International Audit of Research, Development & Innovation in the Czech Republic

R&D Governance in the Czech Republic

Annex 2 to the Second Interim Report

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Executive Summary

This report contains the findings of the activities implemented in Work Package B and Work Package C (further: WP b and WP c) of the International Audit of Research, Development and Innovation in the Czech Republic.

WP b had as focus the analysis and assessment of the state administration of R&D, while WP c looked into the policy consistency of evaluation in the Czech Republic. As the spheres of analysis in this work packages partially overlapped, we report on their findings and conclusions in one single report.

The report is structured as follows: we first provide an overview on the key concepts for R&D&I Governance, setting the intellectual framework for our audit. Subsequently, we describe the current R&D&I Governance system in the Czech Republic, covering especially the characteristics and functions of the R&D&I Council and the intermediaries (ministries and agencies) and setting these in the context of international experience. We then focus on the processes adopted for the implementation of the R&D&I Governance activities, i.e. the policy and programme design, management and evaluation. Finally, we draw the conclusions and provide recommendations to the policy makers in the Czech Republic.

The R&D&I Governance System

In the Czech Republic, the **R&D&I Council** is the high-level advisory body to the government on research, development and innovation, setting overall directions and priorities across the National Research and Innovation System. It is the high-level advisory body to the government on research, development and innovation, and currently counts 16 members. A member of Government, normally the Prime Minister, acts as Chair of the Council, thus ensuring its legitimacy. Two expert Advisory Commissions and three S&T Expert Committees support the Council in its activities, as well as a Secretariat with a staff of 20 employees (in 2010).

At least from a structural point of view, we see serious limits to the capacities of the R&D&I Council to perform one of its key roles, i.e. coordination of all actors involved in R&D and Innovation: industry stakeholders are involved only to a limited extent and only some of the intermediaries (the two agencies, the Ministry of Education and Industry) have the possibility to attend the Council meetings as permanent guests, i.e. without voting right.

Set in an international context, the R&D&I Council furthermore plays an unusual role in the management of Research and Development in the country, operating almost as a virtual science ministry. Unlike the international policy councils, the R&D&I Council effectively assumes the *role of principal* to the Technology Agency and the Science Foundation. Equally unusual for international standards is the *breadth of its tasks* covering long-term strategy development, monitoring and evaluation, and the decision-making on budget allocations – and especially the level at which these tasks are being performed: in contrast to normal practice in international policy councils, the R&D&I Council tends to fully centralise all activities, taking responsibility of the *micro-management*. The Council thereby increasingly assumes a role of an executive body. This sets a heavy burden on the members of the Council and its advisory committees – and most of all on the Secretariat and the Secretary in person.

Most of the resources of the R&D&I Council and its Secretariat - in terms of human resources and time availability - are currently devoted to the development and drafting of the annual R&D&I budget proposal and to the definition of the Evaluation Methodology that lies at the basis of the Performance-Based Research Funding system. Seeing the limited number of staff in the Secretariat, the Council has a low level of internal analytical capacity and heavily relies on external experts for the development of its strategic intelligence.

The National R&D&I Policy 2009-2015 centralised the implementation of the R&D&I policies in a set of **7 ministries and 2 agencies** (the Science Foundation and the Technology Agency. The agencies and most of the Ministries provide support to R&D&I through the development of competitive research programmes. An exception is the Ministry of Industry that officially does no longer have the responsibility for targeted funding programmes, even though it currently runs a programme that will last until 2017. All Ministries distribute institutional funding to the research institutes under their responsibility.

The 'dynamic inconsistency" between the need for long term policies to support research and innovation and the short term incentive systems within which politicians live was an issue emerging during our study in relation to the Ministries' governance of R&D&I: senior officials in the Ministry of Education as well as recently the head of the sub-department for research in the Ministry of Agriculture were removed from their positions as an indirect consequence of the governmental changes last summer.

The emerging funding structure in the Czech Republic based on the Grant and Technology Agencies plus a range of other more specialised funding sources corresponds to the 'two pillar' structure used in Finland and the Nordic area. It follows practice in many countries by having a research council (the GA), where funding decisions are effectively put into the hands of the beneficiary research community and an innovation agency (the TA) that is under wider societal control. Such structures are becoming increasingly influential elsewhere in the world, at a time when it is however becoming increasingly clear that the distinctions on which it is based – basic versus applied research, response-mode versus programme funding - are declining in validity. Internationally, many research funders are trying to cope with the limitations of a 'two pillar' approach and move beyond these rigidities, taking a *mixed response-mode and programmed approach* to funding and conducting a *mixture of more fundamental, applied and innovation-related research*.

The Technology Agency seems not to have a clearly defined role and mission yet: it currently fulfils a double role, acting as an executive agency for the seven ministries with competence for R&D&I taking up the role of a *multi-principal* intermediate research funder, and acting as a technology/innovation agency for a single policy-making organisation, i.e. the R&D&I Council (*mono-principal intermediary*).

The **research community** is predominantly composed of public research institutes constituting the Academy of Sciences, universities, 'sectoral' public research institutes, private research institutions, and industry. Over the last decade, public research institutes and universities considerable increased their co-operation in R&D. This was to the benefit of especially the universities and therefore the education system of the Czech republic, and led to an improved internal cohesion of the Czech system as a whole.

Finally, the involvement of the **Government and Parliament** in the current R&D&I System is considerable. The two agencies have a unique status, with their governing bodies being nominated by the Government – upon proposal by the R&D&I Council, while their Supervisory Bodies are nominated by the Parliament. The Government also nominates – or removes - the members of the R&D&I Council and the Secretariat of the Council is part of the Office of the Government.

In the Czech R&D&I system, **national public funding** is divided between two major groups of instruments: institutional funding and "targeted" funding. The term "targeted funding" – in international terminology 'competitive' or 'project' funding - stands for 3 funding modes: response-mode funding, related only to basic research; competitive funding for research programmes in the field of applied research; and public tenders for projects that have the public administration as sole future user.

The last decade was characterised by a considerable increase in national public R&D funding, reaching in 2009 the level of 25,000 M CzK. In the last three years, this growing trend came to a hold.

In 2009, the National R&D&I Policy set the target to reach a 60:40 ratio 'targeted'/institutional funding by 2015. Thanks to the reduction of the institutional funding in 2010 and 2011, essentially, the 2015 targets have already been met: in 2011, institutional funding accounts for 38% of the total national R&D&I budget, 51% is allocated to 'targeted' funding, and 10% covers the costs for the co-funding of international cooperation and Operational Programmes.

This target is to be set against the increasing urge to steer research, a trend that is visible also internationally. However, a 60:40 ratio is high in international comparison. While our estimate of the national budget allocation in the UK indicates similar shares, one should bear in mind that historically, the UK system constitutes an exception in the international scene for its particularly strong emphasis on 'targeted' funding.

The increase in targeted funding in 2011 was especially to the benefit of the Science Foundation, receiving close to 20% of the 'targeted' funding budget. This agency is the sole funding provider for basic research, 96% of its budget is allocated for response-mode funding. In 2011, there is therefore an approximate 20:80 ratio response-mode/programme funding, which in the current system implies also a similar ratio in national 'targeted' public funding for basic versus applied research.

The National R&D&I Policy 2009-2015 documents recognised that funding for basic research is considerably lower than in other countries and declared the intent to increase it – predominantly in the form of targeted funding.

Processes for R&D&I Governance

Policy design and implementation processes are since 2002 governed by a centralised and **formalised model**; the 2002 Act on R&D Support set the legal framework for this approach. The objective was to improve the efficiency of the R&D support system through the development of common planning processes and implementation procedures, including evaluation. We note a growing trend among policy makers in the Czech Republic to change the initially "soft" approach - merely providing structures for planning and evaluating interventions - into a "hard" one, i.e. aiming to connect the results of policy design and implementation processes back to budget allocation, with the idea of rewarding good performance and punishing bad. The trend is to considerably strengthen the top-down steering of the national-funded research activities, accompanied by an ongoing and increasing control of the performance of the responsible administration bodies.

A main conclusion to draw from international practice in relation to the use of indicators and performance contracts as a way to steer research performers and agencies is that these appear generally to be tied into a bigger process of *dialogue-based 'soft' steering* and the use of *distributed strategic intelligence*. For this purpose, *stakeholder involvement* is an increasingly important component of the policy making process. However, stakeholder involvement is by no means the only aspect of strategic intelligence that needs to be distributed. Crucially, *analytic capacity* and the ability to design programmes and other interventions need to be present at several levels in the system. International experience also shows that fundamental for the effectiveness of a policy making process is a good *linkage between the different levels* in the governance structure.

In the policy-making processes implemented in 2008/2009 in the Czech Republic, the **"vertical" dialogue** was limited: ministries were involved in the discussions only in the final decision-making process and ongoing involvement was limited to the 2 major Ministries, i.e. the Ministry of Education and the Ministry of Industry and Trade. No ministry was represented in the R&D&I Council, which was – as mentioned above - the main seat where discussions took place on the 2008 Reform and the thematic priorities.

Nevertheless, the policy making process implemented in the years 2008/2009 resulted being effective in terms of the establishment of a **consistency in policy priorities** between the strategies defined at the various levels of R&D governance (the National R&D&I Policy and the departmental Strategic Concepts). In contrast to the common impression among policy-makers, our in-depth analysis showed a good coherence between the strategies at the different R&D&I governance levels – both in terms of systemic and thematic priorities.

Consistency in the implementation of priorities is guaranteed also through the explicit linkage of programme objectives with the criteria applied in the proposal appraisals. The overall result of our assessment was that the procedures established by law reflect international good practice in their attention to the general principles of rigour, transparency, objectivity and fairness, and efficiency. We noted good practice especially in the simplification and rationalisation of procedures across the funding providers, in the publication of process and selection criteria, in the use of online application tools to enhance efficiency, and in the selection of the reviewers. The only Ministry where some problems emerged was the *Ministry of Health*, in particular in relation to the perceived transparency and fairness of the process.

In terms of **horizontal co-ordination**, at the high level of policy making in the Czech Republic, i.e. the level of the R&D&I Council, the attention for *consensus building among stakeholders* was particularly limited in the 2008/2009 policy making exercises. Discussions most often took the form of pure negotiations at institutional level; the pattern was one of an exclusively indirect involvement of the stakeholder communities - normally through their representatives in the R&D&I Council itself. There was no direct involvement of the broad stakeholder communities in 2008/2009 and open consultations involving the individual actors in the research communities did not take place.

We see a similar pattern emerging in the set-up of the approved and currently running priority-setting exercise that is to define the new priority areas (problem-oriented rather than thematic). Furthermore, one can envisage serious limits to the effectiveness of the priority-setting exercise in terms of consensus-building capacities, seeing the explicit intentions to *re-distribute the budgets* based upon the importance of the newly defined priority areas. International practice is that whenever the identification of priority areas was intended to guide budget allocations, this regarded additional investments rather than a redistribution of existing budgets. By taking away the threat of budget reductions, it was easier to create the needed support for the implementation of the policy – which was considered to be the key priority.

In general, we note little willingness - and even reluctance sometimes - for an open communication with broader stakeholder communities and the general public on discussions within the R&D&I Council. We also note an apparently difficult collaboration between the Expert Committees that act as advisory bodies to the Council and the Council itself; there are clear signs of dissatisfaction and frustration - on both sides.

At the level of the ministries and agencies, stakeholders are intensively involved in both the policy-making and programme management processes. For the development of the Concepts and programmes, stakeholder involvement was indirect through the ministerial Advisory Bodies, but in most cases also direct. The "distribution of labour" that was adopted for the development of the Strategic Concepts and the Programmes varied from Ministry to Ministry, depending on the role that Advisory Bodies

traditionally play within these public agencies. We especially note two ministries with fundamentally different approaches: the Ministry of Health that essentially *delegated* the development to the stakeholder communities, with a minimal involvement of the ministerial staff, and the Ministry of Industry that exclusively relied on its *own internal expertise*.

Consultation with stakeholder communities governed by means of a direct involvement of key staff members of the ministerial departments provide an important opportunity for the creation of *distributed strategic intelligence*, i.e. the transfer of sectoral knowledge from the stakeholders to the institutional programme managers, which is a crucial factor for the overall efficiency and effectiveness of R&D support administration. The distribution of this intelligence is even more enforced in the procedures implemented by the Ministries for their programme management, creating ad-hoc Programme Committees for each programme that involve stakeholder experts as well as Ministry employees.

Finally, several ministries indicated also inter-ministry collaboration for the development of their concepts or programmes. We note an increasing level of such collaborations, aiming at an improved coordination of the research funding as well as an improved response of the funded research activities to the needs of user communities beyond the traditional sphere. Whereas internationally, the use of stakeholders as source of strategic intelligence is common good practice, it is unusual and positive to see this level of co-operation among the different intermediary-level organisations.

One of the most important problems emerging from our analysis was the provision and use of **strategic intelligence**, including evaluation. We noted crucial gaps in the set of strategic information that the policy makers had at their disposal in the years 2008/2009. There was a set of statistical and analytical background studies that provided information on failures related to the R&D system and innovation; failures specifically related to the governance of national R&D support emerged from some monitoring exercises focusing on the implementation of the National Policy and – especially – the National Research Programmes. However, the analytical component of these studies was limited; most importantly, analyses that looked in-depth into the *systemic causes* of these failures were rare, and studies analysing the factors determining the success or failure of previous *policy interventions* in terms of impact achievement – thus allowing for policy learning, were close to non-existing.

Equally, most ministries commissioned studies in support of their policy making, but references to past programmes were more related to vague "past programme experiences" than specific evaluation studies.

Evaluation is an ongoing challenge in the Czech Republic. Essentially, the Evaluation Methodology for Completed Programmes is currently the only framework for programme evaluations. Rather than being "methodology" papers, the descriptive documents merely indicate the basic information that the administration bodies should provide to the R&D&I Council for the implementation of the Collective Programme Evaluations. The methodology adopted for this 'collective' evaluation is purely quantitative, based on a calculation of an input/output ratio. Its declared key objective is to provide the R&D&I Council with a view on the efficiency of programme implementation by the intermediary bodies.

The National R&D&I Policy 2009 – 2015 introduced substantial changes in the evaluation system. However, the current flaws in the evaluation system in the Czech Republic from the perspective of the quality of the evaluations and the role of evaluation in the policy cycle will only partially be corrected once the measures envisaged by the National R&D&I policy 2009 – 2015 are implemented:

- The responsibilities allocated for the implementation of evaluation are problematic. Each level in the structural hierarchy evaluates its own activities. This ultimately undermines the credibility of the evaluations.

- The approach established by the "Evaluation Methodology for Completed Programmes", which focuses exclusively on efficiency and R&D output indicators, heavily dominates the evaluation culture: during our meta-evaluation of 7 recent evaluations, covering all evaluation typologies currently implemented in the Czech Republic, we noted a prevailing focus on efficiency, with little to no effort for an effective measurement of the extent at which the expected effects on S&T fields, industry sectors, or society as a whole were actually reached – or were in the progress of being reached. An additional note regards the quality of the input variables that currently do not allow for slightly more sophisticated analyses related to outcomes and impacts, such as the level of science-industry collaborations achieved or the level of cooperation between organisations located in different regions.

Most important, the concept of the evaluation system as being intrinsically part of a **policy cycle** is not perceived. On the one hand, evaluations were – and for the moment still are - predominantly monitoring exercises. On the other hand, we found only one Strategic Concept that explicitly established a link between its policy objectives and the attainment of the objectives at the level of the programme that implemented the policy. Evaluation - in the sense of evidence-based analysis to understand the degree to which public interventions have relevant goals and actually reach them - is little practised in the Czech R&D&I system. It produces little that is useful for policy learning or improving implementation.

Conclusions

The Reform approved in 2008 and the subsequent National Research, Development and Innovation (further R&D&I) Policy document (2009) for the years 2009 – 2015 and the necessary legislative interventions set the fundaments for a radical change in the system. However, the effectiveness of these efforts is constrained by a number of flaws in the current design and practice of research and innovation governance in the Czech R&D&I system.

The increasing trend of adopting a strong top-down steering of policy implementation, accompanied by the creation of an ever growing number of control mechanisms, has led to a generalised limitation of the role of evaluation in the policy cycle, reduced it to being uniquely a tool for accountability. This causes gaps in the strategic intelligence that policy makers had – and still have - at their disposal, at all levels of the hierarchical system. It also implies that policies are currently defined on *impressions* of the factors determining the effectiveness – or lack of effectiveness - of previous policy interventions rather than on hard evidence and facts.

Closely linked to the strong top-down steering approach is the currently limited consideration - at the high level of the policymaking hierarchy - of the importance of consensus building and an open dialogue with policy implementing bodies, stakeholders and citizens, creating a common vision on innovation and the innovation strategy to adopt. Such common vision is the most sustainable and effective fundament for the attainment of a consistent and coherent policy implementation and thus ultimately the achievement of policy objectives. The difficult communication between high-level policy makers and the other actors in the R&D&I system currently prevents the constructive creation of a common knowledge on innovation needs and challenges. It ultimately inhibits high-level policy makers from adequately taking up their role as change agents and acknowledged referees whenever goals of different stakeholder groups conflict.

The current breadth of the tasks of the R&D&I Council, and in particular its prominent role in the definition of the rules for budget allocations and decision-making on national R&D&I budgets, inevitably implies that discussions in the Council are predominantly centred around the financial aspect of national R&D support so that members of the Council tend to act as representatives of their stakeholder group rather than as disinterested experts. The predominant focus on budgets prevents the R&D&I Council from taking up the key role of an innovation council, i.e. to act as an

open arena for the definition and coordination of longer-term strategies for research and innovation, to the benefit of the country's economic growth and social welfare.

The current structure of the R&D&I system as well as the composition of the R&D&I Council, the categorisation of the research stakeholders, and even the classification of R&D outputs depends on the idea that 'basic' versus 'applied' research can coherently be separated. This contrasts with the current understanding of the more complex reality of knowledge production and use for innovation. An R&D&I system that is built along this old stereotypical model 'basic versus 'applied' cannot but encourage disconnectedness and gaps in the system of research and innovation funding that needs to be tackled at the minimum through good coordination and the use of modern R&D&I funding instruments.

We therefore **recommend** policy makers in the Czech Republic

- *To establish an R&D&I Council that focuses primarily on performing the key function of a research and innovation council, i.e. to act as a platform for consensus building on longer-term strategies*. This implies that it should no longer have the responsibility for the budget definition or for the implementation of monitoring and evaluation practices, that it should include representatives of ministries in its structures, that it should set up ongoing communication systems with R&D users and end-users and ensure the wide (public) availability of statistical, analytical, and evaluation studies in order to allow for an informed and open dialogue-based policy making
- *To ensure the development of a common evaluation methodology* that looks beyond R&D outputs and focuses on the outcomes and impacts of projects, programmes, departmental policies and national policies – in line with the common international practice. The purpose of these evaluations should be to monitor the progress towards objectives, to assess the achievements of the objectives, and to act as tools for policy learning. For the sake of the credibility of these evaluations, the 'waterfall' principle should be implemented, whereby no level in the hierarchical system evaluates its own policy intervention. Adequate knowledge of evaluation principles and standards among the administration bodies needs to be ensured in order to specify policy-useful forms of evaluation and to enable a correct interpretation of evaluation results – no matter whether evaluations are conducted internally or by external experts – as well as a correct validation of the professional level of eventually outsourced evaluation exercises
- *To urgently launch ex-post impact evaluation exercises of departmental and national policies* in the light of the upcoming discussions for the development of the National R&D&I Policy after 2015, in order to ensure informed policy-making, based on evidence related to the success factors and barriers that determined the achievement – or lack of achievement – of the policy objectives
- *To move beyond the two-pillar model for the funding of R&D&I* and define the activities, scope and mode of funding in the Science Foundation and the Technology Agency along a more adequate model of research, taking into account in particular the growing role in modern science and research of fundamental application-oriented research, the importance of creating platforms for the implementation of interdisciplinary research, and the value of bottom-up research funding – also in the context of applied research.
- Last but not least, we must *warn against evaluation practice becoming overly mechanistic*. Experience abroad is that mechanistic models provide poor policy guidance, for example by implying that programmes that are important but poorly implemented should be closed rather than be implemented better. The main conclusion to draw from international practice in relation to the use of indicators and performance contracts as a way to steer research performers and agencies is that these appear generally to be tied into a bigger *process of dialogue-based 'soft' steering*. As with institutional funding, a mechanistic link from indicator values to funding and other decisions is not advisable.

Introduction

This report contains the findings of the activities implemented in Work Package B and Work Package C (further: WP b and WP c) of the International Audit of Research, Development and Innovation in the Czech Republic.

WP b had as focus the analysis and assessment of the state administration of R&D, while WP c looked into the policy consistency of evaluation in the Czech Republic. As the spheres of analysis in this work packages partially overlapped, we report on their findings and conclusions in one single report.

The overall aim of WP b was to evaluate the processes involved in governing, managing and administering R&D&I policies. It focused on programme design & management. This meant considering all the levels of governance, decision-making and implementation from the level of the R&D&I Council down to the process of providing individual grants and evaluating its efficiency and effectiveness.

WP c had as objective to evaluate the way in which policy priorities are translated into policies and programme designs, to understand how designs relate to the interim and final evaluations of programmes' outcomes and impacts as well as their management efficiency and effectiveness.

The report is structured as follows: in Section 1, we provide an overview on the key concepts for R&D Governance, setting the intellectual framework for our audit. Subsequently, in Section 2, we describe the current structure for R&D Governance in the Czech Republic, covering the characteristics and functions of the R&D&I Council and the intermediaries. We also report on our findings related to the trends in R&D collaborations between public research institutes and universities and depict the levels and focus of the national R&D&I budget allocations over instruments and among intermediaries.

Section 3 focuses on the processes for R&D Governance. Major topics covered in this section are the procedures implemented for policy and programme design and implementation, the proposal appraisal processes and results, and the evaluation system in the Czech republic.

Finally, in Section 4 we draw the conclusions of our audit of the Czech R&D&I Governance System and provide recommendations to the policy makers in the Czech Republic.

1. Concepts for R&D Governance

This report presents an audit of R&D governance and policy implementation in the Czech Republic, in the light of international norms, principles and practices.

In order to do the audit and to make it intelligible, we need an intellectual framework. This chapter aims to provide such a framework, illustrating it with examples. In the following two chapters, which discuss respectively the Czech governance structures and policy implementation processes, we provide further examples that – together with the framework – give us a comparative basis for making judgements about the Czech system.

1.1 Governance

Governance refers to the effective implementation of state supported actions and the management of research and innovation by organisations that have been allocated responsibilities from the state. In the public management literature, it " ... is a perspective within which the conventional boundaries between politics and administration are perhaps less significant, and which enables large social questions to be approached more directly than from within the narrower perspective of traditional public administration". Governance is a systemic activity, where "the boundaries between individual institutions become less significant than the question of how the whole ensemble dances (or fails to dance) together."[1] Thus in research and innovation governance we do not look only at policy but also at the interplay between the various actors that together determine the priorities, strategies, activities and outcomes in research and innovation. The focus is on the **processes** of policy formulation and implementation, rather than on the contents.

> Governance is about handling of complexity and the management of dynamic flows. It is fundamentally about interdependence, linkages, networks, partnerships, co-evolution and mutual adjustment.[2]

We use a simple model of research and innovation organisation and governance to think about how R&D&I governance works. This is ideal-typical, rather than representing any particular national practice (see Figure 1). In this scheme, there are four levels of policy co-ordination

- **Level 1** is the highest level. This involves setting overall directions and priorities across the whole National Innovation System. It may be achieved through advice to government or by more binding means, such as decisions of a cabinet sub-committee
- **Level 2** is co-ordination among ministries, whose sectoral responsibilities otherwise encourage them to pursue independent policies. In practice this level of co-ordination may involve administrative aspects, policy issues or both.
- **Level 3** is more operational, in an attempt to make the actions of funding agencies into a coherent whole. This level, too, can involve administrative co-ordination as well as more substantive co-ordination of funding activities, such as co-programming

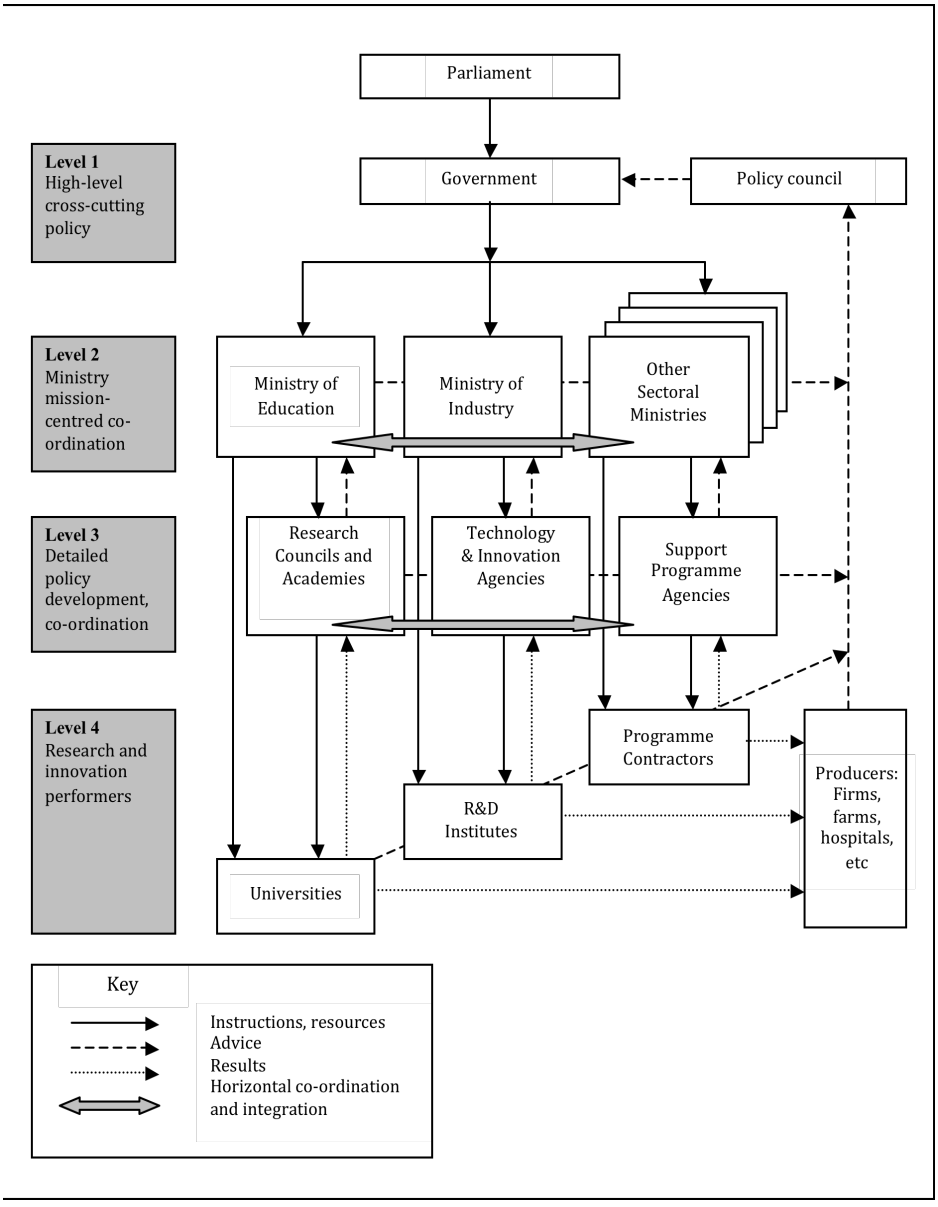
[1] Pollitt, C., Bouckaert, G., *Public Management Reform, A Comparative Analysis*, Oxford University Press, 2000.

[2] John de la Mothe, Knowledge Politics and Governance, in: John de la Mothe (ed), *Science Technology and Governance*, Continuum, London, New York, 2001.

- **Level 4** involves co-ordination among those who actually perform research and innovation. Co-ordination at this level tends to be achieved through self-organisation rather than using formal mechanisms

Despite the apparent complexity, the network of flows of information and resources shown is actually very simplified compared with what happens in reality.

Figure 1: Generic Organisational Structure for Research and Innovation Policy



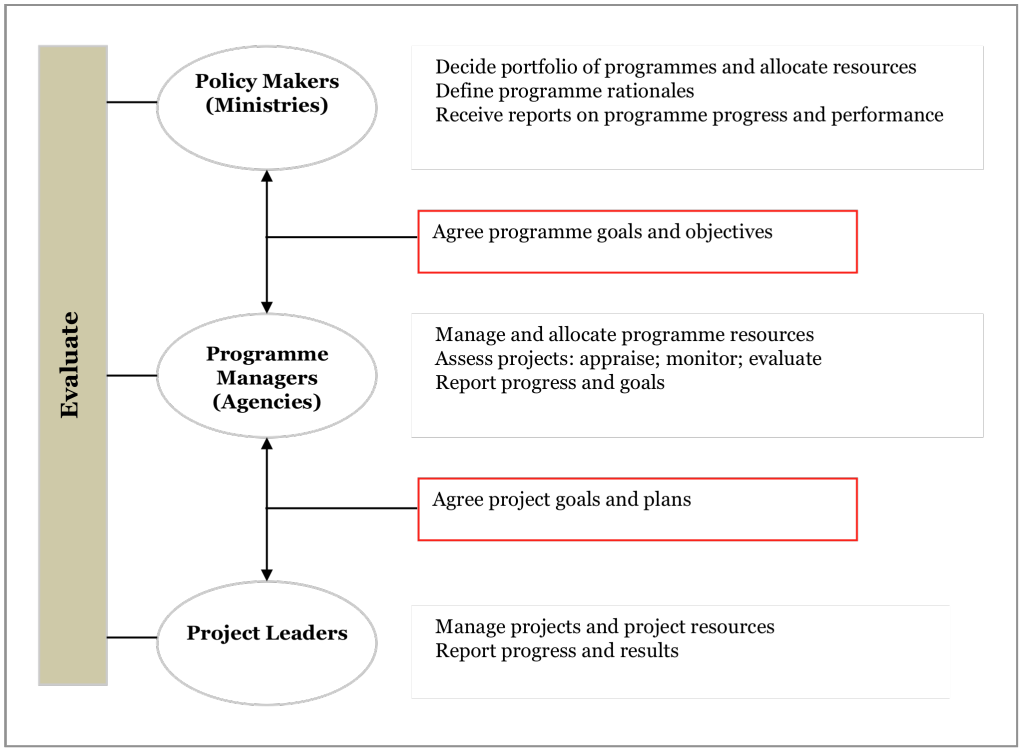
From the Figure it is clear that governance has vertical and horizontal dimensions.

The vertical dimension involves **steering**, where an organisation at one level in Figure 1 tells another at a lower level what to do and receives an upward flow of information in return. For the past couple of decades, refining the way that steering works has been a key part of the agenda of the New Public Management[3] movement, which has more widely promoted

- Professional, management oriented leadership, decentralisation and increased local autonomy in resource allocation
- Management by objectives, using quantitative indicators
- Increased use of competition and markets, as well as privatisation
- Separation among customers and contractors in the production of public services
- De-integration of traditional administrative institutions
- A focus on the state as a producer of public services
- Increased use of incentives, contracting and local autonomy on wages
- Reduced costs and increased budgetary discipline[4]

as well as the use of evaluation in ensuring accountability and in fostering learning and improvement. The general principles of the New Public Management imply a **hierarchy of 'steering levels'** in R&D funding from ministry (policy) down to project (implementation) level. Practices differ in the institutional division of labour involved, the degree of decentralisation created and in the location of the 'intelligence' needed to set and implement policy.

Figure 2: Policy, Programme and Project Management with Evaluation



Source: Erik Arnold, Patries Boekholt and Patrick Keen, *Good ideas in Programme Management for Research and Technological Development Programmes*, Project HS-02 report to the EC VALUE Programme, Brighton: Technopolis, July 1996

[3] An important focus is the PUMA (Public Management) group at the OECD. See www.oecd.org

[4] Tom Christensen and Per Lægreid, *Den moderne forvaltning*, Oslo: Aschehoug 1998

The New Public Management therefore combines ambitions from the era of top-down strategic planning, implemented through management by objectives, with a desire to understand and be responsive to needs. In practice, governance mechanisms need to combine the ability to plan strategically with a role in mediating among stakeholders to produce alignment among objectives. "Successful policymaking normally means compromising through a 'reframing' of stakeholders' perspectives and joint production of consensus."[5] So governance is not just about 'steering' but about **creating arenas**, to decide the right direction in which to steer, and generate consensus-based commitment to steering in that direction.

There appear to be strong arguments for some **balance in strategic intelligence capabilities** between the ministry and agency levels

- It connects the implementation of research and innovation policy with the political sphere
- It generates tension between the levels of policy and programmes, so that policies and interventions are mutually questioned
- It ensures that ministries have 'buyer competence' when setting up performance contracts with their agents
- By delegating aspects of policy implementation to agencies, it reduces the need for ministries to be all knowing. Thus, it generates a source of operational intelligence that is close to the eventual beneficiaries of research and innovation policy and that can provide kinds of knowledge not readily available at ministry level

Distribution of strategic intelligence in Sweden and the Netherlands

Sweden's ministries are very small and lack analytic resources. As a result, a lot of research and innovation policy is *de facto* made by the agencies. In contrast, the Netherlands' Ministry of Economic Affairs has large internal analytic resources, leaving only a very operational role for its agency SENTER-NOVEM in programme delivery

An important way in which the New Public Management has been expressed in innovation and research funding has been through the **use of programming** in research and innovation activities conducted for socio-economic purposes. Policy makers (often in ministries), in effect, write performance contracts with programme managers, who act as *agents* in the delivery of policy goals (Figure 2). The programme managers in turn write performance contracts with project performers. Since the managers need the performers in order to deliver the policy goals, the performers often end up having a large say in, sometimes even controlling, the way resources are allocated[6] at programme level. This is especially true in research councils, but also – to a considerable extent – among innovation agencies. While this type of capture of agents by beneficiaries is not unique to research and innovation funding, it is a particularly strong feature of the area.

International practice shows that this **vertical dimension of governance** is far from being the only important one[7]. First, societal actors and institutions outside the research community are likely to be increasingly involved in the governance of research and innovation. For agenda setting and prioritisation of actions, this implies a variety of stakeholders need to be involved. Given the wider perspective more strategic intelligence will be necessary to come to decisions and priorities.

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5 Stefan Kuhlmann, 'Future governance of innovation policy in Europe – three scenarios,' *Research Policy*, 30 (2001), 953-976

6 See Dietmar Braun, 'Who governs intermediary agencies? Principal-agent relations in research policy making,' *Journal of Public Policy*, 13 (2), 1993, pp135 – 162

7 Erik Arnold and Patries Boekholt, *Research and Innovation Governance in Eight Countries: A Meta-Analysis of Work Funded by EZ (Netherlands) and RCN (Norway)*, Brighton: Technopolis, 2003

Second, governance mechanisms are needed that handle the systemic nature of research and innovation and the need for policies to be coherent and co-ordinated across institutional boundaries. This implies **horizontal co-ordination** along three lines

- *The co-ordination of different societal and economic goals of research and innovation*. In policy terms co-ordination and attuning between research and innovation policies for stimulating industrial growth, for the better use of information technology, environmental preservation, a healthy population, good quality food, and so on
- *The integration of knowledge creation and use*. In an innovation system this could involve bringing together those actors that focus on different roles in the knowledge production chain. In policy terms this involves the integration of science, research and innovation policy
- *The combination of knowledge from different disciplines* to tackle interdisciplinary research needs (e.g. bio-technology) and overarching societal problems that need such an interdisciplinary approach (e.g climate change)

Third, governance mechanisms will be needed that can handle change in the innovation and research funding and performance system – and in the reality with which it deals. Overlaps and boundary ambiguities accompany change, and it is not necessarily clear that eliminating these will improve system performance.

Fourth, governance mechanisms should allow effective implementation of the actions decided upon.

Finally, some of the failures to which innovation systems are prone are the result of failures in governance. Governance systems need, therefore, to be sufficiently reflexive to allow such failures to be identified and acted upon.

1.2 Functions of R&D Councils

In the past 20 years or so, an increasing number of countries have established advisory committees or councils similar to the Czech R&D&I Council. The Finnish Research and Innovation Council has served as an inspiration for many. The growth appears partly to be due to the increasing degree to which research and innovation policy issues affect several sectors of society and partly to the spread of the 'innovation systems' perspective, which recognises the systemic nature of innovation and therefore the need for a coordinated approach from government. Here, we draw some lessons from experience with such councils from eight countries.

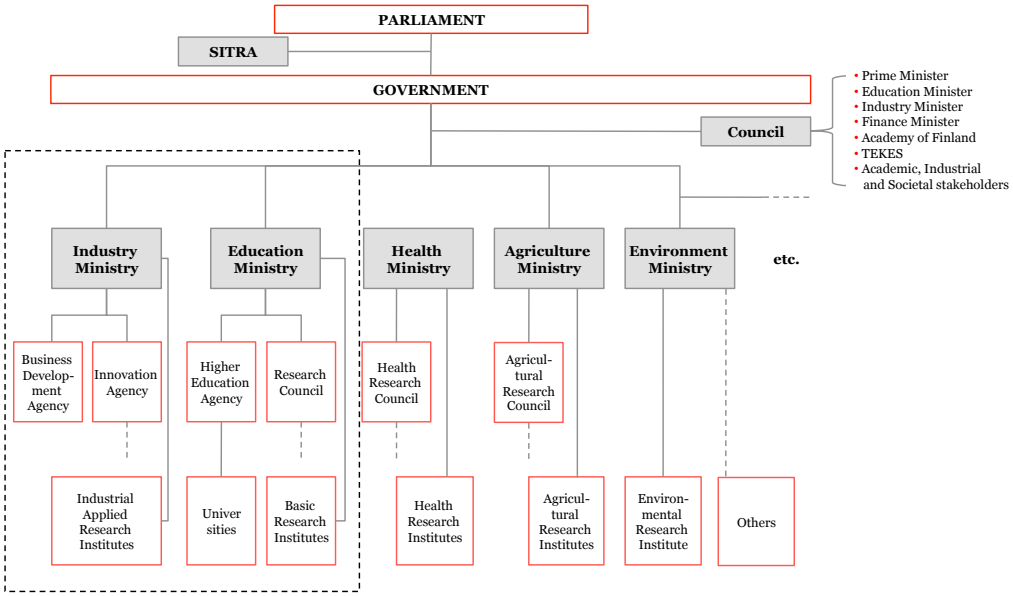
The *Austrian Council* was set up in 2000, against a context of extremely fragmented governance, lack of clarity about roles – especially in the division of labour between ministries and agencies – and uncertainty about the national direction. It was a response to the need for better research and innovation performance in the light of the European Union's Lisbon Agenda for innovation and competitiveness. Its role is advisory, but it is listened to by government and has had a significant influence on policy – though there are also other important influences, such as the agendas of the major research and innovation agencies. The council's *Strategy 2010* focused on short-medium term actions and is symptomatic of the council's near-term engagement with the innovation system.

Canada's Science, Technology and Innovation Council was established in 2007 replacing three former councils in an attempt to provide a single source of holistic advice to government across science and innovation in support of the new national science, technology and innovation strategy. However, while its remit covers science as well as innovation, the council is appointed by the industry minister and supported by a secretariat housed within that ministry. The intention appears to be that it will focus on giving (sometimes private) advice to government rather than being an outwardly orientated source of strategic intelligence, although it is also in the process of commissioning external studies. To date, Canada's industry-ministry dominated

advice system appears to have had limited influence on overall R&D and innovation policy, but the new council structure is expected to improve this.

The Finnish *Research and Innovation Council* is chaired by the Prime Minister and contains other innovation ministers as well as academic and industrial people. It has a successful history of setting broad strategic directions in research and innovation policy, including the very daring decision during the recession of the early 1990s, which coincided with the collapse of the Soviet Union and Finland's largest export market, to increase national R&D spending. The council publishes a review of science, technology and innovation once during the term of each government. Recently, it has focused on the importance of internationalisation and the R&D funding agencies have modified their funding instruments to reflect this new priority. While the Council is generally seen as having been very important during the 1990s, there is less agreement about the centrality of its role today (Pelkonen, 2006), when the Finnish innovation system is arguably in much better shape that in the earlier days of the Council.

Figure 3: Structure of the Finish R&D&I Governance System



The *Irish Advisory Council for Science, Technology and Innovation* (ASC) was set up in 2005 as the successor to the Irish Council on Science, Technology and Innovation (ICSTI: 1997-2005). The number of members was halved (from 25 to 12) and the responsibility of approving government S&T funding priorities was taken away from the Council. In parallel, Ireland created the post of Chief Scientific Advisor, modelled on the UK's Chief Scientist. The ASC interfaces between research and innovation stakeholders and the government, tackling and recommending policy on issues such as internationalisation, absorptive capacity and researcher careers. Since 2000, Irish economic and technological development has been very rapid and has involved the injection of greatly increased funding into the higher education system. This education ministry sphere has therefore developed its own parallel set of governance structures and advisory bodies separate from the ASC and the industry ministry.

The role of the *Japanese Council for Science and Technology Policy* was redefined in 2001 and the council reconstituted so that it no longer only advised the prime minister about science policy but brought six sectoral ministries together with academics and industry to coordinate policies for the innovation system. It is an operative organisation that meets weekly, using its 100-strong secretariat to devise plans and sets relevant budgets, so it combines the roles of advice giving and policymaking.

Table 1: Some Characteristics of Research and Innovation Councils

	Austria	Canada	Finland	Ireland	Japan	Netherlands IP	Switzerland	UK
	Austrian Council	**Science, Technology and Innovation Council**	**Research and Innovation Council**	**Advisory Council for Science, Technology and Innovation**	**Council for Science and Technology Policy**	**Innovation Platform**	**Science and Technology Council**	**Council for Science and Technology**
Established	2000	2007*	1963	2005*	2001*	2003	2000*	1993*
Own law	Yes	Pre-existing	Yes	Pre-existing	Yes	No	Yes	No
Mission/ToR	Advice, networking, strategic intelligence	Advice (may be secret)	Develop the NIS, coordinate ministries, advice	Advice, interface with stakeholders	Strategy, coordination of ministries	Analyse NIS needs via projects and propose interventions	Advise on science policy; Evaluations	Advise Prime Minster on S&T
Membership								CSA Chairs
PM, President	No	No	Yes	No	Yes	Yes	No	No
Other Ministers	Yes	3 deputy ministers: health, trade, industry	7 other ministers	No	6 other ministers	Ministers of education and industry	No	No
Industry	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Academics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Foreigner(s)	Yes (1)	No	No	No	No	No	Yes (1)	No
Appointment	BMVIT, BMBWK	Industry Ministry	Government	Industry ministry	Cabinet office	PM	Government	PM
Members	8 (12)	18	23	12	15	17	12	17
Controls budgets?	Additional appropriation	No	Directional	No	Yes	No	No	No
Own reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Studies?	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Influence?	M/H	?	H	M	H	H	M	M
Secretariat?	8	Yes	3	Forfás	100 people seconded from ministries	8-10 people	7 people	Yes
Consult stakeholders?	Working groups	?	No	Yes	Yes	Yes	Yes	Yes
Communications	Reports Awareness campaigns	Reports, secret advice	Reports	Reports	Plans, budgets	Reports, extensive working groups and conferences	Reports	Reports; dialogue with PM
Evaluates	(No)+	No	No	No	Expert sub-group	No	Occasionally	No
Uniqueness	Parallel science council	Yes	Yes	Parallel Education Council	Yes	AWT in parallel provides S&T advice to the same ministries	Yes	Yes

* Continuation of a previous council +Evaluation activity established together with a national R&D evaluation network

The *Netherlands* has separate councils for science and technology, on the one hand, and innovation on the other. The Netherlands has a strong consultative tradition and it has enjoyed a proliferation of advisory bodies, whose numbers were reduced in the first years of this century. The Council for Science and Technology Policy (AWT) has survived this process and responsively advises government on longer term research policy debates and issues. The Innovation Platform, (2003-10) brought ministers (prime minister, education and industry) into the process. It communicated and consulted widely, identifying problems in the innovation system and launching projects intended to lead to their resolution, often through a new instrument.

In contrast, the *Swiss Science and Technology Council* is made up wholly of academics and – despite its name – is narrowly focused on science. The traditionally non-interventionists stance of the Swiss state is reflected in the fact that there is no other council working on technology and innovation. In practice, these issues are handled by agencies and the Council has little influence on the totality of innovation policy.

The *UK's Council for Science and Technology* has been reorganised several times. It has the function of advising the prime minister about science, technology and research policy and makes a growing number of excursions into broader innovation policy, especially where this involved cross-ministry coordination. The Chief Scientist (Chief Scientific Advisor) co-chairs the council and has the additional task of ensuring that policy advice to government contains a scientific component. The CST appears chiefly to tackle incremental improvements needed to the innovation system and does not set overall innovation policy or strategy.

The fact that five of the eight councils considered are **reorganised versions of previous committees** underlines the degree to which these things are hard to get right. The Norwegian experience (Arnold, Kuhlmann and van der Meulen, 2001) of experimenting with such committees for 50 years without finding a consistently good recipe would also support that idea. It appeared that the key success factor in Norwegian research and innovation advice was the quality of the personal relationship between the chair of the current committee and the government.

Most of the councils have been **established via legislation**. The fact that the UK and Dutch ones have not reflects national legislative practice rather than a difference in status. The prime minister chairs three of the councils, though these tend to have two levels of meeting, with working meetings taking place in the prime minister's absence. Four involve other ministers and a fifth (Canada) involves deputy ministers. Most include representatives of a wide range of sectors of society, especially making sure that the span the industry and education ministry spheres. The Irish and Canadian councils, which sit within the industry ministry sphere, both contain numbers of academics but no representatives of the governance structures from the education ministry sphere, limiting what they can say with authority about holistic policies that span the industry and education ministry spheres.

Benavente (2006) describes the Irish and UK models as **'dominant actor' models**, meaning that the advice function is provided from within the sphere of a particular ministry: in these cases the ministry of industry. This is certainly the case for Ireland, where actors from the health and higher education areas bitterly resent the fact that the national arena for research and innovation policy discussion is within the industry ministry's territory. It is less obviously the case in the UK. The Office of Science and Innovation (formerly Office of Science and Technology) originated within the Cabinet Office and was moved to the industry ministry once its functions had become routine. However, in practice it functions as an independent actor. Benavente's category is certainly relevant not only to Ireland but also to Canada and the criticism his categorisation implies is probably generally valid.

Most of the councils are **national** in composition. Only two contain a foreigner – a sacrifice of external perspective that seems roughly analogous to a large company operating without any non-executive directors.

Unusually, the *Japanese Council* has budget planning and allocation as a central task and hence a secretariat of about 100, seconded from the ministries represented in the Council. Other councils' secretariats amount to a generous handful of people. The education and industry ministries jointly provide the secretariat to the Finnish council, thereby uniting the two important but traditionally warring factions whose actions and strategies need to be coordinated via the council.

Based on international experience, it appears important that coordination and advice councils do not get entangled in resource allocation or budgeting. The *Finnish council* can set the broad direction of budgets but implementation is up to the individual ministers and does not always follow the lines the Council suggests (Pelkonen, 2006). The *Austrian Council* had the task of allocating an additional appropriation of funds for R&D but its suggestion that it should assume wider budgetary responsibility has been firmly rejected by the government and the rest of the governance system. **Most of the councils considered here do not allocate budgets**.

All act as sources of **strategic intelligence**, both commissioning reports and publishing their own, though in some cases advice to government may be confidential. However, their involvement with evaluation is limited. The *Austrian Council* suggested that it should play a role in the evaluation of the innovation system but did not have the legitimacy to do so. It has since established a relationship with a national R&D evaluation network that allows it to overview the sum of national evaluative activity in research and innovation. The Swiss council occasionally produces evaluations on request from the government. **None of the councils considered has systems-wide responsibility for evaluation.**

The councils almost always **involve both industry and academia** as advisors. Curiously, only the Finnish council involves the research institute sector, despite its inherent closeness to innovation processes. The councils considered tend not to suffer policy capture. They engage with a sufficiently wide set of stakeholders and provide a neutral forum for discussion, so that attempts by special interests to pursue their own objectives quickly become visible.

Most of the councils have a wider role in **stakeholder consultation and communications**. Some of the most effective councils use working processes that involve external people in project teams or sub-groups and go well beyond advising about problems to proposing solutions. The Dutch platform was especially strong in this respect, with very conspicuous communications activities ranging from conferences to films and making much more use of consultative meetings than the other councils.

From the government perspective, the councils reviewed provide three possible choices

- A **joint planning model** (Japan), where the government uses the council as a virtual 'horizontal ministry of innovation', much as engineering companies build project teams by bringing together people across different disciplines
- A **coordination model** (Finland, Netherlands Innovation Platform, Austria), where the intention is that the council should communicate horizontally across ministry responsibilities so as to align policies in support of innovation, without this alignment always being binding. The Czech council is in this category
- An **advice model** (Canada, Ireland, Netherlands AWT, Switzerland, UK), where the government is happy to be advised on research and innovation policy but does not want to be restricted by that advice

The planning and coordination models require significant commitments of ministers' time as well as a willingness across political parties to see research and innovation as permanently central aspects of government policy.

All the councils generate reports of the advice they give to government, though this is not always in the public domain. All but the Finnish council in varying degrees commission and/or produce studies of bottlenecks in the innovation systems. They usually complement these with proposals for policies to solve the problems. These councils are therefore not only **arenas for internal discussions** among council members but also **sources of strategic intelligence** for the national research and innovation policymaking communities and discussion more generally. Wisely exploited, these publications can trigger wider debates and awareness of the importance of research and innovation – especially if coupled with Dutch-style information and consultation campaigns.

The councils examined all inhabit systems where there is considerable **distributed strategic intelligence** within the state's part of the innovation system. This means that a great deal of instrument and even policy design takes place in ministries, agencies and at other levels 'below' that of the advisory council. It has the advantage of exploiting the superior knowledge of needs and implementation found at lower levels of the system and demands good communication between the council and organisations working at 'lower' levels. Making good use of the intelligence distributed across the system appears to depend to a fair extent on developing what might be called 'social networking capital'. For example, the Finnish system strongly depends upon constant informal communication between the agencies, ministries and the Council. The Austrian system appears to work better than its fragmented and unclear governance structures and processes would suggest for similar reasons.

While it is important to use distributed strategic intelligence, the fact that all the councils also generate their **own intelligence** underlines the importance of this function: not only in order to acquire the knowledge needed to build good strategy advice but also to create an evidence base on which consensus can be built.

Based on international experience, it is possible to state a number of desiderata for councils such as the Czech R&D&I Council – always recognising that these are subject to needs and circumstances in the local context.

- An innovation policy council should serve as a publicly open **arena** in which stakeholders and decision-makers debate and influence the directions of long-term research and innovation policy. This arena role should be complemented by actively consulting stakeholders
- Its composition and status should be such that it is socially and politically **legitimate** and therefore largely robust against changes in government. It should include scientific and technological expertise
- The council may sometimes need to act as referee and take decisions with which not everyone agrees, but an important goal is to create **consensus** about policy, so that it is natural for stakeholders to do things that are consistent with the policy
- Part of the council's function is to create and collate the '**strategic intelligence**' it needs in order to analyse deficiencies in the innovation system and propose improvements. This should be part of a **wider pattern of distributed strategic intelligence**, in which others also gather and analyse data and exploit them in support of policy analysis and deployment. The information produced and exchanged should be open so that it can be debated
- The council should produce a **long-term strategy** for the innovation system that goes beyond treating systemic and market failures to be selective, is holistic, suggests an appropriate policy mix and serves to reduce dynamic inconsistency
- A key role of the council is **coordination**: vertically, horizontally and over time. In many countries, coordination also needs to have a regional dimension. Coordination serves to reduce inconsistencies and goal conflicts among policies and actors, make the division of labour in the support system efficient and reduce fragmentation of effort while empowering the actors involved to do their jobs effectively

- The council needs to maintain a high **profile** with the public and at the level of opinion-formers, promoting the importance of research and innovation and demonstrating its own impact
- It should be sufficiently **independent** of the system that it can act as a change agent. This means it should have no agendas or operational functions other than its brief to promote R&D&I and it should not have an interest in acquiring or spending significant resources of its own
- The council should have a clear **interface to government**, at least at the level of ministers, so that someone is responsible for accepting (or rejecting) and implementing its advice. This often means that some ministers should be members of the council

1.3 Basing Policy on Adequate Models of Research

The emerging funding structure in the Czech Republic based on the Grant and Technology Agencies plus a range of other more specialised funding sources corresponds to **the 'two pillar' structure** used in Finland and the Nordic area[8]. Such structures are becoming increasingly influential elsewhere in the world, at a time when it is however becoming increasingly clear that the distinctions on which it is based are declining in validity.

The 'two-pillar' structure is based on the conceptual definition of research in terms of basic versus applied research.

Swedish experience with a 'two pillar' system in the past is that it has left some fields unfunded – for example, in the past, more fundamental production engineering research in Swedish universities was not funded by the research councils, which regarded the field as too applied, and not funded by the innovation agency on the grounds that it did not have sufficient industrial involvement.

The internationally recognised set of definitions of different types of research and development is that used by the OECD to collect international R&D statistics. In its Frascati Manual, R&D is defined as

- **Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.
- **Applied research** is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- **Experimental development** is systematic work, drawing on knowledge gained from research and practical experience, that is directed to producing new materials, products and devices; to installing new processes, systems and services; or to improving substantially those already produced or installed[9].

In practice, the distinction between basic and applied research is bizarre: the same research could be in either category, depending on the extent to which the researchers involved know why they are doing it[10].

[8] Gustav Björkstrand, *NORIA Vitbok om nordisk forskning och innovation*, TemaNord 2004:502, Copenhagen: NMR, 2004

[9] OECD, Frascati Manual: Proposed Standard Practice for surveys on Research and Experimental Development, Paris: OECD, 2002

[10] It is tempting to ask how to classify an experiment if half the research team has an application in mind but the other half doesn't.

'Basic research' survives as a term in common use, but is one that has many meanings.[11] Scientists use the term variously to mean

- Research that is in some way 'fundamental' and underlies other knowledge[12]
- Research guided purely by the researcher's curiosity. (This is the basis of the OECD definition, used in the collection of research statistics)
- Research that is a long way from application
- Research done in public research institutions
- Research on which there are no limits to publication
- Work in certain scientific fields (physics, chemistry, etc)

There seem to be two important reasons why the term remains current. First, it is an established statistical category. This makes it an object of study and gives it longevity.[13] More important, it was the central rhetorical concept in the *Endless Frontier* vision of asocial science, and it remains the key concept used by the communities that benefited from the science policies of the 1950s and 1960s in defending their funding and their lifestyle. In certain cases it is being used to try to retake 'funding territory' from more socially oriented categories of research.[14] In these discussions, 'basic' research is effectively equivalent to 'researcher-directed' as opposed to 'user-directed' research, conducted for the benefit of an institution such as a ministry or a company, who intend to do something with the research results. The issue is not what is done but who decides to do it and, crucially, the extent to which the taxpayer is willing to be a patron, rather than a customer, for research.

Donald Stokes[15] points out in his 1997 book *Pasteur's Quadrant*, much fundamental science is actually done with considerations of use in mind. His examples (Figure 4) of the curiosity-driven Bohr, of Pasteur (doing fundamental research in order to understand and control disease) and Edison (with his ruthless empiricism, not much interested in underlying mechanisms) give a better sense of how research actually operates. Research funding instruments such as competence centres operate mostly in Edison's quadrant, but they systematically devote more of their resources to Pasteur's Quadrant.

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[11] Jane Calvert and Ben Martin, 'Changing conceptions of basic research?' Background document for the OECD workshop on policy relevance and the measurement of basic research in Oslo, 29-30 October 2001; Brighton, SPRU

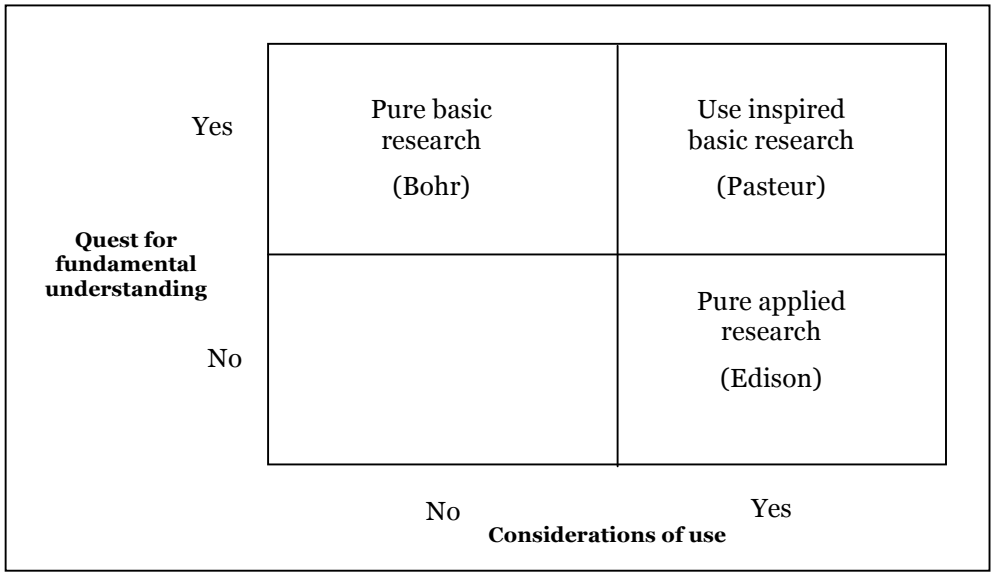
[12] An idea we can trace back to the long-vanished 'logical positivist' school in philosophy, which believed that all knowledge was ultimately reducible to physics

[13] B Godin, 'Measuring science: Is there 'basic research' without statistics?' Project on the History and Sociology of S&T Indicators, Paper No 3, Montreal: Observatoire des Sciences et des Technologies INRS/CIRST, 2000

[14] See, for example, *Slutbetänkande av kommittén för översyn av den svenska forskningspolitiken* (Forskning 2000), Stockholm, 1998 - Final report of the Committee to Review Swedish Research Policy (Research 2000)

[15] Donald Stokes, *Pasteur's Quadrant: Basic Science and Technological Innovation*, Washington DC: The Brookings Institution, 1997

Figure 4: Types of Research, According to Stokes



The related issue is not only **who** makes knowledge, but also **how** they do so. Gibbons and colleagues[16] have brought together a lot of thinking about this in a distinction between **two modes of knowledge production**. We have summarised their distinctions between the two modes of knowledge production in Table 2**,** below. This is a simplification[17] of a complex reality, but one that gives us some useful concepts for tackling policy and research administration. Like Stokes' work, the Modes distinction challenges the idea that a 'two pillar' funding system is adequate to the way knowledge is produced in society.

Mode 1 is disciplinary science, and can often be basic science, though applied science can be done in Mode 1, too. Its logic comes from its internal organisation and control mechanisms. Its institutions tend to be centralised and stable. In terms of education, Mode 1 tends to provide 'basic training' and a disciplinary 'entry ticket' (such as a PhD) for people to qualify as credible researchers in either Mode. However, Mode 1 is not the same as 'basic science.' Research that is in some sense fundamental or long-term can be done in either Mode.

Mode 2 includes not only the practice of applied science in universities and other research institutions but also the generation of research-based knowledge elsewhere in society. Mode 2 work tends to be transient. It forms and re-forms around applications problems. Calling on different disciplines and locations at different times, it is hard to centralise. Since Mode 2 work is performed in an applied, social context, it is normally subject to social and economic evaluation, and not solely to traditional quality reviews by scientific peers. To the occasional irritation of those used to the Mode 1 tradition, this means that relatively frequent evaluation – in part by non-scientists – is normal in Mode 2 work, and has become part of the new social contract between scientific researchers and society.[18]

[16] Michael Gibbons, Camilla Limoges, Helga Nowotny, Schwartzman, S., Scott P. and Trow, M., *The New Production of Knowledge*, London: Sage, 1994

[17] Gibbons and colleagues also get their history wrong, claiming that Mode 2 is new. In fact, it is Mode 1 that is historically new, while Mode 2 is the traditional form of science, as practised for many hundreds of years

[18] Ben Martin, Ammon Salter et al, *The Relationship Between Publicly Funded Basic Research and Economic Performance*, report to HM Treasury, Brighton: Science Policy Research Unit, 1996

Table 2: Mode 1 and Mode 2 Knowledge Production

Mode 1	**Mode 2**
Problems set and solved in the context of the (academic) concerns of the research community	Problems set and solved in the context of application
Disciplinary	Transdisciplinary
Homogeneous	Heterogeneous
Hierarchical, tending to preserve existing forms of organisation	Heterarchical, involving more transient forms of organisation
Internal quality control	Quality control is more socially accountable

The sharp distinction between Mode 1 and 2 can make it seem as if they are alternatives. Many researchers, however, do both, so they take closely related research problems to different research agencies to ask for funding.

In recent years, new technologies have enabled rapid economic development. Many are ones that we think of as 'hyphen' fields[19] such as opto-electronics, bio-engineering, nano-technology and so on, where an explicit or implicit hyphen shows that the field works across the boundaries of more traditional disciplines. These new growth fields are essentially *Mode 2 activities*. Research funding for them would tend to be ruled out by the internal rules of disciplinary Mode 1 science. The massive use of science and technology in industry and the increase in industry's links with external research which has brought the share of Gross Domestic Product (GDP) devoted to R&D up to about 4% in extreme cases like Sweden and Finland , involves mostly Mode 2 activity.

Especially in fields like biology and Information and Communications Technology (ICT), fundamental and more short-term research problems are increasingly being tackled in parallel. Over the last 20 years, engineers in industries that make complex products have begun to design different parts of these products at the same time – so-called concurrent engineering. As they need to tackle more fundamental problems at the same time, we can begin to talk about **concurrent engineering and science**.

Generally, when the state becomes involved, the Modes have had **different funding and evaluation mechanisms**. Mode 1 is underpinned by the part of the funds going directly to universities that are intended for research. By and large, traditional research councils are also organised according to the rules of Mode 1, with scientific quality being the main criterion used in setting priorities – deciding who gets money and who does not. Some research councils have been grappling with the new 'hyphen' fields by funding themes in addition to (or, sometimes, instead of) disciplines. Funding sources for Mode 2 are much more diverse. They are more liable to include intended users of research than in Mode 1, where research is more often funded via patronage.

Traditional universities and research councils are systematically liable to both the strengths and the weaknesses of Mode 1. Strengths include stringent and mostly transparent quality control procedures and the ability to build an immense, interesting and often useful body of knowledge over time. Weaknesses include domination by the intellectual and institutional conservatism of the research establishment, slowness to change and difficulty in recognising values outside the scientific core. Collegial decision-making and the use of peer review to distribute resources reinforce the conservatism of Mode 1 science. This leads to problems, notably where research

[19] Following Frieder Meyer-Kramer

funders and performers react too slowly to the emergence of new fields and opportunities.

Internationally, many research funders are trying to move beyond these rigidities and to cope with the limitations of a 'two pillar' approach. One response in the research councils is to study and adjust disciplinary boundaries to respond to new, interdisciplinary opportunities. The UK Engineering and Physical Sciences Research Council (EPSRC) has for many years taken a mixed response-mode and programmed approach to funding, taking inputs from committees of scientists (Technical Opportunities Panel) and 'users' (User Panel). The reorganisation of the Research Council of Norway in 2001, following a critical evaluation, created not only 'basic research' and 'innovation' division but also a 'large programmes' division intended to create an arena for mixing research and funding modes. More widely, there has been a noteworthy increase in the number of 'competence centre' programmes that create long-term alliances between universities and industrial consortia with the aim of conducting a mixture of more fundamental, applied and innovation-related research.

The cyclical innovation model in the NWO

The Dutch national research council NWO has as mission "to facilitate scientific talent by means of national competition, to raise society's awareness of the importance of world-class research and to enable the results of such research to benefit society."

At the end of the eighties, the NWO expanded the focus of the research activities from pure 'free' basic research to fundamental application-oriented research. In recent years, it implemented a reorganisation of its scientific divisions to improve the steering of such research activities; research in medical science and research in healthcare, for instance, are now governed in a single Scientific Division ZonMW.

In 2008, the NWO Evaluation Commission recommended the NWO to continue its activities in the field of fundamental application-oriented research and depicted as shown below the cyclical innovation model implemented.

The Evaluation Commission argued that a cyclical innovation model reflects reality better than a linear one and pointing at the inter-linkages between fundamental research and innovation, it stated that fundamental research provides precious contributions to the innovation cycle. It also considered the added value of governing basic and applied research in a single governance body as this reflects current practice among researchers who often combine the two types of research.

Source: Report of the NWO-Evaluation Commission, April 2008

1.4 Policy, Programming and Evaluation

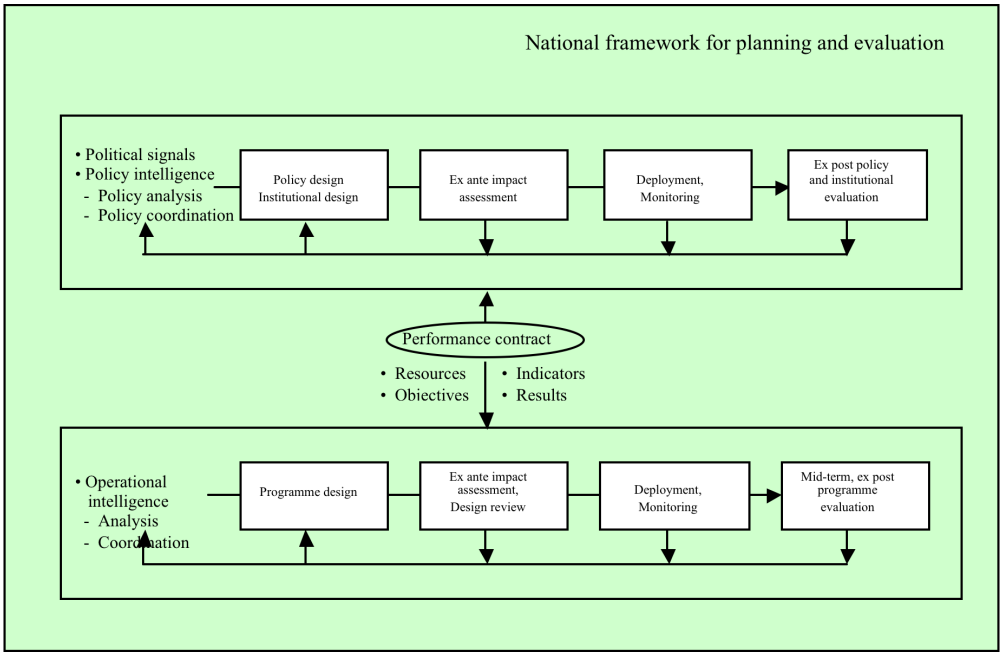
Over the last 20-30 years, the spread of ideas from the New Public Management has encouraged two trends that are especially important for this audit.

The first is a growing **separation of policymaking and programming**: that is, of setting broad goals and then deciding in detail how to achieve them. This has in many cases meant that ministries set policies and agencies programme, though there are also cases – as in the CR – where ministries effectively have internal agencies that deliver programmes.

The second has been a **convergence between evaluation techniques and those of policy and programme design**. In the past, evaluation was typically a process of trying to understand the effects of an intervention during or after the event. Because evaluators needed to understand what programmes had been intended to do, they have increasingly integrated design techniques into ex post evaluations; and because of the need to quality assure and improve programmes, policymakers have increasingly involved evaluators in design through processes such as ex ante impact assessment – namely reviewing the need for an intervention and the logic that has been proposed for making it.

In principle, the policy-programme or principal-agent relationships are as shown in Figure 5. At the upper level is the **policy cycle**. While there is general agreement on the need for evidence-based strategy and evaluation schemes for policy formulation and implementation, this is also the level at which politics has a significant influence and may cut across rationalistic or technocratic approaches to policymaking. In part, evaluation plays a backwards-looking role here. However, it can also provide inputs to policy formulation, becoming a **prospective** tool. In order to meet the need at this level to do the evaluation before formulating policy, various techniques for meta-evaluation (techniques for synthesising results from different evaluations studies) of similar policies and classes of intervention can be useful.

Figure 5: Policy and Programme Cycles

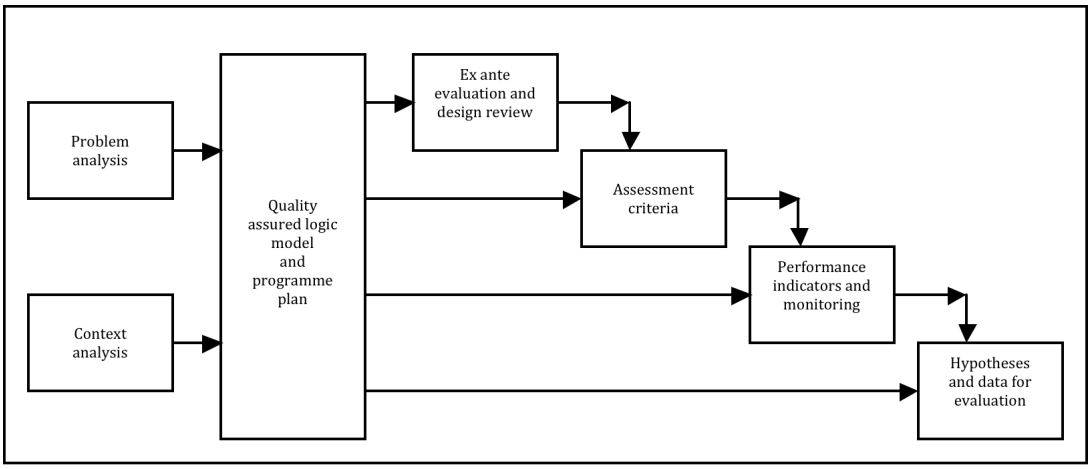


Strategic intelligence is key to both policy development and to individual interventions. While in formal terms it may be the business of ministries to set policies and of agencies to implement them, the distribution of strategic intelligence explains where the real policymaking goes on. Normally, the **balance of evaluation effort** among different parts of the policymaking and implementation system reflects the distribution of strategic intelligence.

The lower part of Figure 5 shows the **programme cycle**, which implements policies. There is a need for logical consistency across the programme cycle, to maximise the chances that interventions reach their objectives.

Figure 6 shows the interrelationships involved, drawing from and synthesising existing models and practice. Clearly, this type of consistency requires an articulated programme design and development model**.**

Figure 6: Programme Design, Monitoring and Evaluation



State interventions are undertaken in order to solve problems, so a **problem analysis** is a first step. Practices vary, but often involve a formally documented study. Nordic practice[20] is typically to use a group of stakeholders supported by a project officer to do this. Other processes (such as staff or externally-conducted studies) are possible, but the element of stakeholder consultation is important both to understand needs and as a 'reality check'. It is also important to analyse the context, looking for assumptions built into the programme design that could turn out to be dangerous and checking the compatibility of the proposed intervention with other state interventions.

These analyses provide the basis for building a model of the **intervention's logic**, deciding its goals and articulating a plan for a programme that puts the logic into practice. There is widespread agreement on the need to state policy and programme objectives in ways that support evaluation and monitoring. A traditional specification for such goals (there are alternatives) is that they should be SMART: Specific; Measurable; Accepted; Realistic; and Time-dependent. The European Commission, for example, proposes[21] that such goals should be used for proposed interventions, in order to enable (ex ante) impact assessment.

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20 Erik Arnold and Paul Simmonds, *Programme Management Benchmark*, Report to NUTEK, Brighton: Technopolis, 1997; Erik Arnold, James Stroyan and Paul Simmonds, *Programme Management Benchmark*, Report to the Research Council of Norway, Brighton: Technopolis, 1998; Erik Arnold, Paul Simmonds and James Stroyan, *Programme Management Benchmark*, Report to TEKES, Brighton: Technopolis, 1998

21 European Commission, *A Handbook for Impact Assessment in the Commission: How to Do and Impact Assessment*, Brussels: European Commission, 2002

The programme logic defines the expected results of the intervention and provides a basis for generating performance indicators, for use in monitoring and in data collection. These are generally expected to be useful also for mid-term and ex post evaluations.

The final link from the programme logic back to the intervention logic is the mid-term and ex-post **evaluation**. It provides hypotheses about how the intervention works that can direct lines of enquiry in evaluation. It makes sense to combine this approach with an evaluation that looks for both intended and unintended effects but the focus of evaluation needs also to be determined in the context of policy and learning needs at the time. Not everything has to be evaluated.

The intervention (or programme) logic can be thought of in the following sequential way

- A public action is undertaken for a reason
- It has objectives which address needs
- It provides inputs which lead to activities
- It achieves outputs
- Which lead to outcomes
- Leading to impacts

Taking these steps in turn; a programme is always undertaken for a **reason** and is conceived with a given set of **needs** in mind. These needs might be the socio-economic problem the programme is seeking to address for example. These needs are usually documented in a range of policy and strategy documents. They should ideally be described and analysed in a programming document that makes the case for funding the programme. In the ideal case, too, the programming document contains a baseline: a measurement of the value of key variables before the intervention, so that it is possible to compare the situation at the outset with the situation later on, when an evaluation is done.

In order to address the **needs**, programmes pursue a number of **objectives** (desired effects). To address these programme objectives it is necessary to have a set of **inputs**, which can include the following

- The programme budget which can include funding from different sources, matched funding, in-kind funding
- Time such as operational and management staff time
- Resources such as equipment (computers, laboratories etc…)
- Physical space
- Staff experience, expertise and skills

We need inputs in order to run the programme **activities** which are the specific tasks (in research and innovation, normally projects) undertaken in order to deliver **outputs**.

Outputs are the programme delivery targets - concrete goods or services, which are produced in order to fulfil the **operational objectives**. Outputs may take a wide range of forms, such as documented knowledge, facilities, services or information.

The **outputs** from the activity lead to **outcomes**[22]**.** **Outcomes** are advantages, which direct beneficiaries obtain from their participation in a public intervention. **Impacts** are the wider effects on society. Outcomes and impacts are sometimes together referred to as the **effects** of an intervention. Impacts can be observed some time after the **results** and **outcomes**. Certain impacts can be observed among direct beneficiaries after a few months and others only in the longer-term (for example through the monitoring of assisted firms). In some cases the **impacts** of interventions

[22] In some terminologies these are called **results**

will therefore not be known without long term follow up of beneficiaries or analysis of the effects of outcomes.

Evaluators sometimes treat outputs, outcomes and impacts as first, second and third order effects. While this a useful approach in that it emphasises the chain-link logic' that leads from the intervention to the eventual social effects, it is misleading in that the number of links in the chain from intervention to social effects can vary. From the policy perspective, the number of links (or 'orders') is not important. What matters is that the intended effects start with outputs that belong to, or are close to, the beneficiaries and that the outcomes that these enable tend also to be connected to the beneficiaries. In economic terms, these are the result of redistributing social resources (income) to the beneficiaries. Society gets a payback on this investment only when the results spill over to society itself. It is often useful, therefore, to distinguish between outcomes that relate to *beneficiaries* and impacts that provide *spillovers or externalities to society*. It is comparatively straightforward to articulate these questions in the form of a logic model, such as a logical framework.

In the context of Czech evaluation practice, it is crucial to note that the purpose of a programme is to solve the initially identified problem or, in other words, to achieve the intended **impacts**. Outputs are an essential step on the way to achieving these impacts; however, **counting outputs tells you nothing about impacts**. Evaluation therefore needs to focus on impacts, not outputs.

The **scope of 'evaluation'** covers work to quality-assure policy and programme designs, test their rationales and potential benefits and judge the attractiveness of funding alternative projects, in addition to the more traditional, backwards-looking work of understanding performance.

An evaluator must describe the programme being evaluated and a comprehensive programme description clarifies all the components of a programme, including its intended outcomes and impacts so that the evaluation can be focused on the most important questions. A key task for the evaluation is normally to examine the validity of the programme's intervention logic (its **relevance**). This should not involve redoing all the analysis that was needed in order to design the programme but it should involve testing during the course of the evaluation that the needs addressed are indeed (still) needs.

As we illustrate in Figure 7, this provides a framework that defines many of the key evaluation questions. However, it systematically steers us away from **unintended effects**, so a search for such effects should form an element within the wider evaluation.

As Figure 7 suggests, the I-O-O-I relationships give rise to a number of generic evaluation issues

- **Relevance**. Do the objectives of an activity correspond with the needs, problems and issues it is intended to address?
- **Effectiveness**. This is especially pertinent in the context of mid-term and ex post evaluation. It consists of asking whether results and impacts generated by the activities supported meet the objectives
- **Efficiency**. The issue of efficiency consists of examining the level of resource use (inputs) required to produce outputs and generate effects. In other words, optimisation of resource utilisation is concerned
- **Utility**. The issue of utility consists of looking for expected and unexpected effects (i.e. those that were respectively identified and not identified at the design phase as objectives) and whether these, when they are positive, correspond with needs
- **Sustainability**. The issue of sustainability consists of examining whether the positive impacts would continue into the future, even after the ending of the intervention.

Figure 7: The Inputs-Outputs-Outcomes-Impacts Model

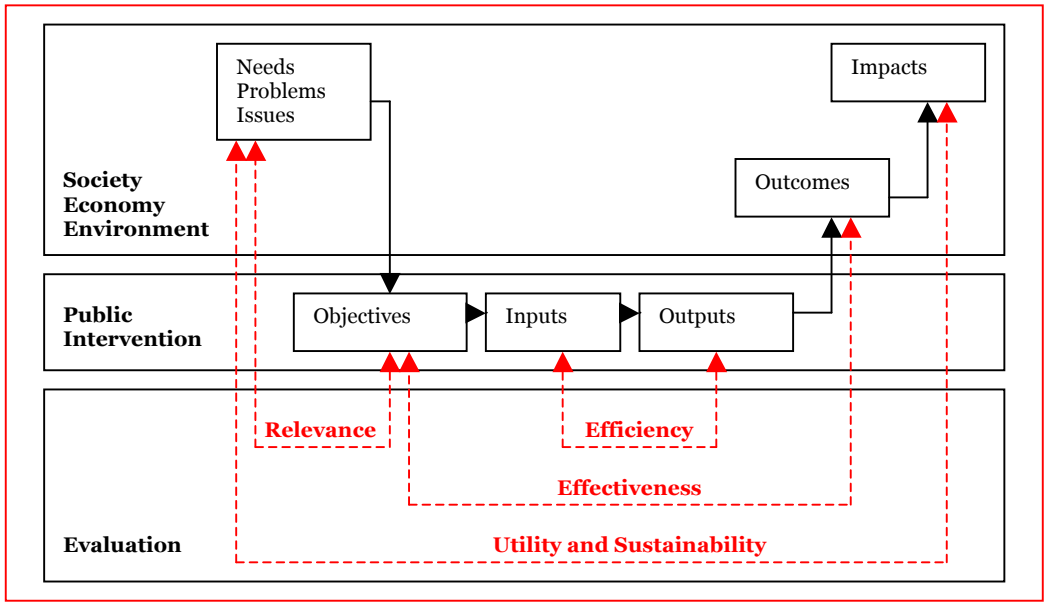
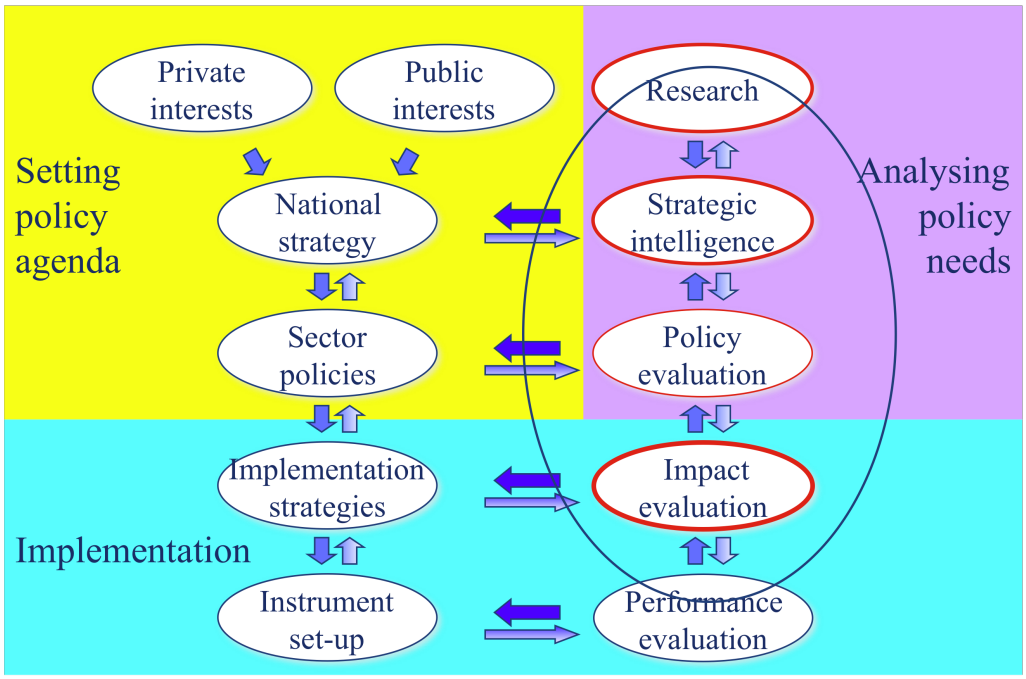


Figure 8 presents Tekes' view[23] of how evaluation should be used in policy formulation and implementation. It distinguishes policy-level evaluation from evaluation of implementation. At each level, the interest is in impacts and the processes used to obtain them. At no level is there an interest in outputs **per se**.

Figure 8 Tekes 'View of Evaluation in the Policy Cycle



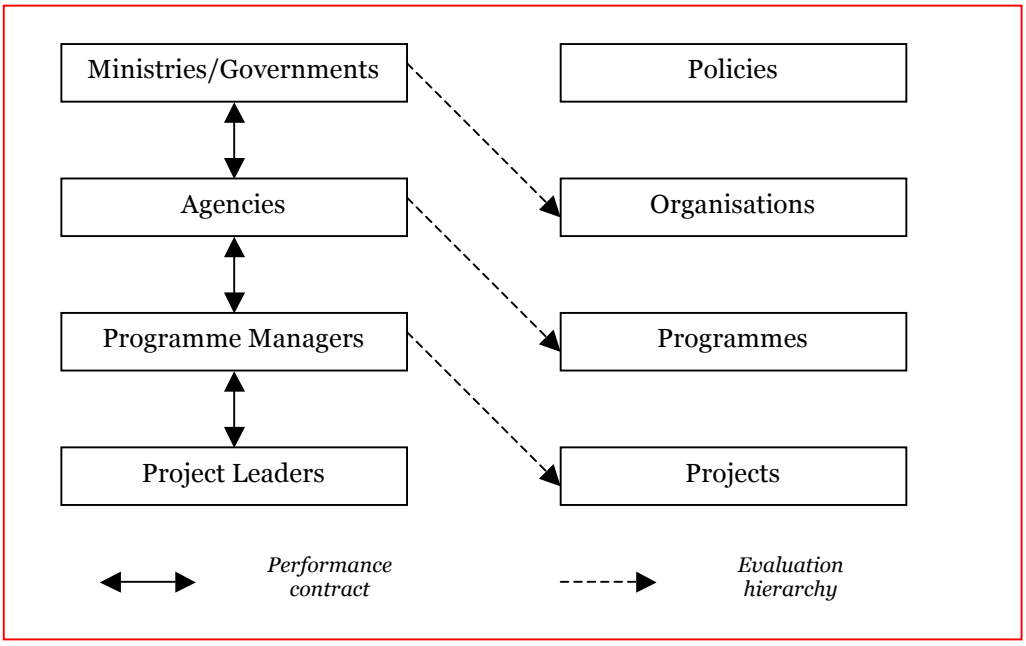
Source: Jari Romanainen, Tekes

[23] Tekes is the Finnish innovation agency, whose practices are widely seen as 'best practice' in the innovation funding community

Figure 9 shows the hierarchy of explicit or implicit performance contracts between the different levels of the policy system in countries that follow the principles of the new public management. In former times, many countries did not make clear distinctions between these levels and as a result governance was unclear. Performance contracts involve explicit allocation of tasks and goals, improving clarity. In most places, evaluation follows **a 'waterfall principle'** where actors at each level evaluate actions at the level below them. This tends to make policy an evaluation-free zone. A key goal in establishing a **system of evaluation** is to bring policy – in the form of its own strategy – into the sphere of evaluation.

In some cases, ministries explicitly or implicitly contract programme management out to competing agents. Examples include New Zealand's Ministry of Research, Science and Technology, the UK Department for Business Innovation and Skills (the former Departments of Trade and Industry) and the Dutch Ministry of Economic Affairs (EZ). In these cases the agents cannot evaluate their own programmes as they would have a clear conflict of interest. Hence, the ministries themselves take responsibility for the evaluations.

Figure 9: Hierarchy of Performance Contracts and Evaluation



A key goal in establishing a **system of evaluation** is to bring policy – in the form of its own strategy – into the sphere of evaluation.

The 'EPUB' report[24] points to a trend, following the lead of the UK Department of Trade and Industry, to **separating the evaluation function** in ministries and agencies into a specialist, in-house group. This group can assist research funders to evaluate their research programmes by advising on the format for the preparation of terms of reference, organising tendering processes, managing contractors and interpreting and disseminating results of evaluations. They may propose evaluation strategies for the organisation, for example maintaining rolling programmes of

24 Gustavo Fahrenkrog, Wolfgang Polt, Jamie Rojo, Alexander Tübke and Klaus Zinöcker (eds), *RTD Evaluation Toolbox: Assessing the Socio-economic Impact of RTD policies (EPUB)*, Strata Project HPV 1 CT 1999-00005, Seville: IPTS, 2002

evaluation to ensure that all policies and interventions are evaluated regularly. Encouraging the use of evaluation results is typically their responsibility.

Georghiou argues[25] that such groups should be separate not only from 'line' programme management but also from the strategy function, since not only implementation but also strategy should be evaluated.

Separating evaluation function and 'line' management – examples

Technopolis has experience of working with a number of organisations that make such a separation between the evaluation function and 'line' management. These include

- *Research Council of Norway*, where one staff member is responsible for evaluation strategy but where 'line' departments actually commission the evaluations.
- *TEKES, Finland*, where a specialised staff department handles both evaluation and the agency's system for project-level impact assessment, attempting to estimate the economic effects of TEKES funding. This department advises on evaluation strategy, contracts with external evaluators and manages their work
- *VINNOVA, Sweden*, where two members of the Analysis department are responsible for evaluation. They provide evaluation advice to the 'line' departments, manage the evaluation contracting process and assist in managing the contractor when that is desired, but evaluations are funded by the 'line' departments themselves. Their work also links to VINNOVA's work on understanding and explaining its socio-economic impacts
- *Forfás, Ireland*, which is the national policy and advisory board for enterprise, trade, science, technology and innovation and has a specialist evaluation and statistics group working on research and innovation. Formerly, this group did some evaluation itself, but most evaluation is now contracted out. It has its own budget to fund evaluations and other studies

The GAO notes[26] that one of the justifications for Government Performance and Results Act (GPRA) was the tendency of evaluations managed by agencies to focus on the formative aspects of how to improve programme delivery, at the expense of reaching the summative judgements about results that are needed for accountability. In our experience, the separation of the evaluation function from the 'line' reduces this tendency, since the evaluation unit's 'customers' are not only programme management but also top management and therefore have a need to justify the agency budget to its principals.

A specialised evaluation group typically

- Participates in the evaluation research community
- Develops an evaluation strategy for the organisation
- Acts as an 'evaluation help desk'
- Allows the organisation to maintain an understanding of the evaluation market and identify qualified suppliers. Programmes are so infrequently evaluated that

25 Luke Georghiou, 'Issues in the evaluation of innovation and technology policy,' in OECD, *Policy Evaluation in Innovation and Technology: Towards Best Practices*, Paris: OECD, 1997

26 Government Accountability Office, Report to the Chairman, Sub-committee on Government Management, Finance and Accountability, Committee on Government Reform, *Program Evaluation: OMB's PART Reviews Increased Agencies' Attention to Improving Evidence of Program Results*, GAO-06-67, Washington DC: GAO, 2005

programme managers have to build up this knowledge from scratch if they are to contract out their own evaluations

- Creates internal capacity for commissioning, understanding and assessing evaluations
- Is an important buffer between external evaluators and the activities being evaluated, making it easier for the evaluator to deliver critical messages and harder for those evaluated to put pressure on the evaluators or to try to suppress evaluation reports

Independence is widely referred to as a key requirement for evaluation[27]. Naturally, internal evaluation groups can behave as if they were independent, but there are many circumstances where the credibility of an evaluation, and therefore its purchaser, relies on the use of **external evaluators**[28]. Use of external evaluation contractors reinforces the need for internal evaluation capacity – in order competently both to buy and to quality assure evaluations.

Some countries have a **legislative framework** that requires evaluation. Others do not. The difference is largely a matter of national tradition. Legislation can, however, be used as a way to emphasise the priority given to evaluation and to promote the creation of an evaluation culture. We cover this topic further in Section 1.5.

John Killeen (Killeen and White, 1992) is credited with generating the term '**evaluation culture'.** The current Guide to evaluation of the EU Structural Funds (Tavistock *et al.*, 2003) concludes: "the creation of an evaluation culture is essential for organisational learning. Key components of an evaluation culture over and above the generation of quality evaluation work include: a presumption that interventions should be designed and implemented in a manner that facilitates subsequent evaluation; an appreciation of the range of purposes of evaluation; a recognition of the limits of evaluation, the scope for interpretation and the need to combine quantitative and qualitative evidence; and, a recognition of the needs of different users of evaluation".

The Association for Technology Implementation in Europe (TAFTIE) argues that internal evaluation manuals and their dissemination are keys to embedding evaluation culture. The European Commission's decision to provide large-scale basic evaluation training to managers and project officers represents an unusually strong commitment to the idea of evaluation culture, involving training several hundred people.

To an increasing extent, other R&D funders are also taking up this kind of training, so that evaluation (and the clarity of planning that accompanies the use of logic models) becomes embedded in programme design and delivery.

A study of the use of evaluations in the European Commission (Technopolis, 2005) found that crucial factors in fostering use are:

- The timing and the purpose of the evaluation.
- Support from senior management.
- The quality of the evaluation process and the evaluation report.
- The monitoring and follow-up of evaluation recommendations.

These findings are hardly surprising – but reinforce the point that evaluation needs to be embedded in the processes of the agency involved, if it is to make an important contribution to practice.

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27 Georghiou in OECD 1997; Tavistock, 2003; Louis Lengrand & Associés, PREST, ANRT, Reidev Ltd, *SMART Innovation: A Practical Guide to Evaluating Innovation Programmes*, A study for D-G Enterprise and Industry, Brussels: European Commission, 2006

28 Tavistock, 2003

1.5 The Use of Formalised Frameworks

With the spread of increasingly formal implementations of the New Public Management, there is a trend for countries to specify how policy and programmes are to be designed and evaluated via formalised frameworks. The general intention is to standardise and improve the processes through which interventions are planned and evaluated and thereby to provide a better basis for reviewing individual policies and programmes. Our observation is that over time these ambitions tend to be realised.

Internationally, there is wide variation in the extent to which evaluation and management processes are formalised in government. Some countries such as Sweden and the UK that are generally seen as being among the international leaders in the use of evaluation do not have an explicit legislative basis for using evaluation or a strongly standardised planning process. Other countries have started to set up national frameworks, explicitly creating a legislative basis for national planning and evaluation processes. The best-known examples are the US Government Performance and Results Act of 1993 and the more recent 'PART' process for assessing programme performance, but other countries have put in place government-wide systems with more or less similar aims. We distinguish here between '**soft' approaches**, that provide structures for use in planning and evaluating interventions (see the example of Canada), and a **'hard' approach** that aims to connect the results of such processes back to budget allocation, with the idea of rewarding good performance and punishing bad (see the example of the USA).

The experience so far is that the creation of formalised frameworks is valuable, because it produces a focus on using evidence, achieving results, accountability and – if well implemented – learning that is likely to improve policy coordination and coherence in R&D governance. In short, much of the value it brings is in sharpened attention to planning and policy effectiveness. However, it also requires changes in the way planning and evaluation are institutionalised and therefore in the culture within the government apparatus.

Yet, if such systems become **overly mechanistic**, they provide poor policy guidance, for example by implying that programmes that are important but poorly implemented should be closed rather than be implemented better.

Nor can systems based solely on planning and evaluation cope adequately with significant changes in circumstances or in political priorities. Such evaluation and planning systems therefore need to **support**, rather than try to determine the outcomes of policymaking.

A General Audit Office report[29] on GPRA and PART implementation (see the USA example) identified lack of use of the indicators as a de-motivating factor for many agencies. There is no clear relationship between PART scores and funding, since funding is driven by politics and policy objectives. Aggregate PART scores mix up ratings of the **purposes** of initiatives, how well they are **managed** and whether they get **results**. They do not help much in thinking through whether an important programme that is failing to achieve good results should be given less money because it is doing badly or should be given more money so that it can be improved. According to the GAO, mechanistic application of OMB review and PART to everything meant that unimportant priorities were analysed and scarce analytic resources therefore were misused. GAO concluded, "Many [agency officials] view PART's programme-by-programme focus and the substitution of programme measures as detrimental to their GPRA planning and reporting processes."

[29] GAO, *Performance Budgeting: Observations on the use of OMB's Program Assessment Rating Tool for the Fiscal Year 2004 Budget*, GAO-04-174

'Soft' Approaches - Canada

Canada has for many years had a strong culture of accountability in public policy. On April 11, 2006, the Government of Canada introduced the new Federal Accountability Act and Action Plan to make government more accountable, increase transparency and oversight in government operations. This recent Act is a continuation of a long tradition of introducing new public management aspects in Canadian policy. Evaluation was officially introduced into the federal government in the late 70's to help improve management practices and controls. The 1977 Evaluation Policy mandated that evaluation be a component of the management of each department and organisation.

In February 2001 the Treasury Board set Evaluation Policy and Standards for the Government of Canada, which are still in place today. The policy separated the evaluation and internal audit functions as well as extending the scope of evaluation to include programmes, policies and measures. The policy focused on results-based management and aimed to embed evaluation in the life cycle management of policies, programs and measures. The Treasury Board policy also required that Departments employ qualified staff for evaluation with a Departmental head for evaluation who "must provide leadership and direction to the practice of evaluation in the department".[30] Therefore it has become common policy practice in Canada to employ common evaluation tools (such as logic models) in an early stage of policy development.

Before launching new instruments, Industry Canada – one of the key departments involved in research and innovation policy – goes through several steps to prepare the instruments, including a process to assess the likely effects of the programme. These include a process of defining the spheres of influence of a certain problem area to create a basic theoretical understanding of the problem that the new instrument aims to address. This is followed by a needs assessment, involving stakeholders and asking for their opinion about the main bottlenecks and required government action.

A central element in this policy process is the design of an Evaluation Framework for every policy instrument. In general terms an evaluation framework describes a programme in terms of its objectives, outlines what an evaluation should entail or examine, describes the kind of information and data that are to be collected, and proposes some measures to assess performance relative to the programme's intentions. Before any budget allocation is made, the department has to present the Treasury with the Evaluation Framework, which is usually prepared by outside consultants and takes 2-3 months of work.

The Evaluation Framework's core is the definition of the Performance Framework, which describes the programme's purpose, activities and expected results. The expected results are defined in measurable terms and the data collection strategy is attached to those indicators. Examples of such expected targets for instance for a new Software Products Sector Campaign are phrased as "80% of target client respondents will state that they are at least satisfies with the expertise and technical advice received" or "Doubling of the proportion of the top 200 firms using methodologies and tools".

In this approach, the criteria for success are unique to each individual programme. That implies that a comparison of programmes in terms of effectiveness on the basis of equivalent parameters is not possible. The Evaluation Framework is used on the single programme level but never on the intermediate level of programme portfolios.

[30] Treasury Board Canada, Treasury Board Manual 2001; see www.tbs-sct.gc.ca

Source: Management Systems for the Evaluation of the Impact of Research – Literature and Good Practice Review - A Report to the European Court of Auditors, Technopolis Group, 2006

A 'Hard' Approach – the USA

The Government Performance and Results Act (GPRA) of 1993 has been a major driver for evaluation in the policy making process. This Act was modelled on similar legislation already in place in individual states, and in several other countries. The GPRA requires every agency to: 1) Make a strategic plan every three years, in which they define their missions, establish results-oriented goals and identify the strategies that will be needed to achieve those goals; 2) Translate the three-year plan into specific annual performance plans with quantified targets and performance indicators; 3) Report every year on the extent to which the targets were met and explain what corrective actions are being taken where performance is below plan.

These measures are not only intended to increase transparency and accountability but also to allow the *Office of Management and Budget (OMB)* and others to coordinate policy across departments of state and to increase public confidence in the federal government, in a culture that is often hostile to government.

In 2002, the Bush Administration introduced the President's Management Agenda. It noted that, after eight years of GPRA implementation, "progress towards the use of performance information for programme management has been discouraging." It criticised continuing lack of clarity about missions, noting that "the objective of NASA's space science programme is to 'chart our destiny in the solar system' and the goal of the US Geological Survey is to 'provide science for a changing world'. Vague goals lead to perpetual programmes achieving poor results."

The President's Management Agenda set up a Programme Assessment Rating Tool (PART), developed by OMB. The PART was developed to assess and improve programme performance so that the Federal government can achieve better results. A PART review is supposed to help identify a programme's strengths and weaknesses to inform funding and management decisions aimed at making the programme more effective. Departments and agencies have to report how their programmes perform and reports are made public on the website of the Federal government. Using the tool, the OMB should assess a fifth of the federal government's programmes each year and score them on 4 criteria: programme design and purpose (20%); strategic planning (10%); programme management 20%); programme results/accountability (50%). OMB converts the PART scores into qualitative ratings using the following scoring bands: Effective (85–100); Moderately Effective (70–84); Adequate (50–69); Ineffective (0–49). Regardless of the overall score, a rating of Results Not Demonstrated (RND) is given if the programme does not have performance measures that have been agreed-upon by OMB, or if the measures lack baselines and performance data.

Source: Management Systems for the Evaluation of the Impact of Research – Literature and Good Practice Review - A Report to the European Court of Auditors, Technopolis Group, 2006

1.6 R&D Governance Issues Arising

In recent years, as we have taken an increasingly systemic view of research and innovation, there has been growing interest in developing and studying better governance systems. Complexity means that it is hard to make a scientific link between practices and performance, but there is a growing body of 'principles of good practice' and experience of 'what seems to work' that can inform the design and practice of research and innovation governance.

One key axis is **vertical steering** – the appropriate division of policy design and execution among ministries, agencies. Programme managers and project performers to achieve policy goals.

A second is **coordination** – not only vertically but also horizontally among different ministries' sectoral responsibilities and with other important stakeholders. Interdependence among different parts of the innovation system means some changes are prevented without coordination.

A third is the principle of **distributed strategic intelligence** – that governance is more effective if it is carried out in concert my well-informed people and organisations at different levels. This is the opposite of the 'command and control' systems formerly used in government and many industries.

A fourth is the importance of **R&D councils** as coordinators and contributors of strategic intelligence in governance systems. There are different models for such councils but important functions they should fulfil include

- Acting as an open arena for discussing strategy and policy
- Creating consensus
- Promoting long term strategies
- Policy coordination
- Influencing but not itself deciding about budgets
- Maintaining a high profile with the public and with opinion formers

Such councils need legitimacy in the eyes of the other actors in the system and strong influence with government, often involving key members of government or otherwise having an effective interface to government.

A fifth is the increasing **clear separation between policymaking and programming**, with the use of performance contracts to connect these levels. This leads to a need for greater clarity in goal setting and communication.

A sixth is the **extension of evaluative and other techniques into programme design**, with design routines becoming more stringent and codified with clearer justifications of intervention, growing use of a single model for designing, monitoring, setting performance indicators and evaluation.

A seventh is the need to focus programme design and therefore evaluation on **goals and impacts**, rather than short-term outputs.

An eighth is the need to **separate evaluation form performance**, so that people are not required to evaluate themselves.

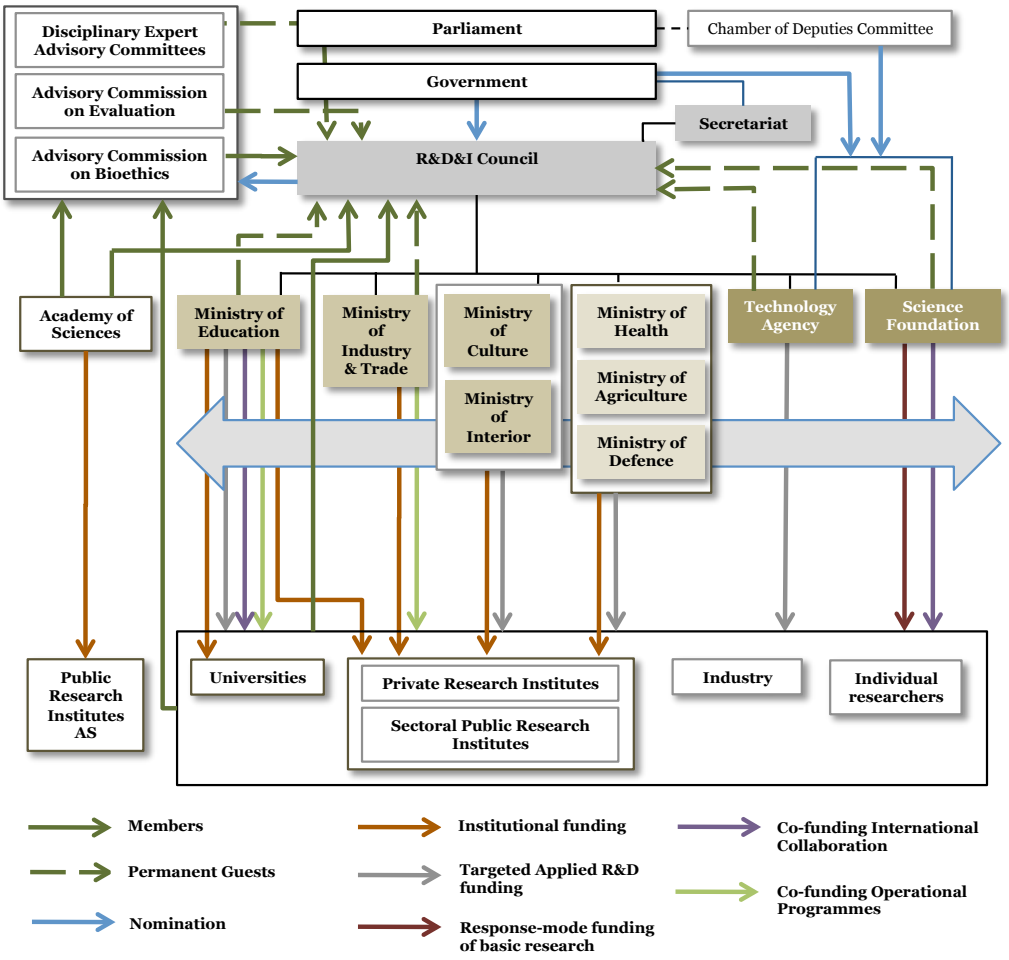
A ninth is understanding and designing organisations and instruments that can cope with the **variety and interconnectedness of knowledge production and use**. Old stereotypes about 'basic' versus 'applied' research are unhelpful here, causing disconnectedness and gaps in the system of research and innovation funding.

2. The R&D&I Governance System in the Czech Republic

In recent years, the Czech Republic set the fundaments for a radical change in its R&D&I governance system. These were based on the Reform approved in 2008 and the subsequent National Research, Development and Innovation (further R&D&I) Policy document (2009) for the years 2009 – 2015 and other necessary legislative interventions.

Applying the model of research and innovation organisation and governance as described in the previous Section 1.1, the current R&D&I Governance Structure in the Czech Republic can be depicted as illustrated in Figure 10.

Figure 10: The current structure for R&D Governance in the Czech Republic



At the first level in the structure, setting overall directions and priorities across the National Research and Innovation System, we find the R&D&I Council. A set of ministries and 2 agencies (the Science Foundation and the Technology Agency), responsible for the implementation of the R&D&I policy, constitute the second 'intermediary' level.

The involvement of the Government and Parliament in the current R&D&I System is considerable. The two agencies have a unique status, with their governing bodies being nominated by the Government – upon proposal by the R&D&I Council, while their Supervisory Bodies are nominated by the Parliament. The Government also nominates – or removes - the members of the R&D&I Council and the Secretariat of the Council is part of the Office of the Government. Chairman of the Council is a Member of Government, typically the Prime Minister.

In the Sections below we describe the set-up and functioning of the R&D&I Council and the Intermediaries (the Ministries and Agencies) and provide a description of the research performing categories in the Czech republic. Subsequently, we report on our key findings when setting the R&DI governance system in the Czech Republic within the international context.

The programmes implemented by the Ministries and Agencies are described in detail in Annex 1 to the Interim Report.

2.1 The R&D&I Council

The Council for Research, Development and Innovation (R&D&I Council) is an expert *advisory* body to the Government of the Czech Republic.

2.1.1 The structure of the R&D&I Council

The R&D&I Council has 16 members and is governed by a Board. A member of Government - normally the Prime Minister[31] - acts as the Chairman of the Council, thus enforcing its legitimacy. The R&D&I Council makes use of the support of 3 disciplinary advisory Expert Committees and 2 Advisory Commissions.

- The Board of the R&D&I Council is composed of 3 members, one of them acting as First Deputy-Chairman. They are elected by the Council members and manage the activities of the Council in between their sessions, prepare the meetings of the Council, and coordinate the activities of the advisory bodies. Board meetings are normally once a week.
- Members of the Council are nominated by the Government on proposal of the Chairman, with a mandate of 4 years (once renewable). They are remunerated and can resign or the government can withdraw their nominations, at an individual level or for the whole Council[32]. Council meetings are once a month.
- The 2 Advisory Commissions are the Commission on Bioethics (BK) and the Commission for Evaluation (KHV). By law, they meet at least 4 times a year. Members of these Commissions are selected from among the top experts in the relevant scientific fields
  - The Commission on Bioethics has 13 to 16 members; its Chair is a member of the R&D&I Council
  - The "Commission for Evaluation of Research Institutions and Completed Programmes" was established late 2007, replacing an interdepartmental working group that addressed the development of an evaluation methodology in 2006 and 2007. It has 9 to 14 members and the Chairman participates in the R&D&I Council meetings as permanent guest (without voting right)

31 In 2004 the Deputy Prime Minister of Economy covered this position
32 In spring 2010, for example, the Government decided completely to renew the Council, nominating a new Council in May 2010

- The 3 advisory Expert Committees group S&T experts into broad disciplinary areas. They support the Council on specific issues related to Life Sciences (OK ZV), Technical Sciences & Engineering (OK NZP); and Social Sciences and Humanities (OK SHV). The Chairs of these Expert Committees participate in the R&D&I Council meetings as guests, i.e. without voting right. Expert Committees have 5-12 members, with the exception of the Technical Sciences one that has 7 to 15 members.

  The statutes of the Committees rule that meetings should be monthly (i.e. 10 times per year) or however at least once every 3 months (i.e. a minimum of 4 times a year). Upon approval, the Secretariat should place the minutes of the meetings on the R&D&I Council websites. Table 3, below, shows a more limited-than-foreseen intensity of support to the R&D&I Council's activities - especially by the Non-Life Sciences and Life Sciences Committees.

Table 3: Frequency of the Expert Committee meetings

	2003	2004	2005	2006	2007	2008	2009	2010*
Non-Life Sciences & Engineering	6	3	2	2	2	2	0	3
Life Sciences	6	3	2	2	2	2	0	1
Social Sciences & Humanities	6	3	3	3	3	5	3	3

* Since August 2010 when the new Committees were launched. All Committees were apparently inactive in the first half of 2010.The publicly available information regarding the meetings of the Life Sciences committee may not to be completely updated: the Committee had 4 meetings planned for the second half of 2010

Source: Based on the dates of the meeting minutes stored on the R&D&I Council website

The Council appoints the Chairmen of its two Advisory Commissions and the three Expert Committees, while the Members of these advisory bodies are appointed - and removed[33] - by their Chairman, upon proposal by the R&D&I Council. Members are nominated for 4 years (once renewable) and the Council seeks to reach a balanced composition in each Committee; criteria are gender, representation of S&T fields, regional coverage, and representation of the categories of research actors (Academy, universities, public research institutes).

Over the last decade, the principles for the **composition of the Council** itself evolved from a balanced representation of all scientific disciplines to the inclusion of industry players in those times when the role of science for innovation was stressed (2004).

While in 2006, the R&D Council statutes indicated that members of the Council would be chosen from all stakeholder groups – including *ministries and national R&D funding providers*, the statutes approved in 2009 limit membership to "leading experts in basic and applied research, experimental development and innovation". Representatives of some of the national R&D funding providers – the two agencies, the Ministry of Education and Industry – are now permanent guests to the Council meetings, i.e. without voting right. Table 4 illustrates the composition of the current Council[34], nominated in May 2010.

[33] A removal of an Expert Committee occurred in the beginning of 2008 when the Expert Committee for Social Sciences and Humanities was completely renewed

[34] December 2010

Table 4: Organisational background of the members of the Council, January 2011

Typology	Institution	Number of members
Research	Universities	6
	Academy of Sciences	4
	Public Research Institute	1
Industry		4
Other	Ex Minister Education	1

Source: the R&D&I Council website, January 2010

According to the 2009 Council statutes, the **Director of the Council Secretariat** (who is nominated/dismissed by the Head of the Office of the Government)

- Is responsible for the fulfilment of the tasks by the Secretariat of the Council and manages the activities
- Acts as Secretary of the Council and participates in meetings of the Board of the Council and Council sessions having an advisory vote
- Is responsible for the use of the funds allocated for research, experimental development and innovation in the budget chapter of the Office of the Government in relation to the management of the Council's activities and of the Information System for research, experimental development and innovation

The **Secretariat** of the Council is part of the Government Office - Department for research, development and innovation. Currently, there are three sub-departments: the sub-department for Specific activities of the Council and the Budget, the sub-department for the R&D&I Information System, and the sub-department for Programmes and strategic concepts. The latter was founded after the crucial change in 2009 when the responsibilities for strategic policy-making were transferred from the MEYS to the Council.

At the end of 2010, the Secretariat had a staff of 20 employees; a reduction to 18 was foreseen as of January 2011 following the budget cuts in the public administration. In 2008, the Secretariat had 12 staff members, i.e. the Head of the Department/Secretary of the Council and 3 support staff, 7 employees in the Budget department, and 5 employees in the Information System department.[35] In October 2008, the Government voted a Resolution on Changes in the State Administration of Research, Development and Innovation that foresaw an increase in manpower of the Secretariat to 23 employees by 2013, in response to the expansion of its responsibilities following the 2008 Reform.

Together with the expert and advisory bodies, the Secretariat is to ensure technical, organisational, and expert support to the Council. According to the 2009 statutes[36], tasks of the Secretariat are

- To gather and process documents and information that are needed for the activities of the Council, its advisory bodies and working parties
- To arrange for the preparation of documents for the Council sessions and meetings of the Board of the Council
- To organise the Council sessions and meetings of the Board of the Council and any other meetings related to the fulfilment of the Council's tasks

35 Source: Výroční zpráva Rady pro výzkum a vývoj za rok 2008

36 Source: Statut Rady pro výzkum, vývoj a inovace, P ř í l o h a k usnesení vlády ze dne 30. listopadu 2009 č. 1457

- To manage the operation and development of the Information System for research, experimental development and innovation, in compliance with the Act on support for R&D&I, other special legal regulations and the strategy approved by the Government
- To keep record of all documents related to the activities of the Council and ensure their processing and signing off
- To regularly update information on the activities of the Council and its members on the web sites of the Office of the Government and on the web sites of the State Administration of research, experimental development and innovation of the Czech Republic

In 2009, the total **budget** to cover the Council's activities was 36 Million CzK (~1.5 Million €).[37]

2.1.2 The Role of the R&D&I Council

Following the 2008 Reform and the approval of the National R&D&I Policy for 2009 – 2015, the R&D&I Council has become the central body responsible for the co-ordination of the national R&D&I governance. The Ministry of Education, Youth and Sports saw its responsibilities from this perspective limited to the international collaboration for R&D&I.

While the Council remains formally an advisory body to the Government, the breadth of its tasks as well as the established R&D&I governance processes implies that the Council increasingly assumes the role of an executive body – and effectively of principal to the Technology Agency and the Science Foundation.

The current phase is to be considered one of transition: the National R&D&I Policy 2009-2015 included a clause foreseeing the transformation of the R&D&I Council in 2013 leading to the instalment of a new co-ordinating body for the national R&D&I policies and governance. The discussions on which form such co-ordinating body should take are still ongoing.

In the sections below we first provide an overview of the current role of the Council in the R&D&I Governance System; subsequently, we briefly cover the main ideas emerging from the current discussions.

2.1.2.1 The Current Functions of the Council

Currently, the R&D&I Council acts as a central body that takes decisions on a broad range of R&D&I governance issues. These include the allocation of the national R&D&I budget, monitoring and evaluation, longer-term policy-making, and other R&D related support activities to the Government. As an advisory body, however, all of its documents and decisions require approval by the Government.

The more detailed description of its tasks below illustrate the following:

- The R&D&I Council does not only define the principles for the above-mentioned R&D&I governance issues, but also covers the detailed elaboration of the same
- The Secretariat of the Council plays a kernel role in many of these tasks
- The Council and its Secretariat heavily rely on external expertise for the development of strategic intelligence

[37] Source: Návrh závěrečného účtu kapitoly Úřad vlády ČR za rok 2009, Úřad vlády České republiky, 2009

Allocation of the national R&D&I budget

The Council is responsible for the drafting of the national R&D&I budget. The various operational steps for the decision-making on the yearly budgets typically take approximately 8 months. It is a key activity of the Council's Secretariat[38], which plays a central role in the whole process, and dominates much of the discussions in the Council.

The Council's Secretariat is responsible for the drafting of the principles and objectives, guidelines and overall objectives; for the development of the first draft of budget on the basis of the guidelines and framework agreed upon in the Council, which is then submitted to ministries & statutory representatives. Once agreement is reached between these entities and Council representatives, the draft budget is discussed with the Ministry of Finance. Upon agreement, the Secretariat develops the final proposal, submitting it first to the Council and subsequently to the Government for approval.

Also the Secretary of the Council plays an important role in this process, acting as referee in the discussions on the draft budget between the Council representatives and the statutory representatives (Ministries, Academy, universities). He also accompanies the Prime Minister (Chair of the Council) when the draft budget is discussed with the Ministry of Finance (Minister & Deputy Minister) in case an agreement could not be reached with the statutory representatives.

According to the Secretary of the Council, 90% of the final budget proposal is determined by the results of the 'Evaluation Methodology', the funding of ongoing and approved new programmes, the obligations for co-funding of EU programmes and other international obligations, as well as some policy decisions on "principles and objectives", which are discussed within the Council at the beginning of the budget drafting process.

The final outcome is a financial budget for the subsequent year (and a draft for the two following years), including details of the budget allocations to the various funding bodies, programmes, and institutions.

Monitoring and Evaluation

The R&D&I Council covers multiple tasks related to monitoring and evaluation.

- First, it is required by law to produce "annual analyses and evaluations of the state of research, experimental development and innovation in the Czech Republic with international comparisons". The Secretariat commissions these - predominantly statistical - studies to external experts, amongst which the Czech Statistical Office and the Technology Centre AS CR (see also Section 3.3.3 in this report)
- Secondly, it develops and decides upon the Evaluation Methodology that governs the distribution of the budget for institutional funding and the evaluation of R&D programmes. In the last 5 years, the Evaluation Methodology has been revised annually and has caused considerable controversy in the stakeholder communities. The development and refinement of the Evaluation Methodology is the task of the Evaluation Commission, which is however only an advisory body for the Council. Also the disciplinary Expert Committees are currently involved, for example for the refinement of field-specific evaluation criteria. Decision-making, however, is in the hands of the Council (an in-depth assessment of the Evaluation Methodology is provided in Annex 3 to the Second Interim Report)
- A key component of the Evaluation Methodology is the data on R&D outputs that are stored centrally in the Information System. The operational management of that system is outsourced, while the Secretariat is responsible for its administration and overall management

38 According to the Secretary of the R&D&I Council, it takes up ¾ of the year activities

- Finally, every year the R&D&I Council also performs a benchmarking exercise between completed R&D programmes, focusing predominantly on their cost-efficiency (results reached versus funding) - on the basis of the data stored in the Information System. In theory, the outcomes of this benchmark influence the Council's approval of new programmes proposed by the administrative bodies. A reporter performs this task, member of the Council and nominated by the Council members (see also Section 3.5 in this report)

To these tasks and responsibilities one should add also the scrutiny of the Strategic Concepts and applied research Programmes developed by the Ministries and the Technology Agency, which necessitate the approval by the R&D&I Council before they can be forwarded to the R&D&I Council.

The intention was that the Council would hereby control whether policy objectives are effectively reflected in the ministries' and agency's activities. Recently, in the case of the submission of a new programme by the Ministry of Agriculture, the interpretation of this task has been extended to a detailed quality control, implemented by one of the Council members (assigned to this task by the Council) with the support of the Council's Secretariat. Several revisions of the programme description were requested as well as an extended impact evaluation of past and ongoing programmes, leading to the final approval of the programme approximately one year after the first version of the programme was submitted.

Longer-term Policy-making

By law, the Council is responsible for the definition of the National R&D&I Policy – including the establishment of the systemic and (thematic) R&D priorities. According to the Statutes, a key task of the Expert Committees in this context is to prepare proposals for thematic R&D priorities - by law "in response to the needs of Czech industry and society" - and to identify promising directions in basic research.

Closely related to this task are the 'duties' of the Secretariat to provide the Council with the needed documentation and information for its decision-making.

In this context we note a change in the 2009 Council Statutes compared to those approved in 2006 in relation to the time that is put at the disposal of the Council members for the consultation of the documents to be discussed in the Council: the 2006 Statutes stated that documents were to be submitted not later than *3 weeks* prior to the Council session; this was reduced to *7 days* in the 2009 Statutes.

Seeing the number of staff members, the analytical capacity of the Secretariat of the Council results insufficient to cover the Council's need for background studies upon which to base its decision-making. Not surprisingly, we notice that the Secretariat outsources to external experts most of its analytical duties.

Until recently, however, also the budget at the disposal of the Secretariat for these activities was highly limited. According to the Council Secretary, until July 2010, the R&D&I Council had an availability of about 200,000 CzK a year for the development and implementation of the National R&D&I Policy, which was to cover costs strictly related to its specific tasks and sufficient for the budgeting of 1 to 3 studies a year.[39] This situation changed in 2010 with the transfer of the responsibility for the development and implementation of the National R&D&I Policy from the Ministry of Education to the R&D&I Council - including the budget linked to these responsibilities (approximately 10 Million CzK, i.e. ~400,000 €, a year).

This increase in budget availability allowed for the commissioning of a study that has the features of a framework contract and should conduct a broad range of "Analyses and information for the implementation and updating of the National R&D&I Policy". In line with the Statutes of the Council attributing competence for the use of the Council's budget to the Secretary, who to the best of our knowledge also defined the

39 Source: Minutes of the R&D&I Council meeting of June 09, 2010 – communication by the Secretary

focus of the study[40], the Office of the Government signed the contract in September 2010 following a public tender, [41]. The study was launched in October 2010 and will last until 31 December 2013. The budget for the study is 30.7 Million CzK, i.e. about 1.2 million €.

The study has 2 major tasks: the assessment of the progress in the implementation of the National R&D&I Policy and the delivery of support to the R&D&I Council in the formulation of the next R&D&I Policy.

- *Themes related to the National R&D&I Policy 2009 – 2015*. The study should analyse and collect information in relation to the implementation of the National R&D&I Policy and conduct an ongoing assessment of the achievement of the objectives. The latter is to be understood as a monitoring whether the tasks identified in the National Policy for the step-wise implementation of its decisions have effectively been accomplished. Other tasks include the identification of longer-term R&D&I priority areas (see further Section 3.3.6); the analysis of support for R&D&I and the achievement of outputs and results, as well as innovation and the implementation of research results - in the Czech Republic and abroad; Human Resources for R&D&I (mobility issues and international collaboration); and the relations between R&D&I and society (awareness raising activities)
- *Themes for the preparation of the future national policy and supporting the decision-making in the R&D Council*. Focus for analysis will be the value and the future of R&D&I in the Czech Republic; Linkage of small and medium enterprises to R&D&I; and Human Resources in R&D&I (doctorate & postdoc studies)

Other support to the governance of R&D&I

Other governance and advisory tasks include proposing to the Government the Chairmen and members of the Science Foundation and Technology Agency Board and Committees; international collaboration with R&D governance bodies; drafting of opinions on licence applications to conduct research on human embryonic stem cells or for changes in such licences or on applications to import human embryonic stem cells. For the latter, the Council bases itself on the opinion of its Bioethical Commission.

2.1.2.2 Discussions on the Future Coordinating Body for R&D&I Governance

One of the objectives indicated in the National R&D&I Policy 2009-2015 was the establishment of a Co-ordination Body at the level of central government for the governance of R&D&I, resulting from the transformation of the R&D&I Council in 2013.

From the currently available documentation on policy discussions and analytical input in relation to the features of such new Co-ordination Body emerges the following picture:

- The current breadth of the tasks covered by the Council is considered as mandatory and there is even a push to further expand the Council's responsibilities
- It is unclear what the characteristics of the future R&D&I Council will be in the future in terms of composition of its members
- The Council will continue relying close-to-exclusively on external experts for its strategic intelligence and the National Policy foresees the instalment of 3-year framework contracts, to one single provider at a time

[40] No trace could be found in the R&D&I Council minutes related to discussion and decision-making on the focus of this study

[41] The study was commissioned to the Technology Centre AS CR upon approval by the Council

The National R&D&I Policy 2009-2015 specifies that this coordinating body "will have the responsibility for the strategic governance of R&D&I, including the coordination of public support. In relation to the management of the R&D&I policy, this body will coordinate the activities of the single central state government bodies [i.e. the 2 agencies]. In relation to public support for R&D&I, the coordination body will propose to the government the allocation of public expenditure for R&D&I (institutional and targeted), evaluate the cost-effectiveness of the support on the base of the attained results, and define priority areas that will steer the public support for applied research."

The National R&D&I Policy furthermore specifies, "The Coordination Body will include a council of leading experts in basic and applied research, development and innovation. The Chair of the Coordination Body, who will also be a member of the Government, will have at his/her disposal a sufficient level of human and financial capacities for the strategic management of the R&D&I system and for the fulfilment of the routine tasks associated with the coordination of public support for R&D&I."

It also foresees that in the future, analyses gathering strategic intelligence for the Council's activities will continue being the task of predominantly external experts, through the commissioning of a 3-year framework contract – and therefore to one single service provider at a time.

In 2009 and 2010, upon initiative of the Prime Minister, Round Table discussions were held on the R&D&I Governance system, with the participation of representatives from the major stakeholder communities - but not the ministries. Apparently, the intention is to re-launch these discussions in the upcoming months.

The aim of these round table discussions was to identify the open problems and agree on how to tackle them. Topics on the table were especially the appropriate level of centralisation of the system and the role and characteristics of the to-be-founded "Central Authority for R&D&I". The Technology Centre AS CR was asked to provide background information on R&D&I governance systems abroad and to develop proposals for discussion.

In their input for the 3rd Round Table, the experts at the Technology Centre AS CR (further: TC) considered that in order to ensure adequate coordination between different authorities responsible for implementing the R&D policy, there was a need to establish a *Central Authority* that would cover all basic functions in R&D&I Governance, i.e. strategy development, priority setting, national fund management, and evaluation – at the same level of 'micro-management' as today. The characteristics of such Central Authority, for example in terms of members, are not further defined.

It would be the task of the Central Authority to set up mechanisms for securing the *strategic intelligence* for decision-making, provided by *external experts*. These studies should create a professional background primarily for the preparation of R&D strategies and priorities. At the same time, the Central Authority should receive expert services for the development of the evaluation methodologies.

They saw as a potential scenario the institution of an *Inter-ministerial Council* composed by representatives of the funding providers as part of the Central Authority. The main task of this Council should be to ensure the *coordination of policies* among different R&D departments and other providers of public support, related to the financing and definition of R&D strategies. For this purpose, members of this Council were to be at the political-administrative level, i.e. Deputy Ministers or senior government officials.

Next to the Central Authority, the TC experts considered the constitution of a *Council of Experts,* grouping a number of leading experts in various fields R&D&I - ideally with a professional perspective beyond the boundaries of individual disciplines. These experts were to be appointed by the Central Government on proposal of the R&D institutions. This Council would primarily be involved in defining strategic R&D&I priorities.

The future set-up of the Co-ordinating Body was the topic also of one of the papers delivered by the Technology Centre AS CR in the context of its Framework Contract with the Office of the Government/Secretariat to the Council.

In this paper[42], the experts at the Technology Centre consider, "Similar to the practice in European countries that are successful in innovation, in order to ensure effective coordination it is appropriate to concentrate in one body the responsibilities for at least the following four areas of R&D&I governance, i.e. strategies, priorities, funding and evaluation."

More specifically, they consider that in relation to these tasks, the role of the Council should be strengthened and recommend

- In relation to the *development of long-term strategies*, an intensive collaboration between the (new) Council and the MEYS allowing for an improved coordination of the national activities for R&D&I support and the activities related to international collaboration. This could take the form of representatives of the Council's management structures for international collaboration participating in the MEYS' committees and participation of the MEYS ones in the relevant meetings of the Council
- In relation to the *definition of the priority areas*, the establishment of "Strategy Expert Committees" defining problem-oriented priorities rather than the current thematic (scientific) ones
- In relation to the *national R&D&I budget management*, the management of the flows of financial support ("an important element of the coordination function of the Council") should reflect the problem-oriented research priorities formulated on the basis of long-term strategy
- A strengthening of the Council activities related to the *evaluation* of the effectiveness and efficiency of R&D&I spending of public funds by the individual providers. They envisage a more active involvement of the Council in the evaluation of the R&D&I system (the audits); in the methodological guidance for programme evaluation through the development of a single binding methodology that would include evaluation of efficiency as well as of objectives and impact achievement; and the provision of methodological support for evaluations at the institutional level - primarily methodological support for the management of these institutions through manuals and handbooks

2.2 The Ministries

The National R&D&I Policy 2009-2015 restructured the R&D&I governance system as follows:

- The number of Ministries and other public administration bodies with competences for R&D&I funding was reduced, limiting the national R&D budget chapters from 22 to 11
- The role of the Science Foundation was enhanced, becoming the sole provider for *basic research* funding. It covers five broad scientific areas: technical sciences, natural sciences, medical sciences, social sciences and agricultural sciences
- A new Agency was created for the development and implementation of *applied research and experimental development*, the Technology Agency
- The role of the Academy of Sciences was limited to acting as a body managing the distribution of the institutional funding among its institutes

[42] A 1-1, A 8-1 ROLE KOORDINAČNÍHO ORGÁNU PŘI PŘÍPRAVĚ A NAPLŇOVÁNÍ POLITIK A KONCEPCÍ ZAMĚŘENÝCH NA OBLAST VÝZKUMU, VÝVOJE A INOVACÍ, Technology Centre AS CR, November 2010

Currently, intermediaries for the implementation of the R&D&I policies are 7 Ministries and the 2 Agencies (the Czech Science Foundation and the Technology Agency). We describe the internal structures and key characteristics of these public institutions further below.[43]

An obvious consequence of the 2008 Reform was the dismantling of the R&D departments in those Ministries that agreed to transfer their responsibilities for R&D to other Ministries or the Agencies. These include the Ministry for Transport, the Ministry for Environment, the Ministry for Labour and Social Affairs, and the Ministry for Regional Development. In these Ministries, the departments responsible for overall strategy and/or policy-making are the ones now covering the scrutiny of needs for R&D and share the information on these needs in cross-departmental working groups. A considerable restructuring also happened in the MEYS when the Department for R&D Policy was dismantled because policy-making at the national level had become responsibility of the R&D Council. This was the department that was responsible for strategy development and analyses.

In total 7 Ministries currently hold management responsibilities for national public R&D&I support (see Figure 10, above)

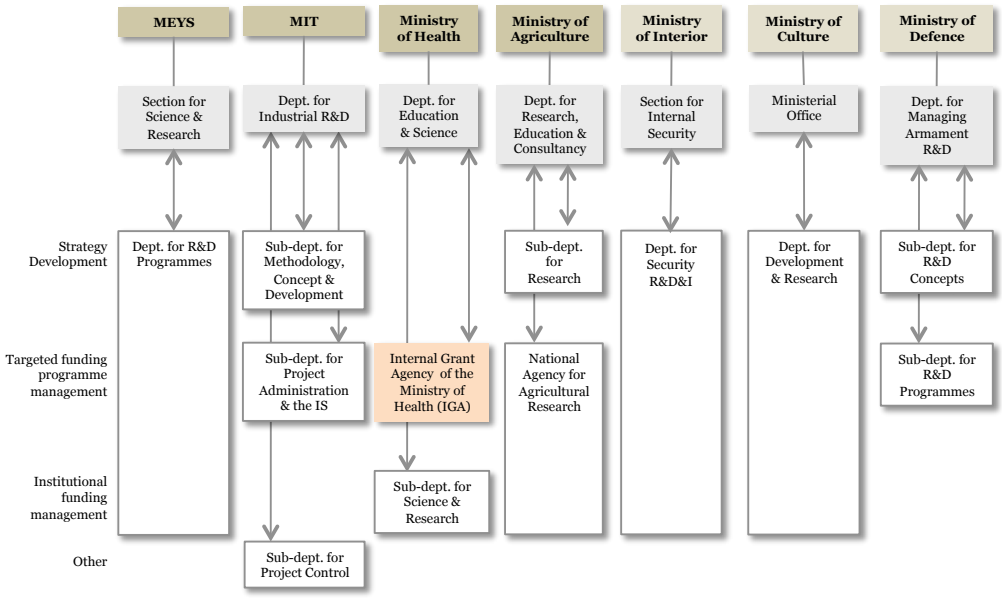
- Three ministries, i.e. the Ministry of Defence (MoD), the Ministry of Health (MoH), and the Ministry of Agriculture (MoA) were assigned responsibility for sector-specific R&D
- Four ministries, i.e. the Ministry for Education (MEYS), the Ministry for Industry and Trade (MIT), the Ministry of Culture (MoC), and the Ministry of Interior (MoI) are in charge of "cross-sectoral R&D" and are expected to co-ordinate also the research needs of ministries that 'lost' their competences for R&D&I by setting up cross-departmental working groups

All of these Ministries manage the national institutional funding for the research organisations – public or private non-profit – in their area of competence; most of them also develop and manage competitive R&D programmes. Exception is the Ministry of Industry that officially does not have the responsibility for targeted funding programmes, even though it currently runs such a programme that will last until 2017.

Figure 11, below, maps the **institutional structures** for the governance of the national R&D support in the various Ministries. In this mapping, the Ministries are ranked according to the level of their overall national R&D&I budget for 2011; those with the highest national R&D&I budget are shaded darker.

[43] Details on programme portfolio are provided in Annex 1 to the Second Interim Report

Figure 11: Institutional structures for national R&D support governance in the Ministries



In all Ministries but the Ministry of Health, **programme management** is implemented by Programme Committees, composed by Ministry employees and expert stakeholders (respectively 1/3 and 2/3 of the members).

The Ministry of Health has its own Internal Grant Agency (IGA) taking care of this task. In contrast to the Ministry of Agriculture where the former internal grant agency is now incorporated in the ministerial and departmental structures, the IGA still is an independent entity, with its own Supervisory Board, Scientific Board, Expert Committees, and Secretariat. The Minister directly nominates all members of the Boards and Committees; the Deputy Minister nominates the Director of the Secretariat. The Minister can also dismantle the Agency upon autonomous decision.[44] It is responsible for all programme management activities, including proposal appraisals, monitoring and evaluation. The specific characteristics of this Ministry are also illustrated by the absence of key staff dedicated to strategy development. It can be described as a young ministry, with all key staff members younger than 40.

Table 5 illustrates the **number of staff** that is allocated in the Ministries for the fulfilment of key tasks related to the management of R&D&I support.

The Ministry of Culture has recently seen a huge increase in its responsibilities for national R&D funding: in 2007, it funded programmes for a total of 18.6 M Czk, in 2011, the total budget for R&D programmes in this Ministry is 341.3 M CzK. Compared to the other Ministries, the Ministry of Culture seems under-staffed, especially in relation to strategy development. Also, more than half of the key staff members is younger than 40. Management expertise is, however, guaranteed in each task category by the presence of a 50+. None of the key staff members in this Ministry had more than 5 years working experience outside the Ministry; working experience outside the Ministry - in teaching or research positions or in industry/stakeholder organisations – is an important facilitator for efficiency in programme development and management because of the knowledge gained on the specific working environment and needs.

[44] Source: Statut Interní grantové agentury Ministerstva zdravotnictví České republiky, 2009

Table 5: Staffing of the ministerial departments per task description

	MEYS*	MIT	MoH	MoA	MoInt	MoC	MoD
Directorate/management & their support staff	2	3+7	4	1 - also for strategy dvpt	5	1.2	16
Staff responsible for strategy development	4	not appl.	0	5	5	1.8	4
Programme managers responsible for the management of targeted funding programmes	5	5	2	5	2	1	5+2
Staff responsible for institutional funding management	3		1	1	1	2.5	1
Support staff for targeted funding programme management	5	4	1	0	6	3.5	1+3
Financial auditing & project control		6**					
TOTAL	19	25	8	11	19	10	21

Notes: *The data for the MEYS are only related to the sub-department for national R&D funding; **In other Ministries, such as the MEYS, the financial auditing is covered by other departments in the Ministry

Source: data provided by the Ministries, survey in September 2010

The 'dynamic inconsistency" between the need for continuity in strategic intelligence and long term policies to support research and innovation, on the one hand, and the short term incentive systems within which politicians live, on the other, was an issue emerging during our study in relation to the Ministries' governance of R&D&I: several senior officials in the Ministry of Education as well as recently the head of the sub-department for research in the Ministry of Agriculture were removed from their positions as an indirect consequence of the governmental changes last summer.

Especially in the Ministries of Agriculture, Defence and Education, we note a high level of expertise among key staff members. In these ministries, the majority of the responsible staff is a graduate/postgraduate professional in the relevant scientific areas and most of them have more than 5 years experience outside the ministry (in teaching or academic research or in user/stakeholder organisations).

Training of staff is a key aspect for the achievement of management efficiency. In the Ministries / departments for R&D, in general little attention is dedicated to this aspect of HR management. This is especially the case for the MEYS (see Table 6, below). Employees in the Ministries of Interior and Defence benefit from a slightly more intensive training.

Table 6: Average number of training days per person per year

	MEYS	MIT	MoH	MoA	MoInt	MoC	MoD
Number of days per person per year budgeted	1	n.a.	0	2	10	3	5
Number of days per person per year actual	1	n.a.	1-2	2	8	3	5

Notes: n.a. = Not answered

Source: data provided by the Ministries, survey in September 2010

2.3 The Agencies: the Science Foundation and the Technology Agency

The Czech national R&D&I support governance system includes two agencies with competences for programme funding strictly divided according to the nature of research: the Science Foundation (GA CR) provides funding for basic research; the recently installed Technology Agency (in 2010) ensures the development and implementation of competitive programmes for applied R&D, with a specific focus and attention for the implementation of R&D results in innovation. The Czech system hereby reflects the "two-pillar" structure for the funding of research, applied in several Western countries.

In Czech legislation, the Frascati definition for "basic research" is adopted, i.e. "theoretical or experimental work carried out with the aim of acquiring new knowledge of the basic principles of phenomena or observed facts, which does not primarily focus on their practical use or application". The definition for "applied research" is defined more narrowly than the Frascati manual does. The latter states, "Applied research is original investigation undertaken in order to acquire new knowledge. It is directed primarily *towards a specific practical aim or objective*." Czech legislation instead defines applied research as "Theoretical or experimental work carried out with the aim of acquiring new knowledge and skills for the *development of new or fundamentally enhanced products, technologies or services*". Interviewees informed that in real life, 'basic research' is considered to be research whose results are public rather than appropriated.

The **Science Foundation** provides predominantly response-mode funding, building upon its structure of scientific committees as described in Section 2.2.

The **Technology Agency**, instead, is to ensure the development and implementation of *competitive programmes* for applied R&D, with a specific focus and attention for the implementation of R&D results in innovation. It communicates and cooperates closely with all ministries and other governmental organizations relevant to its core focus in applied research, experimental development and innovation. Another important objective of the Technology Agency is to stimulate cooperation between R&D institutions and industry, which is a challenge in most European countries.

The programmes implemented in these agencies are further described in Annex 1 to the Interim Report. In this report, instead, we look further into the - current and potentially future - positioning of the Technology Agency in the R&D&I system and provide some input on experiences with innovation agencies abroad.

2.3.1 The Structure of the Agencies

Both agencies have similar structures at the management level, constituted by an executive body, a strategy body, and a "monitoring" body. The offices of the two agencies are the organisation and administration bodies.

- Executive bodies are the *Boards*, whose members[45] are nominated – and eventually removed – by the Government, upon proposal by the R&D&I Council. They coordinate the activities of the conceptual bodies, decide on public tenders and on the final selection of projects to be funded, and submit statutes (or their amendments) and budgets to the Council for approval.
- The Strategy bodies are called *Scientific Council* in the Science Foundation and *Research Board* in the Technology Agency. Both of these bodies comprise 12 members who are nominated by the Government upon proposal by the Council and represent scientific disciplines. Industry is involved only in the Technology Agency.

[45] In both agencies, the 'Presidium' counts 5 members

These bodies implement the agencies' programme management and evaluation activities at the higher levels. In detail, they propose to the Boards the creation and focus of ministerial commissions (for the Science Foundation) or Programme committees and their members (for the Technology Agency); comment on draft programmes (only in the TA); submit proposals for funding of grant projects and their focus (in the GA CR) or proposals for new programmes (in the TA CR) to the Board; and evaluate the level of scientific expertise of the agency and make recommendations for improvement (GA CR) or evaluate interim and final outputs of programmes implemented (TA CR).

- The "monitoring" bodies performing the financial auditing of the agencies' activities; they are called Supervisory Board in the GA CR and Control Board in the TA CR. In both cases, the Parliament nominates members – more specifically the competent Committee of the House of Deputies.
- The Offices of the two agencies are the organisation and administration bodies. The director is appointed and removed by the President of the agency.

Bodies responsible for the operational implementation of the *proposal appraisals* are

- In the Science Foundation, Scientific Committees that cover 5 general scientific areas, mirroring those of the Scientific Council (Technical Sciences, Physical Sciences, Medical and Biological Sciences, Social Sciences and Humanities, Agricultural and Biological/environmental Sciences). They are supported by 39 panels involving approximately 450 experts (see further Section 3.4.2.3, below)
- In the Technology Agency, specific Programme Committees are set up

Key for the management of the operational activities in the **Science Foundation** are the 5 Scientific Affairs Departments in the Office who mirror the set-up of the Scientific Committees. Even though these departments are responsible 'only' for the operational activities, no doubt the level of skills and capacities of the staff and their knowledge on the scientific field are fundamental factors for the efficiency of their management activities. Half of the staff members in these departments are graduates/postgraduates in relevant or other scientific or technological areas; five staff members also have more than 5 years teaching or research experience.

Table 7 illustrates the tasks covered by the departments in the Science Foundation Office, as well as the number of employees.

Table 7: Number of staff and tasks covered in the departments of the Science Foundation

Department	Nr. of personnel	Tasks
Scientific Affairs Departments	15	Organisation of the evaluation process of submitted project proposals and the agenda for ongoing and completed projects
Department of International Relations	3	Idem + all the international activities of GACR and projects within the framework of international cooperation
IT Department	3	Database of the ongoing and completed projects – responsible for the electronic on-line submission system and on-line evaluation process of the project proposals
Auditing Department	4	Monitors compliance with prescribed procedures and rules, controls economic management of recipients of grants
Finance Department	3	Provides for transfer of funds to the recipients of the grants, consulting for recipients and grant project researchers in financial matters, administers the budget of the GACR Office and provides for all related agenda
Secretariat of the President of the GACR	1	From 2011 only one joint secretariat due to the reduction of staff
Secretariat of the Director of the GACR Office	1	

Source: data provided by the Science Foundation, interview in September 2010

A rough estimate of the running costs of the Science Foundation Office in 2009 is shown in Table 8.

Table 8: Rough estimate of running costs in the Science Foundation Office, 2009

Cost	In CzK	In €
Travel costs, reimbursements for external experts (members of Presidium, experts in evaluation Panels, external reviewers, members of Audit Committee), and cost of consumables associated with the panel meetings	~ 26 million CzK	1 million €)
Salaries of the GACR Office employees	~ 18 million CzK	720 000 €)
Other administration and operating costs	~ 4 million CzK	160 000 €

Source: data provided by the Science Foundation, interview in September 2010

The Office of the **Technology Agency** currently has 13 employees. They are responsible for the preparation of programmes and programme documents (specifications, manuals, etc.), and the subsequent implementation of these programmes. The TA CR Office handles the project proposals, controlling their formal requirements before sending them on for further evaluation; provides counselling (legal, financial and IPR) on programmes and projects for applicants and project teams; and monitors and evaluates the fulfilment of the objectives of approved projects.

It is a young agency; all 6 key staff members (responsible for strategy development or programme management) are younger than 40. None of them has specific scientific or technical professional qualifications; however, half of them have more than 5 years working experience in teaching or research.

In terms of HR management, compared to the other intermediaries, the Technology Agency offers a good level of training to its employees (5 days per year). Qualitative performance indicators are in place, covering all the important parts of the work.

There is an internal programme management handbook with indication on programme design principles, while the information sharing on programme management occurs predominantly through ad hoc workshops of the dedicated working groups.

2.3.2 Positioning of the Technology Agency

The National R&D&I Policy 2009-2015 considered, "An important component of an effective system for the public support to R&D&I is also an effective implementation structure. While the targeted support to basic research is in the CR sufficiently concentrated (through the dominant position of the Science Foundation), targeted support for applied research is considerably fragmented. In order to improve concentration (and thus the effectiveness) of the targeted support for applied research, the amended law 130/2002 regulated the scope of he Technology Agency. In line with this law, the Technology Agency will be founded and its activities will be launched, consisting in the distribution of the gradually increasing state expenditure for applied research within its field of competence, as of 2011. After an evaluation of its activities, a second phase of its development will be set up, including the optimisation of its activities and its organisational structure."

The before-mentioned amended law 130/2002 states as tasks of the Technology Agency the preparation and implementation of programmes of applied research, development and innovation including programmes to serve the needs of the public administration, public tenders in research, development and innovation and the issuance of public contracts" and the full management of these programmes; advisory services to Project Managers and users of the results of applied research, development and innovation, particularly in the area of legal and financial advice and as concerns the protection of intellectual property rights; support for communication between research organisations and the private sector and the co-financing of programme projects; and international co-operation with similar agencies.

It also indicates as task of the Technology Agency to implement programmes on behalf of the ministries – and in particular those ministries and state entities that, following the 2008 Reform, no longer provide R&D&I funding.

Currently, the Technology Agency therefore fulfils a **double role**: on the one hand, it acts as a *multi-principal* intermediate research funder (similar to the Research Council of Norway), acting as an executive agency for the seven ministries with competence for R&D&I. On the other hand, it also has the competence for the development of R&D programmes, in particular those directly tackling the research priorities defined by the R&D&I Council. In this case it acts as a *mono-principal intermediary*, working for a single policy-making organisation, i.e. the R&D&I Council.

2.3.3 The History and Practices of Innovation Agencies Abroad

The innovation agencies in Sweden, Norway and especially Finland are widely admired as models for how to address the 'Technology Agency' function in small countries. (Denmark has pursued a different path, often leaving the operational role that elsewhere belongs to agencies integrated with the parent ministry.)

Norway established an innovation agency (NTNF) immediately after the Second World War, which in turn set up applied research institutes, supporting technological research and industrial innovation both directly through the institutes and indirectly via funding on a project-by-project basis. The institutes were separated from NTNF during the 1980s. A key innovation was 'user-directed research', where company innovation projects are subsidised on the understanding that the subsidy will largely be used to buy research services from the institutes. The principle that such funding should be led by industrial needs rather than the technological interests of the researchers remains alive, long after NTNF has been merged (1993) into the Research Council of Norway (RCN).

Sweden merged several organisations in 1968 to form STU[46], in response to criticisms in an OECD study that said the existing system of research councils failed to produce sufficiently dynamic changes in technology and industry. However, in the absence of other business models, STU acted very responsively to the universities' for project-by-project requests for funding.

Initially, project funding decisions were taken by research council-like committees but this tended to lock funding into a static pattern. The General Audit Office complained in 1972 that no reallocation seemed ever to take place between different fields. In 1973 the Board transferred the right to take project funding decisions to STU's project officers. From that point on, all expert committees became advisory. Such was the frustration with STU that a government commission investigated it. The commission confirmed that of the Audit Office that STU's system of budgeting across a large number of fixed areas caused lock-in. STU therefore moved to a system of flexible but fixed-term framework programmes with clear start and end dates.

STU then asked the universities what the contents of the framework programmes should be. Their response was essentially a series of long lists of projects – proposing to continue what they already were doing. Therefore STU's planning department identified and prioritised key areas. Four framework programmes were launched in July. Over the next few years, STU evolved a programming practice that built on close interaction with stakeholders and where programme design was supported, rather than steered, by the planning department, which increasingly focused on overall strategy and on producing tempting budgets ('proposals' as Tomner called them internally) to offer to the industry ministry at three-year intervals. Programming came to involve a planning committee of academic and industrial experts in a field, which supported a project officer in writing a plan based on identifying technological and industrial needs and opportunities for Sweden. Once STU management approved

[46] The Swedish National Board for Technological Development

a programme, the planning committee was dissolved. Programmes typically ran for two successive 3-year periods and were overseen by a programme steering committee of knowledgeable but uninvolved industrialists and academics. They advised the project officer on project funding, but STU staff formally took these decisions.

STU had two kinds of programmes. From 1980, it ran so-called framework programmes that aimed to build capacity in the university system and from 1985 it added programmes that involved industry. By the mid-1980s, STU was programming roughly half its project funding resources and awarding the rest in 'response mode' to projects proposed by the academic and industrial communities.

STU was merged with other organisations responsible for business and regional development in 1991.

TEKES was set up in 1983, strongly influenced by STU, whose programming practice evolved in Helsinki into TEKES' famous Technology Programmes. These come in two variants: one rather open, where a partly industrial steering committee oversees applied research in the university and public institute system; a second, where company work is subsidised using grants or loans, usually in partnership with public research organisations. TEKES design and planning process for Technology Programmes is still similar to STU's, except for the addition of a step where TEKES staff tries to identify international hot spots and potential partners and considers what kind of internationalisation measures could be integrated into the programme design.

Technology Programmes were the dominant part of the innovation activities in Norway, Sweden and Finland through the 1990s. In each case, however, 40-50% of the budget was spent in response mode: i.e. in response to unsolicited proposals not attached to the programmes.

In 2001, the part of NUTEK corresponding to STU was de-merged and integrated with research funding on transport and on working life to form today's VINNOVA, which was announced as the world's first 'innovation systems agency'. VINNOVA had an innovative organisation that separated a new 'Actors Group' from those working with Technology Programmes. The Actors Group ran programmes, which were intended to cause **structural change** in the research and innovation system. Since 2000, such programmes have become increasingly important in all three agencies, and the separation between Technology and Structural programmes was copied in the creation of the new Austrian innovation agency (FFG) in 2004. The Research Council of Norway has also followed the trend of funding structural programmes during the last ten years.

The job of the **Nordic innovation agencies** can be thought of as having two components. In this respect they are similar to the new Czech Technology Agency.

- First, funding research and innovation activities that would not be done in response to market forces alone – compensating for 'market failure'
  - Responsive or '*bottom-up' funding* of individual projects
  - *Technology Programmes*, which are generally driven by the needs expressed by a group of stakeholders, but which may be supported by needs analysis from the agency
  - Research needed to *support government and regulation* (which may also be defined in sector ministries and/or funded and performed by separate sectoral funders and specialist research organisations)
- Second, acting as change agents by encouraging interest in new and emerging technologies and encouraging needed structural changes (such as building critical mass in competence centres and centres of excellence, reducing the gender imbalance among researchers or improving the integration of the Technology Transfer function into universities)

- *Structural programmes*, aiming to induce change ('behavioural additionality') in the research-performing system
- *Proactive programmes*, which may be Technology Programmes or other types, but which are initiated more as a result of the agency's own analysis than through consultation and may, for example, involve exploring new fields

Some **key success factors** also emerge from looking at the history and practices of the Nordic agencies

- A high proportion of their staff is scientifically or technically qualified, enabling them to understand proposals and projects in ways not open to traditional administrators
- Considerable authority is devolved to the operational level and to line management, including in taking funding decisions
- The agencies have strong analysis capabilities – intelligence is 'distributed' to the agency level, and not only held centrally
- They also maintain close contact with relevant parts of industry and the research community, so that they are aware of emerging trends and needs within specific areas. This kind of contact cannot be maintained centrally
- Especially in Sweden and Finland, the agencies are very proactive in defining their own strategies and programmes. The ministries do not tell them what to do; rather, the agencies periodically submit the strategies and actions they would like to undertake to their parent ministries, which then decide what to fund and what not to fund as well connecting the strategies to larger national priorities. (Norwegian ministries steer in a more top-down fashion, however, leading to loss of internal synergies and probably to over-programming.)
- The agencies evaluate their own programmes but – following the 'waterfall principle' their parent ministries in turn evaluate them
- Evaluation is increasingly integrated into strategic and programming processes in the agencies
- TEKES and RCN now collect baseline information about beneficiaries and all three agencies maintain the right to involve beneficiaries in evaluations even after projects are complete, so that evaluation can tackle outcomes and impacts, not just short term outputs

2.4 The Research Performers

2.4.1 Profile of the Research Communities

The research community is composed of researchers employed in universities, public research institutes (including those 'grouped' in the Academy of Sciences and 'sectoral' public research institutes), private research institutions, and industry.

In the Czech Republic there are 26 public **universities,** 2 state universities (the Policy Academy and the University of Defence), and 45 private higher education institutions.

The **Academy of Sciences** has historically a special position in the Czech R&D system, answering directly to the Prime Minister rather than a Ministry. Currently it has responsibility only for the allocation of institutional funding to its institutes, having agreed in 2009 to dismantle its grant agency and transfer the activities to the Science Foundation.

The 54 institutes of the Academy of Sciences are organised in 3 Scientific Divisions: Mathematics, Physics, and Earth Sciences (18 institutes); Chemical and Life Sciences

(18 institutes); and Humanities and Social Sciences (17 institutes). It also has its own publishing house and has been assigned financial responsibility for 71 specialised Czech scientific societies associated with the Council of Scientific Societies.

The Academy of Sciences is financed primarily from the state budget. It has two main categories of funds: the Non-Investment Funds covering operational costs, and Investment Funds covering predominantly the acquisition of instruments and equipment and the construction of buildings. The ratio Non-Investment Funds/Investment Funds was fairly stable throughout the period 2000 – 2009, i.e. 88/12.

Historical data on the funding structure (covering the time period 2000-2009) indicate that the Academy and its institutes are decreasing their dependence on institutional funding for the financing of their research activities. Over the last 6 years, the 'direct resources of the institutes' (income generated through contract research and licences) has grown as a source for funding, accounting for 23% of the budget in 2009 (compared to 20% in the year 2000).[47]

In the context of the analysis of the national R&D&I Governance system, it is important to bear in mind that

- The **Entrepreneurial sector** includes researchers employed in manufacturing and service-providing enterprises, but also in a broad range of private enterprises offering R&D services to industry. The latter include industry-oriented research institutions that took up the role of public RTOs under communist times and survived the privatisation wave in the beginning of the 1990s.
- **Sectoral public research institutes** are public research institutes that were previously governed by specific Ministries (such as the Ministry of Agriculture or Transport) and gained the status of public research institutes in 2007. In several cases, these institutes have public administration as their target users of their products/services

Finally, Table 9, below, illustrates the **number of research workers** active in the various research performing 'sectors' in the Czech Republic. It shows that in 2009, 44% of research workers were active in the industry sector, while universities employed 34% and 'governmental' research institutes 22% (the latter include the research institutes in the Academy and the other public 'sectoral' ones). Research workers at the Academy of Sciences represented 15% of the national total.

Table 9: Research workers in the CR, in full time equivalent

Sector	2005	2006	2007	2008	2009
Entrepreneurial	10,143	11,053	12,230	13,253	12,657
University	7,575	8,352	8,664	9,358	9,664
Governmental	6,323	6,800	6,915	7,084	6,270
Private non-profit	127	61	69	90	168
CR total	**24,169**	**26,267**	**27,878**	**29,785**	**28,759**

Source: Czech Statistical Office, 2010

The share of these research-performing sectors in the total of R&D activities and investments, as well as a detailed description of the organisations included in the research-performing sectors, is described in Annex 1 to the Second Interim report.

[47] These data are further commented in Annex 1 and Annex 4 to the Second Interim Report

2.4.2 Co-operation in research

Evidence collected during this study points to a considerable increase in the last 10 years of co-operation in research between the different institutional actors, at both an individual and institutional level. This trend is to the benefit of especially the universities - and enhances the internal cohesion of the Czech science system as a whole.[48]

We conducted a questionnaire survey[49] to all researchers in the Czech Republic and a finding of this exercise was that ~40% of researchers employed in universities[50], slightly more than half of those in the Academy of Sciences, and ~60% of the researchers active in "other public & private research organisations"[51], are professionally active also in other institutions than their 'primary' employer.

The beneficiaries of these 'cross-institutional' professional activities are especially the universities: close to half of the researchers active in "other public & private research organisations" and in the Academy of Sciences indicated a secondary involvement in universities.

Especially researchers in the field of Life Sciences[52] indicated such cross-institutional professional activities (57%), predominantly by researchers in "other public & private research organisations" and in the Academy of Sciences, to the benefit of universities. Not surprisingly, especially researchers in the field of Engineering and Technical Sciences indicated collaboration at the individual level with industry organisations (10%).

Evidence also shows that collaboration in R&D is set up at the institutional level. Close to 80% of the researchers in the Academy of Sciences stated that their institutes had strategic partnerships with other research organisations categories, and more precisely public universities; a similar response was given by ~70% of researchers employed in universities and ~65% of those active in the other public & private research organisations.

These data essentially confirm the 2009 annual report of the Academy of Sciences. In its 2009 Yearbook, the Academy stated it concluded 22 framework contracts on cooperation within doctoral study programmes with individual higher education institutions, and that there are now 53 joint workplaces in terms of centres of cooperation with higher education institutions.

National-funded research programmes played an important role in this positive evolution. It is overall recognised in the Czech R&D&I community that the much appreciated Research Centres programme - funded by the MEYS in the context of the National Research Programme I and prolonged until 2011 due to its high level of effectiveness[53] - was fundamental for the set-up of institutional collaborations. Through this programme, research centres were created in various disciplines and often at a cross-regional level, involving especially research institutes or departments

[48] The evidence is based on numerous interviews, surveys conducted in the R&D communities, and elaboration of bibliometrics data related to co-publication in international papers among Czech researchers

[49] The survey was conducted in September 2010; 2607 individual researchers were contacted and we reached a response rate of 26.5%

[50] This category groups Public Universities, University Hospitals and Private Universities

[51] This category groups the Non-Academy Public Research Institutes, Partly funded state organisations (SPO), Private Research Organisations, and Research Organisations abroad

[52] Life Sciences includes Biosciences, Human Medicine, and Agricultural Sciences & Veterinary Medicine

[53] The Science Foundation is currently setting up a programme to facilitate ongoing funding of the established Research Centres

in the Academy and universities. In 2009[54], the MEYS published a list of 57 basic research centres, with in total 166 participations by research institutes and university departments[55]

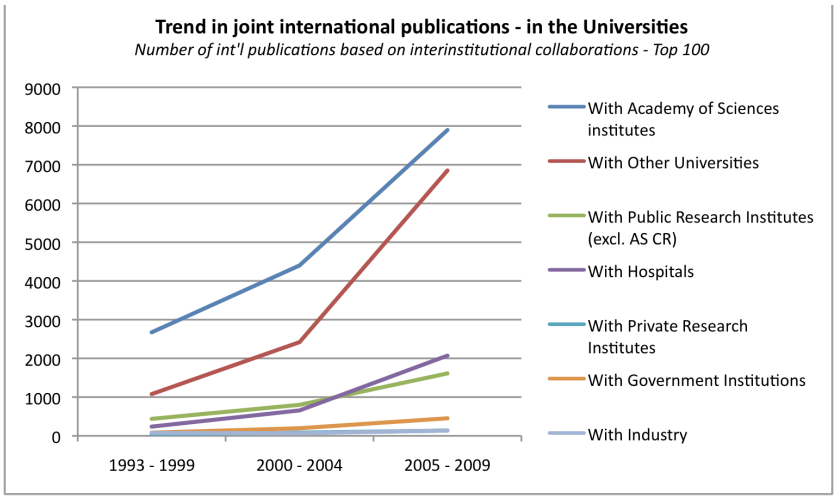
Co-authorship of scientific articles provides a direct measure of collaboration in science and the bibliometric data on international publications by Czech researchers that we analysed in our study confirm the above-mentioned positive trend.

A major finding of our bibliometric analysis was that Czech scientists show an increasing trend in scientific collaboration. Over the whole period, some 45% of all publications are the result of international collaborations. This part of the Czech Republic's output has remained relatively stable in the last decade, while elsewhere it has tended to grow; instead, there has been a huge shift in the last two decades from publications with no collaboration at all, towards publications resulting from national cooperation.[56]

In a second stage of the analysis we looked into the international publication patterns of the Top 100 internationally publishing institutions[57]. This allowed us to analyse the bibliometric data in terms of categories of stakeholders. We noted that especially in the time period 2005-2009 there has been a strong growth of national co-publications in international journals– for all categories of research stakeholders (see Figure 12, below).

For researchers in universities, the growth was especially marked for co-publications in international journals with researchers employed in the Academy of Science institutes and other universities; researchers in the Academy of Science institutes and the other Public Research Institutes built especially on their joint research activities with researchers in universities.

Figure 12 : Trend in inter-institutional publications in international journals

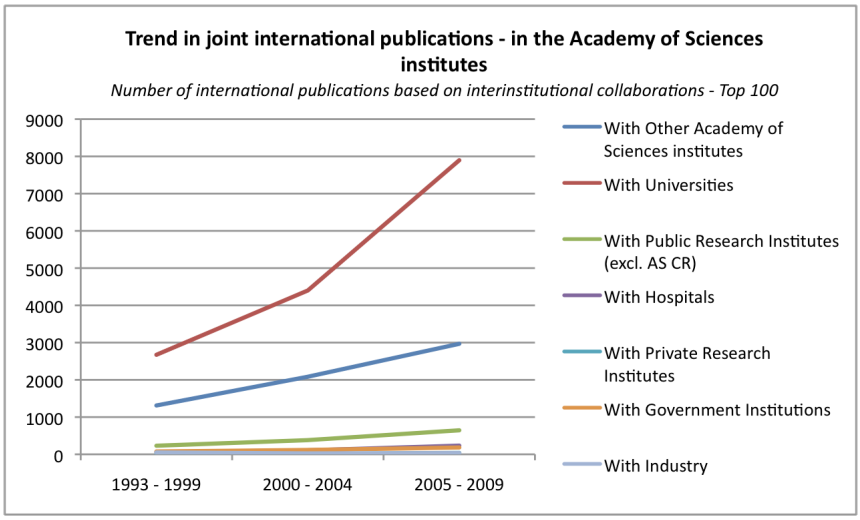


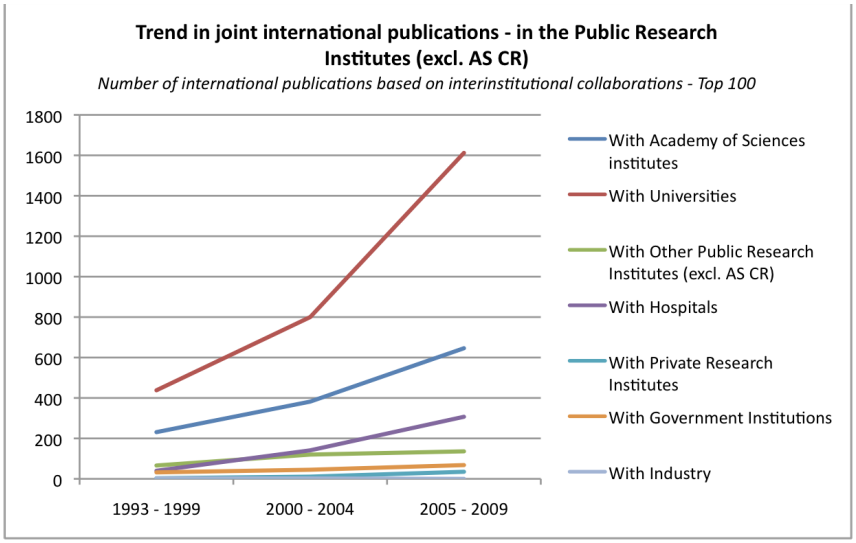
54 State Supported R&D in the Czech Republic - Short Guidebook 2009, MEYS

55 The data on these research centres as it is provided in this list and publicly available in the Information System does not allow for an analysis of the exact number of research institutes and especially university departments involved. The Information System provides only information at the level of university faculty.

56 See the First Interim Report of the International Audit of R&D&I in the Czech Republic

57 See Annex 8 to the Second Interim Report, Section 8.3.1.1





Source: data elaboration based on the analysis by CWTS, International Audit of R&D&I in the CR, 2010

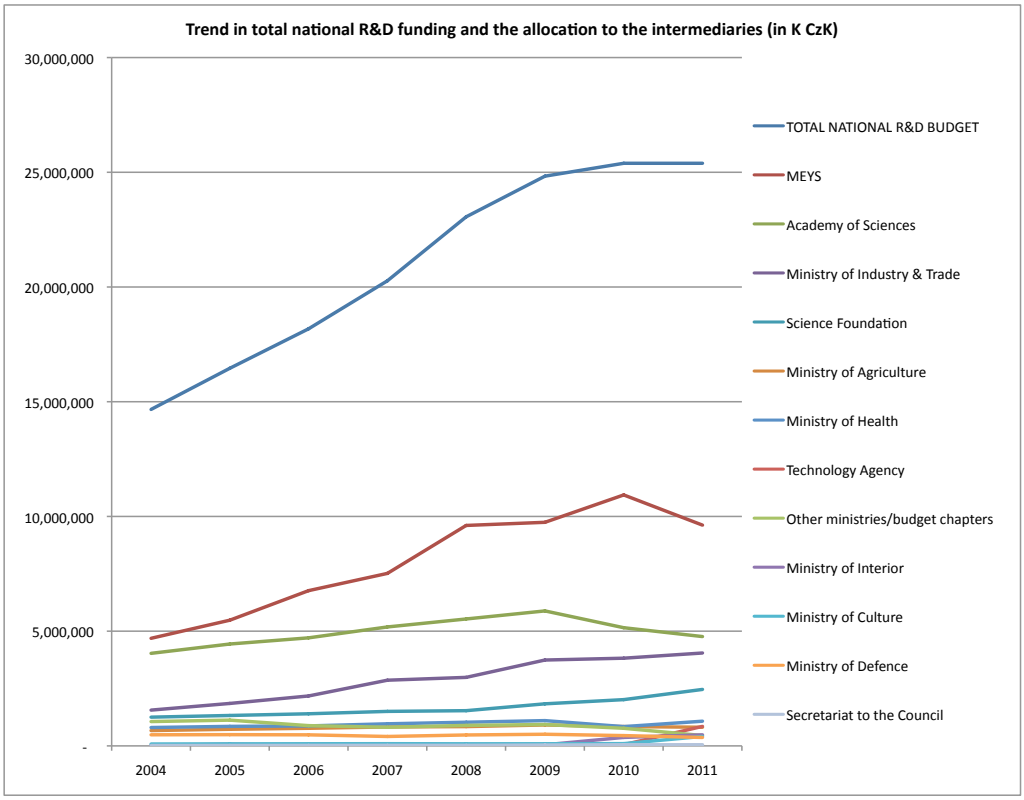
2.5 The R&D&I National Funding System & Instruments

In this Section we relate on our analysis of the trends in national R&D funding distribution over the instrument categories (institutional/targeted funding), funding bodies, and typologies of research.

2.5.1 Overview

In the Czech R&D&I system, the last decade was characterised by a considerable increase in national public R&D funding. Figure 13, below, shows a halt in this growing trend in the last three years. Policy decisions related to competences for R&D governed the distribution of this budget over the intermediaries; these are covered in the paragraphs below on the distribution of the institutional and targeted funding.

Figure 13: Trend in total national R&D funding distribution over the intermediaries, 2004 - 2011



Sources: data for 2004 – 2006 are based on the approved budgets published on the R&D&I Council website; data for 2007 and 2008 are those reported in the approved budget for 2009; data for 2009 are those reported in the approved budget for 2010; data for 2010 and 2011 are those reported in the approved budget for 2011

In the Czech R&D&I system, national funding is divided between two major groups of instruments: **institutional funding** and **"targeted" funding**.

The term "Targeted Funding" – in international terminology 'competitive' or 'project' funding - stands for 3 funding modes:

- Response-mode funding, related only to basic research and provided by the Science Foundation

- Competitive funding for research programmes in the field of applied research, provided by ministries and the Technology Agency through calls for departmental programmes or in previous years, for their sub-programmes in National Programmes
- Public tenders for projects that have the public administration as sole future user. In particular the Ministries of Defence and Interior launch calls for these types of projects; also the new programme BETA of the Technology Agency belongs to this category

Institutions entitled to institutional funding are universities, public research institutes (most of them grouped under the Academy of Sciences), and private (non-profit) research institutes. Distribution of the institutional funding among these research organisations was until recently governed through contracts for "research intentions" (strategic R&D plans at institutional level); the CR is currently progressing towards the implementation of a performance-based funding system, with the intention that this system will govern 100% of the institutional funding distribution as of 2012.

The yearly national R&D&I budgets are subdivided in institutional funding versus 'targeted' funding. Scrutiny of the detailed budget chapters covered in each sub-budget showed us that over the years, there was a discontinuity in allocating to one sub-budget rather than another costs related to administration (such as the administrative costs for the agencies and support for evaluation) as well as those related to international cooperation programmes and the state contribution to the Operational Programmes. To allow for an accurate comparison between the yearly budgets, we therefore performed a rudimentary *activity-based cost analysis* of the national R&D&I budgets from 2007 till 2011. We grouped all costs into 4 categories: Institutional Funding, Funding for International Cooperation & Operational Programmes, Funding for Targeted Programmes, and Administrative Costs and Awards.[58]

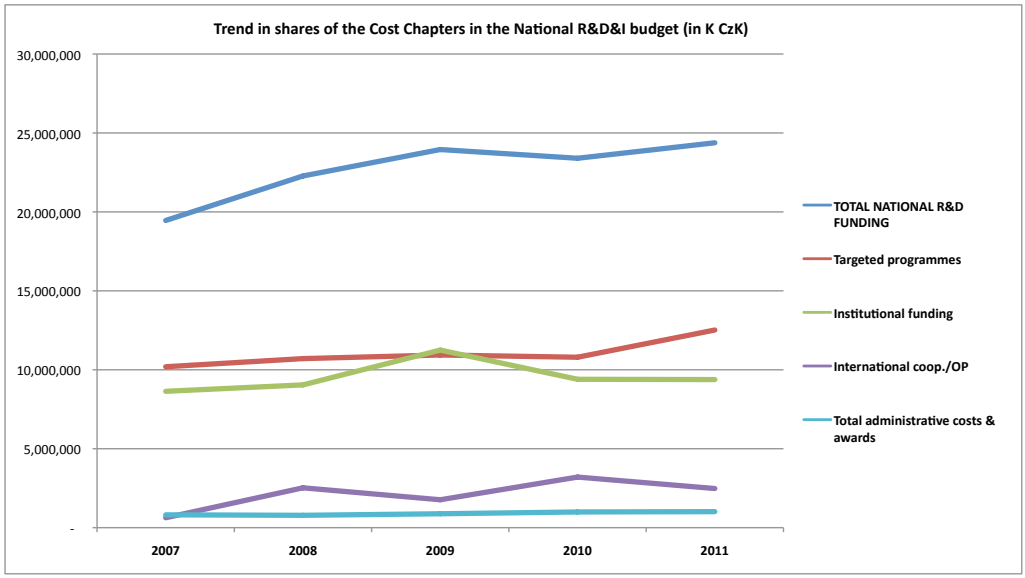
The results of this analysis are illustrated in Figure 14, below. They show that while in 2009, the overall rise in the national public R&D&I budget was to the benefit of institutional funding, in 2011 the budget for competitive ('targeted') funding was increased. In absolute terms, the budget for institutional funding returned to its 2008 levels.

In 2011, institutional funding accounts for 38% of the total national R&D&I budget, 51% is allocated to 'targeted' funding, and 10% covers the costs for international cooperation and Operational Programmes. The target set in the National R&D&I Policy 2009-2015 for the year 2015 of a 60:40 ratio targeted/institutional funding has therefore already been reached.

An international comparison of these shares in the funding system is not easy because in most countries, the sub-division institutional versus targeted funding happens at the lower levels of the governance structure. However, as is highlighted in Annex 1 to the Second Interim Report, a 60:40 ratio is high in international comparison. While our estimate of the national budget allocation in the UK indicates similar shares, one should bear in mind that historically, the UK system constitutes an exception on the international scene for its strong emphasis on 'targeted' funding.

[58] The cost category Institutional Funding includes the funding related to the research intentions; funding for the "development of research organisations (governed by the EM); the budget for "support to the workplaces of the Academy"; the budget for specific research in the universities; and adjustments of budgets due to "changes in the structure of the National Budget" or "the law 130/2002". The cost category Administrative costs and awards groups the costs for evaluation and support activities; operational costs of the Science Foundation, the Academy Grant Agency, and the R&D Council; and the budget for awards

Figure 14: Trend in shares of the cost chapters in the national R&D&I budget

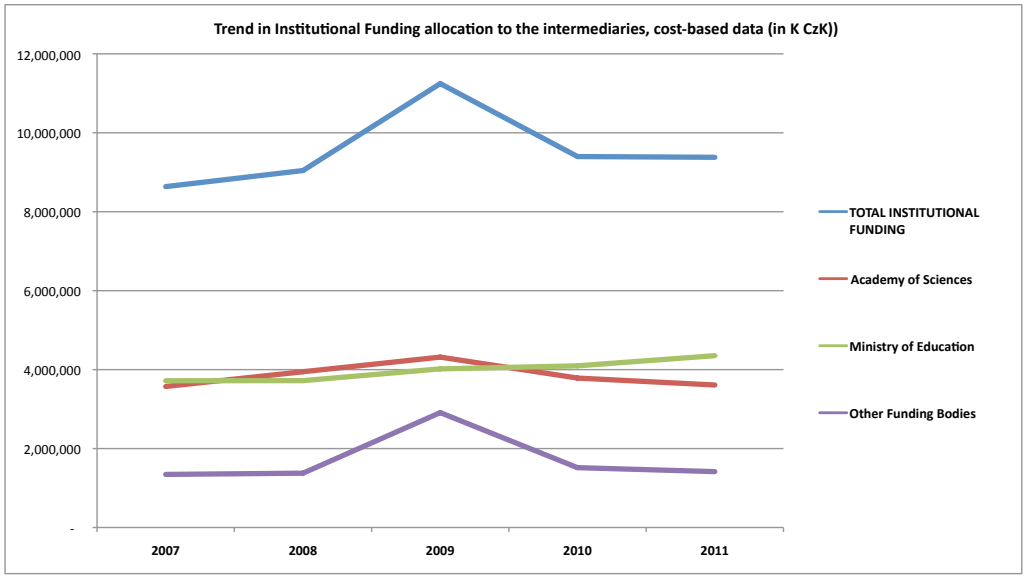


Sources: data for 2007 and 2008 are those reported in the approved budget for 2009; data for 2009 are those reported in the approved budget for 2010; data for 2010 and 2011 are those reported in the approved budget for 2011

2.5.2 Trend in the institutional funding distribution

The trend in distribution of the institutional funding budget among the administration bodies is illustrated in Figure 15, below.

Figure 15 Trend in national institutional funding distribution among the intermediaries, cost-based data, 2007 - 2011



Sources: data for 2007 and 2008 are those reported in the approved budget for 2009; data for 2009 are those reported in the approved budget for 2010; data for 2010 and 2011 are those reported in the approved budget for 2011

The increase in institutional funding for intermediaries other than the MEYS and the Academy of Sciences in 2009 is due to the introduced by the National R&D&I Policy 2009-2015, to assign the responsibility for institutional funding of private (non-profit)

research institutes to Ministries depending on the focus of the institutes' research rather than to the Ministry of Education, as was previously the case.

We note an increase in the institutional funding budget for the MEYS in 2010 and 2011 (99% of this budget is distributed to universities), despite a stabilising of the overall budget.

The budget for institutional funding governed by the Ministries – and its allocation among the institutions - is determined by still ongoing 'research intentions' and/or the outcomes of the point-based evaluation system of R&D results. Table 10 depicts the distribution of institutional funding by each funding provider[59], showing the number of institutions funded and listing those that account for 10% or more of the total institutional funding in that sector. It shows

- A *concentration of institutional funding resources* in the Ministries of Industry, Culture and especially Defence (40% or more of the departmental institutional funding was allocated to 1 single institution)
- A *fragmentation of institutional funding resources* in the Ministries of Interior, Agriculture, and especially Education where institutions receiving less than 10% of the Ministry's funding budget accounted for respectively 70%, 80% and 90% of the total number of institutions

Table 10: Major beneficiaries of institutional funding in the Ministries

	Total institutional funding in M CZK, 2010	% of total
MEYS - 36 institutions	**4094.0**	
Charles University in Prague	1101.7	27%
Czech Technical University in Prague	446.9	11%
Masaryk University	390.2	10%
MINISTRY OF INDUSTRY - 10 institutions	**197.6**	
Aeronautical Research and Test Institute	85.7	43%
Research Center Rez	35.7	18%
Research Institute of Textile Machines Liberec	18.9	10%
MINISTRY OF CULTURE - 10 institutions	**73.0**	
National Heritage Institute	29.7	41%
National Museum	10.5	14%
National Library of the Czech Republic	7.9	11%
MINISTRY OF INTERIOR - 10 institutions	**51.4**	
State Institute for Nuclear, Chemical and Biological Protection, vvi	17.3	34%
Ministry of Interior - Institute of Criminology	9.1	18%
National Radiation Protection Institute	8.4	16%
Institute of Criminology and social. prev.	7.1	14%
MINISTRY OF DEFENCE - 2 institutions	**88.4**	
Ministry of Defence /University of Defence	85.9	97%
CASRI - Sports Research Institute of Czech Armed Forces	2.5	3%
MINISTRY OF HEALTH - 10 institutions	**204.4**	
General University Hospital in Prague	48.911	24%
Institute for Clinical and Experimental Medicine	39.448	19%
University Hospital in Motol	29.069	14%
University Hospital Hradec Kralove	26.853	13%

[59] With the exception of the Academy for which details of distribution are not provided in the official budget documents provided by the R&D&I Council

	Total institutional funding in M CZK, 2010	% of total
Institute of Hematology and Blood Transfusion	22.018	11%
MINISTRY OF AGRICULTURE - 18 institutions	**483.6**	
Crop Research Institute	117.294	24%
Institute of Animal Science	112.016	23%
Veterinary Research Institute	85.987	18%

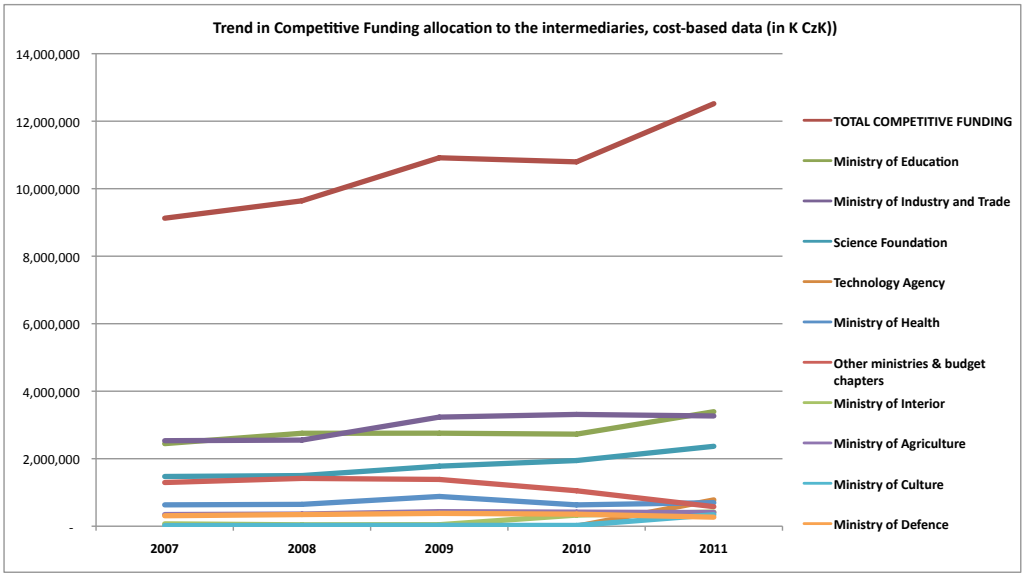
Source: Approved budget 2010

2.5.3 Trends in competitive funding budget distribution over the ministries

Figure 16 illustrates the trends in the competitive ('targeted') funding of research and the distribution of the budget over the ministries.

Also in this case 'other ministries and budget chapters' stands for those that consented in transferring their R&D budget to other ministries or the agencies; this includes the Academy of Sciences. In 2007, they jointly accounted for 15% of the targeted funding budget, which was reduced to 5% in 2011.

Figure 16: Trend in the distribution of the national funding for targeted R&D among the intermediaries, cost-based data, 2007 – 2011



Sources: data for 2007 and 2008 are those reported in the approved budget for 2009; data for 2009 are those reported in the approved budget for 2010; data for 2010 and 2011 are those reported in the approved budget for 2011

This overall budget allocation shows that the *Ministry of Education* and the *Ministry of Industry and Trade* still are the two major funding providers, each of them accounting for approximately 27% of the targeted funding budget. In 2009, the increase in overall targeted funding budget was predominantly to the benefit of the Ministry of Industry programmes; in 2001, it especially provides additional budget for the programmes in the MEYS and the research funded by the Science Foundation. The programme launched by the *Technology Agency* accounts for 6% of the total targeted funding in 2011.

These data indicate that already now there is a positive effect of the 2008 Reform in terms of a more coordinated and less fragmented distribution of funding for R&D programmes. The effects are predominantly visible in the field of *basic research* where previous activities in this field, handled in other ministries and the Academy of

Sciences[60], are now concentrated in a unique competent body, the Science Foundation.

Compared to the year 2007, the *Science Foundation* saw its share in the 'targeted' funding budget increase from 16% to 19%; 96% of this budget is dedicated to response mode funding.

In 2011, there is therefore an approximate 20:80 ratio response-mode/programme funding, which in the current system implies also a similar ratio in national 'targeted' public funding for basic versus applied research.

The National R&D&I Policy 2009-2015 documents recognised that funding for basic research is considerably lower than in other countries and declared the intent to increase it – predominantly in the form of targeted funding.[61]

2.5.4 Trend in competitive funding distribution over the programmes

In the light of the recent policy decisions related to the restructuring of the R&D&I system, it is interesting to look into the distribution of the targeted funding budget over the various **programmes**, making a distinction between 'new' programmes (i.e. programmes that are intended to implement the National R&D&I Policy 2009-2015) and ongoing 'old' ones. We included the TIP programme among the 'new' programmes as this programme will last until 2017, i.e. even beyond the time frame of the policy.

Our analysis of the 2011 budget shows an overall share of 11% allocated to international programmes, 19% of the 2011 budget was to support ongoing project contracts in 'old' departmental programmes, and 70% was dedicated to 'new' programmes.

We reach a clearer picture of the level of investment in various 'new' programmes looking into the targeted funding distribution that is currently foreseen for 2012 – see Figure 17, below.

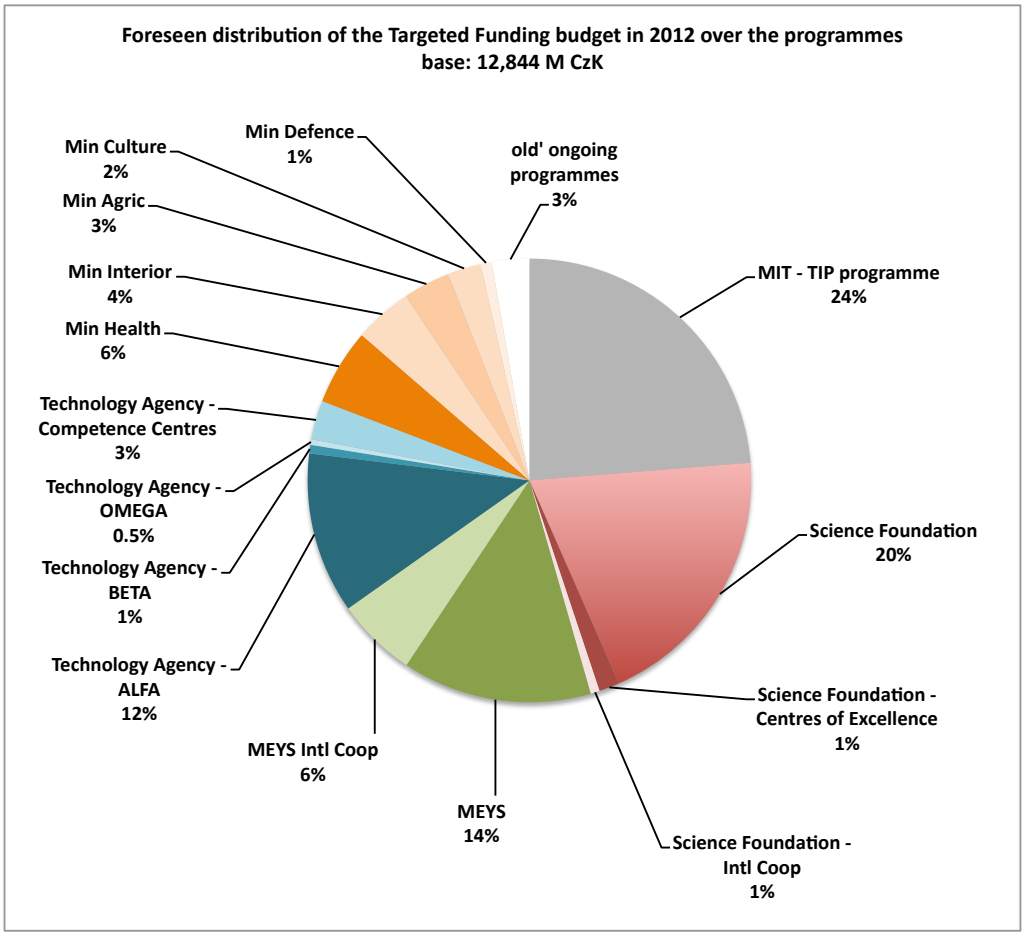
Quite obviously, the number of calls that were launched before 2012 determines the shares of the various programmes. This partially explains the high share of the TIP programme in the 2012 budget (the TIP programme was launched in 2007) and the lower shares of the departmental R&D programmes, which were launched at the earliest in 2009. The Ministry of Agriculture also had only recently its second departmental programme approved (the KUS programme).

Nevertheless, this picture illustrates the effect that the efforts made in 2009 to reduce the fragmentation of the national R&D&I funding for programmes is starting to have: in 2012, 4 intermediaries will administer 81% of the budget (the Ministry of Industry, the Science Foundation, the Technology Agency and the MEYS); in 2008, these intermediaries (without the Technology Agency) accounted for ~70% of the targeted funding budget.

[60] The Academy of Sciences agreed to dismantle its internal grant agency that managed funding for 10% of the (cost-based) national targeted funding in 2007.

[61] See Goal A 3-2 of the National R&D&I Policy 2009-2015

Figure 17: Distribution of the 2011 Targeted Funding budget over the programmes



Source: Draft national R&D&I budget for 2012 – proposal of 28 January 2011

2.6 Key Findings in the Light of International Experience

In this overview of our key findings, we first describe the structure for R&D governance in the Czech Republic and subsequently highlight some emerging key characteristics in comparison with international practice.

In recent years, the Czech Republic made considerable efforts in improving the coordination of its governance system for the national funding for research and innovation. The Reform approved in 2008 and the subsequent National Research, Development and Innovation (further R&D&I) Policy document (2009) for the years 2009 – 2015 and the related legislative interventions set the fundaments for a radical change in the system.

However, the R&D&I System is still in a transition phase, with some aspects of the 2008 Reform and the subsequent National R&D&I Policy still in course of implementation or to be implemented. This is in particular visible in, on the one hand, the ongoing discussions on the role of the R&D&I Council, and on the other hand, the - to a certain extent - unclear positioning in the system of the Technology Agency.

The role of the R&D&I Council

Following the 2008 Reform and the approval of the National R&D&I Policy for 2009 – 2015, the R&D&I Council has become the central body responsible for the co-ordination of the national R&D&I governance. It takes decisions on a broad range of R&D&I governance issues, including the allocation of the national R&D&I budget, monitoring and evaluation, longer-term policy-making, and other related support activities to the Government. Following approval by the Government, these decisions most often become part of a 'formalised framework' for the overall governance of research and innovation support. Furthermore, since the Reform 2008, the Council also assumed the role of principal for the two agencies, i.e. the Science Foundation and the Technology Agency. Current policy discussions in the Czech republic justify this breadth of tasks of the R&D&I Council and even indicate the desirability of expanding the Council's responsibilities.

Set in an international context, however, the R&D&I Council plays an unusual role in the management of Research and Development in the country, operating almost as a **virtual science ministry**. Unlike the international policy councils, the R&D&I Council effectively assumes the role of principal to the Technology Agency and the Science Foundation. Equally unusual for international standards (see our overview of the functions of policy councils in Section 1.2) is the breadth of its tasks: the R&D&I Council conducts various monitoring and evaluation exercises, develops and decides on longer-term policy-making, and – most importantly – develops the proposals for the yearly national R&D&I budget. Finally, while policy councils abroad in general define broad principles related to research and innovation governance issues, leaving the micro-management of their decisions over to administrative entities at the lower structural levels, the R&D&I Council in the Czech Republic tends to fully centralise all activities, taking charge also of the micro-management.

While the Council remains formally an advisory body to the Government, the breadth of its tasks as well as their detailed implementation – with the subsequent translation of decisions taken into legislatively binding regulations - imply that the Council increasingly assumes the role of an executive body. This sets a heavy burden on the members of the Council and its advisory committees – and most of all on the Secretariat and the Secretary in person.

Most of the resources of the R&D&I Council and its Secretariat - in terms of human resources and time availability - are currently devoted to the development and drafting of the annual R&D&I budget proposal and to the definition of the Evaluation Methodology that lies at the basis of the Performance-Based Research Funding system.

Seeing the limited number of staff in the Secretariat, the Council has a low level of internal analytical capacity and heavily relies on external experts for the development of its strategic intelligence.

The role of the Agencies

The emerging funding structure in the Czech Republic based on the Grant and Technology Agencies plus a range of other more specialised funding sources corresponds to the **'two pillar' structure** used in Finland and the Nordic area.[62] It follows practice in many countries by having a research council (the GA), where funding decisions are effectively put into the hands of the beneficiary research community and an innovation agency (the TA) that is under wider societal control. Such structures are becoming increasingly influential elsewhere in the world, at a time when it is however becoming increasingly clear that the distinctions on which it is based are declining in validity. As we discussed in Section 2.3.3, the Swedish experience with a 'two pillar' system is that it has left some fields unfunded – for example, in the past, more fundamental production engineering research in Swedish universities was not funded by the research councils, which regarded the field as too applied, and not funded by the innovation agency on the grounds that it did not have sufficient industrial involvement.

Internationally, many research funders are trying to cope with the limitations of a 'two pillar' approach and move beyond these rigidities. One response in the research councils is to study and adjust disciplinary boundaries to respond to new, interdisciplinary opportunities. The UK Engineering and Physical Sciences Research Council (EPSRC) has for many years taken a mixed response-mode and programmed approach to funding, taking inputs from committees of scientists (Technical Opportunities Panel) and 'users' (User Panel). The reorganisation of the Research Council of Norway in 2001, following a critical evaluation, created not only 'basic research' and 'innovation' division but also a 'large programmes' division intended to create an arena for mixing research and funding modes. More widely, there has been a noteworthy increase in the number of 'competence centre' programmes that create long-term alliances between universities and industrial consortia with the aim of conducting a mixture of more fundamental, applied and innovation-related research.

The Technology Agency

The Technology Agency seems not to have a clearly defined positioning in the R&D&I Governance yet: it currently fulfils a double role, acting as an executive agency for the seven ministries taking up the role of a *multi-principal* intermediate research funder, and acting as a technology/innovation agency for a single policy-making organisation, i.e. the R&D&I Council (*mono-principal intermediary*).

Following the model of the Nordic innovation agencies, the mission of the Technology Agency can be seen as encompassing two components: first, to fund research and innovation activities that would not be done in response to market forces alone – compensating for 'market failure' and through the adoption of broad policy mix. Second, to act as a change agent by encouraging interest in new and emerging technologies and encouraging needed structural changes (see Section 2.3.3).

Establishing the Technology Agency from scratch is a very large task, especially given the broad scope of its intended operations, the need to recruit a cadre of competent people, many of whom should be technologists and the requirement that staff members should be or become well networked with clients and stakeholders. The Agency has put some simple programmes in place to allow it to start to function and is developing more, chiefly using foreign models. But the practical problems of starting a new and sophisticated organisation are such that this can only be done slowly. The

[62] Gustav Björkstrand, *NORIA Vitbok om nordisk forskning och innovation*, TemaNord 2004:502, Copenhagen: NMR, 2004

current situation of the Agency combined with what we know of similar agencies abroad suggests the following recommendations.

- The role and activities of the Agency are likely to shift over time, so it should have a legal basis sufficiently flexible to allow such changes to take place
- It should be equipped with an internal analysis and strategy group able to investigate the need for interventions, plan the and integrate them into an Agency strategy
- Where programmes will tackle particular groups of stakeholders, such as branches of industry, these should be involved in a Nordic-style process of design. More abstract studies, such as foresight exercises, can be useful but are not adequate substitutes for the 'on the ground' knowledge of stakeholders
- In programme design and operations, governing committees should involve stakeholders with knowledge of R&D and industrial needs in the relevant field(s)
- Dialogue-based processes of 'soft steering' need to be developed with ministries that no longer hold R&D budgets, in order to ensure that their needs are met and that they can access the amount of budget appropriate to meeting those needs
- The Agency should develop a standard process for accompanying programmes through the policy cycle. This will involve agreed principles for programme design and agreement on monitoring needs for each individual programme and how these relate to any standard indicators collected
- Programmes should have a fixed term (what that is depends upon the nature of the programme) and a plan for both formative evaluation and summative evaluation of outcomes and impacts as well as outputs
- The Agency should strive to avoid 'copy/pasting' foreign programmes, but perform research and analysis to determine how generic programme types can best be modified and exploited in the Czech context
- A lot of the knowledge the Agency needs to develop itself exists in tacit and codified forms elsewhere among European innovation agencies. The Agency should make best use of the TAFTIE network to access this knowledge
- Early success is important in establishing the Agency's reputation and building trust. The Agency should look for and propose 'low-hanging fruit' that will provide rapid and conspicuous returns

3. Processes for R&D&I Governance

3.1 Introduction

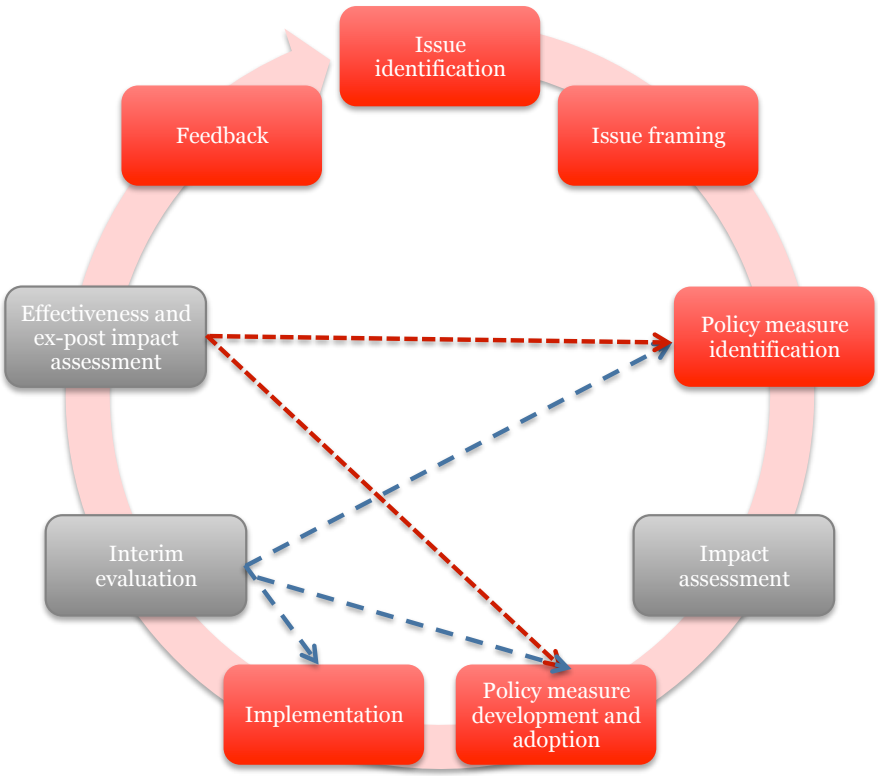
In this Section of the report we report on our analysis and assessment of the processes that were adopted in the Czech Republic for the governance, management and administration of the national public support to R&D&I. We considered all the levels of governance, decision-making and implementation from the level of the R&D&I Council down to the process of providing individual grants and the evaluation of its efficiency and effectiveness.

Literature tells us that there is a need for **logical consistency across the policy cycle** to maximise the chances that interventions reach their objectives. In Section 1.4 of this report, we mentioned that the model based on a hierarchy of performance contracts connecting through ministers, ministries and agencies with research and innovation project performers dominates current thinking about policy and evaluation.

Such a hierarchy implies a process in which broad policy decisions made at high levels (e.g. the R&D&I Council) are broken down into constituent actions and sub-actions (e.g. Strategic Concepts and programmes at the Ministry level). It implies that programme design incorporates explicit links to higher-level policy, i.e. programmes and programme portfolios should have an explicit 'middle' logic, connecting individual activities and programmes with higher-level goals.

In international practice there has also been a convergence between evaluation techniques and policy and programme design. **Evaluation** plays an important role in the policy cycle as both a retrospective and prospective tool, informing policy and programme design in the various stages of the policy cycle.

Figure 18: The role of evaluation in the policy cycle



In the Sections below we report on our findings in relation to the processes that were adopted for the design and implementation of the National R&D&I Policy. We describe both the characteristics of these processes and their results from an intervention logic perspective, i.e. the *consistency between the priorities and objectives* defined at the high level of policy making and those established at the Ministry and Agency level in the strategic concepts and programmes (Section 3.3); the policy coherence in the processes adopted for the *appraisal of project proposals* (Section 3.4); and the *policy consistency of the evaluation system* in the Czech Republic, i.e. how at all levels the interim and final evaluations of outcomes and impacts as well as their management efficiency and effectiveness relate to the policy intervention logic (Section 3.5). Finally, we draw our Conclusions in Section 3.6.

First of all, however, we depict the evolution in the Normative Formalised Framework that since 2002, governs the processes in the Czech republic related to the processes for policy and programme design, implementation, and evaluation (Section 3.2).

Methodological approach

The analyses in this Section build upon the concept of the **intervention logic** that lies at the base of the public funding of research (see Section 1.4). We applied the *logic modelling methodology,* which provides a useful and explicit way both to test designs and to understand – after the event – how a programme's implementation differs from its design.

We hereby focused on the current *mainstream* implementation of the policy through R&D programmes, thus excluding the current 2 anomalies in the policy implementation system: the TIP programme of the Ministry of Industry, which will run until 2017 but is not connected to a Concept that implements the National R&D&I Policy, and the programmes of the Technology Agency that are intended to implement directly the thematic R&D priorities defined at the national policy level.

A first step in the use of logic models for policy evaluation is to define – or reconstruct - the 'hierarchy of objectives' within a policy and its implementation. This allows for the subsequent analysis of the appropriate interconnection between the main levels of objectives and their results in terms of Outputs and Outcomes and Planned impacts.

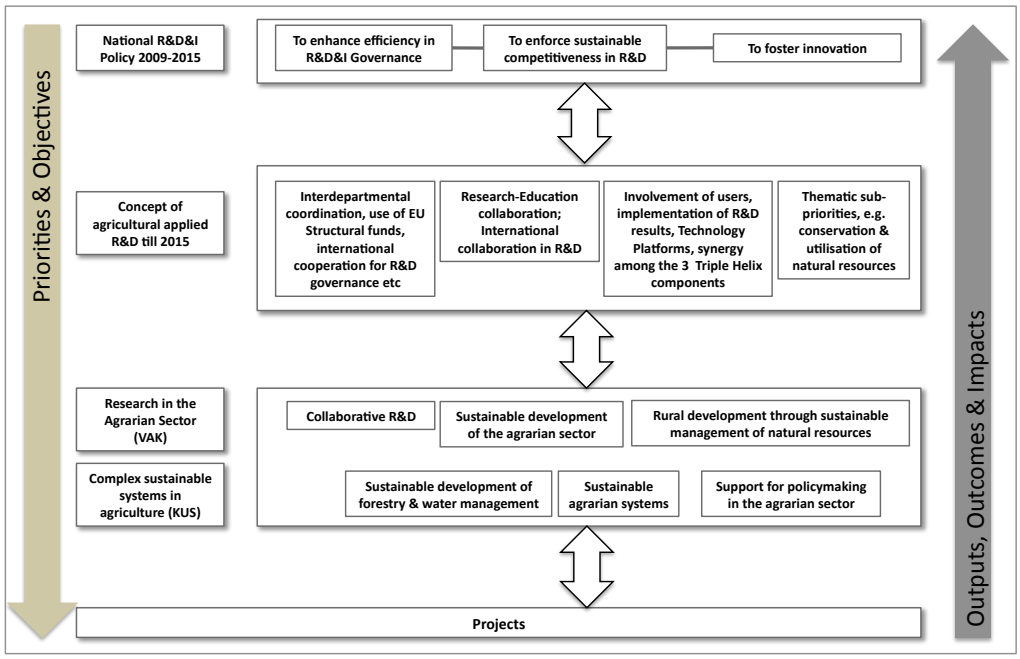
In the context of this study, we defined the categories of objectives as follows:

- *National High-level Objectives* relate to the key strategic objectives of a policy. These may be systemic, scientific or socio-economic or all of those
- *Departmental High-level Objectives* are the key objectives formulated at the Intermediary level, i.e. in the Concept documents of the Ministries
- *Operational Objectives* illustrate the measures that the Ministries intended to implement to reach their high-level ones - at institutional level or through the development of programmes and sub-programmes

As an example, Figure 19 illustrates the **intervention logic** for the National R&D&I Policy 2009-2015 in relation to R&D in the agricultural sector. It depicts the logical sequence for the implementation of the objectives and priorities established in the National R&D&I Policy in three major steps: the objectives defined at the intermediary level in the Strategic Concepts, guiding the objectives and focus of research in the programmes and sub-programmes, to which projects were expected to respond.

In international practice, the logic implemented for the design and implementation of policies is reflected also in the evaluation system: the findings on outputs and outcomes reached in the projects feed into the evaluation at the programme level. The findings on outcomes and impacts attained in the various programmes *jointly* provide input for the evaluation at the level of departmental strategies (the Concepts). Finally, the evaluation of the effectiveness of the national R&D policy builds on the *joint* findings on outcomes and impacts reached at the intermediary levels.

Figure 19: Intervention Logic of the National R&D&I Policy 2009-2015



A fundamental concept from a systemic point of view is that all activities implemented at the various levels are interconnected and are all equally important for the final attainment of the high-level policy objectives. This implies that efforts made at the departmental level to implement the systemic priorities of the national policy, for example by enhancing the efficiency of their R&D governance or setting up structures and modalities for an enhanced cooperation among the stakeholders, is to be seen as fundamental and complementary to the implementation of the thematic R&D priorities through the programmes. All these activities are *equally important* pieces of a jigsaw that will ultimately lead to the attainment of the key objective of the national policy: to enhance social welfare and sustainable economic competitiveness and growth.

In good international practice, the role of evaluation in this system is *both summative and formative*: it is to provide evidence on the achievement of the objectives at all levels as well as to inform policy makers on the reasons why certain interventions did or did not produce the desired effects and how they can be improved.

3.2 The Formalised Framework in the Czech Republic

In 2002, the policy makers in the Czech Republic decided to adopt a centralised and formalised model for the management of R&D policies and programmes. The 2002 Act on R&D Support set the legal framework for this approach. The objective was to improve the efficiency of the R&D support system through the development of common planning processes and implementation procedures, including evaluation.

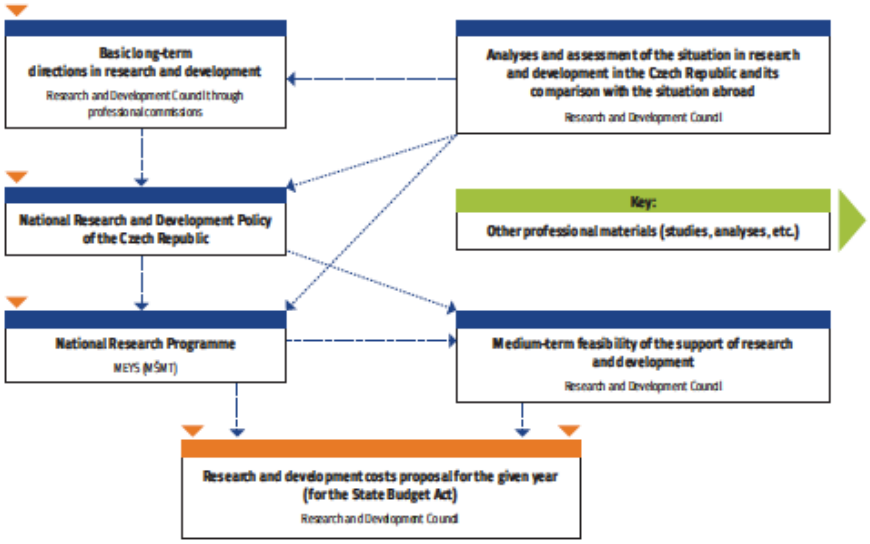
Initially, the formalised framework can be categorised under the frameworks with a "soft" approach. We note an increasing trend, initiated in 2004 and formalised in the National R&D&I Policy 2009-2015, to change this approach into a "hard" one.

In the Sections below we describe the trends in the two major components of a policy framework: the definition of priority areas and policy implementation, and the role of evaluation.

3.2.1 The definition of the priority areas and their implementation

The **2002 Act on R&D** installed the concept of identifying basic priority areas to steer R&D support. These were to be established in the National R&D Policy, based upon the exploration of long-term trends in research developments. Additionally to the R&D programmes developed in the Ministries, National Research Programmes would be launched to implement the Policy, focusing their support on the thematic priority areas. The departmental research programmes were expected to "complement the National Research Programme according to the needs identified by the individual providers."

The **National Policy 2004-2008** confirmed the co-ordinating role of the National Research Programmes and stated that the programmes in the ministries would focus on the "solution of the problems in the individual departments". The National Research Programmes were therefore the instruments that directly implemented the National R&D Policy. In its presentation of R&D Policy and Programme management in 2009[63], the MEYS depicted the policy and programme design model as shown below.



The 2008 Reform and the National R&D&I Policy 2009-2015 disrupted the logic that was developed in 2002. The Technology Agency was created to act as centralised body for applied R&D programmes, directly steered by the national R&D priorities. This policy intervention made the coordinating and integrating role of National R&D Programmes superfluous; as a consequence, the National Programme III, developed in 2007 by the MEYS for the time period 2009-2014, remained in its draft version and was never launched. The consideration was that the National Research Programmes had essentially provoked further fragmentation of the research efforts, in some cases overlapping programmes funded by the individual Ministries.

The **2008 Reform** did not specify any principle for the definition of R&D priorities other than the general indication that research needed to lead to "results for innovation". The instructions given for the definition of the priority areas included the indication that these were to provide guidance for the R&D programmes implemented by the Technology Agency. The concept was that the strategic plans and programmes

[63] Source: State Supported R&D in the Czech Republic – Short Guidebook 2009, Ministry of Education, Youth & Sports, 2009

of the Ministries would simply reflect the broad guidelines of R&D oriented towards innovation according to the needs of their sector of reference. In other words, the Ministries were given autonomy for their decision-making on their sub-priority areas.

The **National R&D&I Policy 2009-2015** introduced important changes:

- It *reduced the autonomy* of the Ministries in their definition of sub-priorities and explicitly included them among the funding bodies that are to implement directly the national priorities[64].
- It established *new guidelines* for both the focus of the priority areas and the approach that should be adopted for the priority setting process, hereby setting the framework for the preparatory activities to be implemented in the first-coming years for the discussions and decision-making of the new National R&D&I Policy for the time period after 2015 (see also Section 3.3.6)
- It declared its intentions to *re-distribute the programme funding budgets* based upon the importance of priority areas
- The aim is to define *problem-oriented* priority areas, covering both basic and applied research
- *Programme evaluation* takes up a predominant role for both the launch of new programmes and the guidance or modification of the running ones

3.2.2 The role of evaluation

Throughout the last decade, the implementation of regular evaluation exercises has constantly been stressed in all policy papers. Equally constantly, it was noted that the Ministries did not comply "to the rules" on evaluation in a satisfactory manner.

- The *2002 Act on R&D* set precise rules for the appraisal of project proposals and ruled that after completion of the programmes, funding bodies were to evaluate *achievement of programme objectives, results and cost-effectiveness*. At every level of the system, evaluations had to be regular and repeated after time; look into the achievement of previously set out specific objectives; and adopt evaluation criteria that are known and binding, clear-cut (not contradicting), quantifiable, measurable, evaluable, and related to a given objective.
- The *National Policy on R&D for the years 2004 – 2008* made a considerable attempt to improve the quality of the evaluation system in the country. It pointed at a "desirable" increase of the overall evaluation culture and stressed the importance of evaluations to act as input for policy development and decision-making. Specific reference is made to the evaluation of the National Policy that "will be part of an analytical basis for the preparation of other national policies" and programme ex-post evaluations that "will serve as feedback for future decision making on the selection of projects and their solvers". In general it was stated that the importance of ex-post evaluations would increase. Programme evaluations – both monitoring and at the end of the programme – were conceived as "summarised assessments" of the ongoing and attained results of individual projects, with attention for expected impacts in the economic and social spheres, as well as an estimate of the efficiency of the funds spent.

  In its resolution accepting the National Policy on R&D, the Government commissioned the Ministry of Education (MEYS) and the R&D Council to conduct a complex evaluation of the results and efficiency of R&D funded from public funds and formulate recommendations. The inter-departmental working group in the MEYS and the R&D Council came to the conclusion that the evaluation of R&D

64 The Policy states, "The identified priority areas will be transformed into programmes for targeted applied research support that will be launched by the Technology Agency and other public fund providers. During their decision-making on support for applied research, the support providers have to base themselves on these priority areas. The focus of targeted programmes for applied R&D will consistently respond to the needs for the development of the knowledge society and the needs of the user spheres."

showed systemic weaknesses. Main shortcomings were in the overemphasis in legislation of *proposal appraisal procedures* and a lack of attention for an assessment of attained results in comparison with objectives declared – *at project and programme level.* It was however considered that legislative regulations could not cover all evaluation aspects, especially at programme level. They recommended an accurate check of the adherence of programme proposals to the principles that were established in the 2002 Act on R&D and the appropriate definition of specific and measurable goals. The variety of evaluation methodologies in the system, sometimes even at programme level, was another recognised issue.

In its *Resolution No. 644 on the evaluation of R&D and its results* (June 2004), the Government accepted part of these conclusions and recommendations and requested the MEYS and the R&D Council to develop a *common evaluation methodology* of R&D and its results and to implement a *collective evaluation of the results of R&D programmes* that were completed in the time period 2000 – 2003. It hereby set the principles of current practice, where the R&D&I Council (previously together with the MEYS) defines the "methodology for the evaluation of results in research organisation and for programme evaluation" – since 2005 with yearly updates, and every year it conducts "Collective Evaluations of Completed Programmes".

The currently legal document is the 2009 "*Act on support to research, experimental development and innovation" no. 211,* which constituted a complete amendment of the previous Act no. 130/2002. It describes, in detail, the procedures and modalities to be adopted for both the appraisal of proposals and the monitoring and evaluation of projects, but it provides only general indications in relation to the evaluation tasks of the administrative bodies. It stipulates that the funding bodies are responsible for the "Monitoring of *the use of targeted or institutional support* provided from their budgetary chapters, meeting goals where these have been set and evaluating the results achieved."

Also the Evaluation Methodology documents, developed by the R&D Council, cover programme evaluation only in terms of its Collective Programme Evaluations. In the "*Methodology for the evaluation of research organisations' results and the evaluation of completed programmes"* valid for the years 2010 and 2011, the R&D&I Council states as objectives for these evaluations

- To provide the government, public, and eventually other interested parties with a comprehensive set of information on results gained while providing purposeful support on the R&D activities of individual providers
- To provide the R&D&I Council with information on how individual providers of R&D support fulfil their own defined programme goals that are indicated in the government-approved programme proposals; these observations will be used by the Council when judging new programme proposals

The methodology adopted for these "collective" evaluations is exclusively quantitative and measures input versus output efficiency, based on data stored in the Central Information System. It is based on a "Summarised Assessment" of the completed programmes in that year that the funding bodies are to transmit to the Council. Information and data to be covered in these summarised assessments are

- Basic data on the *characteristics* of the programme such as actual total costs and funding from the national budget
- Data on the *implementation* of the programme such as data on public calls, number of approved and successfully completed projects
- A list of significant and *concrete R&D "results"* – i.e. R&D outputs
- Indications on how these "results" will be used or implemented
- A comparison of the achieved "results" with the stated objectives and with the situation abroad

In 2009, the National R&D&I Policy 2009 – 2015 document openly admitted, "The evaluation system in the Czech Republic is not implemented systematically. It has more of an administrative character and the new R&D policy measures are formulated without sufficient evaluation of the impact of previous measures."[65]

Also in relation to the evaluation system, this most recent policy document introduces substantial changes:

- It sets an obligation for a proper evaluation of results and impacts of R&D&I programmes, in *all phases of their implementation* (ex-ante, ongoing, and ex-post)
- It stresses the formative character of programme evaluation: new programmes are to be developed based on the results of "consistent" evaluations of previous programmes and should be guided and eventually modified based on ongoing evaluation

3.3 Policy and Programme Design and Implementation

In this Section of the report, we look into the processes that were adopted for the design and implementation of the National R&D&I Policy. We first provide an overview of international practice in the policy design and implementation. Subsequently, we look into the processes adopted in the Czech Republic during the time period 2008/2009. We first describe the time line adopted (Section 3.3.2), to then cover the characteristics of the policy design processes (Section 3.3.3) and of the policy implementation in terms of strategic concept and programme design at the Ministry levels (Section 3.3.4). We analyse the results of these processes in terms of consistency of the strategic objectives in Section 3.3.5. In Section 3.3.6 we briefly depict the procedures and principles for the definition and implementation of the priority areas for research as of 2012. Finally, we draw our overall conclusions in Section 3.3.7, setting our key findings against the context of international practice.

3.3.1 International Practice

Our recent analysis of priority setting processes in 5 countries[66] showed that this is most often a multi-level process: broad priority areas are defined at the level of government, while the sharper choices are made at the level of the implementing bodies.

We can summarise our findings as follows:

- A good linkage between the different levels is crucial for the effectiveness of the priority setting process. The modalities to create such linkages as well as their strength differ from country to country. An important coupling mechanism is a **national strategy**, setting thematic priority areas and acting as a strategic framework within which the implementing bodies define their own strategies and programmes. The dialogue between the two levels in governance on the strategic plans of the implementing bodies is therefore an important component of the priority setting cycle. Experiences gained during the implementation need to be taken into account in the new priority setting cycle
- In most cases, priority setting did not imply a redistribution of existing budgets, but rather an **additional investment in priority areas**. By taking away the threat of budget reductions, it was easier to create the needed support for the implementation of the priorities

[65] Národní politika vyzkumu, vyvoje a inovací České republiky na léta 2009 – 2015

[66] Priority Setting in Five Countries – Experiences from Canada, Germany, Finland, France and Norway, Technopolis Group, 2009

- In most countries, the strategies for R&D were embedded in broader scientific and innovation strategies, leading to a focus on both systemic and research priorities. Research priorities are increasingly defined looking into **knowledge-for-innovation demand**, rather than through the adoption of a technology-push approach
- The broad priorities focus on areas of societal and economic challenges where strengths and opportunities from a scientific and R&D perspective were identified. Broad priorities in the economic sphere most often reflect the industrial structure and are sometimes implemented in cluster policies (Finland, France, to a certain extent Germany). The societal priority areas are normally related to societal challenges that are similar in most countries (climate, health, sustainability). One can note a shift from priorities defined in areas of scientific and technological strengths to **broad priority areas** that contribute to societal challenges

We can distinguish **3 major phases** in the policy making process:

- The starting point of the process is the **definition of the rationale** for the policy intervention, i.e. the identification of the failures in the R&D or innovation system. In this context, strategic intelligence is predominantly provided by studies analysing strengths and weaknesses in the overall innovation system in an international context, as well as in-depth studies looking into the specifics of the national structure.
- The priority setting process normally starts with a **filtering phase** during which broad priority areas are identified. Often, it focuses on the identification of (known and recognised) strengths in both research and economy; recently, also potential or desired strengths are increasingly targeted – eventually based on *foresight exercises*. Most often, the objective is to find *combinations of strengths* in knowledge production (i.e. scientific/technological strengths) on the one hand, and industry sectors that constitute opportunities for economic growth on the other. Knowledge needs related to important societal challenges may be another determining factor. This is in line with the rise of the "strategic science" concept, where scientific research is expected to be not only excellent, but also relevant for the national economy and/or society.

  For both categories of priorities, stakeholder involvement is an increasingly important component of the priority setting process. Not only are stakeholders a source of information and 'strategic intelligence', their involvement also has the objective to create *consensus, involvement and support*. This does not only regard the actors 'in the field', i.e. the research communities and industry, but also the different Ministries and the different levels of the governance structure.

  The timing and modalities for stakeholder involvement in the priority setting process differ from country to country. A timely involvement is important for an open debate on the thematic priorities. Sometimes, the stakeholders are directly involved (for example, by offering them the possibility to comment online or through wide-spread consultations with surveys); sometimes their involvement is indirect (for example, through advisory bodies). Also the use of the advisory bodies varies: they can be used as sources for strategic intelligence or for the creation of support and legitimacy or both. In some cases, broad advisory bodies are set up, acting as a forum for consultation and coordination.

  Canada, Norway and France explicitly build on external foresight studies before choices are made; in Finland and Germany large foresight exercises were implemented, but they do not forcefully determine the decision-making.

  Some countries have built in a specific phase for *external analysis and advice*. In Canada the Council of Canadian Academies plays an important role in the filtering process, subsequently taken over by the Science, Technology and Innovation Council that has a broader composition. In Germany, external consultation is

adopted only for the implementation of the priorities. In Finland, the Science and Technology Policy Council has a central role.

- The process for **decision-making** differs from country to country, depending on the political culture and structure. Another factor that is different is the object of the decision-making. In some countries the decision-making regards a rather uncompromising strategic document that has no immediate budgetary consequences (for instance, Germany), in other countries such as Canada the consequences in terms of budgetary allocations can be quite prominent – even though this normally regards additional funding for instruments targeting priority areas.

Countries leave the **implementing** entities different degrees of autonomy for their decision on how to respond to the national priorities. Tekes, for example, has relatively a lot of autonomy, while the Norwegian NRC receives more top-down steering (for example, to target the funding). When many themes are selected, or if the themes are defined very broadly, the risk exists that anything can fit under it leading to fragmentation rather than concentration. The further narrowing down of the themes in sub-priorities, strategic programmes etc. is what truly determines the focus. Often, the true selection of the priorities occurs when programme and project proposals are developed and selected.

Ideally priority setting is an **ongoing process** and in international good practice, decision-making on policy interventions builds on lessons learnt from previous exercises while forming the starting point for a new strategic intervention cycle. Progress in terms of achievement of the desired effects is monitored (also for the purpose of accountability) and the analysis of strengths and opportunities is periodically repeated.

Priority setting and implementation in Canada

In 2006, the Canadian Government delegated the decision-making on the priority areas to the Minister of Industry. For this task, the Minister took in the advice of the Science, Technology and Innovation Council (STIC). The filtering process took place in 2 steps: in the first step, the Council of Canadian Academies (CCA) played an important role. It identified Canada's strengths and capacity in S&T in 4 thematic priority areas, after having launched a large-scale online survey and an analysis of bibliometric (publications in scientific journals) and technometric data (patents granted). The principal source of new insight in the study was the survey. Subsequently, the STIC used the input from the CCA to identify 13 sub-areas of strength and upward momentum within these four domains.

In September 2008, the Minister of Industry accepted STIC's recommendations on the 13 sub-priority themes. These sub-priorities cover both basic and applied research and innovation, and will serve as a springboard to leadership by Canada in areas of significance to the nation.

The federal S&T Strategy provides the strategic framework in which the research councils have to operate. The sub-priorities have to be applied as appropriate by the research councils in their strategies and their design and implementation of research support programs.

To build a critical mass of expertise in these priority areas, the granting councils and the National Research Council of Canada (NRC), in collaboration with other federal funding partners that support higher-education research, such as the Canada Foundation for Innovation, have to work together. They are supposed to support multidisciplinary research that brings together expertise from diverse fields, including natural sciences and engineering, social sciences and humanities, and health sciences. The councils will report annually on their collective progress. In addition, there are other (complementary) federal initiatives that support important S&T advances in these priority areas.

The priorities are not static. They are periodically reviewed to ensure that world-class leadership is achieved in these fields. The Minister of Industry can periodically renew research priorities (in consultation with other federal government departments and provincial departments responsible for innovation). To inform this process, the Science, Technology and Innovation Council (STIC) undertakes periodic assessments of Canada's S&T strengths, weaknesses, and opportunities

The federal investments in research ($9.7 billion per year) are guided by the federal S&T strategy and by the sub-priorities identified by the STIC. The priorities provide strategic direction and guidance for the department Industry Canada in its efforts to cultivate an innovative, knowledge-based Canadian economy.

In terms of budget allocation, there are indications that the priority setting has effects. For instance, the federal Budget 2007 provided $85 million per year in new annual resources for Canada's three granting councils — the NSERC, the SSHRC and the CIHR, — to support new research in the four priority areas identified in the S&T Strategy (environmental science and technologies, natural resources and energy, health and related life sciences and technologies, and ICT).

Source: Priority Setting in Five Countries – Experiences from Canada, Germany, Finland, France and Norway, Technopolis Group, 2009

3.3.2 Time Line for the Design & Implementation of the National R&D&I Policy 2009-2015

The time line of the policy design and implementation processes adopted for the National R&D&I Policy 2009-2015 illustrates that the *systemic priorities* guiding the priorities set in the Strategic Concepts and Programmes of the Ministries were the ones defined in the 2008 Reform rather than those effectively approved in the National R&D&I Policy 2009-2015.

It also implies that the approach for the implementation of the *thematic R&D priorities* was the one indicated in the 2008 Reform, leaving the Ministries autonomy for the definition of sub-priority areas in line with the needs of the users in their own specific sphere of influence.

In 2008/2009, the processes for the design and decision making on the national policy occurred in three different steps, focusing on 1) the definition of the systemic priorities and strategic concepts (the 2008 Reform); 2) the filtering and decision making on the R&D priority areas; and 3) the final decision making on the national policy. There was a slight overlap between these two last phases. Policy implementation in the Ministries occurred through the development of Strategic Concepts and new R&D programmes.

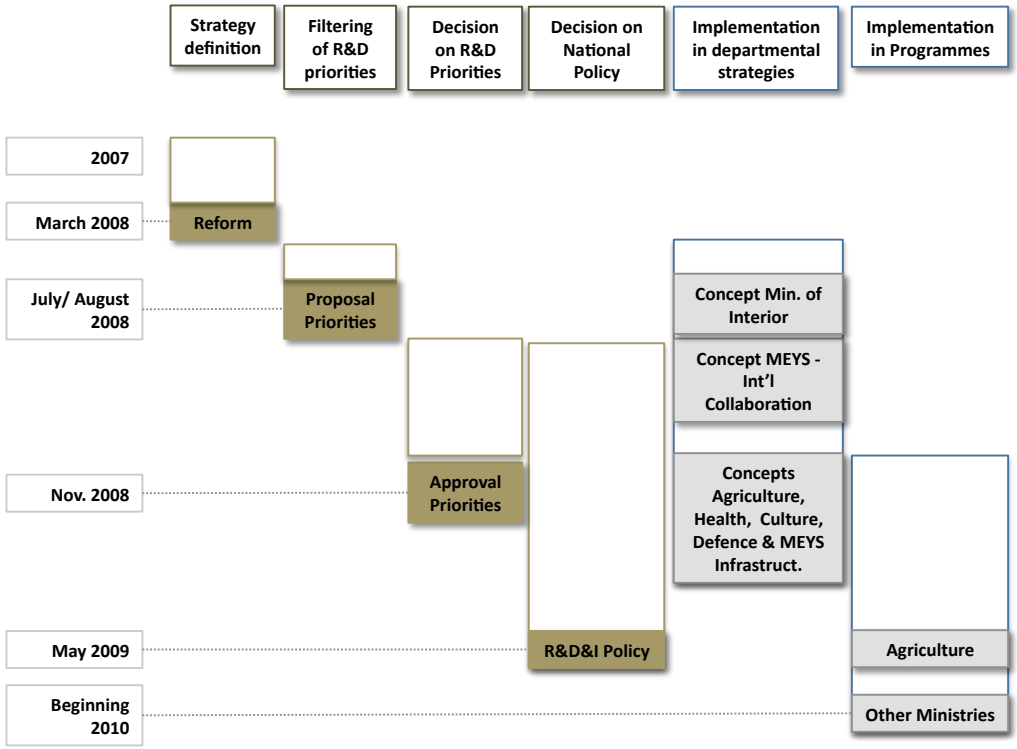
In common international practice, R&D governance systems that seek a consistency between systemic and – especially - thematic R&D priorities set at the higher policy levels and those defined in policies and programmes at the intermediary level, typically plan the implementation processes as a step *subsequent* to the policy development phase. The time frame adopted for the processes related to the National R&D&I Policy 2009-2015, instead, shows that they were implemented *contemporaneously*: the Government Resolution approving the 2008 Reform requested the Ministries to immediately draft new strategic Concepts, and therefore while the activities for the R&D&I priorities were going on and even before the activities for the decision-making on the National R&D&I Policy were launched (see Figure 20). The Council approved all Concepts in November 2008, while the Government approved the National R&D&I Policy 2009-2015 six months later, i.e. in May 2009.

The reasons for this apparently contradictory behaviour are to be found in the historical context and more specifically in the approach for policy implementation, decided upon in the 2008 Reform. We describe this further in the next Section, but essentially the approach was as follows:

- The strategic concepts and programmes of the *intermediaries* would implement *relevant sub-priorities* for the users within their sectors of reference, decided upon by the Ministries themselves. The most important priorities that they were to implement were the *systemic ones*
- The thematic R&D priorities defined at the national level were to be implemented by the *Technology Agency* and the Expert Committees were given the task to update the description of the priority areas that were established in 2006, now defining innovation-relevant and promising R&D application areas

Both in the 2008 Reform and the National R&D&I Policy 2009-2015, exception was made for the *two principal ministries*: the Ministry of Education was given the mandate to develop Strategic Concepts that would co-ordinate its activities in relation to international collaboration and the large infrastructures; it hereby directly implemented the systemic priorities. No mention was made that other more department-related Concepts were expected, which, in fact, the Ministry of Education did not develop. The Ministry of Industry no longer had the competence to develop R&D programmes and therefore was not requested to develop a Strategic Concept.

Figure 20: Time line for the design and implementation of the National R&D&I Policy 2009-2015



Sources: Informace k Dlouhodobým základním směrům výzkumu –prioritám VaV

3.3.3 Processes for the Design of the National R&D&I Policy 2009-2015

This Section describes the key findings related to the processes adopted for the design of the national R&D&I policy in the years 2008/2009. It is structured along the key phases as defined in international practice (see Section 3.3.1).

Definition of the systemic priorities and strategic concepts

The policy paper "Reform of the System of Research, Development and Innovation in the Czech Republic", approved by the Government in March 2008, established the Vision for a thorough restructuring of the R&D&I system in the country: "*To create an innovative environment through reforming the system of research, development and innovation in the Czech Republic in order to be held true that "Science makes knowledge from money, innovation makes money from knowledge"*

The core objective was to simplify and increase the efficiency of the R&D support system so that public funds invested into applied R&D and innovation would lead to concrete economic or other social benefits. It set seven main objectives, indicating also measures to be taken. We can group these objectives into three major categories:

- *To enhance efficiency in R&D&I Governance*. This objective was to be reached through a simplification of the R&D&I support system and the administrative procedures, improvement of the evaluation system for public financed R&D, and the creation of a single agency responsible for support to industrial research projects (the Technology Agency)
- *To enforce sustainable competitiveness in R&D*. Fundamental for the achievement of this objective are interventions aiming at an enhancement of the excellence in research such as improved evaluation of R&D, an increase in the availability of *qualified human resources* for R&D&I and an intensification of international collaboration in R&D and innovation
- *To foster innovation*. Measures that were proposed to reach this objective included a focus in national funded programmes on R&D responding to societal and especially industry needs, setting research-industry/user cooperation and co-funding from public and private resources as key criteria; an extension of the indirect support of R&D (tax reliefs) to R&D results purchased by enterprises from (Czech) public research institutes and universities; and more flexible organisational structures of public research organisations in order to create the conditions for the commercialisation of research results

The R&D&I Council was in charge of the definition and decision-making on national R&D policies – to be approved by the Government. In the case of the Reform, these processes took predominantly place within the R&D Council – with a major support by the Secretary of the Council.[67]

Stakeholder involvement was therefore indirect, through their representatives in the R&D&I Council. In that time, the stakeholder categories represented were the research and industry ones, the latter including major enterprises such as Skoda as well as the private research organisations.[68]

Stakeholder communities, including industry and ministries, were also involved in the development of a set of statistical and analytical background **studies,** which supported the definition of the systemic priorities and strategic concepts. These included the analyses of the R&D system in the Czech Republic (2006/2007) and 5 other analytical studies. They all led to the perception of serious flaws in the R&D&I system that required urgent – and drastic – policy interventions.

67 In 2008, the Secretariat to the Council did not have a sub-department dedicated to the definition of strategies – see Section 2.1.1
68 Source: Výroční zpráva Rady pro výzkum a vývoj za rok 2008

The most important ones were[69]:

- By Law, the R&D&I Council is requested to produce *yearly analyses of the progress and international positioning of R&D&I in the Czech Republic*[70]. These analyses are drafted by some external organisations (including the Czech Statistical Office and the Technology Centre AS CR) with support from the Secretariat of the Council and in collaboration with a working group composed by Ministry officials and representatives of research organisations. These studies can be considered *statistical monitoring devices* on the trends in the overall positioning of R&D&I in the Czech Republic in the - predominantly European - R&D&I context[71]. At times (e.g. in the Analyses referring to the years from 2004 to 2006), they also included information on the progress in *implementation* of the National Policy and especially National Research Programmes, suggesting measures for improvement
- The "*Green paper on R&D&I in the Czech Republic*" analysed the national innovation system, identifying its weak points and specifying barriers for the effectiveness of R&D&I and the successful realisation of research knowledge in practice. Its intent was to provide a comprehensive evaluation of R&D&I in the Czech Republic in an international context to initiate a wider national professional discussion in key thematic areas. Topics covered were the trends in the EU for R&D&I, the positioning of the Czech Republic in relation to macroeconomic issues such as competitiveness, infrastructures and legislations, HR and financial resources for R&D&I, and R&D results and innovation in industry. It concluded with a SWOT analysis. The study was conducted by the Technology Centre AS CR CR, with supervision by a panel composed of industry and research stakeholders as well as some Ministry officials
- The "*White paper on R&D&I in the Czech Republic*", drafted by the Technology Centre AS CR in co-operation with an expert group, had the characteristics of a policy analysis paper and defined the main principles for the future policy strategy, suggesting concrete targets and proposing principles for implementation

Filtering and Decision-making on the R&D&I Priority Areas

The R&D Council Expert Committees were the authors of the *Priorities for Applied Research, Development and Innovation* document, approved by the Board of the Council and submitted to the full Council in November 2009.

Rather than a true filtering of R&D Priority areas, the experts were requested to update the previous "Longer-term Fundamental Directions for Research" documents, identifying potential fields and focus areas for – exclusively - applied R&D, responding to the country's socio-economic needs. In line with the 2008 Reform, the intention was that these R&D priority areas would steer only the programmes funded by the Technology Agency. The 8 "historical" S&T priority areas were: Biological and ecological aspects of a sustainable development, Molecular biology and biotechnology, Sources of energy, Material research, Engineering for competitiveness, Information society, Security and defence research, Social Sciences[72]. The Expert Committees had

69 Studies not further described are: "Analysis of the R&D&I policies in selected countries", "The role of the state in support of innovation", and "Analysis of the innovation potential in the Czech regions". All these studies were authored by the Technology Centre AS CR

70 The official title is "Analysis of the current state of research, development and innovation in the CR and comparison with the situation abroad"

71 They contain statistical data and an analysis on R&D expenditures, human resources, research outputs, innovation and international co-operation, and compare the situation in the Czech Republic with the EU-15 average, some EU-25 member states and the USA. From 2004 to 2006, the studies also provided information on the progress in implementation of the national programmes, highlighting successes and pitfalls and suggesting measures for improvement.

72 The Longer-term Fundamental Directions for Research (DZSV) were developed in 2003/2004, with an update in 2006. The last DZSV built upon the previous one in terms of priority areas, adding the priority area Social Sciences. They were expected to act as "basic inputs for the drafting of the National R&D

very little time at their disposal for this task (2 months for the first version, 1 month for the second, and 1 month for the final version).

In none of the Priority Areas documents, 2nd level priorities were defined – with the exception of the area "Priorities for the development of the Czech Society"[73]; however, in all documents application sectors and/or some general sub-areas were defined. In line with the legal prescriptions, for each theme a description of its characteristics was provided (definition, rationale for R&D, and expected results – from a short- and longer-term perspective), along with a SWOT analysis, the depiction of the situation abroad, and the situation in the CR in terms of readiness, use, potential impacts, and finally, proposals for action.

The consultation with stakeholders in this process was very limited: the various versions were predominantly discussed in the Board of the Council – once with the whole Council - and an external international reviewer (Prof. Hanka of Cambridge University) was called in for comments.[74]

Nevertheless, we need to make a distinction between the formal and informal processes:

- *Formally,* the thematic R&D priorities were defined through the indirect involvement of researchers experts in scientific and technological fields, organised in the 3 disciplinary categories of the Expert Committees. However, if the publication of the Expert Committees meeting minutes on the R&D&I Council website is to be considered as a trustworthy reflection of their activities, especially the level of contributions from the Non-Life Sciences and Life Sciences Expert Committees are to be questioned[75] - at least, in their formal function as a committee
- *Informal* stakeholder involvement was based on the personal contacts of the experts in the Committees. Minutes of the Expert Committee meetings point at collaboration between the Committee members and stakeholder organisations, such as the Association of Industry - based on their personal contacts, as well some personal interactions with the other committees; several ministries state in their Strategic Concepts that they were involved in the development of the priorities - directly or indirectly through personal contacts with the experts

The Council did not commission any specific study to facilitate and support the definition of the R&D priority areas.[76]

A note to be made in this context regards the apparently difficult collaboration between the Council's advisory bodies and the Council itself. There are clear signs of dissatisfaction and frustration - on both sides. According to the interviewees, the functioning of the Committees and the regularity of their meetings was – and is - predominantly dependent on the level of commitment of their Chairs. The Life Sciences and Non-Life Sciences Committees met rarely - in 2009 they did not even meet once. Apparently, the reason for this disruption was that these two Committees were due for renewal at the end of 2008[77] and discussions in the Council on the nomination of new Council members impeded the nomination of these new

Policy" and had as objective to "identify promising research directions in terms of benefits for economic development and competitiveness and for the sustainable development of society."

73 `Five sub-priorities were defined: Management and Administration; Human Potential; Competitiveness of the Czech society; Czech identity and its surrounding environment; Technologies and methods

74 Source: Informace k Dlouhodobým základním směrům výzkumu - prioritám VaV

75 Based on the minutes on the R&D&I Council website, the Non-Life Sciences Committee held its last meeting in 2008 in June; the Life Sciences Committee had a meeting in March and another one in September

76 In the Minutes of the Expert Committee OK SHV meeting on 14/4/2008 we read "The priorities can only partially be defined based upon existing studies because these are by now obsolete."

77 Minutes of the 17th meeting of the Expert Committee for Non-Life Sciences and Engineering, 09/06/2008

committees in 2009.[78] It is also interesting to note that in the minutes of the 25/08/2010 meeting, the members of the (new) Technical Sciences & Engineering Expert Committee considered it necessary explicitly to state, "The Commission requests that in the event a proposal is not accepted, it would be immediately informed, along with an indication of the reasons why it was not accepted, and which authority took this decision." They proposed to add this practice to the rulings of the R&D&I Council. An implicit message that the Committee hereby conveyed is that such practice was so far not adopted by the R&D&I Council – or at least not at a satisfactory level.

Decision-making on the national policy

This decision-making process saw a considerable involvement of stakeholder community representatives, including the ministries and in particular the two major ones, i.e. the Ministry of Education and the Ministry of Industry.

For the drafting of the National R&D&I Policy 2009 – 2015, the R&D&I Council set up a working group, headed by Mrs. Kopicova, at that time 1st Deputy Chairman of the Council. The 16 members of this working group included representatives of the two major ministries (Education and Industry & Trade), representatives of the research communities (i.e. representatives from the universities, the Academy of Sciences, industry sectors and user communities) and some external experts.

Draft versions were frequently discussed with representatives of the stakeholder communities and ministries and once a broader consultation was organised at an institutional level, involving various stakeholder institutions and other interested institutions and organisations. The final draft of the Policy was submitted for approval to all Ministries.[79] Open consultations involving the individual actors in the research communities did not take place.

Overall, however, we note a limited attention - and at times even reluctance - for open communication with broader stakeholder communities and the general public on discussions within the R&D&I Council – ongoing or in the recent past.

The information that is publicly available on the activities of the R&D&I Council is predominantly related to institutional topics, such as the statutes and rulings of the various organisms, the legal context, policy documents and national programmes, the national R&D&I budgets, the results of the centralised evaluation of R&D results, etc. Minutes of the Council meetings and the meetings of its advisory bodies are most often documents acting as pro-memoria for the members rather than communication to the public. Key strategic information studies such as the yearly "Analysis of the situation of R&D&I in the CR" and the Green and White Papers that acted as input to the development of the 2008 Reform are available, but documents properly illustrating recent decisions-making processes such as documents on the 2009/2010 Round Table discussions are not. Finally, one should note that since 2009, the Statutes of the Council, approved by the Government, include an article stating, "Members of the Council are obliged to maintain confidentiality of material discussed until these are approved by the Council and made public" (Article 3.5,d)[80].

3.3.4 Processes for the Implementation of the National R&D&I Policy 2009-2015

In most ministries, **stakeholder or user organisations** are an important source of strategic intelligence for the definition of their strategy and its implementation (respectively through the development of the Strategic Concepts and the Programmes). Stakeholders were intensively involved - indirectly through the

78 Information provided by the Council's Secretariat

79 Source: Harmonogram přípravy Národní politiky vyzkumu, vyvoje a inovací ČR na léta 2009 – 2015 a složení Řídící skupiny pro její přípravu

80 Source: Statut Rady pro výzkum, vývoj a inovace, P ř í l o h a k usnesení vlády ze dne 30. listopadu 2009 č. 1457; Statute of the Research and Development Council, Annex to Government Resolution No. 82 of 19th January 2005

ministerial Advisory Bodies, but in most cases also directly. An exception is the Ministry of Industry where recent programme development was based on internal strategic intelligence and consultation with the R&D&I Council.[81]

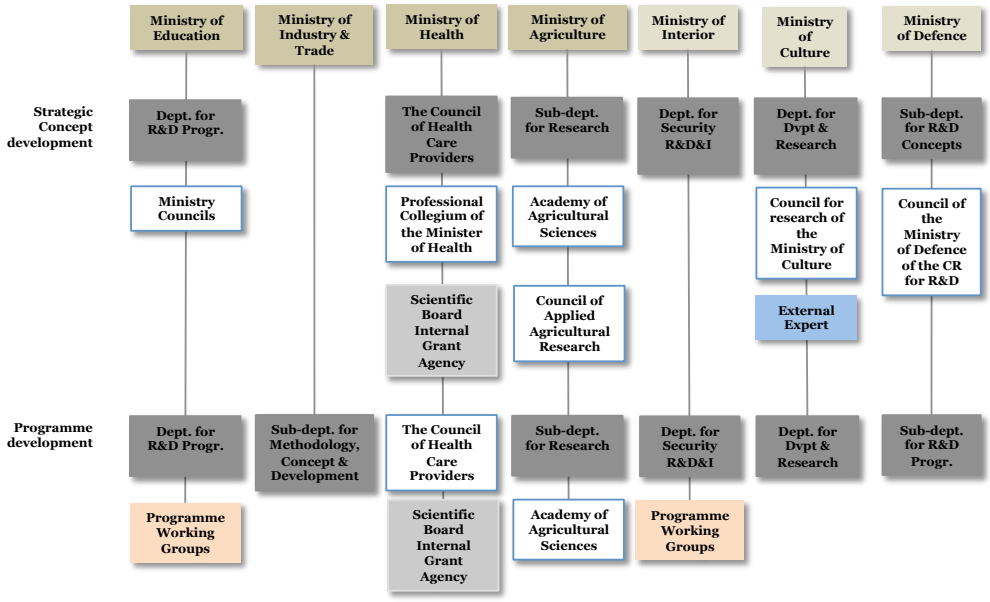
The degree of such stakeholder involvement varied from Ministry to Ministry, depending on the role that Advisory Bodies traditionally play within these public agencies.

Figure 21, below, maps the "**distribution of labour"** that was adopted in the Ministries for the development of the Strategic Concepts and the Programmes. It illustrates the ministerial departments involved and their eventual grant agencies (shaded respectively in dark and light grey); the Advisory Bodies involved (outlined in blue specifically set up working groups, involving both stakeholders and ministry officials (shaded in orange); and external experts involved (shaded in blue).

We detect four categories of approaches:

- Ministries that essentially delegated the development to the stakeholder communities, with a minimal involvement of the ministry staff (the Ministry of Health)
- Ministries that set up an intense consultation process and developed the concepts and programmes in close collaboration with their stakeholders (the Ministries of Agriculture and Defence)
- Ministries that predominantly relied on internal or external expertise, but involved stakeholders in programme working groups (the Ministries of Education and Interior)
- Ministries that exclusively relied on their own expertise (the Ministry of Industry)

Figure 21: Distribution of labour for policy and programme development



[81] The main sources for the establishment of the goals for the TIP programme was the MIT industrial policy, approved by the government, as well as some analyses that were run in the Ministry, in other departments. From those analyses resulted that certain industry sectors/activities were not covered in R&D programmes in 2005/2006. The R&D&I Council (i.e. the secretariat) was consulted and advised to develop an overall programme to close the gap. One senior official in the R&D department was set in charge of leading the programme design activities, in close collaboration with the Secretary of the Council and no involvement of the stakeholders. Source: interview with the Director of the Department of Industrial Research & Development at the Ministry of Industry and Trade

These different approaches raise different challenges for the managing ministries - and in particular for the ministries at the two poles, the Ministry of Health on the one side, and the Ministry of Industry on the other.

- Consultation with stakeholder communities on strategies and programmes allow for effectiveness because the concepts and programmes build upon a shared vision that derives from participants' own interests and are in line with their needs. Limited or no stakeholder consultation therefore sets at risk the effectiveness of the decisions taken
- However, intensive stakeholder involvement contains a potential for lock-in and needs to be properly governed. The risk of stakeholder participation is that the game can become a stable one of 'you fund my project and I'll fund yours.' The result is a lock-in, with the ministry finding itself unable to make or change strategies and acting more in the interests of a specific stakeholder group than in line with its own policies

Apart of their communication with stakeholders, most ministries also made use of two additional sources of **strategic intelligence**: external studies and programme evaluations as well as previous programme experiences.

- Several ministries commissioned external studies to support the development and decision-making on Programmes. These included the Ministries of Culture[82], Defence and Interior. The MEYS often makes use of input provided by studies funded under previous programmes for its decision-making on new programmes[83].
- All Ministries also state that their Concept and programme development is based on past programme experience and programme evaluations. The description of the strategy development process in the Ministry of Agriculture reported below gives us a feel of what this may mean.

Process for the development of the Concept for Applied Research in Agricultural Sciences until 2015

Overall, the process was characterised by:

- An extensive stakeholder consultation process, including research, industry, and other ministries
- The background documents used were sent in by various public and private research organisations
- No 'independent' study collecting background information

The four major phases in the design process were:

1. *Consultation of the other departments in the Ministry and the Academy of Agricultural Sciences*, providing suggestions on R&D priorities, subsequently complemented by suggestions of employees in the R&D department, based on their experience with the situation in the EU
2. *Drafting of a first version by a working group* consisting of 3 people with a long-term experience in strategy development, i.e. the head of the R&D department, a representative of the Institute for Agricultural Economics and Information, and a scientist active in a public non-CAS research institute in the field

[82] A study on "Applied Social Science Research"

[83] An example is the Brain Drain - Brain Gain study, analysing the context, needs and possible modalities for a policy intervention aimed at stimulating the return to the home country of Czech researchers. It set the framework for the current Navrat programme in the MEYS

3. *Consultation of a vast group of stakeholders*, including the various research institutes, the Agricultural Chamber, the Chamber of the Food Industry, the Association of the Farmers etc., as well as the consultancies in the agricultural field and the members of the Council. The latter included representatives of other Ministries such as the Ministry of Health (cross-cutting areas of applied research). The outcomes were suggestions for other priorities or improvements to the formulation of the ones already included
4. *Drafting of the final version of the Concept*, also through submission to the R&D Council and taking into account their comments

This approach adopted, i.e. elaborating first a draft version before submitting it to the stakeholders, constituted a change to the approach taken in 2001 during the preparation of the 2004-2008 Concept. In that occasion and with the intent to develop a user-oriented rather than a research-oriented concept, the Ministry asked the users to express their ideas in the first phase of the development. More than 120 field consultants approached farmers and companies active in the sector. A huge number of ideas was collected of different quality, which caused considerable processing problems. The respondents also were not always able to precisely define what they intended and their information was not always up to date.

The result was that the Concept-design process took longer than expected. Furthermore, it did not produce the expected effects in terms of user participation: when the departmental programme was then launched, those parts of the programme that were expected to lead to the highest levels of user participation and co-funding (based on the input provided during the design process) were under-subscribed. Possible reasons were that the research communities were not able to respond to the users' expectations or that the users were not able/interested in co-financing the research.

Finally, several ministries indicated **inter-departmental collaboration** for the development of their concepts or programmes.

In general, we note an increasing level of such collaborations and not only in the four ministries that were expected to create such cross-departmental links in the new R&D&I governance structure. Key objectives for these co-operations were an improved coordination of the research funding as well as an improved response of research funded to the needs of user communities beyond the traditional sphere. Internationally, this level of co-operation is unusual.

The examples are manifold: "cross-departmental" working groups are set up or are about to be created between, for example, the Ministries of Interior and Defence, in the MEYS and the Technology Agency; the Ministry of Agriculture states in its Concept the intention to enhance its collaboration with other ministries such as the Ministries of Health and Environment; the Ministry of Health will liaise with the Science Foundation to tackle the difficult issue of the distinction basic/applied research. The only Ministry that seems somewhat isolated in this context is the Ministry of Culture.

3.3.5 Consistency in the Strategic Objectives at the two Policy-Making Levels

In this Section we analyse the consistency between the policies set at the higher level and those defined and implemented at the intermediary level, i.e. to what extent policy-making and programming at the intermediary level were in line with the objectives defined at the higher policy levels.

Table 11 below, lists the Strategic Concepts and departmental Programmes included in our analysis; we excluded the Concepts developed by the Ministry of Education as these were explicitly requested to implement key systemic priorities (only).

Table 11: List of departmental Concepts and Programmes

Ministry	Strategic Concept	Departmental Programmes
Ministry of Agriculture	The concept of agricultural applied research and development till 2015	VAK – Research in the agrarian sector - KUS - Complex Sustainability Systems in Agriculture
Ministry of Health	The concept of health applied research and development till 2015	Ministry of Health's Departmental Research and Development Programme III
Ministry of Culture	Interdepartmental concept of applied research and development of national cultural identity till 2015	Programme of Applied research and development of national and cultural identity (NAKI)
Ministry of Interior	National Strategy of Security Research in the Czech Republic 2010-2015	Security Research for the Needs of the State 2010-2015, Programme of security research of the Czech Republic 2010-2015
Ministry of Defence	The concept of defence applied research and development till 2015	Defence applied research, experimental development and innovation

Note: in this analysis

Figure 22 maps the logic model that links the vision and strategic concepts of the 2008 Reform and the National R&D&I Policy to the departmental Strategic Concepts. We defined the categories of objectives as follows

- *National High-level Objectives* relate to the systemic objectives of the 2008 Reform, categorised under 3 headings, i.e. to enhance efficiency in R&D Governance, to enforce sustainable competitiveness in R&D, and to foster innovation (see Section 3.3.3 for a description of these objective categories). The first two high level objectives are systemic ones, focusing on an enhancement of efficiency and effectiveness of R&D governance; the last one points at the expected strategic research focus of the programmes funded and their relevance for socio-economic welfare.
- *Departmental High-level Objectives* are the key objectives formulated in the Concept documents of the Ministries. As is often the case also in international practice, the departmental Concepts did not always fully convey their strategic objectives in an explicit statement; those stated in the mapping below are therefore our understandings of their key strategic intent
- *Operational Objectives* illustrate the measures that the Ministries intended to implement to reach their high-level ones - at institutional level or through the development of programmes.

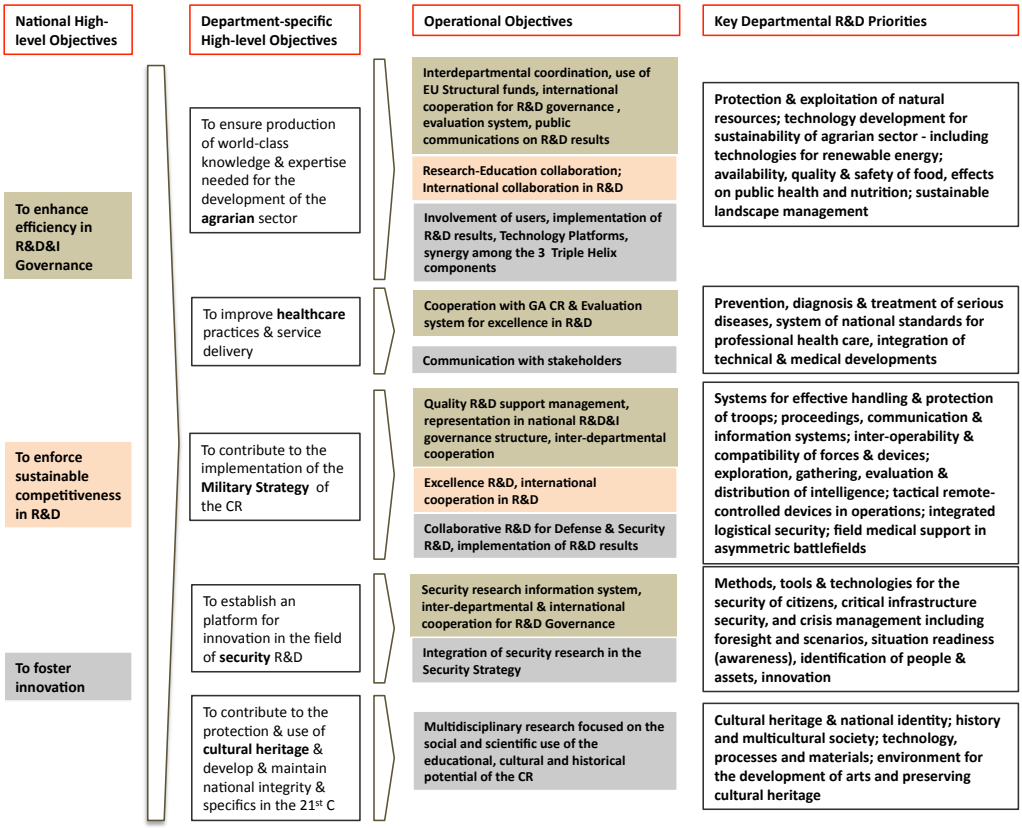
The colour coding highlights the consistency between the Operational Objectives in the Concepts and the categories of National High-Level Objectives.

The mapping allows for the following observations:

- Measures for the enhancement of *R&D governance efficiency* are indicated in all but one Concept - the Concept of the Ministry of Culture. These include intentions to set up cross-departmental collaboration, evaluation methodologies or information systems, and even quite basic measures such as 'set up the department'. We note a strong variety in intensity of activity, though, with the Ministry of Health mentioning only that it will liaise with the Science Foundation in relation to basic research in the field and set up an evaluation methodology (for ex-post programme impact evaluations)

- Measures related to an enhancement of the Czech *R&D competitiveness* are mentioned by only two Ministries – the Ministries of Agriculture and Defence – in relation to an increase in international mobility; the Ministry of Agriculture is the only ministry explicitly aiming at an intensification of education-research linkages in order to ensure and increase availability of human resources for research in its fields
- The delivery of *support to innovation* through an improved alignment of research with socio-economic needs is an intention stated by all Ministries. Most of them list specific measures to enhance research-industry/user collaboration (exceptions are the Ministries of Culture and Interior)

Figure 22: High-level Policy Objectives implemented in the Departmental Concepts



Conclusion is that there is a strong coherence between the strategies at the different R&D governance levels in relation to the need to enhance both efficiency in R&D governance and the response to user needs. Limited attention was dedicated to the more structural issues in the R&D system related to international mobility and especially the availability of human resources for R&D.

The single Ministries implemented the key concepts of the 2008 Reform at different levels of intensity:

- The *Ministry of Defence* and - especially - the *Ministry of Agriculture* were the ministries that adhered to the 'vision' of the 2008 Reform in the most complete manner. Both of these ministries included in their strategic Concepts measures that aimed at an improvement of their R&D governance efficiency and a sustainable R&D competitiveness in their fields of research as well as instruments that would ensure and improve the user focus of the research activities funded
- The Concepts of the *Ministry of Health* and – especially – the *Ministry of Culture* were strongly focused on the identification of the relevant fields of research. Seeing the sphere of their ministerial activities, they considered alignment of the research with societal needs as implicit to the research activities in their field
- The *Ministry of Interior* responded adequately to the national high-level objectives related to both R&D governance efficiency and alignment with the user needs

We also considered to what extent and how the thematic sub-priorities defined and implemented in the Ministerial R&D programmes relate to the thematic R&D priorities defined at the national level. For this analysis we took into account the scientific and technological fields upon which research in the ministries would need to build in order to achieve its objectives.

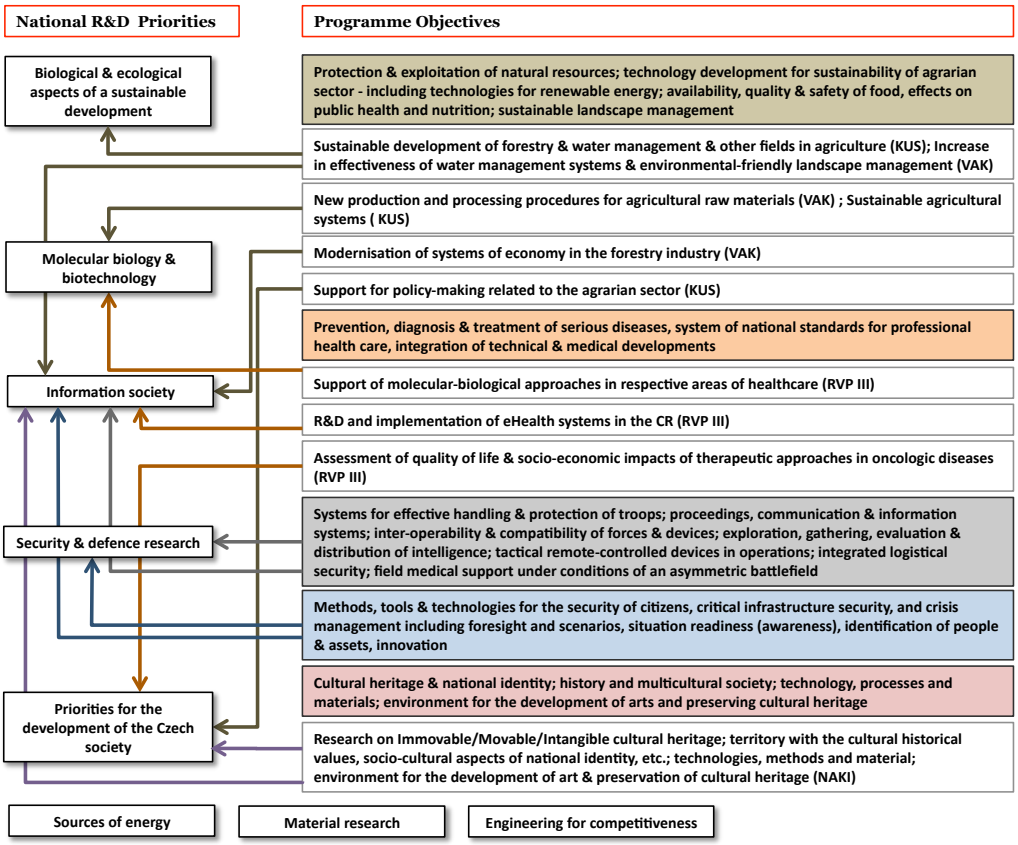
Figure 23, below, illustrates the results of this analysis. The colour coding allows for a clear distinction between the different Ministries. For the sake of completeness in the logical model, we listed also the *departmental* R&D priorities that were defined in the Concepts (see Figure 22, above).

The conclusions one can draw from this analysis are obvious and in line with the expectations: the research objectives of the programmes in the ministries all are interlinked to the national R&D priorities, for the simple reason that these are – and were conceived to be - broad thematic priority areas.

However, we do note that the intermediaries show a limited attention to the concept of a policy cycle: only the Concept description of the Ministry of Culture establishes a direct link between the priorities and objectives defined in the Concept and the activities subsequently implemented in the Programme. This was facilitated by the fact that these two documents were developed contemporaneously in this Ministry.

In the Concepts of the other Ministries, thematic priority areas were indicated, but it is unclear how and to what extent these are then 'covered' in the programmes. Also the programme descriptions do not allow for a straightforward link from that perspective.

Figure 23: Thematic R&D Priorities in Departmental Programmes



The mapping shows that 3 national R&D priorities are not directly tackled by any of the departmental programmes. This is equally the case for 3 of the 5 sub-priorities in the category "Priorities for the development of the Czech society", namely Management & Administration (predominantly eGovernment), Growth & education of the human potential, and Competitiveness of the Czech society.[84] This does not imply that these lines of research are currently not covered in national-funded research:

- The *Technology Agency* launched– or is about to launch – programmes that had/have as target the priority Sources for Energy (the programme ALFA) and 3 sub-priorities of the "Priorities for the development of the Czech society" [85]
- The *TIP programme* of the Ministry of Industry (2009 – 2017) includes the sub-programmes 'New Materials and Products', 'New Advanced Technologies', and 'New Information & Controlling Systems'. It covers the more industry-related national R&D priorities, i.e. Materials research and Engineering for competitiveness

[84] The 2 sub-priorities targeted by departmental programmes are Czech identity and the surrounding environment and Technologies and methods for evidence-based policy-making, the latter only to a certain extent

[85] Management & Administration in the programme BETA, Growth & education of the human potential and Competitiveness of the Czech society in the programme Omega

3.3.6 Procedures and principles for the design and implementation of the research priority areas as of 2012

In its meeting of February 25, 2011, the R&D&I Council approved the document outlining the principles and processes to be implemented in the first coming months that should result in the definition of new problem-oriented priority areas for research and their implementation, in line with the National R&D&I Policy 2009-2015. The organisation responsible for the analytical support and the overall management of the process is the Technology centre AS CR, in the context of its Framework Contract with the R&D&I Council's Secretariat/the Office of the Government (see Section 2.1.2.1).

The description of these processes below leads to the following reflections:

- One cannot but note the significant time pressure set upon the experts at the TC for the implementation of the background analyses, constituting a true challenge for the production of quality up-to-date strategic information on such a broad range of topics
- We note a limited involvement of the stakeholders and the direct nomination of the members of the Coordination Committee of Experts by the R&D&I Council.
- The explicit intention of redistributing the budgets based upon the importance of the newly defined priority areas can be expected to considerably limit the consensus-building effects of the foresight exercise

In the first phase of the process (March-May 2011), the **rationale** will be defined through the implementation of a set of studies aiming at the identification of the major problem and opportunity areas for the Czech society as well as the R&D potentials of the CR. Topics for analysis covered by these studies will be: the research potential; the absorptive capacity of industry for innovation and potential applications; the large R&D infrastructures (i.e. infrastructures financed by the Operational Programme); international cooperation for R&D; state expenditures and human resources for R&D; the existing networks and structures in the national innovation system; the socio-economic needs of the CR; and existing relevant development strategies. In all studies, there will be a comparison with the situation abroad. The expected outcome of this first phase will be:

- The identification of key areas of opportunities and threats for the development of CR in a time horizon of 15 to 20 years, based upon "severity" and likelihood
- A mapping of the R&D&I system, including the identification of its strengths and weaknesses (SWOT analysis), research capacity and potential for innovation

The second phase (June – September 2011) will be the **'filtering' phase** during which a foresight exercise will be conducted. For this purpose, the R&D&I Council will nominate *a Coordination Committee of Experts* (10 to 20 members) that will have as tasks to nominate the members of the specific Panels of Experts; to coordinate the Expert Committees and facilitate their cooperation; to participate in the processing of the outputs of the priority setting exercise; and to propose the funding framework for each priority area.

For each area of opportunity & threat identified in the first phase, a *Panel of Experts* will be set up of 10 to 20 experts in different S&T fields. These panels will define for each priority area the long-term R&D objectives as well as the short-term steps for the attainment of these objectives. These 'operational objectives' will cover a time frame of appr. 4 years. For each priority area – and operational objectives - they will also define the relevant indicators that will allow for ongoing monitoring and evaluation and the "relevant systemic characteristics needed for the effective use of the public funds in relation to these priorities".

In the final phase (September-October 2011), the **decision-making** on the final problem-oriented priority areas as well as the level of funding to be earmarked for each of them will take place in a Panel of R&D&I Support Providers – based upon the results of the meetings of each Panel of Experts. Members of this Panel will be representatives of ministries and agencies, 2 representatives of the R&D&I Council and the Secretary to the Council. The proposal of this panel will then be discussed in the Council (meeting of November), with final decision-making in December.

In relation to the **implementation of the priorities**, the document approved by the R&D&I Council sees as primary use of the priority areas the steering of R&D&I programmes, i.e. the targeted funding; this regards especially thematic programmes to be launched by the Technology Agency – and to a certain extent the programmes of the Science Foundation, but the priority areas are expected to be reflected also in the programmes launched by the other targeted support providers.

The priority areas are also expected to influence the level of institutional support: the priority areas will be used for "the preparation of the draft state budget for R&D&I, which will set the amount of public funds to support R & D aimed at achieving the priority objectives in targeted R & D and institutional support." It is also expected that the priorities will form a basis for the decision-making on targeting support from the EU Structural Funds in the new programming period after 2013.

The document does not further specify the share of targeted funding that will be explicitly earmarked for these priority areas.

3.3.7 Key Findings in the Light of International Experience

In this Section of the report, we look into the processes that were adopted for the design and implementation of the National R&D&I Policy in the years 2008 and 2009. We consider the key characteristics of the process that was implemented in the Czech Republic, i.e. the use of strategic intelligence in the form of studies, the involvement of stakeholders as a source for strategic intelligence, and the effectiveness of the process in the context of the policy cycle and the overall R&D&I system.

The use of strategic intelligence

International practice teaches us the importance of strategic intelligence especially in the first phase of the policy making process, i.e. for the definition of the rationale. In this context, strategic intelligence is predominantly provided by studies analysing strengths and weaknesses in the overall innovation system in an international context, as well as in-depth studies looking into the specifics of the national structure. Priority setting should be an ongoing process, though, and decision-making on policy interventions builds on lessons learnt from previous exercises while forming the starting point for a new strategic intervention cycle. Progress in terms of achievement of the desired effects is monitored (also for the purpose of accountability) and the analysis of strengths and opportunities is periodically repeated.

There were important flaws in the policy-making process in the Czech republic from this perspective: analyses that looked in-depth into the *systemic causes* of these failures were rare, and studies analysing the factors determining the success or failure of previous *policy interventions* in terms of impact achievement – thus allowing for policy learning, were close to non-existing.

The involvement of stakeholders

State interventions are undertaken in order to solve problems, so a problem analysis is a first step. Practices vary, but often involve a formally documented study. Nordic practice[86] is typically to use a group of stakeholders supported by a project officer to do this. Other processes (such as staff or externally-conducted studies) are possible, but the element of stakeholder consultation is important both to understand needs and as a 'reality check'. It is also important to analyse the context, looking for assumptions built into the programme design that could turn out to be dangerous and checking the compatibility of the proposed intervention with other state interventions.

Internationally, stakeholder involvement is an increasingly important component of the policy making process. Not only are stakeholders a source of information and 'strategic intelligence', their involvement also has the objective to create consensus, involvement and support. We note two different approaches to stakeholder involvement in the Czech Republic, depending on whether the policy making process is at the 'high' national level or at the level of the intermediaries.

- At the high level of policy making, i.e. the level of the R&D&I Council, the pattern that we see emerging is one of an exclusively indirect involvement of the stakeholder communities - predominantly through their representatives in the R&D&I Council itself. We noted the overall limited attention - and even reluctance sometimes - for an open communication with broader stakeholder communities and the general public on discussions within the R&D&I Council and the apparently difficult collaboration between the Expert Committees and the Council.

  We see a similar pattern emerging in the set-up of the approved and currently running priority-setting exercise that is to define the new priority areas (problem-oriented rather than thematic).

- At the level of the intermediaries, stakeholders were intensively involved in the recent policy making processes - indirectly through the ministerial Advisory Bodies, but in most cases also directly. An exception is the Ministry of Industry where recent programme development was based on internal strategic intelligence and consultation with the R&D&I Council Secretariat.

Effectiveness of the policy-making process

International experience shows that fundamental for the effectiveness of a policy making process is a good linkage between the different levels in the governance structure. The dialogue between the two levels in governance on the strategic plans of the implementing bodies is therefore an important component of the policy making cycle.

Such "vertical" dialogue was limited in the policy-making processes implemented in 2008/2009. Ministries were involved in the discussions only in the final decision-making process; ongoing involvement was limited to the 2 major Ministries, i.e. the Ministry of Education and the Ministry of Industry and Trade. No ministry was represented in the R&D&I Council, which was – as mentioned above - the main seat where discussions took place on the 2008 Reform and the thematic priorities.

Nevertheless, we noted a strong coherence between the strategies at the different R&D governance levels in relation to the need to enhance both efficiency in R&D governance and the response to user needs. Clearly, the national R&D&I Policy succeeded in reaching consensus on these topics among the ministries. There was less coherence in relation to the more structural issues in the R&D system such as

86 Erik Arnold and Paul Simmonds, *Programme Management Benchmark*, Report to NUTEK, Brighton: Technopolis, 1997; Erik Arnold, James Stroyan and Paul Simmonds, *Programme Management Benchmark*, Report to the Research Council of Norway, Brighton: Technopolis, 1998; Erik Arnold, Paul Simmonds and James Stroyan, *Programme Management Benchmark*, Report to TEKES, Brighton: Technopolis, 1998

international mobility and especially the availability of human resources for R&D; only a few ministries dedicated attention to this in their departmental strategies.

Also the thematic priority areas that were established by the ministries in their concepts and programmes are interlinked to the national R&D priorities, which was to be expected because the national R&D thematic priority areas were conceived to be broad thematic priority areas. It was the task of the Ministries to define the sub-priority areas that were aligned with the needs of the user communities in their field.

However, we do note a limited attention to the implementation of the policy cycle approach among the intermediaries: only the Concept description of the Ministry of Culture establishes a direct link between the priorities and objectives defined in the Concept and the activities subsequently implemented in the Programme. This was facilitated by the fact that these two documents were developed contemporaneously in this Ministry. In the Concepts of the other Ministries, sector-specific thematic priority areas were indicated, but it is unclear how and to what extent these are then 'covered' in the programmes. Also the programme descriptions do not allow for a straightforward link from that perspective.

Finally, several ministries indicated inter-departmental collaboration for the development of their concepts or programmes. In general, we note an increasing level of such collaborations and not only in the four ministries that were expected to create such cross-departmental links in the new R&D&I governance structure. Key objectives for these co-operations were an improved coordination of the research funding as well as an improved response of research funded to the needs of user communities beyond the traditional sphere. Whereas internationally, the use of stakeholders as source of strategic intelligence, complemented by studies and past programme experience is common good practice, it is unusual to see this level of co-operation among the different intermediaries.

3.4 Proposal Appraisal Processes & Results

In this Section we report on our assessment of the proposal appraisal processes, setting them against the background of good international practice.

We first provide a brief overview of international practice from this perspective, to then relate on our overall assessment and consider into detail the quality of the procedures implemented in the case of applied R&D and in the Science Foundation. We close this section off with conclusions on the alignment of the procedures in the Czech Republic with international good practice.

3.4.1 International Practice

In a recent study, we compared the proposal appraisal processes in seven countries: Canada, Denmark, Finland, Netherlands, New Zealand, Sweden, UK. It allowed us to define some common and particular features in the key processes adopted in these countries.

Our analysis showed that all countries provide project-based funding to universities, research institutes and business enterprises through research competitions addressing most if not all disciplines, with the aim of maintaining strong disciplines

- Targeted or strategic competitions where relevance (to the target) is given equal weight alongside quality and originality
- Response mode often open calls, where quality and originality are the primary criteria

In some countries, the **targeted research** programmes are open to institutes or companies and have strategic objectives (e.g. industrial competitiveness or grand challenges). In these cases, the competitions are almost always closely targeted on issues of strategic importance to the country in question (environment, health, etc) and the peer review panels often involve researchers *as well as* research users (UK).

The application process is more likely to operate with multiple stages. Success rates are highly variable, but typically range between 5-30%.

Peer review is accepted as the most effective means of ranking proposals. Often this is a two-part process. First proposals are ranked for eligibility and a process of elimination ensues in which proposals that are unfit for funding are removed. For some countries, at this stage, only an outline is submitted. If the outline progress to the second round, researchers are requested to put together a full proposal or a second, more comprehensive application. A board is then elected to choose the winning proposals and disseminate the funds accordingly. This board may consist of higher-ranking officials in the research council or external peer reviewers.

Application and funding processes in Finland

The Academy of Finland grants applications processing is carried out either through one-stage or two-stage calls:

One-stage calls are standard practice for projects-based and individual grants provided by the academy of Finland. The process is as follows:

- Application submission (online)
- Processing of applications and evaluations arrangements
- Scientific evaluations of applications by peer review of external experts
- Decision preparation in Research Councils
- Funding decision by Research councils

A *two-stage call* is used in most research programmes and Centre of Excellence programmes. Basically, the application process is the same than the one-stage call but in the first round of a two-stage call, applicants draft letters of intent, including plans of intent, which are shorter than a normal research plan. On the basis of the letters of intent, the projects/applicants who are requested to submit full applications in the second application round are selected.

Source: Research Support to the Fagerberg Committee, Technopolis Group, 2010

Assessment criteria in order to receive funding are largely determined by the ideology of the funding organisation. The common criteria include: feasibility of the research project, collaboration between different national or international organisations, and transferability of research outcomes. Not explicitly stated in many of the criteria was whether the project had to provide research that was useful specifically for the grantee country.

The importance of project management varies in the research grants. For some grants the ability to properly manage the project is of the highest concern whereas for others it is barely alluded to - the flexibility of the grant allowing the principal investigator to dictate specifics.

The **Danish Advanced Technology Foundation** provides a handbook on project management, which is meant to compile successful strategies from over 100 completed projects. This guide is suggested to aid the researcher in filling in the application for funding which asks questions about project management. The guidebook provides, amongst other items: advice on the writing of meeting minutes, tasks and responsibilities for different actors taking part in the process of funding research and communication principles.

Incentives and penalties for following the monitoring process were not found. Often they are given in the status report form, which is accessible using a username and password in the web portal. The use of web portals was a common means of data collection. It serves a few purposes. First it ensures that forms are filled out in their entirety in a homogenous manner. Second, it allows the application to be processed by a review board in a fair manner. For example when there is a two stage peer review, the web portal ensures that the application with low rankings (not those that were eliminated) are given the same consideration in the second part of the process as those that are ranked higher.

Key proposal evaluation practices and results in the European Commission

The procedures implemented in the European Commission are overall acknowledged for their striving for excellence in rigour, transparency and objectivity.

Since FP7, the European Commission adopts 3 categories of **evaluation criteria** for project proposals in the Framework programmes:

1) Scientific and Technical Quality (S&T excellence), including soundness of concept, and quality of objectives; progress beyond the state-of-the-art; and quality and effectiveness of the S & T methodology and associated work-plan

2) Implementation (Quality of the consortium and of the management and Mobilisation of the resources), i.e. appropriateness of the management structures and procedures; quality and relevant experience of the individual participants; quality of the consortium as a whole (including complementarity, balance); and appropriate allocation and justification of the resources to be committed (budget, staff, equipment)

3) Impact (Potential impact and Relevance), covering contribution at the European or international level to the expected impacts listed in the work programme under the relevant activity; and appropriateness of measures for the dissemination and/or exploitation of project results, and management of intellectual property

The various criteria are scored on a scale of 1-5 (and 0), predominantly without weights. In order to pass a criterion, the proposal must reach the threshold of 3/5 and the project overall must reach a score of 10/15. Passing these thresholds means that the project can be considered for funding and continues to the next stage of the process.

Independent experts drawn from a register maintained by the Commission carry out the assessment (2 for each proposal). There are experts from all sectors on the register. However, there is an under representation from Industry, and a shortage of female experts which, in the case of ICT reflects the still relatively low number of women working in the sector. Strict rules are in place regarding potential conflicts of interest. It was suggested that these contribute to the low number of industry experts involved. However other factors such as availability, level of remuneration and relatively low awareness of the opportunities available may play a role.

The Commission considers **time-to-contract** as the time taken from the initiation of a project idea i.e. the publication of the call to the signature of contract or grant agreement for successful projects. The figure for the Framework Programme as a whole is 318 days for FP7. The ICT Programme has the shortest time to contract (247 days).

Interviewees repeatedly reported an increased **competition** for EC funding in FP7, lowering the chances of success for the proposals and thus the potential Return of Investment for the application process. Various factors play a role here, including the quality of proposals received, the over-subscription rates (large number of proposals compared to a limited budget in the action lines), and the clarity of the action line description.

Among the 3,170 *eligible* proposals received for the first 3 calls of FP7 mainstream ICT, only 538 (i.e. 17%) led to the positive conclusion of a contract, despite the fact that 50% of them were considered during the evaluation process as 'above threshold'. In other words, only one third of "good quality proposals" finally resulted in a contract.

Source: Interim evaluation of the ICT research in the 7th Framework Programme – Evidence Report, EPEC/Technopolis Group, 2010

Appraisal processes for response mode funding in the EPSRC

In the UK Engineering and Physical Sciences Research Council (EPSRC), responsive mode funding is very flexible, with the scale of projects supported ranging from small value, short-term grants to multi-million pound research programmes. A wide variety of activities are supported, including feasibility studies, instrument development, equipment to support a number of research projects, overseas travel grants and visiting researchers, and long-term proposals to develop or maintain critical mass. High risk/high return research proposals, embracing new concepts or techniques, are particularly encouraged.

The EPSRC adopts a two-stage appraisal_process. The first stage is a reviewing one. When a research proposal is received, a copy is sent to at least four reviewers, including at least one nominated by the investigator. Proposals that receive highly supportive comments from at least two reviewers are submitted to funding prioritisation panels. The reviewers' reports (made anonymous) will be passed back to the investigator to comment on any factual inaccuracies or questions raised. All reviewers' comments received in time will be seen by the peer review panels with the reviewers' names included. The investigator's response is given to the panel for consideration, along with all other documents. Proposals that do not receive sufficiently strong support from reviewers will be rejected without being put to a panel. The investigator will be notified and the reviewers' reports (made anonymous) will be included for information.

The second stage takes place in prioritisation panels. EPSRC relies on prioritisation panels to judge the relative quality of research proposals competing for funding. The panels are responsible for producing a rank ordered list of all the research proposals under consideration. The panel is asked not to re-review proposals, but instead to arrive at a prioritisation between proposals based on a relative assessment of quality. The ranking is based primarily on the comments of the expert reviewers and applicants' responses to the reviewers' comments. Panel members are appointed to represent the collective views of the expert reviewers and to bring the benefits of their general experience in science and engineering research. They are asked to take a broad view, which covers the breadth of research included within the panel's remit.

For the selection of peer reviewers, the EPSRC set up a College of peer reviewers. The membership of these panels is drawn from across EPSRC's scientific remit, to ensure the necessary mix of expertise. Most members are likely to come from the academic community, but some will be from industry and other organisations. College members are expected to review no more than 12 proposals in a 12-month period. They are asked to respond to requests for comments within 15 working days as part of the college's standards of service. Typically around 600 college members will sit on a prioritisation panel each year.

The funding decision is taken by the Heads of Programme, based upon the rank ordered list produced by the panel and the funding available. All Principal Investigators are notified of the outcome of the panel in writing.

Source: EPSRC website, January 2011

3.4.2 Procedures & Results for Proposal Appraisals in the Czech Republic

The before-mentioned 2002 Act on R&D Support formalised the procedures to be implemented in the appraisal processes of proposals in the context of R&D programmes, with the overall objective to ensure efficient and robust application and funding processes in all administration bodies.

Essentially, the procedures established in 2002 are still the same. However, in 2010, a *dual system* was introduced, making a distinction between procedures for applied R&D programmes (funded by the Ministries and the Technology Agency) and those for basic research projects, most often response-mode funded (the Science Foundation). The new rules and strategy for the response-mode funding had a double objective: to reach a more significant differentiation in the evaluation of individual drafts in order to choose the best ones, and to quieten the suspicion of a biased evaluation.

In the paragraphs below we first relate on our overall assessment of the quality and efficiency of the appraisal procedures as they are implemented *in practice*. Subsequently we describe the procedures established by law and look more into detail in some specific features of their concrete implementation.

3.4.2.1 Overall Assessment

Table 12, below, provides a first view on the quality of the implementation of these procedures established by law. It depicts the results of the **assessment by the applicants** of the procedures implemented in the Science Foundation and the principal fund-providing ministries (the Ministries of Education, Industry and Health); we included the satisfaction rate on the quality and efficiency in EU Framework Programmes as an international benchmark measure[87].

[87] Satisfaction rates with the efficiency and quality procedures in EU Framework Programmes are in line with those typically expressed in other EU countries, such as for example the UK

In this table illustrating the outcomes of this exercise, we highlighted in orange positive assessment rates that were above or below the benchmark rates[88] (respectively through orange shading and red letter type).

We can draw two conclusions from this benchmarking exercise:

- Overall, Czech researchers expressed high appreciation for the efficiency of the proposal appraisal procedures. This regards all Ministries and the Science Foundation, even though we note lower-than-average satisfaction with the practice in the *Ministry of Health*.
- Satisfaction rates in relation to the transparency and fairness of the process are overall within the norm – with the exception of the *Ministry of Health* where they are considerably below the benchmark.

We are looking in-depth into the procedures implemented in the Ministry of Health further below.

Table 12: Positive assessment of the appraisal procedures by the applicants

	Science Foundation	MEYS	MIT (includes Czech Invest)	Ministry of Health	EU Framework Programmes
Access to relevant information	85%	78%	78%	58%	60%
Clarity and understanding of relevant documents	78%	73%	69%	51%	47%
Helpfulness in the application process	60%	60%	57%	44%	39%
Transparency regarding the funding decisions	42%	45%	40%	23%	42%
Fairness of the proposal assessment process	45%	51%	40%	26%	46%
Time to Contract	56%	59%	61%	34%	34%
Administrative obligations in the application, reporting and payment processes	51%	46%	49%	35%	16%
Total	100%	100%	100%	100%	100%
Total	481	318	115	105	254

Notes: the survey questionnaire listed only the 3 principal funding providers and the 2 agencies; the other Ministries were not included; The total nr of applicants refers to survey respondents who effectively applied for funding by the specific administrator; we considered 'positive' assessments respondents indicating satisfaction to a moderate, large or very large extent

Source: Questionnaire survey to the individual researchers in the Czech republic, September 2010

[88] In benchmark exercises notable differences are considered those that differ with at least 10%

Apart of giving a voice to the applicants, we also looked into an important measure for the efficiency and quality of the proposal management procedures as well as programme development as such, i.e. the **success rates of the project proposals**.

In international practice, typically a balance is sought between the need to guarantee the *maximum level of quality* in the research funded while contemporaneously avoiding a drop of the success rates under the acceptable level, which could cause de-motivation among the researchers to participate in future calls. While the scientific community tends to regard a success rate of 33% as a guarantee of competition, many research councils operate with lower rates.

In normal practice, policy makers interpret data related to success rates as follows:

- Low levels of eligibility typically indicate a lack of clarity in the call for tender documentation on the administrative requirements
- High levels of success rates need to be looked into in-depth. They may point at a high efficiency in attracting quality researchers, but also at programme budgets that were established too generously and/or the urge of the funding bodies to prove efficiency by 'spending the money'. Ultimately, it raises questions related to the efficiency of the programme managers to set up a truly competitive process, selecting only the best quality proposals
- Equally, low levels of success rates need to be scrutinised with care, establishing the causes. A possible factor is a general low quality level of the proposals. It points at faults in the programme design, i.e. a flaw in the capacity of the programme to attract key players, possibly due to a flaw in the alignment with user needs

Table 13, below, illustrates our *estimate*[89] of the success rates of project proposals that were submitted to the various Ministries in the time period 2004 – 2009, both in terms of eligibility and funding granted.

Table 13: Estimate of success rates of proposals at Administration Body level, 2004 – 2009

Administration body	Total proposals	Total eligible proposals	% eligible proposals	Total granted	Success rate proposals - versus total	Success rate proposals - versus eligible
Min. of Education	2658	2394	90%	1517	57%	63%
Min. of Industry and Trade	3061	2757	90%	1417	46%	51%
Ministry of Health	2265	1744	77%	919	41%	53%
Min. of Agriculture	2135	1872	88%	363	17%	19%
Science Foundation	15251	14661	96%	4387	29%	30%

Source: own elaboration of data provided in the Central R&D&I Information System, August 2010

We note that

- Internationally, it is unusual to see rates of eligibility as low as those highlighted in red for the Ministry of Health, suggesting that administrative requirements are overly bureaucratic, applicants are under-informed on the evaluation criteria, or both

[89] Rather than exact figures, these data need to be considered estimates providing an overall indication. As calculations of these data at funding body level are not provided in the Czech evaluation system, they are based on our elaboration of proposal versus project data that are stored in the Information System, linking the projects back to the funding bodies. This proved to be a particularly tedious exercise and highly fault-risky

- Success rates are high in the major funding bodies, i.e. the Ministries of Education, Industry and Health; low success rates are visible in the Ministry of Agriculture

Based on both the applicants' assessment and the analysis of the success rates, the **Ministry of Health** seems to have some flaws in its appropriate application of the established proposal appraisal processes. We cover the processes adopted in this Ministry further in detail below.

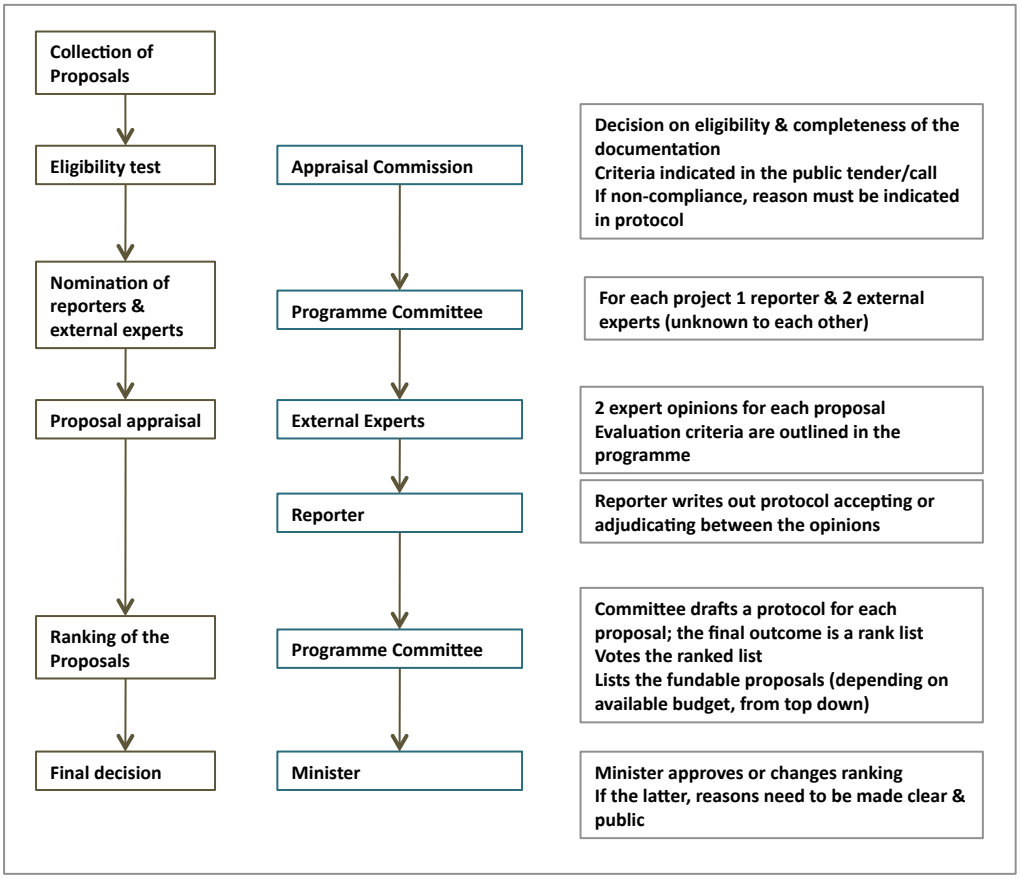
3.4.2.2 Proposal Appraisal Processes for applied R&D Programmes

The procedures established by law overall reflect international common practice in their attention to the general principles of rigour, transparency, objectivity and fairness, and efficiency (see Section 3.4.1).

The applicants' appraisal illustrated above as well as the information at our disposal reported below shows that overall the Ministries implement these principles – with some problems appearing for the Ministry of Health.

We describe them further below, and provide a general overview of the procedures in Figure 24, below.

Figure 24: Proposal appraisal processes in the CR – R&D Programmes



- **Rigour** in the procedures was established through a strict adherence to the criteria for assessment previously defined in the programme design process. Evaluation criteria typically include scientific criteria and expected results of the research funded, as well as eligibility criteria such as the expected composition of the project. A two-step approach is adopted, with a first assessment of the eligibility of the proposals and a subsequent assessment of the quality of the

proposal. The bodies responsible for the various phases draft protocols in which they document and communicate to the hierarchical level above them the reasons and procedures for their decision-making. The body with overall responsibility for the proposal appraisals is the Programme Committee; the ultimate decision-makers are the Ministry and the Minister in person.

- **Transparency** is reached through the obligation to communicate online the criteria for evaluation (at the moment of tender publication), the information in relation to the composition of the Programme Committees, the methods for handling the information contained in the proposals, and other rules governing their activities; and the final results of the appraisal process. The applicant can request the results of the proposal appraisal but the names of the evaluating experts are kept confidential. In case the Minister decides to make changes to the final proposal for funding provided by the Programme Committee, he/she is to explain the reasons in writing in the protocol and publish such decision on the Internet.
- **Objectivity and fairness** is guaranteed through the nomination of two experts who are to assess the appraisal; they are unknown to each other and are nominated by the Programme Committee. A reporter nominated within the Programme Committee then adjudicates between the expert judgements; in case of conflict, a third expert is called in. The final ranking of the proposals is decided in the Programme Committee by a voting procedure where the absolute majority of votes are requested.

  In all Ministries (with the exclusion of the Ministry of Health – see below), members of the Programme Committees include expert stakeholders as well as Ministry employees, at a ratio established by law (currently respectively 2/3 and 1/3 of the members).

  The selection procedures for the nomination of the experts involved are an important factor to guarantee fairness of the decision made and a common criterion for the selection of the Programme Committee members is the prestige of the researcher at international level. In most of the Ministries, the relevant key stakeholder communities propose their candidates to become member of the Programme Committees, while departments in the Ministries may add names to the list based on their internal knowledge. Subsequently, it is the Ministry that decides on the final list. In the MIT, for example, key stakeholder groups and partners include the Association of Industry, associations of specific industry branches such as the Association of the Chemical Industry, the Association of (private) Research Organisations, the Association of Innovation etc. In the Ministry of Interior, members of the Programme Committees are experts from the Ministry, state administration, research institutions and individuals active in security research.

  In relation to possible Conflicts of Interest, members of the Programme Committees "may not have any connection to the subject of the public tender in research, development and innovation or any bias towards the applicants and in particular they may not contribute to drawing up the project, may not have any personal interest in the decision on a specific proposal and may not have any personal, professional or other relationship with the applicants."
- In order to ensure also the **efficiency** of the appraisal process, strict timelines are established in the Law the calls, set at a minimum of 36 calendar days for the duration of one-step public tender calls or for the first level and the second level of two-step ones, and at a maximum of 180 calendar days for the duration of the appraisal process (240 calendar days for two-step public tenders). Time to contract is set at a maximum of 60 calendar days from the date on which the Act on the State Budget of the Czech Republic enters into force for the specific year during which the project is to commence, or - if the results of the call were

announced after that date - from the date on which the results of the public tender were published.

In most of the Ministries, efficiency in the management processes are also reached through the automation of the application process through electronic and online submission and electronic tools for the management of the entire process. Exceptions to the rule are the Ministries of Culture and Interior. All of the Ministries – again with the exception of the Ministry of Culture – also have at their disposal a track record monitoring system for project participants. However, only the Ministries of Agriculture and Health use these systems in their appraisal processes.

In the **Ministry of Health**, the Internal Grant Agency essentially acts as a central Programme Committee to the Ministry. It performs all the tasks typically assigned to these committees, i.e. the appraisal of proposals and project/programme interim and final evaluations. The Supervisory Board is responsible for the overall control of the appraisal process, while the explicit implementation is assigned to *13 Field Committees* and an *Economic Committee*. Members of the Scientific Field Committees are chosen based on proposals from the institutions involved in R&D (with the exception of industrial research); these include the Czech Medical Association of J.E. Purkyne, the Czech Chamber of Stomatology, the Czech pharmaceutical chamber, Hospitals, National health institute, regional hygienic stations, Universities and providers. A major criterion for the final nomination of the members of these committees (by the ministry) is the representation of all related specialisations and particular types of institutions in R&D, taking into account other aspects such as regionality, ethnicity or gender issues. In each Field Committee there has to be at least one member from the Czech Medical association of J.E. Purkyne and there can be only one employee of the same organisation.

We note three major differences compared to the procedures implemented in the other Ministries, which may be related to the low satisfaction expressed by the applicants in relation to transparency and fairness of the process

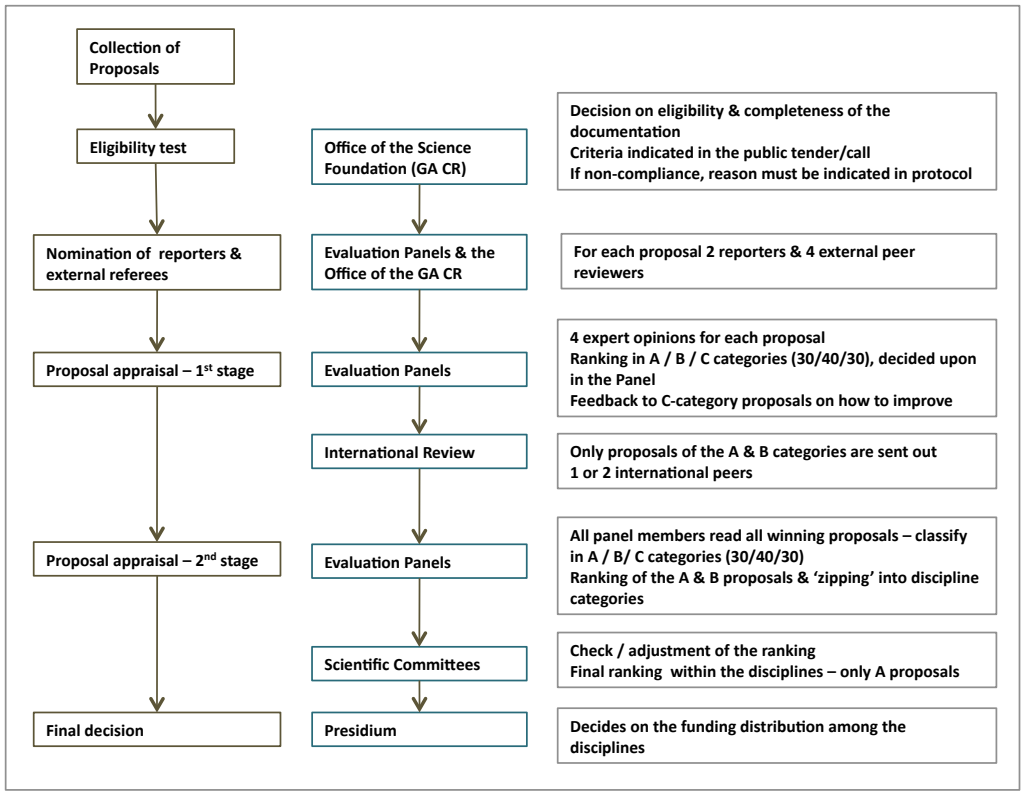
- *Supervision by the Ministry of the nomination of the experts involved*. In the other Ministries, the Ministry nominates the programme committees on an ad hoc basis, i.e. separately for each programme. This implies that the Ministry has a voice in – and control over - the selection of the most appropriate expert in terms of expertise. In the Ministry of Health, the identification of the members of the Field Committees that will be in charge of a specific programme is a process internal to the agency
- *Supervision by the Ministry of the procedures implemented*. Common practice is that the Programme Committees include Ministry employees, which allows for an involvement of the Ministry in both the selection of the projects to be funded as well as their subsequent management. In the Ministry of Health, only members of the Agency are involved
- *Appraisals based on well-established and transparent evaluation criteria*. In the other Ministries, the proposals are appraised applying a two-step approach (eligibility and quality of the proposal) and the evaluation criteria are established and communicated beforehand to the applicants. In the Ministry of Health, a three-step approach is adopted (eligibility – scientific quality – economic viability). The assessment by the Economic Committee on the "economic viability" and appropriateness for funding as well as an establishment of the appropriate level of the support applies a range of subjective criteria that may be hard to establish and communicate to the applicants in an appropriate manner

3.4.2.3 Procedures & Results in the Science Foundation

The Science Foundation adopts different implementation processes for its proposal appraisals. A key measure to ensure objectivity, transparency and consistency in the appraisal of the proposals was the adoption of an ERC[90]-style **panel system** rather than the previously implemented reporting one (2 or 3 external referees and 1 editor/reporter). The procedures adopted are in line with international best practice.

Figure 25 illustrates the procedure that the Science Foundation currently implements.

Figure 25: Proposal appraisal processes in the CR – response mode funding



The Science Foundation has a Scientific Committee for each of the 5 scientific disciplines it covers. In each of these disciplines, Evaluation Panels are established covering the sub-fields; Presidium members responsible for the discipline nominate the members of these Evaluation Panels for 2 years, once renewable. The relevant field of specialisation of these Evaluation Panels is defined through an analysis of a 3-years history of applications. In the last call, there were 39 Evaluation Panels, with an average of 12 members each. Members are not aware of the identity of the other members of the panel until the first panel meeting.

The peer reviewers are selected based upon applications by individual researchers, responding to calls for experts launched by the Office of the Science Foundation to the Academy of Sciences and the universities. A committee including 1 representative of the Presidium, 1 of the R&D Council (including expert committees) and 1 or 2 members of the Scientific Advisory Board decides upon the selection. The filtering is based on key words associated with each panel and criteria taken into account include geographical location and the scientific track record. This includes indicators of R&D results, but these are taken into consideration to a limited extent in the decision-

[90] European Research Council

making process. Evaluation panel members are assigned for 2 years (once renewable). Foreign peer reviewers are nominated by the reporters and agreed upon by the panel.

Further objectivity measures, ensuring also the selection of the best proposals, relate to the **number of peer reviews** for each proposal. In the first stage of the proposal appraisal process, for each proposal the Evaluation Panel assigns between its members 1 reporter and 2 reviewers; the Office assigns another reporter (looking carefully into possible conflict of interest) and 2 additional reviewers (not forcefully experts in the subject). All project proposals have therefore a first reading by 4 reviewers.

In the second stage of the process, all panel members read all winning proposals and comment upon them; in other words, each proposal receives 8 to 12 second-stage reviews. This may be a considerable task for the panel members, depending on their scientific field (in material science reviewers have to handle up to 100 applications). At all stages, the proposals are discussed at the level of panel and decisions are taken collectively.

The applicants receive anonymous feedback from the panel, in the case of both successful and unsuccessful applications for funding.

A final measure allowing for objectivity in the appraisals is the procedure adopted for decision-making on the **budget distribution**. The level of the budget for a scientific field is unknown to the Evaluation Panel until at the very end of the appraisal process – as it is for the members of the Presidium. Once the Evaluation Panels have drafted the final ranking of the proposals, the Presidium discusses with the panel chairs on how to benchmark across the panels and then distributes the budget across the scientific fields, predominantly based upon the proportions of A-category proposals across the Evaluation Panels. Subsequently, the application pressure (number of A- and B-category proposals) and past success rates form the basis for the allocation of the budget among the disciplines by the Presidium - after informal consultation and feedback from the Discipline Committees. The Presidium members participate in the Panel meetings as observers, and so are well informed already in advance. The overall budget for the Science Foundation support activities is divided among the 5 project types, but the Presidium can redistribute the budget during the year.

Also potential conflicts of interest were tackled in the new system. Members of the Evaluation Panels are allowed to submit proposals (one does want the best researchers in the system to be involved in the programme), but their success rate is closely monitored (it is currently 51%).

According to the administrators of the Science Foundation, the new system has substantially reduced the possibility for unfair behaviour of the reviewers, and feedback from both collaborators and clients is that it increased the transparency. Reporters need to sign a declaration on conflict of interest and whenever a conflict of interest exists, the panel member needs to leave the room.

The **efficiency** in appraisal management is secured in particular through the use of an electronic submission system and databases with track records and data on project completions that provide input to the funding decisions. The two-stage appraisal process facilitated the willingness of international peer reviewers to give their contribution. As the other funding providers, the Science Foundation launches calls with a 36 days deadline; in line with the Law, the appraisal process lasts not more than 6 months.

The Presidium receives from the Office annual statistics on applications, performance, success rates etc

3.4.3 Key Findings in the Light of International Experience

In this Section we report on our assessment of the proposal appraisal processes, setting them against the background of good international practice.

The before-mentioned 2002 Act on R&D Support set the **legal background** to the appraisal procedures in the Czech Republic, with the overall objective to ensure efficient and robust application and funding processes in all administration bodies. Essentially, the procedures that were established in 2002 are still the same. However, in 2010, a *dual system* was introduced, making a distinction between procedures for applied R&D programmes (funded by the Ministries and the Technology Agency) and those for basic research projects, most often response-mode funded (the Science Foundation). The new rules and strategy for the response-mode funding had a double objective: to reach a more significant differentiation in the evaluation of individual drafts in order to choose the best ones, and to quieten the suspicion of a biased evaluation.

The **overall result** of our assessment is that overall the procedures established by law reflect international common practice in their attention to the general principles of rigour, transparency, objectivity and fairness, and efficiency. We noted good practice especially in the simplification and rationalisation of procedures across the funding providers, in the publicity of process and selection criteria using online, and in the selection of the reviewers.

The only Ministry where problems came on the foreground was the Ministry of Health, in particular in relation to the transparency and fairness of the process. This may be related to two major differences in the procedures adopted by this Ministry compared to those implemented in the other Ministries: the procedures for the nomination of the experts and the transparency of the evaluation criteria upon which the appraisal will be based.

Another major difference between the Ministry of Health and the other Ministries regards the division of labour in programme management: in the Ministry of Health, this task is entirely delegated to the Internal Grant Agency, which is a legal entity separate from the Ministry R&D department. In the other Ministries, common practice is that Programme Committees are set up, including stakeholder experts as well as Ministry employees. Such expert/employee collaboration is an important facilitator for the enhancement of **distributed strategic intelligence** within the ministry departments.

A final consideration to be made regards the **success rates** of the project proposals. Both the high success rates in the major funding bodies, i.e. the Ministries of Education, Industry and Health, as the low success rates in the Ministry of Agriculture in the time period 2004 – 2009 raise some questions in relation to the efficiency and quality of the proposal management procedures as well as programme development as such.

- High success rates of project proposals may point at a high efficiency in attracting quality researchers, but also at programme budgets that were established too generously and/or the urge of the funding bodies to prove efficiency by 'spending the money'. Ultimately, it raises questions related to the efficiency of the programme managers to set up a truly competitive process, selecting only the best quality proposals.
- Equally, low levels of success rates need to be scrutinised with care, establishing the causes. A possible factor is a general low quality level of the proposals. It points at faults in the programme design, i.e. a flaw in the capacity of the programme to attract key players, possibly due to a flaw in the alignment with user needs

3.5 The Evaluation System

3.5.1 International Practice

There are many formal definitions of evaluation, one being "Evaluation is the systematic acquisition and assessment of information to provide useful feedback about some object."[91] The European Commission definition is: "*Evaluation is a process by which the quality, implementation, target relevance and impacts of RTD policies/programmes are investigated, interpreted and examined.*"

Evaluation is an activity distinct from appraisal, monitoring or audit. Monitoring is the day-to-day collection of information and assists in the management of the programme. The European Commission defines monitoring as "*A process by which information on the progress and the direction of ongoing RTD actions is generated mainly for management purposes.*"

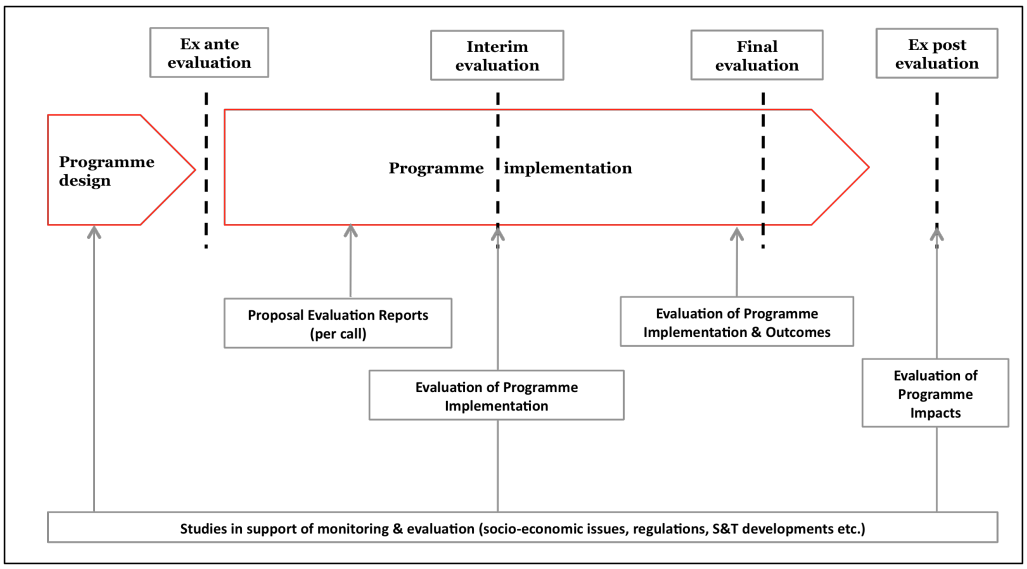
Monitoring should be systematic and regular whereas evaluation is not necessarily systematic and regular and may occur periodically. Crucially the difference lies in the fact that evaluation involves judging. You can have monitoring without evaluation, but you cannot have evaluation without monitoring. Evaluation therefore relies on effective monitoring procedures.

Evaluation has different uses at different parts of the policy or programming cycle:

- *Ex-ante evaluations:* In our sense these are not strictly evaluations but planning studies, which occur at the beginning of a programme, in the planning or developmental stages. It is at this stage that the logic and rationale for the programme are considered, indicators developed and baseline data collected. Robust planning at this stage will make all subsequent stages of the evaluation easier. This type of study can have two forms: one, where it aims to diagnose problems and propose and plan an intervention to solve the; another where such a plan has already been prepared and the 'ex ante evaluation' is in fact a design review, aiming to test the robustness of an intended intervention through systematic criticism.
- *Mid-term evaluations:* These types of evaluations occur at some point during programme implementation and are designed to measure and report on performance to date. They allow for adjustments and refinements of programme operational procedures and can help to identify whether the original objectives are still relevant. They tend to be less focused on outcomes and more focused on processes.
- *Final evaluations* (or final programme evaluation): These take place at (or towards) the end of an intervention. They are focused more on the outcomes, impacts and results of an intervention. The final evaluation report should largely be based on the accumulation of monitoring data and mid-term evaluation reports. Evaluation that is saved to the end of a programme is evaluation too late to improve and sustain the programme. It may be used to generate evidence about what follow-on action is likely to be needed
- '*Ex post' evaluation* (or ex-post impact evaluation) takes place at or after the end of the intervention, and is usually more concerned with understanding its effects.

[91] William M.K. Trochim, Introduction to Evaluation, Research Methods Knowledge Base, 2nd edition, 1999

Figure 26: Time line for evaluation



We evaluate in order to

- Provide accountability – essentially explaining to the taxpayer what happened as a result of tax money being used and providing information to support performance contracting
- Generate evidence about the effectiveness of a policy intervention that can provide information about future decisions
- Learn about how to improve the way current and future interventions are designed and managed

In effect, there are two main types of evaluation, which can be used depending on the purpose.

- Formative evaluation asks how, why, and under what conditions a policy intervention works, or fails to work. In essence, formative evaluations are *geared towards learning* and programme or policy improvement. Formative evaluations are important for assisting the effective implementation and delivery of policies, programmes or projects. Hence, often mid-term evaluations are intended to be formative.
- Summative evaluation (sometimes called impact evaluation) asks questions about the impact of a policy, programme or intervention on specific outcomes and for different groups of people. It looks back at achievements and is *aimed at accountability*.

The distinction between summative and formative evaluations is not always as rigid as the above characterisation might suggest. The following table (Figure 27) gives a quick comparison of formative and summative evaluation.

Figure 27: Comparison of formative and summative evaluation

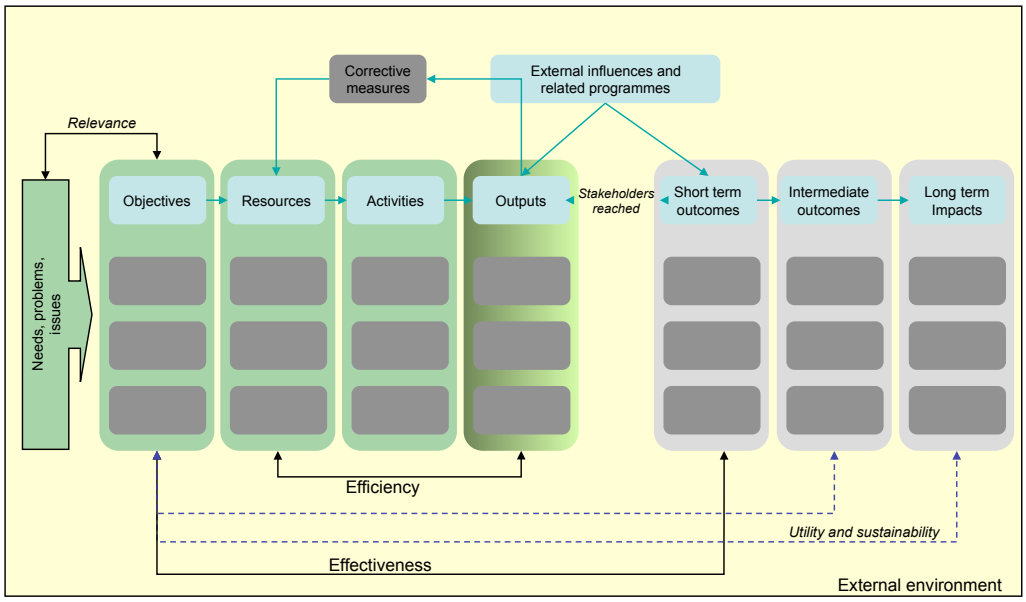
	Formative	Summative
Target audience	Programme managers/practitioners	Policy-makers, funders, the public
Focus of data collection	Clarification of goals, nature of implementation, identifying outcomes	Implementation issues, outcome measures
Role of evaluation	Interactive	Independent
Methodology	Quantitative (hard data) and qualitative (soft data) – emphasis on the latter	Emphasis on quantitative data
Frequency of data collection	Continuous monitoring	Limited
Reporting procedures	May be informal via discussion groups and meetings	Formal reports
Frequency of reporting	Throughout study	On completion of evaluation

Adapted from Joan Herman, Lynn Lyons Morris and Carol Taylor Fitz-Gibbons, Evaluator's Handbook, Sage, 187 p. 26

Evaluations aim at assessing the relevance, efficiency, effectiveness, utility and sustainability of policy interventions. The modalities and extent at which these **generic evaluation issues** are covered depend on the time frame of the evaluation (ex-ante, mid-term, final, ex-post).

The Inputs-Outputs-Outcomes-Impacts model illustrates the scope of the evaluation along these criteria.

Figure 28: Evaluation criteria in the logic model concept

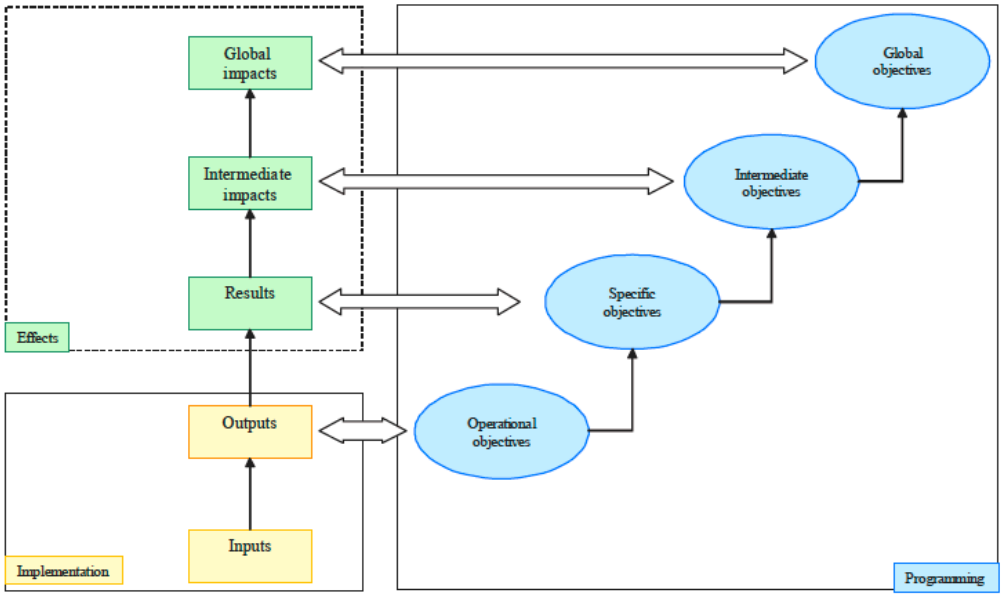


Efficiency evaluations, assessing inputs versus outputs, rely on data covering **"input variables"**. These include the level of funding received at the project level, but also the typologies of organisations involved in the programme activities, the nature of the project consortia, and the specific focus of the research activities in terms of technologies employed and/or industry/service sectors targeted for the outputs.

In the intervention logic concept, the **performance indicators** defined in the programme design phase should be geared to allow for an evaluation of the attainment of the policy intervention objectives. Objectives, in fact, constitute the starting point from which indicators for measuring performance (through both monitoring mechanisms and evaluations) should be developed.

Figure 29 illustrates the linkages between objectives and indicators. Indicators related to *outputs* provide a view on the achievement of the *operational objectives* of projects and programmes, whereas the performance in relation to the attainment of the programme "*specific objectives*" is measured through performance indicators focusing on the *results* (or short-term outcomes) at the level of the direct beneficiaries. The measurement of the attainment of intermediate and global (or "high level") objectives of a programme relies on the development of indicators focusing on the (expected) outcomes and impacts.

Figure 29: European Commission framework for the development of performance indicators



Source: Evaluating EU Activities: A Practical Guide for the Commission Services, DG Budget, Evaluation Unit, July 2004

Performance indicators should be SMART (Specific; Measurable; Accepted; Realistic; and Time-dependent) and cover the following **key impact areas**:

- Scientific and technological impacts – including a range of scientific and technological achievements and cumulative impacts on R&D teams, on their parent organisations and on the broader S&T environment. These can be classified under two general headings: S&T achievements and Research capacity impacts, i.e. knowledge-oriented impacts, R&D network-oriented impacts, strategic research management impacts, and infrastructural impacts
- Economic impacts – spanning impacts on organisations, industry sectors and the broader economic environment
- Societal impacts, such as employment-related impacts, Impacts on the quality of life Impacts in areas such as regional cohesion, inclusion and security, freedom of action etc.
- Environmental and Sustainability impacts

The annual report of the Dutch research council NWO includes performance indicators, which were agreed with the education ministry OCW in a covenant in 2003.[92] This covenant contains the elaboration of the **accountability information** to OCW that originates in the policy lines and objectives of NWO and the multi-annual strategy of NWO. The results and effects of NWO have been expressed as quantitatively as possible. The covenant aims to improve transparency and includes data on

- Productivity and output (publications, press and media coverage)
- The process of subsidy allocation (applications, awarded applications)
- Specific programmes (thematic and individual-oriented programmes, internationalisation and investments in research infrastructure
- Volume of support and the number of funded research positions divided by subsidy receiver
- Management/administrative cost and data on the NWO office.

OCW is responsible for a careful treatment of the information and can only use it to possible consequences. The information plays a role in the annual deliberations between OCW and NWO and is part of the annual planning and control cycle of NOW but *has no automatic link to funding*.

3.5.2 Current Evaluation Practice in the Czech republic

In the Sections below we describe in detail the various processes in policy and programme management, assessing in particular their coherence with the concept of an integrated policy management framework.

Figure 30, below, depicts the current evaluation system within the "mainstream" policy cycle in the Czech republic. It indicates the actors in the system and the activities that they are expected to perform in terms of the design and implementation of the policy instruments and the monitoring and evaluation of their effects. Current formal feedback loops (in terms of input from evaluations to other assessments or policy interventions) are highlighted in red; evaluations foreseen in the National R&D&I Policy and their feedback loops are indicated in blue.

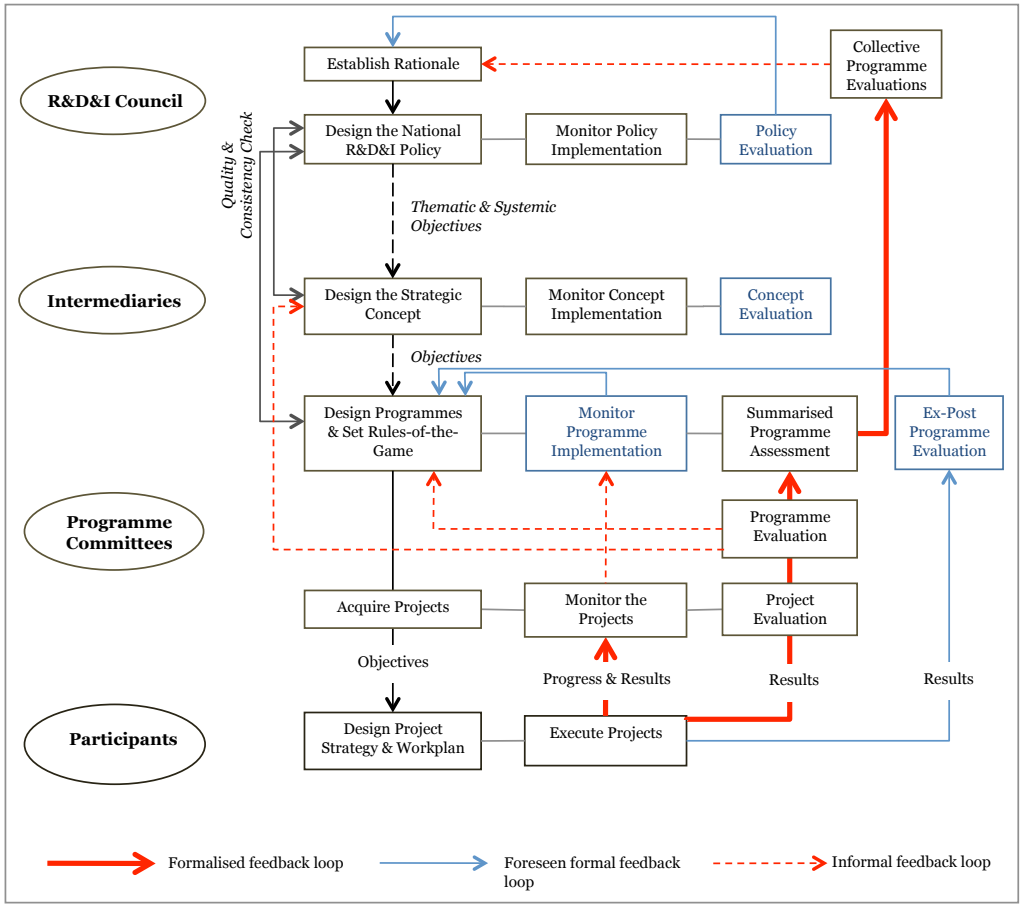
The diagram illustrates the flaws in the current evaluation system that will only partially be corrected once the measures envisaged by the National R&D&I policy 2009 – 2015 are implemented (see Section 3.2.2). We describe them further in the paragraphs below, but can summarise them as follows:

- Evaluations were – and for the moment still are - predominantly monitoring exercises. Only project and programme evaluations were foreseen, with "Collective Programme Evaluations" essentially checking on their trustworthiness. There are currently no ex-post evaluations, and for the future they are planned only at the programme level
- Programme evaluations are dominated by the established "Evaluation Methodology for completed programmes", which focuses exclusively on efficiency and output indicators. For the future ex-post evaluations, the project participants will be requested to input information into the Information System on the use of their outputs
- The indicators defined in the Strategy Concepts to measure achievement of objectives reflect the same "evaluation culture" and are predominantly financial indicators, "minimum activity targets" and "success target rates" in terms of minimum number of projects with R&D outputs

[92] "Convenant Rekenschap met indicatoren op maat", agreed by OCW and NWO on 29 April 2003.

- The same accounts for the indicators defined in the National R&D&I Policy; objectives in terms of impacts are stated with general qualitative indicators
- The credibility of the evaluations is undermined by each level in the structural hierarchy evaluating its own activities
- Last but not least, the evaluation system does not reflect the concept of a policy cycle; in only one concept we see a linkage established to a programme. In all other strategic concepts as well as the National R&D&I Policy there is no mentioning how the achievement of the policy objectives will be related to the achievement of the programme objectives

Figure 30: The Evaluation System in the Czech republic for targeted national R&D support



Timing of the evaluations

Until recently, monitoring exercises were not foreseen at the programme level. The National R&D&I Policy corrected this flaw in the evaluation system and included these evaluations amongst the measures to be implemented. Taking into account that departmental R&D programmes have an average duration of 5 years (and the current TIP programme of the Ministry of Industry even 8 years), feedback mechanisms on the performance of the programmes during their duration are urgently needed, indeed.

We also note the absence in the evaluation system of ex-post evaluations at all levels, seriously limiting the chances offered by evaluations for policy learning. Equally, until now no evaluation at the policy level was foreseen.

Even though monitoring exercises are currently not implemented in a formal manner at the programme level, the overall impression is that such monitoring occurs in an informal manner, by means of the Programme Committees who are responsible for the ongoing monitoring of the projects funded. In most cases employees of the Ministry departments are members of these Committees (exception is the Ministry of Health).

We see a similar pattern of *formal and informal feedback loops* emerging also in relation to programme evaluations: all Ministries indicated that their programme and policy development was based (also) on results of previous programme evaluations – as well as on a more general "past experience with previous programmes".[93] Such input from evaluations was however rarely stated in the description of the rationale of the policy intervention.

Scope and Evaluation Criteria

Based upon the information provided to us by the funding bodies [94], the scope and focus of the monitoring and evaluation exercises related to **projects** have a considerable level of conformity and seem to be overall appropriate.

- In all Ministries and agencies, the project monitoring exercises show an appropriate focus on the technical quality (if relevant), project management and organisation, achievement of milestones, and attainment of output deliverables
- In most cases also the scope of the project evaluations seems to be appropriate, looking into the attainment of the relevant objectives from both a qualitative and quantitative point of view, together with a consideration of the efficiency in use of the financial resources and overall time effectiveness of the project. An exception is the Ministry of Defence that covers the attainment of technical, scientific and socio-economic objectives only from a qualitative point of view.

We do need to mention that this information provided by the administration bodies seems contradicted by the outcomes of our assessment of the evaluations at programme levels (see further below).

In fact, quite different is the situation in relation to the evaluation of **programmes**, where apparently the lack of clear instructions at the national level led to important differences in the coverage of the typical evaluation criteria[95]

- The issue of the relevance of the policy intervention seems covered only in the MEYS and the Ministries of Agriculture, Interior and Culture
- The Ministry of Health indicated that the evaluation delivers only an overall assessment
- The Ministry of Defence states that it does not evaluate the attainment of objectives other than the technical ones

[93] An example is the Ministry of Agriculture, which changed the stakeholder consultation process for its latest KUS programme based upon the results of its previously adopted consultation processes which did not lead to the desired effects of a more enhanced user participation

[94] The Ministry of Industry and the Technology Agency did not provide us with information on this topic

[95] Relevance/utility, efficiency of implementation, effectiveness in reaching objectives (technical/scientific/ socio-economic), overall assessment, recommendations for improvement

Performance Indicators

In relation to indicators, all Ministries stated that in their programme evaluations, they take into account the overall consumption of inputs, the aggregate progress towards project milestones, and the indicators of project outputs. All Ministries but the Ministry of Culture also include indicators of project impacts.

Scrutiny of the recent **programme** descriptions and the objectives/indicators defined revealed that performance indicators are predominantly qualitative, i.e. no *SMART indicators* are established for impacts in the sphere of S&T impacts on research fields as a whole, enhancement of R&D capacities, economic performance and competitiveness, or societal impacts and very rarely we find *baselines,* i.e. a measurement of the value of key variable before the intervention which would make it possible to compare the situation at the outset with the situation later on, when an evaluation is done.

The only exceptions are the indicators related to S&T achievements in terms of project outputs expected - as is mentioned in the programme descriptions, "in line with the Evaluation Methodology established by the R&D&I Council". The Evaluation Methodology for completed programmes requires programme administrators to conduct a "*Summarised Assessment*" of completed programmes. Information and data to be covered in these summarised assessments are

- Basic data on the *characteristics* of the programme such as actual total costs and funding from the national budget
- Data on the *implementation* of the programme such as data on public calls, number of approved and successfully completed projects
- A list of significant and *concrete R&D "results"* – i.e. R&D outputs
- Indications on how these "results" will be used or implemented
- A comparison of the achieved "results" with the stated objectives and with the situation abroad.

These summarised assessments are to be transmitted to the R&D&I Council who subsequently performs a "*Collective Programme Evaluation*" of all programmes completed in a specific year (see further below).

Also in their **Concept** descriptions, ministries typically establish both quantitative and qualitative performance indicators; also in this case the latter is most often of a very general nature. A scrutiny of the latest Concepts revealed that quantitative indicators typically include:

- Financial indicators related to the foreseen overall costs of the programme and the share of the national R&D budget
- "Minimum activity targets" such as a minimum of supported projects (in numbers!) and a minimum of successfully completed projects in order to measure efficiency in implementation
- "Success target rates", i.e. the minimum number of specific R&D outputs as indicators for the attainment of the operational objectives

In some cases, such as the Ministry of Agriculture, programme indicators include also a minimum % of objectives and expected benefits reached. However, Table 14 shows that only rarely SMART quantitative indicators were defined.

Table 14: Objectives and indicators in the Strategic Concepts

		Definition of systemic objectives	Dept. operational objectives	Qualitative performance indicators	Quantitative performance indicators	Setting quantitative targets
Ministry of Agriculture	Concept for applied agricultural R&D	yes, to a substantial extent	yes, to a substantial extent	yes, to a substantial extent	yes, to a substantial extent	yes, to a substantial extent
		7 goals lead to achieving the main goal	well described and specific operational objectives (systems and methods that will be researched)	Numerous	25 of the measures have quantitative measurable indicator	In several cases there was a note on the relative success of achieved measure
Ministry of Health	Concept for health-related applied R&D until 2015	yes, to a substantial extent	yes, to a substantial extent	yes, to a substantial extent	yes, to a substantial extent	no, not at all
		a list of more specific objectives subsequently linked to indicators	Almost each of the priorities also includes detailed focus of research	In most cases qualitative & quantitative indicators	10 "measures" for implementation of the Concept, all of them include an indicator	No specific targets apart from 20% being the maximum share of basic research in a project.
Ministry of Culture	Cross-sectional concept for applied R&D in National and Cultural identity	yes, to a substantial extent	yes, to a substantial extent	yes, to a limited extent	no, not at all	no, not at all
		Specific objectives - in most cases followed up with implementation measures	Detailed description for each priority plus for each thematic priority a llink to the objectives of the programme planned	Very general indicators - basic steps (in chronological order) of implementing the concept via a programme.	none	Nno specific performance indicators and none of them specifically relate to R&D outputs
Ministry of Interior	National Strategy for Security Research in the Czech Republic 2010- 2015	yes, to a limited extent	yes, to a limited extent	yes, to a substantial extent	yes, to a substantial extent	no, not at all
		Some remarks are made on the changes in the ministry of Interior.	Limited - Systems and methodologies could be described in further detail.	Numerous	11 specific "measures" for implementation, all of them include an indicator	The 11 specific "measures" have no specific targets. An example is "Prepare no more than two cross-cutting security research programmes"
Ministry of Defence	Concept for defence-oriented R&D	yes, to a substantial extent	yes, to a substantial extent	yes, to a substantial extent	yes, to a substantial extent	yes, to a limited extent
		Systemic objectives with long descriptions including specific measures	16 "areas of research" indicating specific systems to be developed as well as non-specific priorities such as "anti-missile defence"	All admin efficiency indicators	Most of the 27 "measures" for implementation of the Concept have an indicator	Only in 3 cases there is a specific target

The indicators listed in the **National R&D&I Policy** 2009-2015 document show the same characteristics as those defined in the Concepts at the intermediary level: there are a range of implementation objectives where the established deadline for implementation acts as a measure for efficiency; objectives in terms of impacts are stated with general qualitative indicators. No direct links are established between the policy objectives and their implementation in the departmental strategies and programmes. Interestingly, we do see links established between economic and societal objectives of the policy and research implemented within the broad thematic priority areas.

Authors of the evaluations

In Section 1.4 of this report, we described the “waterfall principle”, which is adopted in common international practice for the implementation of evaluation exercises, i.e. each level of the policy system evaluates the level below them. This practice aims at enhancing the credibility of an evaluation. As such an evaluation system tends to make policy at the highest level an evaluation-free zone, policy evaluation is typically commissioned to external independent experts.

Current practice in the Czech Republic, instead, shows a pattern of each level evaluating its own activities. The only exception is the “Collective Programme Evaluation” implemented by the R&D&I Council. This evaluation only looks into the input/output ratio: core criterion is the average Index SR value of the programmes, i.e. the rate of total point evaluation of all R&D outputs reached in a given programme and the total funding provided from the national budget. Key objective of the evaluation is to provide a view on the efficiency of programme implementation by a specific administration body. The outcome is a table in which the completed programmes are ranked into three groups:

- Above-average programmes, with an SR Index of over 130% of the average SR Index value of all the programmes
- Average programmes, with an SR Index between 70% and 130% of the average SR Index value of all the programmes
- Below-average programmes, with an SR Index of less than 70% of the average SR Index of all the programmes.

At least in theory, these rankings are subsequently taken into account for the approval of new programmes.

3.5.3 Meta-evaluation

The current flaws in the evaluation system in the Czech Republic is illustrated also by the difficulties that we encountered to collect the 10 recent programme evaluations that in our intention, would form the base for a meta-evaluation. Several of the programmes concluded in the last years were part of the National Research Programmes where evaluation was performed by the National Programmes coordinator (the MEYS). For the other programme evaluations, the Ministries referred us to the summarised evaluations delivered to the R&D&I Council – and in some cases even the Collective Evaluations, with the exception of the Ministries of Education, Agriculture and Defence.

The objective of this meta-evaluation, in terms of an "Evaluation of evaluations", was to assess the quality, relevance, effects, and usage of programme evaluations in the Czech Republic. Seeing the difficulties mentioned above, we extended the scope of the exercise to reach a view on the quality of the evaluation practice in general. In our analysis, we are covering the principal typologies of evaluation exercises implemented in the Czech Republic, in terms of their time horizon (monitoring or evaluation) and their focus (policy, groups of programmes, programmes) – see Table 15.

Table 15: List of evaluations included in the analysis

Abbreviation	Title & Author
Monitoring exercises	
Concept MoA - 2009	"Implementation of the Concept of the Ministry of Agriculture", Ministry of Agriculture
NPR I – 2004/05	Report on the implementation of the National Programme for Research I for the years 2004 – 2005", MEYS
Evaluation exercises	
NRDPol – 2009	Review of the results from the National R&D Policy 2004 – 2008, MEYS
NPR I – 2004/09	"Evaluation of the National Programme for Research I – interim report for the years 2004 – 2009", MEYS
Collect. Ev – 2008	Collective Evaluation of the results of R&D programmes concluded in 2007", R&D&I Council
Collect. Ev. – 2009	"Collective Evaluation of the results of R&D&I programmes concluded in 2009", R&D&I Council
MoA– 2010	"Evaluation of the economic and other effects of the programmes funded by the Ministry of Agriculture and justifications for the programme Complex Systems in Sustainable Agriculture – KUS", Ministry of Agriculture
1N - 2008	"Evaluation of the programme Information Infrastructure for Research (1N) by the expert advisory body of the funding provider", MEYS
PA CR–2009	"Final report on the evaluation of the programme Professionalisation of the Army of the Czech Republic", Ministry of Defence

We assessed the quality of the evaluation exercises applying the basic quality standards for evaluations, i.e.

- **Relevant scope**: The appropriate coverage of the effects of an intervention (outputs, outcomes, impacts) and the evaluation questions (relevance, effectiveness, efficiency of implementation, goal attainment, utility, sustainability)
- **Sound data analysis:** The appropriate reliance on a mix of data typologies (quantitative and qualitative), of data sources (own data/data from external sources), and of evaluation techniques (surveys, interviews, case studies etc)
- **Overall assessment:** In our overall assessment, we looked into the clarity of the findings, whether the conclusions were justifiable (i.e. argued on the basis of the findings), whether the evaluation provided any recommendations for policy makers, and whether the evaluation was useful as a contribution to policy learning

The outcome of our assessment is illustrated in Table 16

Table 16: Outcomes of the meta-evaluation

	NPR I - 2004/05	Concept MoA	NRDPol I - 2009	NPR I - 2004/09	Collect. Ev - 2009	Collect. Ev - 2008	MoA - 2010	1N - 2008	PA CR - 2009
Coverage of the effects									
Outputs	NO	NO	XX	XX	XX	XX	XX	XX	XX
Short-term Outcomes	NO	XX	XX	NO	NO	NO	XX	XX	X
(Expected) Intermediate Outcomes	NO	X	X	NO	NO	NO	X	XX	NO
(Expected) Long-term Outcomes	NO	NO	X	NO	NO	NO	NO	NO	NO
Evaluation questions covered									
Relevance	X	NO	NO	X	X	X	XX	XX	X
Efficiency of implementation	XX	XX	X	XX	XX	XX	XX	X	X
Effectiveness	NO	XX	XX	X	NO	NO	XX	XX	XX
Utility/sustainability	NO	NO	NO	NO	NO	NO	NO	NO	NO
Categories of data									
Quantitative	XX	XX	XX	XX	XX	XX	XX	XX	NO
Qualitative	X	XX	XX	X	NO	NO	XX	XX	XX
Typologies of quantitative data									
Own data / IS data	XX	XX	XX	XX	XX	XX	XX	XX	NO
Data from external sources	NO	NO	XX	NO	NO	NO	NO	XX	NO
Evaluation techniques									
Surveys/interviews	NO	XX	NO	NO	NO	NO	XX	X	XX
Other techniques	NO	NO	NO	NO	NO	NO	NO	NO	NO
Overall Assessment									
Clarity of findings	XX	XX	XX	X	XX	XX	XX	XX	X
Justified conclusions	X	X	X	NO	NO	NO	X	XX	NO
Recommendations	X	NO	NO	NO	XX	NO	X	XX	NO
Contribution to policy learning	NO	NO	NO	NO	NO	NO	NO	XX	NO

Our observations are:

- There is an over-accentuation on the measurement of outputs, with only a few evaluations that also consider the short-term outcomes on the beneficiaries. Only in one evaluation covers also impacts and provides evidence on intermediate outcomes that are to some extent attributable to the intervention (the 1N evaluation); in the few other evaluations making such an attempt, the intermediate outcomes are "expected" ones and not adequately measured
- There is an over-emphasis on proving efficiency in the implementation of the programme or policy. Effectiveness in terms of goal attainment is less frequent. Only a few evaluations report the relevance of the intervention at a reasonably detailed level, none of the evaluation looks into the utility/sustainability of the effects
- In most cases, the soundness of the data analysis is questionable: data used are predominantly quantitative ones, in most cases based on the Information System (i.e. R&D outputs). Only in 2 evaluations also data from external sources were used and only 2 evaluations used surveys and interviews among the beneficiaries to collect quantitative data
- Our overall assessment is that even though the evaluation findings were clear, in most cases the conclusions drawn on those findings were not justifiable. Recommendations to policy makers were rare, and even more seldom was the value of the evaluation for policy learning

An overall conclusion of these observations is that the current evaluation practice in the Czech Republic is heavily dominated by the use of the Information System and its focus on output data. It must be mentioned that the evaluators hereby rigorously implemented the current Evaluation Methodology for Completed Programmes, established by the R&D&I Council (see Section 3.2.2).

We note a prevailing focus on efficiency, with little to no effort for an effective measurement of the extent at which the expected effects on S&T fields, industry sectors, or society as a whole were actually reached – or are in the progress of being reached.

An additional note regards the **quality of the input variables** related to the stakeholders involved and the regional coverage of the interventions. In all evaluations, data on stakeholder involvement were reported relating exclusively to the project coordinator, and data on regional coverage were merely based on the geographical location of the organisation coordinating the project. The categorisation of the project coordinator in terms of stakeholder category was on the basis of the legal identity.

The impression is that the only stakeholder data that the administration bodies have at their disposal are the ones related to the project coordinator. This would imply that the administration bodies do not even have the possibility to implement slightly more sophisticated analyses related to outcomes and impacts, such as for example the level of science-industry collaborations achieved – within projects and programmes as a whole, nor can any view been reached on the level of cooperation that was set up thanks to the projects between organisations located in different regions.

From the table above results that the evaluation of the 1N – Information Infrastructure for Research Programme was the evaluation that was **most conform to the *minimal* international quality standards**. We briefly describe it below.

The report on the "Evaluation of the programme Information Infrastructure for Research (1N) by the expert advisory body of the funding provider" is sub-divided into three sections. In the first section, basic information on the programme is provided such as the duration and the objectives of the programme overall as well as the sub-programmes. In the second section, basic data on the programme implementation are reported. These include the success rates of proposals and the final number of projects financed, the composition of the programme committee author of the evaluation, data on projects and participants and data on the financing of the programme and projects. Similar to all other evaluations, the quality of the composition analysis of the stakeholders involved is limited, due to the data limitations described above.

The third section covers the evaluation itself. In a first step the achievement of the objectives is covered at the level of the programme and the sub-programmes. The outputs are described qualitatively but also quantitative data are provided. Specific attention is given to the use of the R&D outputs and outcomes of the programmes in terms of networking and the importance for society are described.

Subsequently, the report enters into more detail on the outputs of the projects, which are described in relation to the sub-programme objectives. Quantitative evidence is provided in relation to the use of the outputs with outcomes in terms of citations, the use of information tools and the increase of international publications that can be directly attributed to the project activities, as well as a qualitative matching of outputs to programme objectives. The report also identifies success factors for the projects (the capabilities of the coordinators) and the programme as a whole (the involvement of users). The comparison with the situation abroad, requested by the Evaluation Methodology, relates on outcomes and results of a similar programme.

Finally, the report recommends policy-makers to continue support for this type of programmes and indicates as possible improvements to define more favourable conditions for the staffing needed for project implementation, an improved alignment with user needs, and a broader definition of the expected results for the evaluation of the project implementation.

It is also interesting to briefly describe one of the Collective Evaluation reports, as an example of an evaluation that is **least conform** to what is commonly understood under the term in international practice.

The **"**Collective Evaluation of the results of R&D&I programmes concluded in 2009" report starts with a description of the legal background of the exercise to the provide an overview of the assessed programmes in terms of their titles, start and end dates and types of projects funded. The third section gives an overview of the time frame and various steps in the evaluation, as well as the definition of the various types of R&D results foreseen in the Evaluation Methodology.

The fourth Section describes the actual results of the evaluation, after a description of how the overall budget indications provided by the Ministries are different from those stored in the Information System.

The evaluation of the programmes in terms of "effectiveness of the support delivered" is based on the SR Index, i.e. essentially a ratio input/output calculation based on the point system attached to each output. These SR Indexes of the various programmes are then aggregated and the *"Average SR Index"* is defined: in this case, 1 million CzK led to 19.37 points of R&D results (as a comparison, the publication of a paper in a prestigious international scientific journal is worth 500 points).

The evaluator then compares the various programmes and indicates the "effectiveness" of the programme based on the number of points reached with 1 million CzK, compared to the average. Also the types of outputs are considered, though: the programme of the Ministry of Agriculture was the most "effective" one but the outcomes were however considered negative because "the majority of the results were publications rather than applications". The latter stands for patents, prototypes etc.

In the next Section the evaluator briefly reports on the evaluations performed by the programme administrators and comments on the correctness of the administrators' statements in terms of the success of their programme. The base for discussion is the number of projects "without results", the share of publications versus application results, etc.

The evaluator then draws the conclusions on the "effectiveness" of the various programmes and recommends a series of measures to be undertaken by programme providers (e.g. to use the legally foreseen sanctions to close projects that don't perform) and by the R&D&I Council (the approval of programmes on condition that they have clearly defined and concrete goals; request for an ongoing monitoring of the programmes every 2 years; request every year of a list of projects that did not produced "results" in the previous 2 years and inform the funding provider and eventually also the government.

3.5.4 Key Findings in the Light of International Experience

The current evaluation system in the Czech Republic shows serious flaws – both from the perspective of the quality of the evaluations and its role in the policy cycle. These flaws will only partially be corrected once the measures envisaged by the National R&D&I policy 2009 – 2015 are implemented.

First, the procedure adopted for the **implementation** of the evaluation is faulted, with each level in the structural hierarchy evaluating its own activities, which ultimately undermines the credibility of the evaluations.

Secondly, the approach established by the Evaluation Methodology for completed programmes", which focuses exclusively on efficiency and R&D output indicators, heavily dominates the **evaluation culture.**

- Programme evaluations are 'geared' towards the needs of the Collective programme Evaluations. Scrutiny of the recent programme descriptions and the objectives/indicators defined revealed that performance indicators allowing for the measurement of results and impacts are predominantly qualitative, i.e. no *SMART indicators* are established for impacts in the sphere of S&T impacts on research fields as a whole, enhancement of R&D capacities, economic performance and competitiveness, or societal impacts. Very rarely we find *baselines,* i.e. a measurement of the value of key variable before the intervention, which would make it possible to compare the situation at the outset with the situation later on, when an evaluation is done. The only exceptions are the indicators related to S&T achievements in terms of project outputs expected - as is mentioned in the programme descriptions, "in line with the Evaluation Methodology established by the R&D&I Council". Premises for the future are that this approach will not change: the current intentions are to base programme ex-post evaluations on information provided by the project participants on the use of their outputs
- The indicators defined in the Strategy Concepts to measure achievement of objectives are predominantly financial indicators, "minimum activity targets" and "success target rates" in terms of minimum number of projects with R&D outputs. Ministries typically do establish both quantitative and qualitative performance indicators, but the former are rarely SMART and the latter are most often of a very general nature
- The indicators listed in the National R&D&I Policy 2009-2015 document show the same characteristics as those defined in the Concepts at the intermediary level: there are a range of implementation objectives where the established deadline for implementation acts as a measure for efficiency; objectives in terms of impacts are stated with general qualitative indicators.

Most importantly, the concept of the evaluation system as being intrinsically part of a **policy cycle** is not perceived. On the one hand, evaluations were – and for the moment still are - predominantly monitoring exercises. Only project and programme evaluations were foreseen, with "Collective Programme Evaluations" essentially checking on their trustworthiness. There are currently no ex-post evaluations, and for the future, they are foreseen only at the programme level. In other words, the role of evaluation as an important tool for policy learning is not conceived.

On the other hand, we found only one Strategic Concept that explicitly established a link between its policy objectives and the attainment of the objectives at the level of the programme that implemented the policy. Even in the National R&D&I Policy we see no direct links established between the policy objectives and their implementation in the departmental strategies and programmes. Essentially, for the purpose of evaluation, Strategic Concepts as well as the National R&D&I Policy are perceived as alone standing interventions.

The results of our meta-evaluation, focusing on 7 recent evaluations covering all evaluation typologies currently implemented in the Czech Republic, confirmed these findings. We noted a prevailing focus on efficiency, with little to no effort for an effective measurement of the extent at which the expected effects on S&T fields, industry sectors, or society as a whole were actually reached – or are in the progress of being reached.

- There was an over-accentuation on the measurement of outputs, with only a few evaluations that also consider the short-term outcomes on the beneficiaries. Only one evaluation covered also impacts and provided evidence on intermediate outcomes that were to some extent attributable to the intervention; in the few other evaluations that made such an attempt, the intermediate outcomes were "expected" ones and not adequately measured
- There was an over-emphasis on proving efficiency in the implementation of the programme or policy. Effectiveness in terms of goal attainment was less frequent. Only a few evaluations reported the relevance of the intervention at a reasonably detailed level, none of the evaluation looked into the utility/sustainability of the effects
- In most cases, the soundness of the data analysis was questionable: data used were predominantly quantitative ones, in most cases based on the Information System (i.e. R&D outputs). Only in 2 evaluations also data from external sources were used and only 2 evaluations used surveys and interviews among the beneficiaries to collect quantitative data
- Even though the evaluation findings were clear, in most cases the conclusions drawn on those findings were not justifiable. Recommendations to policy makers were rare, and even more seldom was the value of the evaluation for policy learning

An additional note regards the **quality of the input variables** related to the stakeholders involved and the regional coverage of the interventions. In all evaluations, data on stakeholder involvement were reported relating exclusively to the project coordinator, and data on regional coverage were merely based on the geographical location of the organisation coordinating the project. The categorisation of the project coordinator in terms of stakeholder category was on the basis of the legal identity.

The impression is that the only stakeholder data that the administration bodies have at their disposal are the ones related to the project coordinator. This would imply that the administration bodies do not even have the possibility to implement slightly more sophisticated analyses related to outcomes and impacts, such as for example the level of science-industry collaborations achieved – within projects and programmes as a whole, nor can any view been reached on the level of cooperation that was set up thanks to the projects between organisations located in different regions.

3.6 Conclusions on the Processes for R&D Governance

In recent years, as we have taken an increasingly systemic view of research and innovation, there has been growing interest in developing and studying better governance systems. Complexity means that it is hard to make a scientific link between practices and performance, but there is a growing body of 'principles of good practice' and experience of 'what seems to work' that can inform the design and practice of research and innovation governance. These are:

- Vertical steering – the appropriate division of policy design and execution among ministries, agencies. Programme managers and project performers to achieve policy goals
- Coordination – not only vertically but also horizontally among different ministries' sectoral responsibilities and with other important stakeholders
- The principle of distributed strategic intelligence – i.e. governance is more effective if it is carried out in concert by well-informed people and organisations at different levels. This is the opposite of the 'command and control' systems
- The extension of evaluative and other techniques into programme design, with design routines becoming more stringent and codified with clearer justifications of intervention, growing use of a single model for designing, monitoring, setting performance indicators and evaluation
- The need to focus programme design and therefore evaluation on goals and impacts, rather than short-term outputs
- The need to separate evaluation from performance, so that people are not required to evaluate themselves

In the Czech Republic, policy design and implementation processes are since 2002 governed by a centralised and formalised model; the 2002 Act on R&D Support set the legal framework for this approach. We note a growing trend among policy makers in the Czech Republic to change the initially "soft" approach, which merely provided structures for planning and evaluating interventions, into a "hard" one, i.e. aiming to connect the results of policy design and implementation processes back to budget allocation, with the idea of rewarding good performance and punishing bad. The trend is to considerably strengthen the top-down steering of the national-funded research activities, accompanied by an ongoing and increasing control of the performance of the responsible administration bodies.

At the high level of policy making in the Czech Republic, i.e. the level of the R&D&I Council, the attention for **consensus building among stakeholders** was truly limited in the 2008/2009 policy making exercises. Discussions most often took the form of pure negotiations at institutional level; the pattern was one of an exclusively indirect involvement of the stakeholder communities - normally through their representatives in the R&D&I Council itself. There was no direct involvement of the broad stakeholder communities in 2008/2009 and open consultations involving the individual actors in the research communities did not take place.

In general, we note little willingness - and even reluctance sometimes - for an open communication with broader stakeholder communities and the general public on discussions within the R&D&I Council. We also note an apparently difficult collaboration between the Expert Committees that act as advisory bodies to the Council and the Council itself; there are clear signs of ongoing dissatisfaction and frustration - on both sides.

International experience also shows that fundamental for the effectiveness of a policy making process is a good linkage between the different levels in the governance structure. The dialogue between the two levels in governance on the strategic plans of the implementing bodies is therefore an important component of the policy making

cycle. Such "**vertical" dialogue** was limited in the policy-making processes implemented in 2008/2009. Ministries were involved in the discussions only in the final decision-making process; ongoing involvement was limited to the 2 major Ministries, i.e. the Ministry of Education and the Ministry of Industry and Trade. No ministry was represented in the R&D&I Council, which was – as mentioned above - the main seat where discussions took place on the 2008 Reform and the thematic priorities.

Nevertheless, the policy making process implemented in the years 2008/2009 resulted being effective in terms of the establishment of a **consistency in policy priorities** between the strategies defined at the various levels of R&D governance (the National R&D&I Policy and the departmental Strategic Concepts). Consistency in the implementation of priorities is guaranteed also through the explicit linkage of programme objectives with the criteria applied in the proposal appraisals. The overall result of our assessment was that the procedures established by law reflect international common practice in their attention to the general principles of rigour, transparency, objectivity and fairness, and efficiency.

At the level of the intermediaries, **stakeholders are intensively involved** in both the policy-making and programme management processes. For the development of the Concepts and programmes, stakeholder involvement was indirect through the ministerial Advisory Bodies, but in most cases also direct. Consultation with stakeholder communities governed by means of a direct involvement of key staff members of the ministerial departments provide an important opportunity for the creation or enforcement of distributed strategic intelligence**,** i.e. the transfer of sectoral knowledge from the stakeholders to the institutional programme managers, which is a crucial factor for the overall efficiency and effectiveness of R&D support administration. The distribution of this intelligence is even more enforced in the procedures implemented by the Ministries for their programme management, creating ad-hoc Programme Committees for each programme that involve stakeholder experts as well as Ministry employees.

Finally, several ministries indicated also **inter-departmental collaboration** for the development of their concepts or programmes. In general, we note an increasing level of such collaborations and not only in the four ministries that were expected to create such cross-departmental links in the new R&D&I governance structure. Whereas internationally, the use of stakeholders as source of strategic intelligence is common good practice, it is unusual to see this level of co-operation among the different intermediaries.

The most important flaw in the Czech R&D&I system came persistently on the foreground when we considered to what extent policy making in the Czech republic was **evidence-based.** We noted crucial gaps in the set of strategic information that the policy makers had at their disposal in the years 2008/2009. Analyses that looked in-depth into the *systemic causes* of these failures were rare, and studies analysing the factors determining the success or failure of previous *policy interventions* in terms of impact achievement – thus allowing for policy learning, were close to non-existing. Equally, most ministries commissioned studies in support of their policy making, but references to past programmes were more related to vague "past programme experiences" than specific evaluation studies.

Evaluation is an ongoing challenge in the Czech Republic. Essentially, the Evaluation Methodology for Completed Programmes is currently the only framework for programme evaluations and the intermediaries are obliged to implement it. The methodology adopted for this 'collective' evaluation is purely quantitative, based on a calculation of an input/output ratio. Its declared key objective is to provide the R&D&I Council with a view on the efficiency of programme implementation by the intermediary bodies.

The National R&D&I Policy 2009 – 2015 introduced substantial changes in the evaluation system in terms of an improved timing of evaluations and use of their

results for policy making. Nevertheless, the current flaws in the evaluation system in the Czech Republic from the perspective of the quality of the evaluations and the role of evaluation in the policy cycle will only partially be corrected once the measures envisaged by the National R&D&I policy 2009 – 2015 are implemented.

The procedure adopted for the **implementation** of the evaluation is faulted, with each level in the structural hierarchy evaluating its own activities, which ultimately undermines the credibility of the evaluations. Secondly, the approach established by the "Evaluation Methodology for Completed Programmes", which focuses exclusively on efficiency and R&D output indicators, heavily dominates the **evaluation culture.**

Most important, the concept of the evaluation system as being intrinsically part of a **policy cycle** is not perceived. On the one hand, evaluations were – and for the moment still are - predominantly monitoring exercises. On the other hand, we found only one Strategic Concept that explicitly established a link between its policy objectives and the attainment of the objectives at the level of the programme that implemented the policy.

Our analysis therefore suggests that there is a disconnect between the Strategic Concept and Programme levels under the present system, which leads to some priorities not being reflected in the ministry programmes. Evaluation - in the sense of evidence-based analysis to understand the degree to which public interventions have relevant goals and actually reach them - is little practised in the Czech R&D&I system. Today, based on the sample we have been able to identify, most 'evaluation' in the Czech R&D&I system is in fact monitoring of outputs, whose importance for achieving objectives is not well understood. It produces little that is useful for policy learning or improving implementation.

4. Conclusions and Recommendations

In recent years, the Czech Republic made considerable efforts in improving the coordination of its governance system for the national funding for Research and Development. The Reform approved in 2008 and the subsequent National Research, Development and Innovation (further R&D&I) Policy document (2009) for the years 2009 – 2015 and the necessary legislative interventions set the fundaments for a radical change in the system. However, the effectiveness of these efforts is constrained by a number of flaws in the current design and practice of research and innovation governance in the Czech R&D&I system.

The increasing trend of adopting a strong top-down steering of policy implementation, accompanied by the creation of an ever growing number of control mechanisms, has led to a generalised limitation of the role of evaluation in the policy cycle, reduced it to being uniquely a tool for accountability. This causes gaps in the strategic intelligence that policy makers had – and still have - at their disposal, at all levels of the hierarchical system. It also implies that policies are currently defined on *impressions* of the factors determining the effectiveness – or lack of effectiveness - of previous policy interventions rather than on hard evidence and facts.

Closely linked to the strong top-down steering approach is the currently limited consideration - at the high level of the policymaking hierarchy - of the importance of consensus building and an open dialogue with policy implementing bodies, stakeholders and citizens, creating a common vision on innovation and the innovation strategy to adopt. Such common vision is the most sustainable and effective fundament for the attainment of a consistent and coherent policy implementation and thus ultimately the achievement of policy objectives. The difficult communication between high-level policy makers and the other actors in the R&D&I system currently prevents the constructive creation of a common knowledge on innovation needs and challenges. It ultimately inhibits high-level policy makers from adequately taking up their role as change agents and acknowledged referees whenever goals of different stakeholder groups conflict.

The current breadth of the tasks of the R&D&I Council, and in particular its prominent role in the definition of the rules for budget allocations and decision-making on national R&D&I budgets, inevitably implies that discussions in the Council are predominantly centred around the financial aspect of national R&D support so that members of the Council tend to act as representatives of their stakeholder group rather than as disinterested experts. The predominant focus on budgets prevents the R&D&I Council from taking up the key role of an innovation council, i.e. to act as an open arena for the definition and coordination of longer-term strategies for research and innovation, to the benefit of the country's economic growth and social welfare.

The current structure of the R&D&I system as well as the composition of the R&D&I Council, the categorisation of the research stakeholders, and even the classification of R&D outputs depends on the idea that 'basic' versus 'applied' research can coherently be separated. This contrasts with the current understanding of the more complex reality of knowledge production and use for innovation. An R&D&I system that is built along this old stereotypical model 'basic versus 'applied' cannot but encourage disconnectedness and gaps in the system of research and innovation funding that needs to be tackled at the minimum through good coordination and the use of modern R&D funding instruments.

We therefore **recommend** policy makers in the Czech Republic

- *To establish an R&D&I Council that focuses primarily on performing the key function of a research and innovation council, i.e. to act as a platform for consensus building on longer-term strategies*. This implies that it should no longer have the responsibility for the budget definition or for the implementation of monitoring and evaluation practices, that it should include representatives of ministries in its structures, that it should set up ongoing communication systems with R&D users and end-users and ensure the wide (public) availability of statistical, analytical, and evaluation studies in order to allow for an informed and open dialogue-based policy making
- *To ensure the development of a common evaluation methodology* that looks beyond R&D outputs and focuses on the outcomes and impacts of projects, programmes, departmental policies and national policies – in line with the common international practice. The purpose of these evaluations should be to monitor the progress towards objectives, to assess the achievements of the objectives, and to act as tools for policy learning. For the sake of the credibility of these evaluations, the 'waterfall' principle should be implemented, whereby no level in the hierarchical system evaluates its own policy intervention. Adequate knowledge of evaluation principles and standards among the administration bodies needs to be ensured in order to specify policy-useful forms of evaluation and to enable a correct interpretation of evaluation results – no matter whether evaluations are conducted internally or by external experts – as well as a correct validation of the professional level of eventually outsourced evaluation exercises
- *To urgently launch ex-post impact evaluation exercises of departmental and national policies* in the light of the upcoming discussions for the development of the National R&D&I Policy after 2015, in order to ensure informed policy-making, based on evidence related to the success factors and barriers that determined the achievement – or lack of achievement – of the policy objectives
- *To move beyond the two-pillar model for the funding of R&D&I* and define the activities, scope and mode of funding in the Science Foundation and the Technology Agency along a more adequate model of research, taking into account in particular the growing role in modern science and research of fundamental application-oriented research, the importance of creating platforms for the implementation of interdisciplinary research, and the value of bottom-up research funding – also in the context of applied research.
- Last but not least, we must warn against evaluation practice becoming overly mechanistic. Experience abroad is that mechanistic models provide poor policy guidance, for example by implying that programmes that are important but poorly implemented should be closed rather than be implemented better. The main conclusion to draw from international practice in relation to the use of indicators and performance contracts as a way to steer research performers and agencies is that these appear generally to be tied into a bigger *process of dialogue-based 'soft' steering*. As with institutional funding, a mechanistic link from indicator values to funding and other decisions is not advisable

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