators in a database that may show the evolution of national research. The aggregation of dispersed data and information aims also to support the work of the expert evaluators.

The 4th National Plan is overall a very structured text but its policy strength is rather weak. Indeed, as the OECD reports, the National Plan for R&D "resembles the model of the EU Framework programmes", but it "is mainly indicative without a strong mandate for its implementation" (OECD: 2005, pg.21).As far as research evaluation is concerned, it does not explicitly require that research evaluation generate inputs for a more efficient policy planning. It neglects to propose a clear plan to translate research assessment into improved policy orientations. Only ex ante assessments are expressly targeted to inform the flow of public financial funds to research.

As in the Italian case study, the 4th National Plan seems to focus mainly on creating the cultural basis necessary to implement evaluation practices. The establishment of a national framework, within which agencies are charged with clearly defined evaluation tasks and first evaluation procedures are given, is a first step in this direction. This approach includes also the strategies aimed to train the administrative and managerial staffs that operate in the field of research evaluation. In this direction, the 4th National Plan points to the need to increase the number of managers in research activities. Adequate training programmes may serve a twofold objective: to ensure that R&D operators perform their tasks with professionalism and to raise understanding on the importance of monitoring research performance. In the late 1990s, some universities (e.g., university of Barcelona and university of Granada) included specific evaluation training courses in their master programmes on Public Administration.

4.3.2 The 5th National Plan and first results in research evaluation (2004-2007)

The 4th Spanish National Plan has yielded first important results. The 5th Spanish National Plan for Scientific Research, Development and Technological Innovation for the financial years 2004-2007 Plan shows in fact how research assessment can be relevant. The 5th National Plan has been designed on the basis of an extensive evaluation process carried out by the government in the previous years. The study aimed to analyse the state-of-the-art of the national science, technology and enterprise system and to identify points of strengths and weaknesses. The study was informed by quantitative analyses (e.g. indicators on human resources, attainment of the strategic objectives, research outputs).

As a consequence, the 5th National Plan aims to contribute to a more harmonious development of the national science system. For example, it provides an overview of past achievements in the field of evaluation. It acknowledges that ex-post assessments have been limited and

inaccurate and that most of the research programmes have undergone only ex ante assessments. The 5th National Plan puts forward a strategy to enhance evaluation at micro (individual proposals or concrete actions) and macro levels (strategic programmes and objectives).

A new Integrated Monitoring and Evaluation System[38] (hereinafter, SISE) has been launched to assess all the phases of R&D programmes: the design phase, the impact of the activities carried out, the implementation of the programmes, and the calls for proposals. SISE operates through the collection of reports submitted regularly by the R&D management agencies. The information include, at a minimum:

- Follow-up reports on the progress of the research programme and its actions;
- Reports monitoring the state-of-the-art in the research, development and innovation system, including a set of performance indicators;
- Annual reports on research, development and innovation activities;
- Reports on research programmes and actions, issued by evaluation panels;
- Foresight studies.

The reinforcement of coordination between the national and regional governments is one of the strategic objectives of the 5th National Plan. It in fact aims to optimise "available resources by strengthening cooperation and coordination with the Autonomous Communities" (National Plan, pg. 31).

A mid-term evaluation of the 5th National Plan was programmed for the end of 2005. The evaluation aimed at reviewing the quantitative indicators and to assess the success of the 5th National Plan's core objectives, the modes of participation and the financial instruments needed to foster research, development and innovation activities. The main purpose of the 2005 evaluation exercise was to orient an update of the quantitative indicators for the years 2006-2007.

The 5th National Plan marks a new step in policy planning also because its strategic objectives are identified on the basis of the Lisbon European Council. In this respect, it aims to "reinforce the international dimension of Spanish science and technology, with special emphasis on the European Research Area" (National Plan, pg.9). Its European-focused profile results, *inter alia*, in a more articulated approach to financial planning and participation in research activities.

5. European Union

Evaluation of scientific research at the level of the European Union is a broad and complex exercise that builds upon a robust management structure and on regular co-operation with European countries. In the following pages we focus on two aspects of the European evaluation mechanism.

First, we describe how the European Union benchmarks national policies on research and development. This activity is basically implemented in close collaboration with national offices of statistics and R&D agencies. R&D data and performance indicators are in fact collected across Europe and compared and stored in a European database named "European

[38] Sistema Integral de Seguimiento y Evaluacion.

Key Facts and Figures" for public consultation and information. The database provides an overview of scientific research in each Member State and offers an overview of research performance throughout Europe.

Second, we focus on the mechanisms established at European level to direct the flow of financial resources to research. The main European funding instrument is the Framework Programme for Research and Technological Development, which finances research across Europe via competitive calls for proposals and tenders.

Both activities have clear policy relevance.

5.1 European Key Facts and Figures

The 2000 Lisbon Council called on the European Commission to select a restricted number of key indicators for benchmarking R&D policies across Europe. The main objectives were:

- To provide an overview of the state-of-the-art in research;
- To (possibly) identify examples of best practices;
- To create a tool for assisting the design and upgrading of national research systems.

The European Key Facts and Figures represent a database of performance indicators across Europe[39]. They provide an overview of how research and development activities are performed in Member States and include comparative indicators per a selection of R&D themes. The European Key Facts and Figures are hosted on the EUROSTAT web site and brief summaries are often released in booklets.

Until 2003-2004, European performance indicators were grouped in four macro-areas that combine two input-focused areas and two output-focused ones. The macro-areas are[40]:

- Public and private investments in R&D (input)
- Human resources in R&D, covering also the attractiveness of S&T professions (input)
- Scientific and technological productivity (output)
- The impact of R&D on economic growth and social welfare (output)

As from 2004, the European Key Facts and Figures database has been renovated in style and content. An on-line portal on science and technology[41] is now available. Indicators are clustered in two main groups:

- Structural indicators, covering:
  - Innovation and research
- Long-term indicators, including:
  - R&D expenditure

[39] The European Key Facts and Figures are part of a more ambitious European project aimed at setting out the basic facts and figure about the European Union in many areas of social interest. For more information: http://europa.eu/abc/keyfigures/index_en.htm.

[40] See Council Resolution on *establishing a European area on research and innovation*, 2000/C 205/01, 15 June 2000.

[41] For more information visit the web site : http://epp.eurostat.ec.europa.eu/portal/page?_pageid=0,1136250,0_45572564&_dad=portal&_schema=PORTAL

- Human resources
- Patents
- Venture capital
- Information society

Each type of long-term indicator is divided in multiple sub groups.

The indicators are based on data provided by the national offices of statistics of each Members States and when available, of Candidate Countries. The EU employs internationally harmonised statistics to build the database. National experts often collaborate with EU bureaucrats and officers. Data are updated regularly and provide a historical series of R&D performance across Europe.

EUROSTAT has recently published the "Statistical pocketbook 2006: Data 1995-2005", a consolidated version of latest European Key Facts and Figures that assemble the data for the years 1995 to 2005. The European Key Facts and Figures are a first effort aimed to overcome the fragmentation that characterises current European research. As the 6th and 7th Framework Programmes for Research and Development point out, a major obstacle to progress in research and development resides in the frail networking basis across Member States.

The policy impact of European benchmarking can be seen in a better co-ordination of national evaluation policies, both as concerns the identification of performance indicators and the definition of research evaluation strategies. The European Key Facts and Figures aim in fact to guide Member States towards harmonised procedures and approaches. The main national agencies responsible for R&D evaluation usually employ the same set of R&D indicators that are used at European level. Cross-national comparisons are becoming more and more accurate and may allow to identify (in the long term) examples of best practices. When different approaches and methodologies are employed, benchmarking still yields altered results. First editions of the European Key Facts and Figures showed a lack of data for some countries or some areas (e.g. EU Key Figures 2001) but there are signals of fast improvement.

Another issue of European concern is the promotion of R&D evaluation practices across the performers of research activities. The lack of an "evaluative culture" is a sensitive issue that is felt also at European level. Systematic actions are taken to make science more visible to the public, to explain how public money is spent, and to enhance understanding on evaluation practices (that may, in fact, also study the social impact of research outputs)[42]. Several European Councils recommended to join efforts in this direction. As a consequence, the internal services of the European Commission submitted a methodology for coordinating benchmarking across countries[43].

The process initiated at EU level provides a thrust towards the introduction of harmonised evaluation mechanisms at national level. It encourages all Member States (and Candidate Countries) to rethink their strategies for research evaluation. In particular, it offers policy guidance to European countries that have weak evaluation mechanisms, such as Italy and Spain. The harmonisation of national procedures may impact positively on European research performance. Collaboration across countries may lead to agreed strategies to accomplish the objectives set in Lisbon and in Barcelona.

[42] Ibid.

[43] *Development of an Open Method of Co-ordination for Benchmarking National Research Policies*, SEC (2000) 1842, 3 November 2000.

5.2 The EU Framework Programmes for Research and Technological Development

The European Union finances research activities through multi annual Framework Programmes for Research and Technological Development (hereinafter, FPs). Since 1984, FPs are the basic financing instrument of the European Union. They provide financial support to many disciplinary areas of European interest, and usually cover a period of 5 years. They are proposed by the European Commission and adopted by the Council of the European Union and the European Parliament following a co-decision procedure.

The Framework Programme has now come to its seventh edition. FP7 is the first FP to last 7 years, from 1 January 2007 to 31 December 2013. It is designed to build on the achievements of its predecessors and to contribute to the creation of the European Research Area. Four main specific programmes have been identified:

- *Cooperation*: it supports all types of research activities carried out by different research bodies in trans-national cooperation and aims to gain or consolidate leadership in key scientific and technology areas[44].
- *Ideas*: it aims to enhance dynamism, creativity and excellence in European research at the frontier of knowledge by supporting "investigator-driven" research projects by individual teams competing at a European level. It puts forward a new approach to basic research that cuts across consolidated disciplinary and geographical boundaries.
- *People*: it aims to improve the quality of human resources in European R&D and opportunities for employment in the European R&D sector by promoting a career path in research, encouraging European researchers to stay in Europe and making Europe more attractive to the best researchers from around the world.
- *Capacities*: it aims to enhance research and innovation capacities throughout Europe and to ensure their optimal use.

The non-nuclear research activities of the Joint Research Centre (JRC) are grouped under a specific programme and have a specific budget.

5.2.1 Ex ante evaluations in the 7th Framework Programme for Research and Technological Development (2007-2013)

The allocation of EC financial support is based on a well-structured, transparent and consolidated mechanism of ex ante evaluation procedures.

A work programme is issued for each specific programme (within the specific programme "Cooperation", there is a work programme for each theme identified for funding). Work programmes are the detailed implementation plans that specify the concrete scientific-technical, economic and societal objectives of each activity, providing both a broad background and the detailed technical content. They are revised annually and indicate the

[44] The themes selected for funding under the Cooperation Programme are : 1) food, 2) agriculture and fisheries, 3) biotechnology, 4) information & communication technologies, 5) nanosciences, nanotechnologies, materials & new production technologies, 6) energy, 7) environment (including climate change), 8) transport (including aeronautics), 9) socio-economic sciences and the humanities, 10) space, and 11) security. Each theme is sub-divided in areas and in topics. For more information: http://cordis.europa.eu/fp7/home_en.html.

[46] For more information visit the CORDIS web site: http://cordis.europa.eu/.

rules for participation, the funding instruments, and the evaluation criteria applicable to the evaluation of the proposals.

They also timetable the calls for proposals envisaged for each programme. The timetable of the calls for proposals contained in the work programme is not binding. Calls for proposals become official only after they have been published in the Official Journal of the European Union. They are issued at the level of topics, and are also uploaded on the Community Research and Development Information Service (hereinafter, CORDIS) web site[46]. CORDIS provides detailed information on the call fiche, the deadline for application, the budget available under the call, the related work programme, the guide for applicants, and the rules for evaluation. All the documents necessary to prepare a proposal, including the guidelines for applicants and the EC templates, are downloadable from this web site.

Competition in FPs is very high and only a restricted number of research proposals are financed for each call. Work programmes are the background document of any successful proposal. As in previous FPs, ex ante evaluations in FP7 are essentially a scientific process aimed at granting funds to the proposals that offer a combination of scientific excellence, innovation, and a clearly structured work plan accompanied by a sound management structure. The basic evaluation criteria focus to a great extent on the scientific and technical content of the proposals, and are also listed in the work programmes. They are basically the same for all proposals throughout FP7[50]:

- Scientific and technological excellence and the degree of innovation;
- Ability to carry out the indirect action successfully and to ensure its efficient management, assessed in terms of resources and competence and including the organisational modalities foreseen by the participants;
- Relevance to the objectives of the specific programme;
- European added value, critical mass of resources mobilised and contribution to Community policies;
- Quality of the plan for using and disseminating the knowledge, potential for promoting innovation, and clear plans for the management of intellectual property.

In addition to the above-listed basic evaluation criteria, each work programme can identify other criteria that are specific for the topic addressed by the call and for the type of instrument proposed.

The selection of the proposals is based upon peer-review assessments performed by independent and anonymous expert evaluators. The evaluators are selected by the European Commission from within a European on line database. Everyone is free to register in the on-line database through CORDIS and to submit their application to serve as an independent evaluator in FP7. The European Commission may also issue calls for evaluators to call for interested experts. Suitable candidates are contacted directly by the EC and contracted for short-term services. Each evaluator signs a confidentiality and conflict of interest declaration

[50] The evaluation criteria are also set out in the European Parliament and the Council Regulations on the Rules for Participation (Article 10).

and agrees to the terms and conditions set in an appointment letter. Typically an evaluator is asked to review up to 8 proposals.

Evaluation teams are usually cross-national and their members hold different competencies that are equally relevant to assess the proposals. They perform their activity under the close control of EC officials and staff, and receive background documents to guide them in their assessments. Expert evaluators pay attention also to the ethical, safety and gender dimensions of the proposals, to its possible exploitable outputs, and to its societal impact.

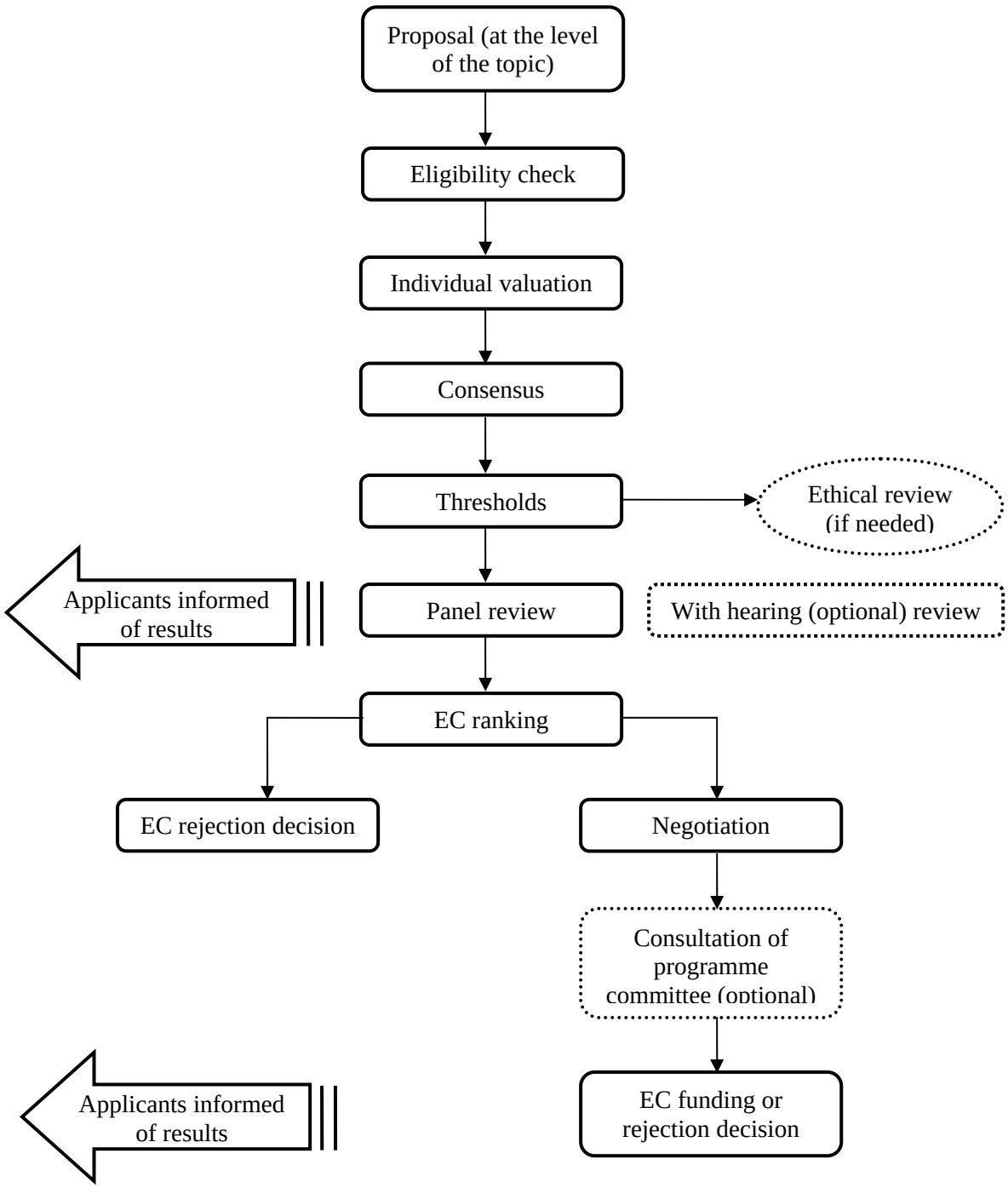
Expert evaluators usually work remotely, but the European Commission may require a stage in the evaluation when experts meet in Brussels to agree on a common view on the proposal (i.e. consensus discussion). In the remote phase, each evaluator draws up an individual evaluation report to give their opinion on the quality of the proposal. The report contains both comments and scores for each evaluation criterion. Only proposals that achieve the minimum score for each criterion and a minimum overall score indicated by the European Commission are recommended for funding. Proposals retained for funding may undergo an ethical review, and this may require that the proponents submit additional information[51].

The final decision is taken by the European Commission with the support of a Committee made up of representatives of Member and Associated States. An Evaluation Summary Report, building on the basis of the individual assessments and detailing the outcome of the evaluation, is sent to the co-ordinators of the proposals. When the evaluation has reached its final stage, the European Commission notifies in writing all co-ordinators of the outcomes of the evaluation and invites the co-ordinators of successful proposal to enter into contract negotiations.

Graph1 below provides an overview of the evaluation procedure leading to the distribution of EC funds to research in FP7.

[51] See the ethical review of proposals for more details on the criteria to be applied and the Guide for applicants, the IV Evaluation and negotiation and the Evaluation Manual.

Graph.1: Overview of evaluation procedure in FP7.



Source: European Commission, 2007

The policy impact of this ex ante selection process is immediate. First, it aims to allocate EU financial resources on the basis of clear and transparent evaluation criteria that are defined *a priori*. This allows to give account of how public money are used and spent. Second, funds are distributed to the proposals that are likely to generate new knowledge[52] and be competitive on the international set. The FP7's funding process addresses a different range of research and research-related initiatives that in the long term aim at two policy-relevant and interrelated objectives:

- To reach the goals of growth, competitiveness and employment, which are the pillar for the European Research Area (ERA);
- To contribute to the Lisbon Strategy's objective to become the "most dynamic competitive knowledge-based economy in the world".

5.2.2 Interim evaluations in the 7th Framework Programme for Research and Technological Development (200-2013)

The European Commission monitors the implementation of the projects selected for EC financial contribution throughout their lifetime. Each EC project is assigned a Project Officer, who monitors the implementation of the scientific work plan, the submission of deliverables and the attainment of milestones, and a Financial Officer, who monitors that the EC financial contribution is spent according to EC rules and provisions. Both the Project Officer and Financial Officer are usually responsible for a bunch of projects.

Interim evaluations are typically conducted yearly. They are based on the delivery of periodic reporting documents that the project co-ordinator submits on behalf of the consortium and by fixed deadlines.

Basically two types of reports must be provided:

- Activity reports, containing an overview of the scientific activities carried out in the reporting period, describing the progress in relation to the project objectives, the progress towards the milestones and the deliverables and any problems encountered;
- Management reports, including a detailed justification of the costs incurred by each project partner, justifying their necessity in relation to the activities implemented. The financial statements are also part of the management reports.

Additional reports may be requested.

In principle, interim evaluations focus equally on the scientific and managerial implementation of the project. In practice, evidence shows that the check of administrative and financial forms outweighs the evaluation of the project's scientific and technological implementation. In a nutshell, interim evaluations differ substantially from ex ante evaluations in that they are fundamentally an administrative and financial control.

The Project Officer revises the project reporting documents with the support of external experts and may decide to withhold (part of) the EC financial contribution if the project intermediary results are not satisfactorily met. Quite often, however, the European

[52] The so-called "knowledge triangle" (research, education and innovation) is a key element in the EU strategy towards the goals set in Lisbon.

Commission discusses with the co-ordinator the outcomes of the interim evaluation and may require a revision of the project work plan.

The procedures for interim evaluation of EC co-funded projects have been recently revised with the adoption of FP7. New rules for evaluation have been introduced and reporting procedures have been streamlined. Overall FP7 seem to reverse the approach of its predecessors: it requires a more punctual assessment of the project's scientific activities, their progress in relation to the objectives, and advancement towards the milestones and the deliverables. The appraisal of how the EC financial contribution is spent by the beneficiaries remains a core aspect of the evaluation for reasons of transparency and accountability of EU institutions and funding mechanisms. However, it is not likely to outweigh the evaluation of the project scientific activities, unless cases of serious misconduct or mismanagement of the EC financial contribution occur. One positive sign in this direction is the decision taken in FP7 to abolish the compulsory submission of yearly (and costly) audit certificates that was putting a lot of burden on the implementation of FP6 projects. In FP7 the certificate on financial statements is mandatory for beneficiaries when EC funding reaches 375,000 € (with the exception of 2-year projects, for which the certificates are submitted at the end of the project).

The first calls for proposals of FP7 were launched in December 2006 and closed in spring 2007. The first round of ex ante evaluations are in the midst of being concluded and first grant agreements will be signed in autumn 2007. It is therefore too early to know how interim evaluations will be conducted and whether they will be a scientific exercise, as EC official documents and FP7 provisions indicate, rather than a formal check of costs and administrative procedures.

6. The US

It is very difficult to outline the US research (and evaluation) system. Science and technology policies in the US are decentralised and very little attention is given to the design of national strategies.

Another fundamental characteristic of the national science system is the mix between public and private R&D activities. The industry is increasingly investing in university research. The negative impact of this trend is that universities tend to research less on basic research and more on driven research, which is of immediate industrial use (e.g. patenting). Notwithstanding the large public and private investments in university research, industry remains the best R&D performer.

6.1 Evaluation at central government level

The US has neither a national research plan nor explicit national research objectives. At Federal level, no single agency is responsible for allocating the R&D budget on a regular basis. Decision-making on R&D funds is fragmented in more that 25 Committees. Financial resources are basically mission-focused and distributed on the basis of merit or past achievements. National scientific committees and administrations across the country define their own research priorities and this is how the national agenda is defined.

Structural changes within the national science system have indeed been limited for decades (OECD 2003, pg. 32). For example, several attempts have been made over the years to establish a federal Ministry of Science, but the Congress has always dismissed any proposals. Governmental official documents offer guidance in this field, but the system remains largely pluralistic and complex. The lack of a robust national research and evaluation system depends also on the difficult collaboration between the central State and the Federal states. First attempts to enhance the level of co-ordination between the two levels draw back to the early 1990s.

6.1.1 The Government Performance and Results Act

In 1993 the Congress adopted the Government Performance and Results Act (hereinafter, GPRA) to introduce evaluation mechanisms in research and technological policies. GPRA's main objective is to set up strategic planning practices in federal agencies that conduct R&D activities. According to GPRA, all Federal agencies are required to:

- Prepare a five-year strategic plan of their objectives;
- Develop yearly a performance plan to assess their activities against clearly defined objectives;
- Provide the Congress with an annual report that summarise the results of the evaluation.

The Congress has direct access to the annual reports. However, evidence suggests that the results of the evaluations are loosely considered for policy planning, both at financial and scientific levels. It is true that GPRA is a relatively new mechanism and its implementation is still at an early stage. For instance, the degree of responsiveness of the federal agencies varies a lot. Some of them have introduced evaluation techniques in compliance with GPRA and started the regular assessment of their research. Many others are still reluctant to adopt GPRA. They consider that the emphasis on quantitative analyses puts the quality of scientific research at risk. In this scenario, the National Science Foundation is a first example of how research assessment is dealt with in the US.

6.1.2 The Program Assessment Rating Tool

The central government has recently launched a set of initiatives to co-ordinate the implementation of research evaluations across the federal States.

In 2002 the Office of Management and Budget (hereinafter, OMB) launched the Program Assessment Rating Tool (hereinafter, PART). PART is a systematic method aimed to assess the performance of research activities across the federal government. Each year, about 20% of an agency's programmes undergo PART reviews[53]. The evaluations include a consistent series of analytical questions. The focus is on programme purposes and design, strategic planning, programme management, programme results, and accountability. PART has a clear policy objective. It aims to identify a research programme's strengths and weaknesses and to inform the allocation of funding resources and science decision-making in science and technology. The results of the PART reviews are uploaded on the Internet[54] and accessible through the governmental database "ExpectMore". To date about 1000 PART reviews have been encoded in the database.

[53] NSF has completed all of its PART-evaluations. All of NSF's PARTs received the highest rating of Effective.
[54] To view the PART's results, see the web link http://www.whitehouse.gov/omb/part/

OMB and the Office of Science and Technology Policy (hereinafter, OSTP) set up the Research and Development Investment Criteria:

- Relevance: R&D programmes must explain why investment is relevant and appropriate;
- Quality: R&D programmes must justify how funds will be allocated to ensure quality;
- Performance: R&D programmes must monitor and document how well the investment is performing.

The three R&D criteria apply only to agencies that invest significantly in R&D activities. The main purpose is to help the agencies improve their investment decisions and upgrade the management of their R&D programmes.

Action at central level is fundamental because it supports horizontally the work undertaken by the federal agencies. It raises understanding on how assessment is relevant to maintain high research standards, and spur research performers on collaborating among us. Quite surprisingly, although fragmentation of roles and responsibilities impinges the successful implementation of many evaluation processes, dispersion of decision-making power in science policy is not perceived as a major problem. The predominant role that the US has in R&D performance compared to most OECD Countries seems to rely also on pluralistic and decentralised approaches to science and innovation.

6.2 Evaluation and the National Science Foundation

The main actor in the US science system is the National Science Foundation (hereinafter, NSF). NSF is an independent agency of the US government founded in 1950 to "promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defence" (National Science Foundation Act, 1950). It performs this task by advising the US President and the Congress on matters of science policy. NSF has no research institutions of its own, and this is a warranty of independence and objectivity in the provision of advice[55]. NSF funds research through grants, contracts and co-operative agreements, and accounts for 20% of the federal support to academic institutions for basic research. The Policy Office of the Division of Grants and Agreements gives detailed information on the procedure envisaged for funding.

NSF has a visible and long-standing practice in research assessment. Among its manifold institutional tasks is in fact to "evaluate the status and needs of national R&D and to take into consideration the results of evaluation in correlating research and educational programmes with other Federal and non-Federal agencies".

First, the agency collects statistical information across the country and by issuing regular statements on science performance. NSF actually pioneered activity in the field of R&D performance indicators with the objective of addressing future policy options and strategies[56]. The focus on performance indicators in NSF is traditionally tied to policy orientation. In principle, it responds to the need to establish a mechanism to inform the national science system and to lead to R&D improvements. The Division of Science Resources Statistics

[55] The NSF represents an exception in the US scenario, because most federal research funding agencies actually conduct in-house research, as well.

[56] "While the OECD launched the idea of indicators, it is to the National Science Foundation that we owe the development of the field" (Godin: 2003, p.687).

(hereinafter, SRS) is responsible for "collecting, interpreting and analysing data on scientific and engineering resources, and also for providing a source of information for policy formulation by other agencies of the Federal Government" (National Science Foundation Act: 1950). Its main purpose is to contribute to the dissemination of information on R&D to the wider public. Every year SRS issues about 30 publications to summarise the findings of its yearly activity. The reports are widely disseminated on the Internet[57] according to the following 5 categories:

- Statistical tables;
- Results from recent surveys;
- Periodic overview reports;
- Periodic reports on focused themes;
- Special reports.

SRS releases infoBriefs to summarise main findings on research. These short publications are made available to the public in a variety of formats. It also compiles surveys on science and technology and an array of R&D-related information (e.g. research projects, R&D data.). SRS performs its mission in close co-operation with other federal agencies including the National Center for Education Statistics, the Bureau of Labor Statistics, the Department of Commerce's patent and Trademark Office,. SRS also works tightly with universities, firms, professional associations, and international organisations.

Second, NSF combines an ample dissemination of statistical data with in-house and third-party activities. However, these different evaluation processes have still little policy impact. In 2001, the governing Board of the National Science Foundation (National Science Board, NSB) issued a report on budget co-ordination and priority setting for government-funded research. The review acknowledged that "the current system for priority setting in the Federal research budget lacks a coherent, scientifically based process for systematic review and evaluation of the broad Federal investment portfolio for effectiveness in achieving national goals" (NSB:2001, pg. 6). Some recommendations were provided to upgrade the evaluation process:

- Enhancement of budget co-ordination;
- Increased rigour for priority setting;
- More punctual reports on the policy impact of the evaluation.

The report insisted on the establishment of a rigorous system of research evaluation based on a 5-year cycle of evaluations of the outcomes of the federal research portfolio against federal goals. The proposed guidelines for evaluations suggested to focus on research impacts and reporting activities; science and technology reviews. The use of the results of evaluations as a policy design tool was also emphasised.

Performance assessment at NSF is increasingly guided by GPRA, the Office of Management and Budget's Program Assessment Rating Tool (hereinafter, PART) and, more recently, by

[57] For more information visit the web site: www.nsf.gov.

NSF's Financial Year 2006-2011 Strategic Plan[58]. The type and duration of assessment varies according to the activities funded. A few obstacles are identified:

- In the case *of long-term science and basic research*, it is not always possible to link research outcomes to NSF's annual investments. Results may be unpredictable and are usually identifiable over a long term.
- *Science and engineering research projects* may generate discoveries in an unrelated area. It can take years before the impact of a research discovery is recognised. The assessment of the impact of advances in science and engineering projects is inherently retrospective and often requires the recruitment of highly professional experts.

Notwithstanding acknowledged obstacles, the recruitment of external experts is a consolidated practice of NSF. The Foundation employs two external review mechanisms: the Committees of Visitors (hereinafter, COVs) and the Directorate and Office Advisory Committees (hereinafter, ACs). Both conduct independent qualitative assessments of the quality and integrity of NSF's investments.

In particular, the Advisory Committee on GPRA Performance Assessment (hereinafter, AC/GPA) was set up by NSF in 2002. The Committee is responsible for assessing the performance of NSF and bases its judgments on the four strategic goals. For each goal, NSF performance is successful if the results reported demonstrate significant achievement. AC/GPA's relies heavily on performance highlights prepared by NSF programme officers to describe main results achieved. The Committee meets once a year to submit to the Director a report that is incorporated into the Foundation's annual Performance and Accountability Report (hereinafter, PAR). This has clear impacts on NSF strategies for the following years.

Last, NSF often commissions its evaluations to external third parties (e.g. the National Academy of Sciences) to assess its high standards or may decide to convene external panels of experts for special studies.

7. Japan

Research evaluation in the Japanese research system is a relatively young experience. In a few years Japan has embarked in a methodical process of renovation of the national research systems. This has clearly affected the way research performance is addressed. Efforts have been directed to design a system with clearly defined goals, long-term strategies and a robust implementation framework.

7.1 Evaluation at central government level

In January 2001, Japan started a process of renewal of the national science system. One of the reforms introduced is the setting up of a central body for research co-ordination, established within the Cabinet Office of the Prime Minister. The national science system has gained in

[58] The National Science Foundation Strategic Plan describes 4 strategic outcome goals for 1) discovery, 2) learning, 3) research infrastructure, and 4) stewardship: http://www.nsf.gov/about/performance/strategic_archive.jsp.

flexibility; many national institutions have developed into independent administrative institutions (IAI), and are now autonomous in financial, organisational, and management issues. The number of governmental Ministries has been reduced from 20 to 12, in order to reduce bureaucracy. Two Ministries are now particularly relevant for the co-ordination and implementation of R&D activities: the Ministry for Education, Culture, Sport, Science and Technology (hereinafter, MEXTI) and the Ministry of Economy, Trade and industry (hereinafter, METI). Renovation in the science system has also affected the way research evaluation is designed and carried out.

At central level, the main actor responsible for science policy formulation and financial resources allocation is the Council for Science and Technology Policy (hereinafter, CSTP, former Council for Science and Technology). CSTP was set up in 2001 under the Cabinet Office. Its core mission is to draw up every five years the Science & Technology Basic Plan, the framework to promote systematic advancements in the national science and technology system[59].

As concerns evaluation, CSTP has the mandate to conceptualise, under the chairmanship of the Prime Minister, the overall evaluation policy and to allocate financial and human resources to R&D initiatives. A panel of experts within CSTP conducts evaluations with a policy-relevant objective: to inform the effective and efficient distribution of resources. The Committee may also commission the evaluation of R&D projects of national relevance.

7.2 The Science and Technology Basic Plans

The 1st Science and Technology Basic Plan for the financial years 1996 to 2000 was adopted in 1995[60] to enhance the national research performance by increasing budget for science and technology and improving the research infrastructure. It also provided first guidance in research evaluation. Its mandate was to "to achieve a higher standard of science and technology, to contribute to the development of the economy and society in Japan and to the improvement of the welfare of the nation (…) prescribing the basic policy requirements for the promotion of S&T and comprehensively and systematically promoting policies for the progress of S&T" (1st S&T Basic Plan, art. 1). The 1st S&T Basic Plan states that the construction of a new R&D system requires the establishment of an impartial evaluation process that is extended to universities, public research agencies, private research performers (although only to those acting in mixed R&D structures) and R&D agencies that benefit from governmental funding. The 1st S&T Basic Plan recommends universities to introduce self-evaluation practices. However, the Plan does not provide for the policy employment of the results of evaluations.

7.2.1 The 2nd Basic Plan: evaluation as a national strategic priority (2001-2005)

It is in the 2nd S&T Basic Plan for the financial years 2001 to 2005 that fair and transparent evaluation mechanisms become a national strategic priority. For example, following an explicit requirement made in the 2nd S&T Basic Plan, in November 2001 the 1997 national

[59] The Basic Plans are implemented in compliance with Art. 9 (clause 1) of the Science and Technology Basic Law adopted in 1995.

[60] The Basic Plan is a masterpiece in the Japanese legislation on R&D. Its aim is to improve national standard of R&D as a major impulse to economic growth and social welfare (Law no. 130 of 1995. Effective on 15th November 1995).

guidelines on the method of evaluation for government R&D were revised thoroughly. The guidelines lay down a new approach to assessment that is based on the activation of regular evaluation processes. They are a point of reference for any R&D agency that needs to formulate specific evaluation guidelines. They highlight the need for each Ministry and R&D agency to issue a "statement of evaluation standard and processes".

Although research evaluation is not a novelty in the Japanese science system, the guidelines provide for a more robust and systematic approach. In particular, they emphasise that the results of evaluation must be translated into management improvements, and require making appropriate use of the results of evaluation when distributing R&D resources. In principle, the policy impact of evaluation is twofold. First, the guidelines underscore the need to optimise the allocation of R&D resources. Research evaluation practices are a policy tool that influences the process of budget distribution and human resources' management. Second, the objective of evaluation is to enhance understanding of R&D at social level. This is achieved by making all relevant information on R&D evaluations visible to the public and by promoting R&D activities through events and publications. Transparency and dissemination of information are core principles of the guidelines.

In 2004, the National Institute of Science and Technology Policy (hereinafter, NISTEP) carried out a very analytical evaluation of the 1st and 2nd S&T Basic Plans. The study was published in March 2005 and looked at different dimensions of national research:

- S&T budget;
- Knowledge creation:
  - Research environment
  - Intellectual achievement and productivity
  - Prioritisation
- Use of wisdom:
  - Cooperation among industry, academia and government
  - Innovation at regional level
- Relationship with society:
  - S&T contribution to society and the quality of life

The report found that the 1st and 2nd S&T Basic Plans had upgraded the quality of national research. This showed in increases in the citation frequency of Japanese papers, in the number of publications in refereed international journals, in the number of post doc researchers, in the number of patent applications by the public sector and in the number of spin-off companies from university research. The report concluded that most university students undertaking advanced study are very interested in pursuing an academic career but there is little interchange between universities, industrial and public research institute sectors. CSTP has taken account of the report's conclusions. In particular, it addressed the issue of interchange between different sectors of the economy and focused upon strengthening mathematics and scientific education, textbooks and graduate education.

7.2.2 The 3rd Basic Plan: cultural support to evaluation (2006-2010)

The 3rd Science and Technology Basic Plan for the financial years 2006 to 2010 aims to improve further the national research system building upon the above-mentioned evaluation report.

The focus is on the need to improve policy and funding co-ordination and to allocate resources fairly among R&D Institutions. The 3rd S&T Basic Plan aims also to motivate interest in developing a research career and identifies instruments to this end. Among them, it acknowledges the importance of a competitive research environment based on fair and transparent procedures for the evaluation of personnel and research proposals. To this end, the government endeavours to support universities and education centres by providing start-up funds and by securing research space for young researchers.

In the field of evaluation, the 3rd S&T Basic Plan highlights the need to establish an evaluation system that is reliable and of global standard. The particular, it emphasises evaluation as a tool aimed to "create a flexible, competitive and open R&D environment for the selection and efficient promotion of R&D and improvement of quality" (3rd S&T Basic Plan, pg.2). Evaluation is also important because it enhances the motivation of researchers, helps formulate better policies and explains to the public how public funds are used.

7.3 Evaluation and the higher education research sector

The main actor of research evaluation in the higher education system is the recently established Ministry for Education, Culture, Sport, Science and Technology (hereinafter, MEXTI). MEXTI has the institutional role to allocate about 64% of the total governmental R&D expenditures, to prepare basic science and technology policies, to formulate research programmes and to promote research evaluation. In performing its tasks, it is supported by the Science and Technology Policy Bureau.

There are three types of universities in the Japanese higher education system:

- 99 national universities;
- 72 public universities (prefectural and city governments), and
- 478 private universities.

Since 1999, national universities must carry out self-evaluations and disseminate the results to society at large. This procedure does not apply to public and private universities. The evaluation of scientific research performed in national universities is more coherent and regular since 2000, when the National Institution for Academic Degrees and University Evaluation (hereinafter, NIAD-UE) was reorganised in a new body. In addition to its original degree-awarding functions, NIAD is now responsible for evaluating all national universities, public universities (as requested by their founders), and research institutes. Evaluation exercises focus on education as well as research activities. Since 2002, NIAD publishes on a regular basis an annual university evaluation report to summarise the outcomes of the assessment. In March 2003, the results of all evaluations have been assembled in one single Report that has been disseminated to all universities, institutes and performers of research in the higher education sector.

There is no common standard of evaluation. Assessments are in fact adapted to the type of university under examination, and are based on data and information collected by the

university itself through self-evaluation activities. For each academic field of research, the evaluation covers:

- Individual faculties;
- Research courses;
- University-affiliated research institutes;
- Inter-university research institutes.

The policy impact of the evaluation is twofold. First, it aims at providing a feedback to universities to improve their research standards. Secondly, results are disseminated widely to the public and aim to enhance social understanding of R&D policies. NIAD-UE publishes the results of the evaluations in the Journal Research in university Evaluation, which is posted on the Internet[61]. Publication of the results of evaluation activities on the web site is considered a useful tool to increase awareness on R&D and its impact on society, particularly as concerns the allocation of public funds. At the same time, it contributes to upgrade the self-evaluations conducted by the universities through benchmarking.

Further to the administrative reform of central government, in January 2001 the national Institute of Science and Technology Policy (hereinafter, NISTEP), a research institute established in 1988 to conduct theoretical and empirical research on matters related to S&T policy, was affiliated with MEXT. Amongst its institutional tasks[62], it contributes to make research visible to the public. This is done by communicating the results of research to society and by carrying out research evaluations. For example, NISTEP publishes an S&T Trends Quarterly Review that summarises main achievements in research. The S&T Trends Quarterly Review is drawn up regularly and uploaded on the web site for consultation and download.

Between 2001 and 2002, NISTEP underwent an external evaluation aimed to review the status of its activities. The external evaluation committee completed an institutional evaluation and drew up a report in November 2002. The purpose of the evaluation was to improve NISTEP's organisational and operational management and to raise the efficiency and effectiveness of research activities to a new level. The Institute web site reports that NISTEP is developing its activities on the basis of the report, but no evidence could be found to support this policy intent.

7.4 Evaluation and the industrial research sector

Most of R&D activities in Japan are performed by the industry sector. The Ministry of Economy, Trade and industry (hereinafter, METI) is responsible for about 16,9% of the total government expenditure to R&D. Resources are distributed through the New Energy and Industrial Technology Development Organisation (hereinafter, NEDO). NEDO is a half-governmental institute placed under METI and responsible for co-ordinating the distribution of R&D funds and the management of R&D human resources. A competitive funding scheme

[61] For further information see the web link: http://svrrd2.niad.ac.jp/rue/list.html.

[62] NISTEP tasks are: to lead planning of government S&T policies by implementing S&T policy research with a comprehensive and long-term perspective; to and support firms and related organizations to formulate strategy for R&D and innovation management; to promote policy research through gathering a wide range of institutions and human resources from Japan and abroad, and to raise corporate research planner, policy researcher, administrative officials, and so on.

is employed to select the research activities eligible for funding. The remaining government R&D resources are distributed as follows: some 3,6% to the Ministry of Health, Labour and Welfare; 4.1% to the Defence Agency; 3,5% to the Ministry of Agriculture, Forestry and Fisheries; 2,3% to the Ministry of Land, Infrastructure and Transport.

In 1997, METI released the guidelines for technical evaluations of the Ministry of Economy, Trade and Industry. Their aim is to inform the Ministry's own R&D projects and those supported by the Ministry. The Guidelines ask for the establishment of a management system for policy-making in the area of R&D. Its main objective is to guide the planning and the implementation of R&D policies. Based on the principles enshrined in the guidelines, over the last decade METI has carried out some evaluation activities. In many cases the evaluation has been conducted in co-operation with NEDO.

The evaluation of the socio-economic impact of R&D is particularly emphasised within METI. The focus is on the development of a set of evaluation techniques that may help monitor how R&D research it linked with society as concerns:

- Visibility of R&D research;
- Enhancement of social understanding;
- Social impact of the final output of R&D research.

The purpose is to identify some common parameters that can be incorporated in the process by which research and development policies are made, so as to tie science planning to society.

Evaluation activities are carried out by experts or professionals holding a specific knowledge in the field under examination. In principle, research projects are evaluated throughout their lifetime, although in some cases assessment is restricted to a specific phase of the project. For example, it may be the case that post-project evaluation is omitted for R&D projects that can be automatically validated by a subsequent project. The evaluation procedure is centralised within METI's secretariat. This body implements the assessment, produce a report to summarise the results of the examination, and deliver it to the relevant department, offices and to the public. An interesting characteristic is that evaluators are responsible for giving action to the results of the evaluation. When the evaluation has been completed, the secretariat of the evaluation submits a copy of all the documentation to the Technology Evaluation Study Section (hereinafter, TESS), which formulates an opinion on the results of the evaluation. TESS' comments often build upon past studies and assessments. Its opinion is forwarded to the Formulation Unit (hereinafter, FU) and the documentation related to the evaluation is delivered to the Appraisal Unit, which provides a final judgment based on the results of the evaluation and TESS' opinion. In the final step, FU reviews the management of the budget and the scientific profile of the project in the light of all the information gathered and on the basis of the opinions given by other bodies.

The following table provides an overview on evaluation activities conducted on technological projects.

Table 2: Evaluation activities conducted on technological projects at METI.

	Pre project evaluation	Intermediate and post-project evaluation		Follow-up evaluation
		Intermediate evaluation	**First year evaluation**	
When	Before estimated budget	Middle year (as specified in the evaluation archive)	End of the last year or beginning of the following year	Within 5/15 years after completion of the project
Evaluator	Project promotion unit (office/department)	Project promotion unit (Technology evaluation unit for important projects)*	Project promotion unit (Technology evaluation unit for important projects)	Technology Evaluation Study Section
Purpose of evaluation	**(1)** To provide the necessary information for project formation and selection **(2)** To specify the purposes and the contents of the project for its enforcement **(3)** to prepare an evaluation archive that can be useful for intermediate and post-project evaluations	**(1)** Administrative evaluation of the progress of the project (mainly in terms of objectives achieved)		**(1)** follow-up for practical applications the achievements of the project **(2)** To judge whether evaluation method is appropriate or not

* Projects having an ambitious critical mass in terms of budget scale, period, and content are defined "important projects". They require a more strict evaluation carried out by an evaluation team other than a unit that does not enforce the project directly or the Technology Evaluation & Study Section.
Source: METI.

The Ministry recommends that the performers of R&D take account of the results of evaluation at two levels:

- As concerns R&D projects:
  - To reconsider the rationale and purpose of the project;
  - To review the objectives and methodology of the project;
  - To review the allocation of financial and human resources.
- As concerns R&D policies:
  - To examine methodologies used to implement R&D activities;
  - To inform future R&D priorities and planning;
  - To advance the whole R&D system;
  - To improve administration of and within R&D institutions and enhance their collaboration.

At policy level the employment of research assessment as a policy design tool is strongly advocated. However, no evidence has been found to support what seem to remain simple declarations of intents. The only actual use that is made of research evaluation within METI concerns its social impact. First of all, METI pursues action to raise awareness among bureaucrats and R&D performers. Second, it aims to near society to the science system and to give clear evidence of how public money is spent. Dissemination, promotion and circulation of information on R&D activities are regular. The mentality of R&D performers is slightly more open-minded than in the past.

Conclusions

Current practices show that research evaluation systems vary a lot across countries. None of the case studies analysed in this paper has developed a comprehensive research evaluation model. A study published by OECD in 2003 compared domestic evaluation procedures across national studies and found a wide fragmentation of approaches (OECD: 2003, p. 21). The study showed that nearly all OECD countries conduct ex ante evaluations, but only Finland and the UK perform on going and ex post exercises to test progress in research performance.

This paper confirms the conclusions of the OECD report. A few countries implement sophisticated procedures on programmes or institutions. This is the case of the UK, where ad hoc assessments are also conducted. Follow-up evaluations are now performed in many countries as a means for future budgetary design, but still many countries lag behind (e.g. Italy and Spain). Evaluation in Japan is an essentially ex ante exercise, whereas on going or ex post appraisals are largely uncommon. In principle, all institutional bodies in charge of evaluation tasks claim that the acquisition of knowledge on research performance aims to understand how innovation processes work in practice. Government statements and official documents emphasise that the objective of evaluation is to address research policy planning and future budgetary allocations[63]. However, policy declarations are often left unspoken. The lack of cultural support is in many cases a real problem that hinders the success of any well-structured research evaluation framework.

This paper moves forward and explores whether and to what research evaluations is employed as a policy design tool. A main conclusion is that the results of evaluation are not sufficiently employed at the level of science policy planning. In 2002 the National Technology Agency of Finland (TEKES) acknowledged that "governments continuously (…) need to adjust their policies as a result of changing circumstances and learning experience, (…) but real significant evaluation practices are not yet that widespread" (TEKES: 2002, p. 14).

From a cross-country point of view, the implementation of research assessment models has gone hand in hand with reforms in the national science system. The unsuccessful use of evaluations often depends on the fact that efforts are still directed at renovating the domestic research structure. For example, in Italy the first committee officially responsible for evaluation (CIVR) was set up in 1998. In Spain, it is the 4th National Plan for the financial years 2000-2003 that provides a clear strategy for research evaluation. At a closer look, evidence suggests that each case study faces specific problems.

[63] In the literature, Godin provides an historical analysis of the process by which evaluation is employed to distribute financial resources, address research policies, and monitor R&D efficiency and economic growth (Godin: 2003). In the cyclical evaluation process proposed by Wouters, research evaluation leads to "*the setting of new targets and the writing of new research proposals*" (P. Wouters: 1997, p. 43). The convergence between research evaluation and public policy strategies shows also in the historical reconstruction of evaluation activities provided by Derlien (Derlien: 1990).

Evaluation practices in Italy suffer largely from a lack of cultural support. In universities, most researchers do not see evaluation as a valuable instrument leading to improved performance and better policy orientation. Available data and information confirm that the success of the research evaluation system cannot be disjointed from the support of the research community. It is important that a system of dialogue, collaboration and transparency is created before the results of assessment can be translated into effective policy action.

Similarly, in Spain weak cultural support hinders the transposition of the evaluation results into a strategic policy action plan. Spain has for a long time suffered from the incapacity to establish an efficient management approach to research, and has only in 2000 introduced evaluation practices as a priority of the National Plan for Scientific Research, Technological Development and Innovation. Energies are still largely aimed to develop a positive attitude to research evaluation and to the benefits it may bring in terms of higher research standards. Furthermore, the wide autonomy of the provicias autonomas in research policy is an obstacle to efficient co-ordination at central level.

In Japan, the government launched a reform in 2001 to upgrade the national evaluation system but this does not seem to be enough. In the higher education system, the increasing autonomy granted to universities in policy planning counteracts the success of central co-ordination (OECD Priority Setting 2003, p.5). The national guidelines on the method of evaluation for government R&D call for the introduction of external evaluations to ensure that the process is equitable, reliable and objective. They require universities to improve self-evaluation procedures, but no evidence has been found. Recent improvements in research evaluation collide with reluctance to disseminate the results to the wider public. Part of the literature point to the fact that “the results of research evaluation and the treatment of researchers will make researchers more conscious of research output” (Sato in Laredo: 2001: p. 109).

It is likely, however, that these efforts will yields first results in the long term. For the time being the success of evaluation research system is very frail and the policy use of results is still unsuccessfully achieved. In the US, there is no national plan for research and decentralisation of power among federal States makes it difficult to conduct systematic and coherent assessments. First evident co-ordination at federal level was launched with the Government Performance and Results Act in 1993 and the Programme Assessment Rating Tool in 2002. At Federal level, the National Science Foundation acts as an independent agency of the US government in the field of research policy. NSF has long-term practice in research assessment. It has also pioneered activity in the field of S&T indicators but bureaucrats claim that it has not fulfilled its mandatory objective of assessing the state of science and technology in the country (Godin: 2003, p.14).

The case studies confirm that “there is a need to know more about the accumulation, renewal, and dissemination processes of S&T knowledge and, more importantly, how to apply this knowledge to improve productivity and general socio-economic development" (UNESCO: 2001, pg.1). This paper has allowed to identify some examples of success and a few recent initiatives that may, in the long run, improve substantially the science system. As some authors put it, “it is slightly paradoxical that

the evaluation exercise, which is the most controversial in methodological terms, is also that which has the greatest effect, at least in terms of allocation of resources" (Georghiou in Laredo: 2001, p. 272). A few countries actually employ (quite) successful evaluation models to distribute public financial flows to research.

In the UK, the results of the Research Assessment Exercise are used to orient the allocation of government funds for research activities. Since 1986, RAE has contributed to renovate the R&D sector, and is (still) an example of best practice for many OECD countries. It is quite paradoxical that the exercise is increasingly questioned in the home country. The literature echoes the dissatisfaction of the UK research community on RAE's methodological approach. The exercise is considered inadequate to respond to the changing features of the UK science system. Based on these concerns, in April 2006, the UK government announced that a new assessment mechanism will be launched after the completion of RAE 2008.

Evaluation in Finland is often ruled by the principle "management by results". Evidence provides a few good examples of how this principle as been implemented in the Academy of Finland and in TEKES. In the latter, assessment is explicitly a means of future budgetary design. Evaluation in both the UK and Finland is enshrined in the local culture and the research community is collaborative. Research evaluation is increasingly seen as a tool to enhance public understanding of R&D both within the research community and outside. This is done by publishing evaluation briefings and reports on the Internet, by circulating information amongst ministerial departments and R&D agencies, by organising events, and so on. In this respect, Finland and the US are taking actions to involve stakeholders and the public at large in the process of science policy design. Both the government and federal agencies establish close consultation processes with private and public interested parties.

This approach is not however widespread. The Japanese case study shows that disclosure of information on evaluation is often limited to simple declarations of intent. As Yamazaki states, no real progress has been made as concerns the social impact of research evaluations. In most cases the information is very poor and only synopses are available on the Internet or in hard copies. Last, documents are often disseminated only in Japanese. These shortcomings have been recently addressed by the central government. The main policy priority of the 3rd Science and Technology Basic Plan for the financial years 2006 to 2010 is in fact to foster the "evaluative culture".

While a few improvements can be identified in the field of ex ante evaluations, very little has been attained as concerns interim or ex post assessments. Furthermore, there is a need for greater public accountability of decisions concerning research priorities (OECD: 2003, pg.36). The public sector is the main R&D performer and research assessment becomes an important means of transparency when research depends on public money. The beneficiaries or public financial support to R&D have a duty to justify the way public funds are employed. Lastly, considering the large economic investments in research, it is compulsory to build a broad consensus within the society on the positive returns of scientific research. In this light, the debate on research evaluation should not neglect the increasingly significant range of activities that research institutions are undertaking to engage citizens in science and technology. RTD

activities are supported by public and private funding schemes and more and more incorporated into mainstream research projects. The need appears urgent to elaborate and validate a set of robust indicators for assessing the impact and effectiveness of communication (and more in general, science in society) initiatives at EU level (EC Science in Society MTA Panel, 2007, Bucchi & Neresini, 2007).

Although research assessment practices are often not yet used at policy level, one must acknowledge that countries are making significant efforts towards improvement. In 2006, the decision of the Italian government to establish a National Agency for Evaluation that progressively takes over the roles of CIVR and CNVSU suggests that the topic is on the political agenda. MIUR is now taking the necessary steps towards the setting up of the agency. A set of guidelines addressing the agency's institutional tasks and structure were released in March 2007.

In this context, the European Union may play a guiding role. For example, the European Key Facts and Figures may act as a point of reference for strengthening national methodologies for research evaluation, data collection, performance indicators, and quantitative analyses. The European Council held in Brussels on 8-9 March 2007 emphasised the importance of exchanging best practices in the context of multilateral surveillance and called for increased cooperation between the performers of R&D activities (Brussels European Council, EU Presidency conclusions, 9 March 2007). Cohesion policies may contribute to achieve the goals set at Lisbon. However, the implementation of the Lisbon objectives (which were also reiterated at Brussels) cannot represent per se the solution to reverse the trend in national research (evaluation) systems. It is important that efforts are prolonged in order to produce the structural changes required.

Annex 1: Main performers of research evaluation across countries

Country	Main actors	Mission	Role in evaluation	Web site
UK	Department of Trade and Industry (DTI)	It sets, develops and co-ordinates R&D policies at national level	It supervises and co-ordinates all evaluation exercises	www.dti.gov.uk/
	Science and Technology Assessment Office (OST)	Established within the Cabinet Office, it provides advice to the government on science, technology and S&T matters and is the main source of financial support for basic research	It ensures that all departments adopt adequate evaluation procedures, publishes guidelines for evaluation and provides performance indicators	www.ost.gov.uk/
	Academic Research Councils (RCUK)	They fund university research on behalf of the Office of Science and Technology (OST)	They conduct ex ante evaluation to distribute funds to academic research	www.ost.gov.uk/research/councils/councils.htm
	Higher Education Funding Councils for England, Scotland, Wales and Northern Ireland (HEFCE, SHEFC, HEFCW, and DEL NI)	They promote and funds high-quality, cost-effective teaching and research in universities and colleges in England	They conduct Research Assessment Exercises (RAE) every few years to distribute public financial support to the higher education sector	www.hefce.ac.uk/ http://www.hero.ac.uk/rae/
Finland	Science and Technology Policy Council (STPC)	It is an advisory body to the Government retaining responsibility in the field of evaluation	It provides guidelines, supervises and monitors evaluation activities across government Institutes	www.minedu.fi/tiede_ja_teknologianeuvosto/eng/
	Ministry of Trade and Industry	It sets, develops and co-ordinates policy in trade and industry at national level	It commissions regularly independent evaluations on research activities carried out by institutions under its branch	www.vn.fi/ktm/
	National Technology Agency of Finland (TEKES)	It is a funding council operating under the Ministry of Trade and Industry. It carries out technological programmes	It evaluates technical R&D programmes	www.tekes.fi

	Ministry of Education	It sets, develops and co-ordinates education policies at national level	It supervises evaluation activities in the public sector and commission evaluation exercises	www.minedu.fi/minedu/
	Higher Education Evaluation Council (FINHHEC)	Established within the Ministry for Education, it has evaluation tasks	It assists higher education institutions in performing evaluation tasks	www.minedu.fi/eopm/committees/finheec.html
	Academy of Finland	It is an expert organisation made up of public research Councils. It performs research activities and funds basic research	It evaluates research conducted by its public research Councils, and issue a Review on the state of national research	www.aka.fi/
	T&E Centres (Employment and Eco Development Centres)	They provide advisory and development services for businesses, entrepreneurs and private individuals	They perform evaluation at regional level	http://www.enterprisefinland.fi/liston/portal/page.lsp?r=4008&l=en
	Research Statistics	It is the national portal for statistics	It provides key statistics and indicators on Finnish science and technology	www.research.fi/
Italy	Ministry for Universities, Scientific and Technological Research (MIUR)	It sets, develops and co-ordinates policy in education and scientific research at national level	It supervises, co-ordinates and commissions evaluation exercises at national level	www.miur.it/
	National Committee for the co-ordination of research evaluation (CIVR)	Established within MIUR, it performs evaluation tasks at national level	It sets guidelines for evaluation procedures and proposes new methodologies	www.civr.it

	National Committee for the evaluation of the university system (CNVSU)	Established within MIUR, it performs evaluation tasks at the level of the national university system	It supervises evaluation activities of research carried out by Universities and sets guidelines	www.cnvsu.it/
	Internal Committee for Evaluation (CIV)	Established within MIUR, they perform evaluation tasks on university research. Each Ateneo sets up its internal CIV	It co-ordinates research evaluation within the university, mainly collecting information of research performance and delivering it to MIUR	n.a.
	Conference of Italian University Rectors (CRUI)	It is an association of the rectors of public/private Universities proposing policy guidelines to improve the national niversity system	It supports the development of evaluation methodologies and provides inputs	www.crui.it/
	National Institute of Statistics (ISTAT)	It is the national agency for statistics and data on R&D performance	It provides key statistics and indicators on Italian science and technology performance	www.istat.it/
	Regional Institute for Research in Lombardia (IRER)	It is an institute aimed at supporting regional and local planning by means of research studies	It provides indicators on regional performance and evaluates the effectiveness of policies and measures at regional level	www.irer.it/
Spain	Ministry of Science and Technology	It sets, develops and co-ordinates at national level technological research	It supervises and commissions evaluation exercises	www.mcyt.es
	Ministry for Education and Science (MEC)	It sets, develops and co-ordinates at national level research conducted by the higher education sector	It supervises and commissions evaluation exercises	www.mec.es/

	National Agency for Evaluation (ANEP)	It is an independent body under the Minister of Science and Technology charged with evaluation tasks	It is responsible for the evaluation of research activities carried out under the National Plan for R&D	www.mec.es/ciencia/jsp/plantilla.jsp?area=anep&id=22
	Inter-ministerial Committee on Science and Technology (CICYT)	It is responsible for the preparation and follow-up of the National R&D plan	It monitors the successful accomplishment of the National R&D plan	www.csic.es/index.do
EU	European Key Facts and Figures	It is a database of performance indicators across Europe implemented by the EU with the support of Members States offices of statistics	It provides an overview of how research and development activities are performed in Europe and include comparative indicators per a selection of R&D themes	europa.eu/abc/keyfigures/index_en.htm
EU	Community Research and Development Information Service (CORDIS)	It is the European on line portal on European research and development	It provides all kind of information on European research, including Framework Programmes, Calls for Proposals, events	cordis.europa.eu/
US	National Science Foundation (NSF, 1950)	It is an independent agency of the US Government promoting, through grants and contracts, the progress of science, national health and prosperity. It advises the President and the Congress on R&D	It evaluates the status and needs of national R&D, provides S&T indicators and issues report on national performance in R&D	www.nsf.gov/
US	Division of Science Resources Statistics (SRS)	Established within the NSF, it is responsible for the collection of R&D performance information	It provides periodic overview reports on S&T and R&D performance in co-operation with other Federal agencies (see below), it offers interpretation of data and information for policy formulation by other agencies of the Federal Government	www.nsf.gov/sbe/srs/stats.htm

	National Science Board (NSB)	It is the governing Board of the NSF	It conducts studies on research policy topics. On a biennial basis, it presents the Science and Engineering Indicators	www.nsf.gov/nsb/documents/policy.htm
	White House Office of Science and Technology Policy (1976)	It co-ordinates R&D programmes of federal agencies and sets strategies for public research	It evaluates the scale, quality, and effectiveness of the Federal effort in science and technology	www.ostp.gov/
Japan	Council for Science and Technology Policy (CSTP)	Established within the Ministry for Science and Technology, it prepares the multi annual S&T Basic Plan and the national strategy for R&D	It evaluates research and development projects, including government-funded large-scale ones	www8.cao.go.jp/cstp/english/s&tmain-e.html
	Ministry of Education, Culture, Sport, Science and Technology (MEXTI)	It is responsible for the planning and drafting of basic science and technology policies and for the formulation of research programmes	It promotes research evaluation in the university system; increases understanding of science and technology and collects statistics	www.mext.go.jp/english/
	National Institution form Academic Degrees and University Evaluation NAID-UE)	It has degree-awarding and evaluation responsibilities	It evaluates all public Universities and research Institutes, it publishes reports on evaluation	www.niad.ac.jp/english/index.htm
	Ministry of Economy, Trade and Industry (METI)	It sets, develops and co-ordinates policy at national level	It evaluates R&D projects	www.meti.go.jp/english/

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