

---

# **Second Interim Report**

**April 6, 2011**



**evropský  
sociální  
fond v ČR**



**EVROPSKÁ UNIE**



**MINISTERSTVO ŠKOLSTVÍ,  
MLÁDEŽE A TĚLOVÝCHOVY**



**OP Vzdělávání  
pro konkurenceschopnost**

**INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ**



## Summary of Conclusions and Recommendations

At this interim stage of the Audit, it is possible to draw some conclusions from the analysis to date and make an initial set of **recommendations**. However, since the national research and innovation system is just that – namely, a system – these must remain preliminary in character until all the different elements of the Audit are complete and can be brought together. Reflecting the systemic nature of the problem, we have structured the discussion here under three headings, rather the larger number of categories suggest

- Research in the innovation system
- Research performance and management
- Governance

### Research in the Innovation System

Modern research on the relationship between research and innovation emphasises that innovation happens through interactions among firms and many other actors. It is a complex social process, not a simple linear flow from research to the market. National competitiveness and innovation performance therefore depend upon the quality and intelligence of the institutions involved in the company sector, the research and higher education system and in government. The policymaker's key roles are to set broad national priorities and to look for and remedy 'bottlenecks' in this complex system.

The business sector is especially important in a research and innovation system because it is where knowledge and other resources are transformed into money and jobs, driving economic development. The level of R&D funding and the ratio of R&D done by business to that done in other sectors (Higher Education, Government Institutes such as the Academy of Science) are at once drivers and indicators of that development.

The amount of R&D done fell significantly after the end of Communism but for the last fifteen years overall R&D investment in all sectors has grown despite the ups and downs of the economy more generally. The proportion of GDP invested in R&D should rise further, with increased investment by both industry and the state in order to support a successful and dynamic economy. The old European 'Barcelona Goal'<sup>1</sup> of spending 3% of GDP on R&D is not necessarily the right objective for every country (the 'right' number depends on, among other things, the nationally-specific structure of industry) but it is directionally correct and the intended ratio of effort between the state (1% of GDP) and business (2%) is about the right one for industrial success.

Industry does about 60% of the Czech Republic's R&D, only a little less than in the most R&D-intensive economies. Small firms, however, do a surprising amount of total business R&D. The next stage of development should involve more R&D in large firms. Policy should encourage not only big Czech-owned companies but also the multinationals to deepen their R&D in the Republic. Industry funding from abroad is already growing. **Increased efforts should be devoted to funding instruments and other measures that encourage business R&D, especially in larger companies and multinationals.**

It is important for a research system to maintain some degree of research capability over a wide range of disciplines, partly because knowledge has an intrinsic or cultural

---

<sup>1</sup> Originally intended as a goal for 2010, it has had its deadline extended to 2020 in *Europe 2020*

value, partly because this makes it hard for the foreigners to fool you and partly so that, when new fields and opportunities evolve, the country has the start-up capability needed to enable growth. Because state research produces not only knowledge but – especially – human resources, it is also important to have a degree of consistency between the fields in which the state focuses its research and the current and future structure of industry. Czech industry R&D focuses on manufacturing and engineering (especially vehicles production), as does the pattern of research in the Higher Education Institutions (HEIs) and Government (especially the Academy). But in international comparison there is limited state effort on life sciences and other areas such as Information Technology. **While manufacturing and engineering research will continue to be needed in order to support existing industry, the state also needs to put additional resources into other areas that will support the newer and faster-growing branches.**

The allocation of state research funds among Government, HEIs and business is hotly debated in the Czech Republic. In fact, the current division is within the normal range seen in other European countries. The Academy was drastically pruned back after the change of economic system. Since then it has received a fairly stable amount of research resources while the growth in research funding has taken place in the course of transforming some of the HEIs from teaching to research universities. This has enabled increasing **cooperation between Academy institutes and the universities** – not only in research but also in education. This collaboration **should continue to grow, in order to make best national use of resources by exploiting the mutual strengths of the two systems.**

### **Research Performance and Management**

Bibliometric evidence shows that the quality of Czech research is improving towards international levels. Some fields and some institutions are of course closer to the world level than others. While the most visible of these, such as Charles University and the Academy's Institute of Physics, are within the traditional concentration of research in Prague, there are also important points of growth and quality in the regions. **National research strategy and governance will need to take more explicit account of this regional dimension.**

As in other countries, Czech research is becoming more internationalised. A growing proportion of publications involve international co-authorship and the quality of these international co-publications tends to be higher than national co-authorships or single-authored papers. While Czech researchers often spend periods of their careers abroad, the proportion of foreign researchers in the Czech Republic is low. **The legal requirement for university teaching to be done only in the Czech language** is probably one of the reasons for this. **It should be reviewed in the light of the needs of a modern HEI system.**

Our work with peer review panels to assess quality and management among the stronger Czech research groups confirmed that there are indeed a number that perform at international levels. A key constraint on performance is fragmentation. In many cases, the groups are too small and are over-dependent on a single senior figure for leadership and intellectual direction. Especially in the light of the growing importance of critical mass and quality as the European Research Area develops, **it is urgent to strengthen groups through Centre of Excellence, Competence Centre and Graduate School funding – increasing inter-institutional cooperation (or even transfers) where necessary. Universities and institutes should make efforts (for example through coaching and increased use of visiting panels) to raise research management skills.**

The Czech system IPR support is of international quality, in part as a result of recent investments and programmes. However, so far both in industry and in the research sector, there is low awareness of the importance of IPR and the opportunities it provides. **An intervention should be launched to stimulate IPR awareness**

**and help both companies and public sector organisations embed IPR in their strategies and operations.**

## **Governance**

The complexity of research and innovation systems defeats central planning. Fortunately, the intelligence distributed among the institutions involved makes it possible for policymakers to work in a dialogue between bottom-up and top-down policy design.

All countries experience difficulties in governing the role of the state in the national innovation system. The most effective governance appears to be the Finnish one, where the **Research and Innovation Council** chaired by the Prime Minister sets broad policy directions. Key to its success is that it serves as an **arena** for discussion and relies heavily on inputs from national ministries and agencies as well as leaving them to work out how to implement policy. It has a minimal secretariat, relies heavily on strategic intelligence gathered by others in the national system and avoids micro-management of implementation.

One would expect that having a Norwegian-style single research and innovation agency would be an alternative way to coordinate policy. In practice, however, the agency lacks the authority to integrate policies decided in the ministries and there is no high-level council that can do this. The French model, where a part of the science ministry coordinates the research budgets of all the ministries, similarly fails adequately to overcome the fragmentation of policy among competing ministries.

Czech governance appears to be in transition from a traditional model where all ministries have responsibility for research to one where potentially none of them has, centralising strategy and authority in the R&D&I Council. Movement towards this model seems to be driven by extremely low levels of trust and the desire to avoid policy capture. In the endgame, that Council would steer the Science Foundation and Technology Agency without involving the ministries. This would have the advantage of strong policy coordination but would come at the cost of disconnecting research and innovation policy from all the sectoral and stakeholder intelligence held by the ministries and from the other policies with which research and innovation policy should be consistent. It would also place an impossible burden of analysis and other work on the Council – especially in the transitional period when the Technology Agency is being constructed.

There is no perfect governance structure. Other countries increasingly aim to coordinate the intelligence that is distributed across the research and innovation system to implement holistic, balanced policies. The Czech Republic is moving in the opposite direction: centralising and depersonalising decisions that others take decentrally and in trust-based partnerships with stakeholders. We are concerned that – with the very best of intentions – the R&D&I Council is over-centralising Czech research and innovation policymaking. This places a heavy burden of work on a small number of people who have little time to devote to it. Naturally, therefore, discussions in the Council tend to focus on money and the members start to become representatives of their own organisations. And the policymaking process suffers a severe loss of information because of its distance from the agencies and ministries.

In policy, the huge opportunity to invest in the research system (especially in infrastructure) provided by the European Structural Funds has been treated somewhat separately from national research and innovation policy. Other small countries have expanded their regional college and university systems in recent years and then had to confront the fact that it is unaffordable for all of the new institutions to be research universities. Governance mechanisms are needed, which better coordinate among research and innovation policies at regional and national levels.

**We recommend policy makers in the Czech Republic to establish an R&D&I governance body that focuses on acting as a platform for**

**consensus building on longer-term strategies. Such body should involve all institutional, research and industry stakeholder categories and make full use of the distributed intelligence in the R&D&I system. The tasks of this body should be limited to the macro-management of R&D&I, i.e. co-ordinate and build consensus on overall strategies. This can be achieved through decentralisation with dialogue-based soft steering and hard monitoring.** In other words, the implementation of the overall strategies and fundamental principles – also in relation to the national R&D&I funding allocation – should be left to other state bodies.

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 some degree to the **‘two pillar’ structure** used in Finland and the Nordic area.<sup>2</sup> It follows practice in many countries by having a research council (equivalent to the Science Foundation), where funding decisions are effectively put into the hands of the beneficiary research community and an innovation agency (equivalent to the Technology Agency) 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. Internationally, many research funders are trying to cope with the limitations of a ‘two pillar’ approach and move beyond these rigidities.

*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.*

The Technology Agency seems not to have a clearly defined positioning in R&D&I Governance yet. It currently has a double role, acting as a *multi-principal* executive agency for the seven ministries that still have research budget lines and acting as a technology/innovation agency for the R&D&I Council. 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 current situation of the Agency combined with what we know of similar agencies abroad suggests that its activities will evolve over time so it needs a flexible legal basis as well as its own internal analytic capabilities. Where programmes will tackle particular groups of stakeholders, such as branches of industry, these should be involved in a Nordic-style process of design and governance involving stakeholders. More abstract studies, such as foresight exercises, can be useful but are not adequate substitutes for the ‘on the ground’ knowledge of stakeholders. 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. Programmes should have a fixed term (what that is depends upon the**

---

<sup>2</sup> Gustav Björkstrand, *NORIA Vitbok om nordisk forskning och innovation*, TemaNord 2004:502, Copenhagen: NMR, 2004

**nature of the programme) and a plan for both formative evaluation and summative evaluation of outcomes and impacts as well as outputs.**

A significant problem in the governance and management of the Czech state's role in the innovation system is the absence of an evaluation culture directed towards the policy cycle. The policy cycle is the process of identifying societal problems and opportunities, developing and implementing measure to address them. It is of key importance to obtain feedback about whether these interventions are effective in achieving their objectives otherwise we do not know whether the state is doing good or harm. Research and innovation programme evaluation in the Czech Republic focuses on the direct *outputs* of the programmes. As a result, there is no evaluation of whether programmes do what they are intended to do. The state does not fund research and innovation programmes in order to get outputs like publications or patents; it does so in order to achieve wider societal benefits. Unless the focus of evaluation is shifted away from things that are easy to count but which do not matter much and towards understanding whether programmes correctly identify and solve societal problems, we will not know whether Czech research and innovation programmes are effective. Public bodies involved with R&D&I funding should therefore modernise their evaluation practices, no longer focusing exclusively on outputs but evaluating interventions' fit with needs and the degree to which they reach their objectives, which ultimately involve societal goals rather than technical outputs.

**A common evaluation methodology should be created 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 credibility, a '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 any outsourced evaluation exercises.

**The Republic should 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.**

The use of a 'one size fits all' Evaluation Methodology (EM) for evaluating institutional performance and allocating institutional funding based on counting recent outputs is similarly problematic. The motives behind the EM are good: a desire for transparency; sending a clear signal that outputs and quality matter; and linking evaluation to policymaking. The EM has technical weaknesses and can be incrementally improved over time. However, its fundamental problems include: reducing complex acts of research and innovation to over-simple indicators of performance; failing to differentiate among classes of institution with different purposes; inducing perverse 'gaming' behaviour; alienating a significant fraction of the research community and encouraging institutions to lock into trajectories that have been successful in the past but may not be relevant in the future. **The EM needs to be replaced by an approach that combines indicators of past performance with the ability to invest in the future. The prospective component needs to have the form of a performance contract so that development and capacity building are not only made possible but also get punished or rewarded when the contracts are periodically reviewed.**





# Table of Contents

1. Introduction	1
2. The R&D&I Landscape in the Czech Republic	4
2.1 Research Performers in the Czech Republic	4
2.2 The Overall State of R&D Financing in the Czech Republic	5
2.3 The Distribution of Public R&D Support among Different Beneficiaries	6
2.4 The Level of Project vs. Institutional Funding	7
2.5 R&D Performance in the Czech Republic	9
3. R&D&I Governance in the Czech Republic	11
3.1 The R&D&I Governance System	11
3.2 R&D&I Governance Performance: Policy & Programme Design, Implementation & Evaluation	15
3.3 Conclusions & Recommendations	24
4. Performance in R&D: Quality Management and Evaluation	26
4.1 Bibliometric Analysis of Research Outputs in an International Context	26
4.2 Quality of Research Management	28
4.3 Research Evaluation and Institutional Funding	31
4.4 Conclusions & Recommendations	36
5. The Intellectual Property Rights System in the Czech Republic	40
5.1 Summary of the Key Findings	40
5.2 Conclusions & Recommendations	41
6. <i>Preliminary Findings on Co-operation in Research</i>	43
6.1 Research-Industry Links	43
6.2 International Co-operation in R&D	44



## 1. Introduction

This is the Second Interim report of the international audit of research, development and innovation in the Czech Republic. The overall aim of the audit is to support the further development of R&D&I policies and practices that will support the development, growth and quality of the system.

This study started in May 2010 and we plan to complete it by the summer of 2011. It is divided into two phases. Each phase concludes with a Report, of which this is the first.

Overall, the aim of the audit is to establish to what extent the present arrangements for governing, managing and funding the R&D&I system are adequate to produce a competitive position for the Czech innovation system today and in the context of movement towards ERA.

The team conducting the audit works within the contemporary ‘innovation systems’ heuristic, which has over the past 20-30 years become the dominant one in analysing research and innovation policies. The innovation systems approach focuses on the complexity of the relationship between innovation and research. Based on empirical evidence that disconfirms the old ‘linear model’ idea that research somehow automatically leads to innovation and wealth, the innovation systems perspective emphasises the role of networking, path dependence, institutions, capacities and co-evolution in determining the successfulness of innovation systems.

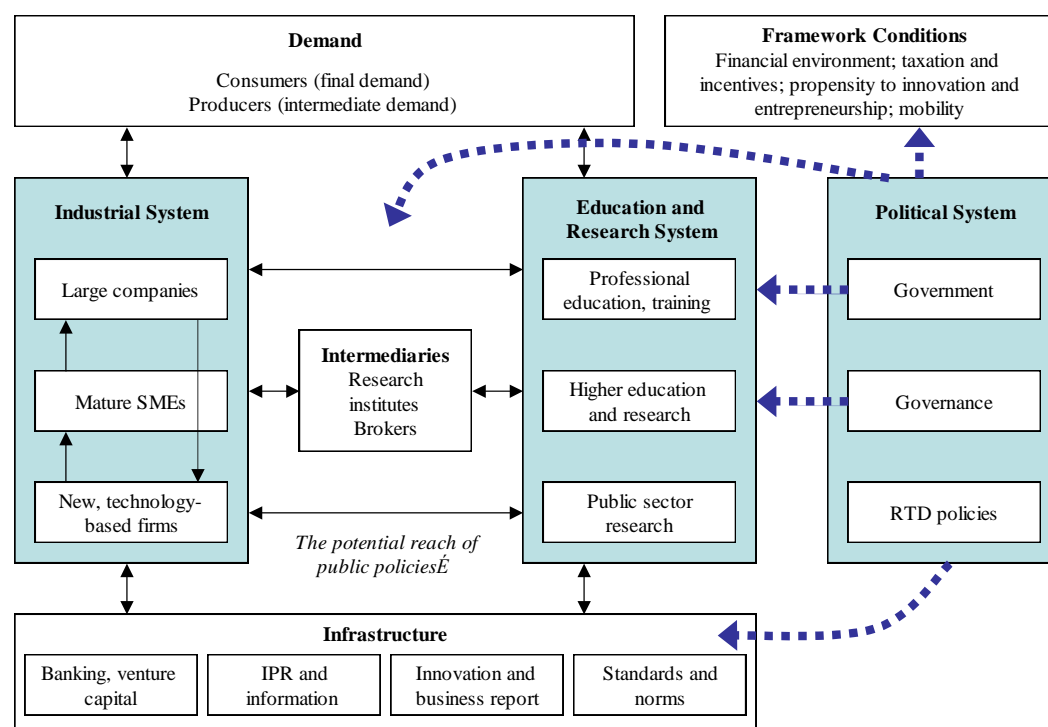
This new perspective uses the slogan ‘innovation system’ but there is no definitive ‘innovation systems theory’ – rather there is a collection of research results, which together provide a way of understanding behaviour and interdependencies in what **we** prefer to call a ‘National Research and Innovation System’ (NRIS): namely, all the actors and activities in the economy, which are necessary for industrial and commercial innovation to take place and to lead to economic development.

The current orthodoxy is that economic well-being is founded on a well-functioning NRIS, in which not only the actors shown in Figure 1, but also the links between them, perform well. In contrast to earlier views, which focused on either basic researchers or entrepreneurs as individual heroes, innovation and learning are now seen more as **network** or collective activities.

This has important implications for policy – and thus indirectly for the set-up and the analyses in this audit, as well as for the interpretation of our current findings

- Interconnection and interdependence are at the heart of the innovation system concept
- Innovation is a non-linear process involving many actors, though business enterprises are central actors in the system
- Demand, not just supply, drives innovation systems
- Innovation functions do not map ‘tidily’ on to organisations
- ‘Bounded rationality’ causes path-dependency and means that both institutions and learning affect performance
- Institutions are inter-dependent and co-evolve in ways that may be specific to the national system
- Good systems performance depends upon intelligence and performance in all sub-systems
- ‘Bottleneck analysis’ and system development are key policy roles
- In policy, balance – or ‘mix’ – is key
- Innovation system complexity tends to defeat central planning but distributed intelligence enables a healthy mix of bottom-up and top-down policy design and implementation (‘subsidiarity’)

Figure 1: A National Research and Innovation System Heuristic



Source: Erik Arnold and Stefan Kuhlman, RCN in the Norwegian Research and Innovation System, Background Report No 12 in the Evaluation of the Research Council of Norway, Oslo: Royal Norwegian Ministry for Education, Research and Church Affairs, 2001. Also available at [www.technopolis-group.com](http://www.technopolis-group.com)

The first steps in our analysis were focused on the assessment of some of the building blocks for an efficient R&D&I system, including the structure of public expenditures for R&D and innovation activities and the R&D governance and policy implementation processes in the Czech republic, in the light of international norms, principles and practices.

This Second Interim Report summarises the findings and presents the conclusions of our audit related to

- The Structure for R&D&I Governance
- The Processes for policy design, implementation and evaluation
- The Guidelines for the evaluation of research and its results
- The Intellectual Property Rights system
- The Public R&D expenditures in the Czech Republic

It also includes some preliminary findings of analyses that are still ongoing, focusing on the co-operation and interplay between the (public) science sector and the private business sector and on international co-operation in R&D.

The full reports on the analyses performed in the various work packages of this study constitute the annexes to this Second Interim Report, i.e.

- Annex 1: Assessment of Public R&D expenditures in the Czech Republic (WP a)

- Annex 2: R&D&I Governance in the Czech Republic (WP b & c)
- Annex 3: Institutional Funding and Research Evaluation in the Czech Republic and abroad (WP d, ii & iii)
- Annex 4: Review of the IPR System (WP d, iii)
- Annex 5: Science-Industry Links, preliminary findings (WP e)
- Annex 6: International Co-operation in R&D, preliminary findings (WP g)
- Annex 7: International Cooperation in R&D, Bibliometric analysis (WP g)
- Annex 8: Bibliometric Analysis of the Czech Republic Research Output in an International Context – Institutional Analysis (WP d,i)

## 2. The R&D&I Landscape in the Czech Republic

Our main findings focus on

- The level of public and private R&D financing in the Czech Republic, the distribution of public R&D financing in terms of institutional funding versus project funding, the socio-economic priorities of public R&D financing, and the distribution of support to industry and the public sector
- The level of R&D performance in the different performance sectors and its specialisation (i.e. existence of critical mass in industry R&D).

In addition, this section presents preliminary findings on the adequacy of the current portfolio of national and international R&D programmes, its thematic priorities and beneficiaries.

*The full analysis is reported in Annex 1 to this Second Interim report.*

### 2.1 Research Performers in the Czech Republic

In accordance with international conventions, the R&D sector consists of four performance sectors (Higher Education Sector, State Sector, Private Non-Profit Sector, and the Business Enterprise Sector), and five main sectors of funding (Government Sector, Business Enterprise Sector, Private Non-Profit Sector, and Funding from Abroad). The sectors are defined as follows<sup>3</sup>:

**The Business Enterprise Sector (BES):** is formed of all companies, organisations and institutions whose principal activity is market production of goods or services for sale to the general public at an economically significant price.

**The Government Sector (GOV):** includes in the Czech Republic especially workplaces of the Academy of Sciences of the Czech Republic and other places of research under the competence of ministries (on 1 January 2007 the statute of most of these entities changed to public research institutions), institutions of central and local government, except for publicly managed higher education institutions; it also contains public libraries, archives, museums and other cultural establishments conducting R&D as their secondary activity<sup>4</sup>.

**The Higher Education Sector (HES):** comprises both public and private universities and other institutions of post-secondary education. It also includes all research institutes, experimental facilities and clinics whose work is directly controlled or managed by higher education institutions or are associated with them<sup>5</sup>.

**The Private Non-Profit Sector (PNP):** includes all institutions serving households sector (referred to as the Private Non-Profit Sector), which comprises

---

<sup>3</sup> The definitions of sectors presented below stem from the methodological notes/fact sheet of the National Statistical Office and were provided by the Technology Centre.

<sup>4</sup> Note: All public research institutions irrespective of their institutional sector used in national accounts belong into the Government Sector in the R&D statistics. Before 2009 some public research institutions were included in the Business Enterprise Sector due to the fact that since 2004 their institutional sector has been identified according to the international classification ESA as – nonfinancial enterprises. In order to maintain methodological correctness and comparability of data in time, all data were recalculated in 2009.

<sup>5</sup> Since 2005, in compliance with OECD methodology, the sector also includes teaching hospitals. This sector is not a separate institutional sector of national accounting, but has been separately identified for its important role in R&D.

private institutions, including private persons and households, whose primary aim is not profit but providing non-market services to households. They include e.g. associations of research organisations, societies, unions, movements, federations or foundations.

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 played the role of public RTOs during communist times and survived the privatisation wave in the beginning of the 1990s. In 2009, 44% of research workers were active in the industry sector (FTE equivalent)
- The **University sector** in the Czech Republic is composed of 26 public universities, 2 state universities (the Policy Academy and the University of Defence), and 45 private higher education institutions. In 2009, universities employed 34% of the research workers in the Czech republic
- The **Government sector** employed 22% of the research workers in 2009. It includes
  - The 54 public research institutes of the Academy of Sciences. Research workers at the Academy of Sciences represented 15% of the national total in 2009
  - 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 target users of their products/services. Researchers in these institutes constitute 7% of the national total

## 2.2 The Overall State of R&D Financing in the Czech Republic

Despite the recent economic downturn, the Czech R&D investment has undergone a period of constant increase, lasting for more than 15 years. Since 1995 total R&D expenditures of the Czech Republic have more than quadrupled, and compound annual growth rates of R&D intensity have by far exceeded the average rates of the EU-27. A comparison with the EU-member states shows that the Czech Republic exhibits the second highest share of R&D investments among the new member states and has already a higher R&D intensity at present than many of the Southern-European member states (notably Spain, Italy, Greece and Cyprus). While these member states by large have joined the EU much earlier than the Czech Republic and have received considerable structural support from EU funds, they are still far away from reaching R&D investment ratios of many northern member states.

Although R&D investments of the enterprise sector have abruptly lost momentum with the onset of the crisis in 2008, the narrowing gap in R&D intensity between the Czech Republic and the EU-27 would not have been possible without a considerable increase of business R&D investments. International comparison of the R&D financing and performance structure shows that the Business Enterprise Sector accounted for a total of 60% of R&D expenditures in the Czech Republic, whereas the Government Sector accounts for 21.4% and the Higher Education Sector for 18.1% in 2009.

In terms of financing, the national Business Enterprises Sector accounts for only 45.8% in 2009. This however, is mainly due to the fact, that funding from abroad provides an additional 9.2% of R&D investments, of which the majority of sources (>70%) stem from foreign parent companies. Despite the economic crisis, the enterprise sector itself has increased its own R&D financing by 40% in the period

2005-2009. Direct government support to enterprises increased by +44% in the same period. The public authorities have also increased the financing for the Government Sector considerably (+58%) and of the Higher Education Sector (+63%).

Overall, the composition of the financing structure has fluctuated considerably in the last decade, mainly due to trends in the Business Enterprise Sector. Business R&D expenditures are closely linked to the business cycle: despite some counterfactual theoretical arguments, businesses tend to invest more in R&D in times of economic upswing, whereas they cut R&D expenditures in times of a recession.

Given these fluctuations, the data of the last decade show, that the Czech Republic has at present the potential, that about 60% of total R&D financing may stem from private sources, if funding from abroad is taken into account. The present financing structure in terms of performance sectors is thereby similar to that of France and the UK.

We may therefore conclude, that nowadays there is a solid base for the provision of both public and private R&D investment in the Czech Republic. There is of course room for improvement, but the overall development can be assessed to be very positive.

### 2.3 The Distribution of Public R&D Support among Different Beneficiaries

In the Czech Republic, the Business Enterprise Sector accounts for 60% of R&D performance, the Government Sector accounts for 21.4%, and the Higher Education Sector accounts for another 18.4%.

All three sectors receive varying degrees of public R&D support. R&D financed by public sources accounts for about 90% of R&D activities in the Higher Education Sector, 87% in the Government Sector, and 14% in the Business Enterprise Sector. Due to this strong dependence on public income sources in all three sectors, the study took a deeper look into the thematic orientation of public R&D financing and the mechanisms of allocation for national R&D funds.

The share of government funding in the Higher Education Sector is comparable with that in most European Union member states. The low level of business funded R&D in the Higher Education Sector increases the role of government funded R&D. Although this could be interpreted as an indicator of low science-industry linkages, the findings have to be interpreted with caution. The international comparison shows that only a very limited number of EU and OECD countries have rates as high as 10% to 20% of business financing in the Higher Education Sector and in most countries science-industry collaborations are heavily co-funded by public authorities.

The Academy of Sciences receives very considerable amounts of licence income: 13% of total research income or €46m. Even though this is predominantly thanks to the successful licensing activities of one single institution, it nevertheless shows that distinct capacities for commercialisation exist in the Academy. According to the survey respondents, the share of funding from contract research and services plays a particular role in public research organisations (18%). In the Academy of Sciences service contracts from private sources are estimated to account for 5% of total income.

Government R&D financing accounts for 13% of total R&D activity in the Business Enterprise Sector – 6% points higher than the EU average. In 2009 20% of public R&D investments were performed in the Business Enterprise Sector because of public funding of the private R&D services sector, in which institutes have the form, but not the function, of private companies.

The GBAORD expenditures for the Czech Republic show that the two unspecific measures General University Funds (27%) and other measures for the General Advancement of Knowledge (30%) account for 57% of total GBAORD, slightly above the EU average. Compared with the EU-27 the Czech Republic further shows large and above EU-average public R&D expenditures in the socio-economic objective industrial production and technology, which points to the strong emphasis on industry support in public R&D expenditures. Czech GBAORD Republic has a strong positive



specialisation in the objectives 'general advancement of knowledge', 'industrial production and technology', 'agriculture, and 'exploration and exploitation of the earth'.

In the Higher Education Sector, the largest part of General University Funds is devoted to engineering (26%) and medical sciences (17%). mathematics and computer sciences. The social and biological sciences each receives about 9% of GUF. In the Government Sector GBAORD in the category general advancement of knowledge is strongly directed towards the physical sciences, the chemical sciences and the biological sciences. The medical sciences and the humanities receive slightly more than 10% of public funds. Hence, public funding for the two sectors is complementary in terms of research fields addressed. However, compared with international R&D specialisation patterns of in Higher Education Sector and the Government Sector, the Czech Republic only shows a positive specialisation in the natural sciences and the agricultural sciences. There is under-investment in R&D in the social sciences and the humanities. In addition, also in engineering no clear positive specialisation exists. As the Czech Business Enterprise Sector shows a very distinct specialisation in engineering and manufacturing, there s potential for more collaboration in these sectors.

The high level of public R&D support to the Business Enterprise Sector is strongly concentrated in the R&D sector, which provides professional, scientific and technical services (40%). The Manufacturing Sector receives 31% of industrial GBAORD, and the ICT sector accounts for 9%. Also the sector human health and social work receives considerable amount of R&D support (11.8%). GBAORD under the heading 'industrial production and technology' shows a strong concentration on engineering related fields. Support for Pharmaceutical Products, Software Development, and Office Machinery and Data Processing Equipment – all sectors with high growth potential – account for limited shares of public R&D support (2%-4%). Compared with the R&D expenditure structure and business R&D specialisation in the Czech Republic, the chemical and pharmaceutical industry, computer and related activities receive comparatively low levels of public R&D support. Government R&D financing is concentrated on fields of traditional strengths within the manufacturing sector. While this makes sense in terms of upgrading existing technologies in order to sustain and further strengthen competitiveness in these sectors, increased efforts should be put on sectors in which positive specialisations with a high growth potential prevail (i.e. computer and related services, financial intermediation), and in sectors, in which not yet a positive specialisation exists, but potential for growth exists (i.e. the pharmaceutical industry).

## 2.4 The Level of Project vs. Institutional Funding

The main direct allocation mechanisms in the Czech Republic are institutional funding and project funding ('targeted' funding). The allocation mechanism for institutional funding is discussed in Annex 3 of this study.

At present 54% of public R&D funds are distributed via project financing mechanisms. Institutional funding accounts for 46% of total public R&D expenditures and is mainly geared towards the Higher Education Sector and the Government Sector.

The main rationales for public authorities to put project funding mechanisms in place are to spur competition, promote quality and to steer the scientific community by setting research priorities in terms of topics and framework conditions (i.e. application requirements, co-funding requirements, public-private partnership requirements).

The ratio of project funding to institutional funding is already high, by international norms, giving the public authorities enough room for strategic steering. We see no need further to expand this share at the cost of institutional funding. Project funding mechanisms also have certain drawbacks.

Project funding can be relatively costly to administer, compared with institutional funding. Project selection mechanisms involve risks of bias in selection, which may

have unintended consequences for the research community and hamper the effectiveness of the measures. Project funding mechanisms focus predominantly on shorter periods of times. Studies suggest that the scientific impact of short-term research funds is considerably lower than long-term centre-based funding. Longer-term funding and higher levels of funding concentrated on distinct research groups are strong determinants of long-term scientific and commercial success<sup>6</sup>.

Research group leaders from universities, technical universities and the Academy of Sciences state, that about 60% of their research activities are financed via project grants and service contracts. This means that project funding measures constitute the main base for R&D knowledge production in the Czech Republic. The EU Framework Programmes account for about 9% of total funds for research activities at the research group level. To date, the operational programmes have only minor importance for actors in the national public R&D sector.

The share of institutional funding has decreased for the majority of research groups in the Higher Education Sector and the Government Sector. As the relative share of project funding is increasingly important: universities must build up support capacities that monitor funding opportunities, make strategic choices about building research capacity and assisting academics in writing and submitting proposals in particular in complex international programmes.

In the Business Enterprise Sector, project financing constitutes the main source of government support in addition to tax incentives. At present, the most important funding scheme is the TIP programme of the Ministry of Industry and Trade. The programme focuses on research for new materials and products, new advanced technologies, and new information & control systems. It is intended to be the only programme for which industry R&D support is going to be provided. Unlike the previous programmes TANDEM and IMPULS, TIP does not require collaborations between industry and research organisations. Each project has to result in at least one of the following outputs: patent, pilot, proven technology, functioning model, design, prototype, 'utility model', applied certified methodology, software. In addition to TIP, the Technology Agency launched its first programme called ALFA, which supports R&D cooperation between businesses and research organisations. Longer-term co-operations will be made available by means of the Operational Programmes and a planned Competence Centre Programme.

The general level of business R&D support in the Czech Republic is comparatively high. Nevertheless, public R&D expenditures can influence business decisions only in areas where public support is necessary to launch R&D activities at all, because the risk for companies to engage in R&D, is too high. This holds in particular true for SMEs, start-up and risk-capital measures. For R&D active institutions the main focus of technology policy in the past seemed to be technological upgrading (i.e. facilitation of new equipment, material etc.). Measures tackling behavioural change and increased knowledge flows need now to be fostered in order to allow for an increased circulation and upgrade of new knowledge.

---

<sup>6</sup> Bourke, P and L Butler 1999. The efficacy of different modes of funding research: perspectives from Australian data on the biological sciences. *Research Policy*, 28, 489–499; Melin, G. und Danell, R. (2006) The top eight percent: development of approved and rejected applicants for a prestigious grant in Sweden, *Science and Public Policy*, Volume 33, Number 10, 1 December 2006, pp. 702-712(11)

## 2.5 R&D Performance in the Czech Republic

In terms of the R&D performance structure, international comparison of R&D expenditures shows that the Czech Republic has considerably closed the gap towards the EU-27 and the OECD member states.

### 2.5.1 R&D Performance in the Higher Education Sector and the Government Sector

In the Czech Republic, as in many Central and Eastern European Countries, the majority of Higher Education Institutions in the Czech Republic were formerly teaching universities. Whereas the Higher Education Sector gained importance in terms of R&D performance in the last decade, the Academy of Sciences (which is the main R&D performer of the Government Sectors) was drastically reduced in size in the early 1990s. Its overall contribution to R&D performance has stabilized since then.

Both the Higher Education Sector and the Government Sector account for about one quarter of R&D activities today and can be considered to have considerable R&D capacities. In many countries, the role of Public Research Organisations is to provide market oriented research and development activities, technology and innovation services to enterprises, governments and other clients. In the Czech Republic, the government R&D sector concentrates to a large extent on the performance of academic oriented research activities, aiming at high shares, and high quality, of scientific publication. More market orientated R&D services are provided by the R&D services institutes, which are formally in the private sector. Hence, the public R&D sector in the Czech Republic has one of the lowest shares of experimental development activities among all countries under consideration.

The fact that both the Higher Education Sector and the Government Sector have competencies in conducting academic research and have a similar size does not necessarily mean that this hampers the creation of knowledge-intensive science-industry relations or increases duplication. The usefulness of the two sectors depends by large on the complementarity of tasks fulfilled in the different types of organisations and the cooperation between the different organisations, which is high and increasing. An example in this respect is the function of tertiary teaching. As nowadays the Higher Education Sector in the Czech Republic accounts for considerable amounts for R&D expenditures, this may contribute that an increasing number of students takes up knowledge created in research activities and make it circulate. On the other hand, the Academy of Sciences has a huge repertoire of research activities, which might be used as well for educational purposes. By means of cooperation, the Academy of Sciences and the Higher Education sector took up its role in tertiary education in a complementary manner as nearly all workplaces of the ASCR were involved in tertiary education and the employees of the Academy guided a considerable number of students (in particular at the doctoral level) through their qualification.

Knowledge derived from frontier research may only be transferred to industry via means of direct collaboration between science and industry<sup>7</sup>. The nearer to the frontier, the most difficult it is to take-up knowledge and make it circulate, or, as Latour said, to circulate knowledge you need to transport the lab. In high technology sectors, it was important for firms to develop strong connections with academic labs, if they wished to be in a position to master new knowledge<sup>8</sup>.

---

<sup>7</sup> Laredo, P. (2007), Toward a third mission for Universities. Université de Paris Est (ENPC) and University of Manchester (MBS), [portal.unesco.org/...third\\_Mission\\_universities.../Towards\\_a\\_third\\_Mission\\_universities.pdf](http://portal.unesco.org/...third_Mission_universities.../Towards_a_third_Mission_universities.pdf)

<sup>8</sup> ibidem

This increased complexity of the knowledge creation and application process means that policy instruments have to focus on measures that allow facilitating this dual flow. Long-term technological programmes and university-industry research centres on the one hand, and so-called triangular doctoral allocations provide opportunities for the state to foster these relationships.

### *2.5.2 R&D Performance in the Business Enterprise Sector*

Although only a limited number of countries provide data for the distribution of R&D expenditures by research field in the Business Enterprise Sector, data show that the majority of countries concentrate their R&D expenditures in engineering and technology. Agricultural sciences are important in early stage catching-up countries (Bulgaria, Romania, Poland).

In the Czech Republic, the sectors producing fabricated metal products, machinery and equipment, instruments, transport and motor vehicles account for more than 43% of all business R&D activities in the republic. In particular the motor vehicle, trailers and semi-trailers sector is the biggest branch in terms of R&D activities, doing about a quarter of total business R&D activities (23.2%). In addition, also the machinery and equipment branch and the precision instruments branch (medical, precision and optical instruments) are very relevant – accounting for 8.1% and 4.7% of total business R&D activities. Some very research intensive branches, namely the pharmaceutical industry (3.3%), the computer industry (0.1%) and the communication, TV and radio equipment industry (3.5%), only account for rather small shares of total business R&D activities in the Czech Republic. On the other hand, the comparatively low levels of private R&D expenditures in the natural sciences and the medical and health sciences reflect a rather limited role of the pharmaceutical industry and chemical production. However, in particular the chemical industry has shown strong increase of R&D investments in the last years.

Within the services sector, the computer and related services branch is comparatively strong in the Czech Republic, accounting for (8.3%) of total business R&D activities. Furthermore, also the Research and Development Sector accounts for 16.6% of total business R&D activities. In many countries, state-owned or funded Research and Technology Organisations perform this function. According to our interviews with both industry members and research institutions, it seems that a common practice of enterprises is to set up affiliated SMEs, in order to be able to gain access to government funded business R&D support measures.

The international specialisation analyses showed that within the services sector, the Czech Republic is positively specialised only in the Public Administration, Financial Intermediation, Computer and Related Services, and Telecommunications. Within Manufacturing, the positive specialisations are in Textiles and Textile Products, other Non-Metallic Mineral Products, Basic Metals and Motor Vehicles can be observed. The branches Fabricated Metal Products, Machinery and Equipment, and Electrical Machinery exhibit no negative specialisation. The majority of sectors in which a positive or no negative specialisation exists are not only important in terms of R&D activities, but also in terms of employment and investment.

On economically developed countries, large companies do a high proportion of business R&D. In the Czech Republic, 55.3% of total business R&D expenditures are financed by firms with more than 500 employees; companies between 250 and 499 spend 8.3% of total business R&D expenditures. In total, SMEs account for 36.2% of business R&D expenditures. The international comparison shows that in particular large enterprises (>250 employees) account for more than 60% of total industry R&D expenditures in many of the old EU member states. In Sweden and Finland more than 70% of R&D activities are performed by enterprises above 500 employees, in Germany even 84% of business R&D expenditures are performed by very large enterprises. The Czech data reflect, that the nationwide R&D intensity increasingly depends upon the R&D activities of large firms.

### 3. R&D&I Governance in the Czech Republic

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

We first describe the structure for R&D&I governance in the Czech Republic and highlight some emerging key characteristics. We then report on the outcomes of our assessment focused on the procedures adopted for policy and programme design, implementation and evaluation. Finally, we draw our conclusions and make some recommendations to the policymakers in the Czech Republic.

*The full analysis is reported in Annex 2 to this Second Interim report.*

#### 3.1 The R&D&I Governance System

##### 3.1.1 The R&D&I Governance Structure

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 has 16 members. A member of Government, normally the Prime Minister, acts as Chair, 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 (see Figure 2, below).

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.

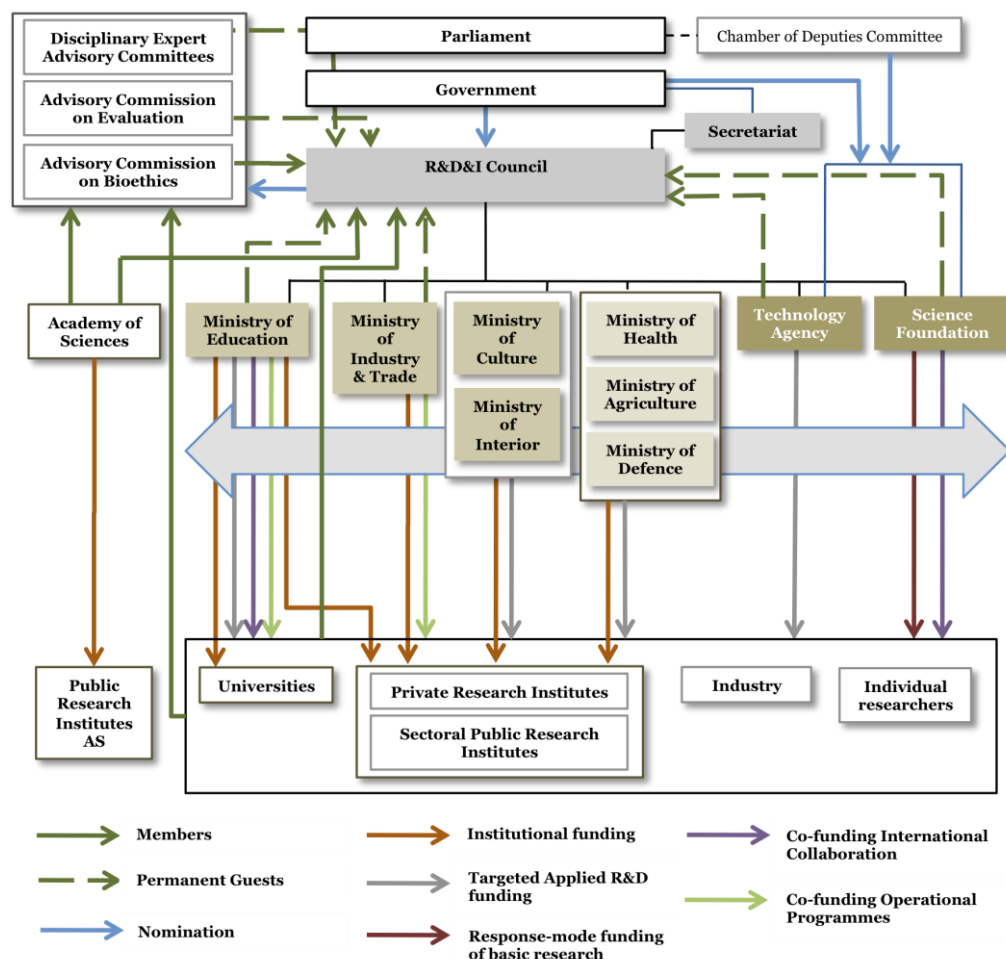
The **research community** is predominantly composed of public research institutes constituting the Academy of Sciences, universities, 'sectoral' public research institutes, private research institutions, and industry. Over the last decade, public research institutes and universities considerably increased 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.

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.

One of the reasons why high-level R&D councils are useful is that they can bridge 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. This is all the more necessary in systems where governments are often short-lived. It is therefore important to avoid the disruption caused if government or parliament too frequently uses its right to change the membership of bodies like the R&D&I Council or the two agencies.

‘Dynamic inconsistency’ was an issue emerging during our study also 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 change of government last summer.

Figure 2: The current structure for R&D&I Governance in the Czech Republic



### 3.1.2 The role of the R&D&I Council

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 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 especially 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, it implies that the Council has a low level of internal analytical capacity and heavily relies on external experts for the development of its strategic intelligence.

### 3.1.3 The role of the two 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.<sup>9</sup> 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 - are declining in validity.

Internationally, many research funders are trying to cope with the limitations of the ‘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.

### 3.1.4 The positioning of 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.

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

---

<sup>9</sup> Gustav Björkstrand, *NORIA Vitbok om nordisk forskning och innovation*, TemaNord 2004:502, Copenhagen: NMR, 2004



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 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

### *3.1.5 Trends in National R&D&I Funding*

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 three 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 the sole user.

Research organisations 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 country is currently moving 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 last decade was characterised by a considerable increase in national public R&D funding, reaching the level of 25,000 M CzK in 2009. In the last three years, this growth stopped.

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 background of an 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, which now administers close to 20% of the 'targeted' funding budget. This agency is the sole provider of project-based competitive funding for academic research; 96% of its budget is allocated for response-mode funding and the rest is committed to essentially academic programmes such as EUROCORES. In other words, in 2011 within the targeted funding chapter, there is an approximate 20:80 ratio response-mode/programme funding, which in the current system implies a similar ratio for basic versus applied research.

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

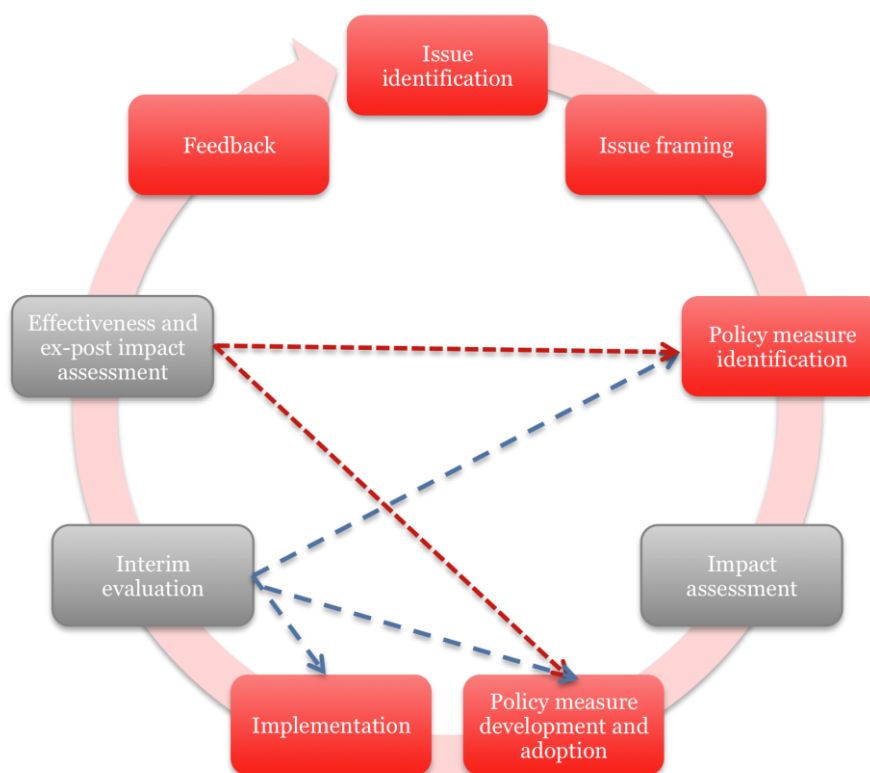
### 3.2 R&D&I Governance Performance: Policy & Programme Design, Implementation & Evaluation

The literature tells us that there is a need for **logical consistency across the policy cycle** to maximise the chances that interventions reach their objectives. 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 3: The policy cycle and the role of evaluation



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. Such ‘*vertical*’ *dialogue* on the strategic plans between the two levels in governance is an important component of the policy making cycle.

### 3.2.1 Vertical co-ordination

In the policy-making processes implemented in the years 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 was 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. Strategies at the ministry levels especially reflected the policy objectives of enhancing efficiency in R&D governance and funding research that responded to user needs; the coherence is less pronounced for more structural objectives such as international mobility and the availability of human resources for R&D. 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. In line with international practice, the approach adopted in both the 2002 R&D Act and the 2008 Reform was to leave the intermediaries relative autonomy in their decision-making on the sub-priorities that were relevant for their sector. Our recent analysis in 5 countries showed that priority setting processes are 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.

Consistency in the implementation of priorities is guaranteed through the explicit linkage of programme objectives with the **criteria applied in the proposal appraisals**. The 2002 Act on R&D Support also set the legal background for the appraisal procedures in the Czech Republic, with the overall objective to ensure efficient and robust application and funding processes in all administration bodies. The Science Foundation introduced a second system in 2010, establishing new rules for response-mode funding in order to reach a more significant differentiation in the evaluation of individual drafts and to respond to suspicions of bias among members of the research community. In our assessment, 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. This may be related to two major differences in the procedures adopted by this Ministry compared and those used in the other Ministries: the full delegation of the appraisal processes and programme management to the Internal Grant Agency and the transparency of the evaluation criteria upon which appraisals are based. In the specific case of this Ministry, these include “economic viability” criteria, which may be hard to establish and communicate to the applicants in an appropriate manner.

### 3.2.2 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); stakeholders are involved to a limited extent and the members of the Coordination Committee of Experts are directly nominated by the R&D&I Council. 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 sometimes reluctance – to have an open communication with broader stakeholder communities and the general public on discussions within the R&D&I Council. The information that is publicly available on the activities of the R&D&I Council is predominantly institutional and of little use even to a highly interested reader; documents properly illustrating recent decision-making processes are not available; and since 2009, members of the Council are bound to confidentiality in relation to information and documents discussed in the Council “until these are approved by the Council and made public”, which few of them are. We also note that it is apparently difficult for the Expert Committees that act as advisory bodies to the Council and the Council itself to collaborate; 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 division 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 ministry staff, and the Ministry of Industry that exclusively relied on its *own internal expertise*. These different approaches raise different challenges for the managing ministries:

- 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
- 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

Consultation with stakeholder communities governed by means of a direct involvement of key staff members of the ministry 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. 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 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.

### 3.2.3 *Analytic Capacity of Policy-makers*

One of the most important problems emerging from our analysis was the provision and use of **strategic intelligence**, including evaluation. International experience suggests 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 typically 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 should build 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 should be monitored (also for the purpose of accountability) and the analysis of strengths and opportunities periodically repeated.

We noted significant 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.

### 3.2.4 *The Evaluation Culture*

Evaluation is an ongoing challenge in the Czech Republic. Throughout the last decade, many policy papers stressed the importance of the regular implementation of evaluation exercises; equally constantly, it was noted that the Ministries did not ‘comply with the rules’ in a satisfactory manner. In 2004, the Government requested the Ministry of Education (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”.

Essentially, the Evaluation Methodology for Completed Programmes is currently the only framework for programme evaluations and the intermediaries are obliged to implement it. 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: it set an obligation for a proper evaluation of results and impacts of R&D&I programmes, concepts and policies, in *all phases of their implementation* (ex-ante, ongoing, and ex-post), and stressed that 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. While this seems to be a positive evolution to improve the current evaluation system, it is unclear whether a new evaluation methodology will be developed, taking a broad view on *outcomes and impacts* - rather than merely outputs as is currently the case, and setting a base for *policy learning*, or whether the methodology for these evaluations will be the current efficiency-oriented one that is applied for the Collective Evaluations.

In any case, 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:

First, 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.

Second, 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**:

- Indicators defined in the programme descriptions are ‘geared’ towards the needs of the Collective Programme Evaluations. Scrutiny of the recent programme descriptions and their objectives/indicators revealed that performance indicators allowing for the measurement of results and impacts are predominantly qualitative, i.e. no *SMART<sup>10</sup> indicators* are established for impacts in the sphere of S&T impacts on research fields as a whole, on the enhancement of R&D capacities, on economic performance and competitiveness, or in the societal sphere. Very rarely do 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”. Expectations for the near 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

---

<sup>10</sup> Specific, Measurable, Achievable, Realistic Timely

- 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.

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 were 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 were data from external sources also used and only 2 evaluations used surveys and interviews among the beneficiaries to collect quantitative data
- Recommendations to policy makers were rare, and even more seldom was the evaluation useful 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 be reached on the level of cooperation that was set up thanks to the projects between organisations located in different regions.

### *3.2.5 The policy cycle*

This flaw in current policy design and implementation processes and – especially – in the evaluation system in the Czech Republic – is illustrated in Figure 4, below.



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. Only project and programme evaluations were foreseen, with “Collective Programme Evaluations” essentially checking on their reliability. There are currently no ex-post evaluations, and for the future, they are foreseen only at the programme level. In other words, the potential of evaluation as an important tool for policy learning is not exploited.

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 stand-alone interventions.

Our analysis 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.



The flowchart illustrates the R&D&I Policy Process, showing the flow from the R&D&I Council to Research Actors, with evaluation loops for Policy, Concept, Programme, and Project levels.

**Stakeholders (Ovals):**

- R&D&I Council:** Associated with the top level (Establish Rationale).
- Intermediaries:** Associated with the middle levels (Strategic Concept, Programmes).
- Programme Committees:** Associated with the lower middle levels (Acquire Projects, Project Evaluation).
- Research Actors:** Associated with the bottom level (Execute Projects).

**Process Flow (Rectangles):**

- Establish Rationale** (Top Level)
- National R&D&I Policy** (Policy Level)
- Strategic Concept** (Concept Level)
- Programmes** (Programme Level)
- Acquire Projects** (Project Level)
- Project Strategy & Workplan** (Bottom Level)
- Policy Evaluation** (Evaluation Level 1)
- Concept Evaluation** (Evaluation Level 2)
- Programme Evaluation** (Evaluation Level 3)
- Project Evaluation** (Evaluation Level 4)
- Execute Projects** (Bottom Level)

**Flow Arrows:**

- Planned input from evaluation (Blue arrows):**
  - From **Policy Evaluation** to **Establish Rationale**.
  - From **Concept Evaluation** to **Strategic Concept**.
  - From **Programme Evaluation** to **Programmes**.
  - From **Project Evaluation** to **Acquire Projects**.
- Existing input from evaluation (Red arrows):**
  - From **Programme Evaluation** to **Establish Rationale**.
  - From **Project Evaluation** to **Programme Evaluation**.
  - From **Execute Projects** to **Project Evaluation**.
- Other Flow Arrows:**
  - Downward flow: **Establish Rationale** → **National R&D&I Policy** (labeled "Thematic & Systemic Objectives") → **Strategic Concept** (labeled "Objectives") → **Programmes** → **Acquire Projects** (labeled "Objectives") → **Project Strategy & Workplan** → **Execute Projects**.
  - Horizontal flow: **National R&D&I Policy** ↔ **Policy Evaluation** ↔ **Strategic Concept** ↔ **Concept Evaluation** ↔ **Programmes** ↔ **Programme Evaluation** ↔ **Acquire Projects** ↔ **Project Evaluation** ↔ **Project Strategy & Workplan** ↔ **Execute Projects**.

**Legend:**

- Existing input from evaluation
- Planned input from evaluation

### 3.3 Conclusions & 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 laid the foundations 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.

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, reducing it to being uniquely a tool for accountability. This causes gaps in the strategic intelligence that policy makers have at their disposal at all levels of the 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 evidence.

Closely linked to the 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 basis for the attainment of a consistent and coherent policy implementation and thus ultimately the achievement of policy objectives.

Poor communication between high-level policy makers and the other actors in the R&D&I system currently prevents the constructive creation of common understanding of 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 allocation 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

## 4. Performance in R&D: Quality Management and Evaluation

This Section provides a view on the quality of research and its outputs. We report on the bibliometric analysis at an institutional level of publications in international journals and look into the topic of Intellectual Property Rights (IPR) in the Czech Republic. Quality of research does not only relate to the quality of its outputs. Equally important is the environment in which research is conducted, which encompasses the sum of factors contributing to (or harming) research quality. In the last paragraphs of this section we draw lessons on the quality of research in the Czech Republic and on the factors contributing to research quality, and give recommendation about how to improve the quality of research.

*The full analyses of these sub-sections can be found in Annex 8 (the bibliometrics analysis) and in Annex 3 to this Second Interim Report.*

### 4.1 Bibliometric Analysis of Research Outputs in an International Context

In the First Interim report, we produced an overview of the current outputs of the Czech Republic's science system in an international context. The focus on the full period 1993-2009 provided a clear view on the situation the Czech Republic came from, and where it stands now as a member of the EU. The analysis clearly showed that the Czech Republic's science system has gone through drastic changes. Accession to the European Union has created large opportunities for the Czech Republic. Important findings of the analysis included

- The increasing international visibility of the output of researchers from the Czech Republic and a remarkable improvement in the quality of the scientific publication output of the Czech Republic over time –especially in the last decade
- The increasing trend in international and especially national cooperation – the latter indicating an improvement of the internal cohesion in the Czech science system

The comparison with a number of benchmark countries made clear that the Czech Republic still has a long way to. However, it is bridging the gap, especially in terms of output development.

In this Second Interim report, we reproduce our findings related to research performance in the international context at the institutional level (meso-level) during the years 1993-2009.<sup>11</sup>

In this meso-level analysis, the focus was on the main scientific institutions and organisations in the Czech Republic with production in the Web of Science.

#### **Overall bibliometric results of the Czech Republic scientific organisations**

Universities and Research organisations are the main players in the research activities of the country, participating in more than 50% of the production of the country<sup>12</sup>.

---

<sup>11</sup> The full analysis as well as all bibliometric data are reproduced in Annex 8 to this Second Interim Report

<sup>12</sup> The total production of the Czech Republic recorded for the period 1993-2009 amounts a total of 85575 publications (see report at country level). This is the value we use for the calculation of the percentages.

Hospitals also play an important role, but we have to keep in mind that part of their production is also included in the sector of universities. Finally it is also interesting to note the role of private companies that participate in around the 4% of the production of the country.

There are two major actors on the international scene in the Czech Republic, the Academy of Sciences as a whole (global), participating in more than 45% of all the scientific publications of the country, followed by Charles University in Prague. The picture is strongly dominated by the Institutes of the Academy of Sciences (the Institute of Physics, the Biology Centre, the Institutes of Macromolecular Chemistry, Microbiology, etc.). Besides them, other major institutes and universities are the Masaryk University, the Institute of Chemical Technology in Prague, the Czech Technical University in Prague, or the Palacky University in Olomouc (all of them with more than 3000 publications during the period 1993-2009) among others.

None of the main scientific institutes in the Czech Republic presents a field-normalized impact (CPP/FCSm) higher than the international level (determined by the level 1). Most of the institutions with the highest CPP/FCSm values are institutes of the Academy of Sciences (the J. Heyrovsky Institute of Physical Chemistry – very close to the international level 1-, the Institute of Physics or the Institute of Macromolecular Chemistry). The University of South Bohemia also presents a relatively high normalised-impact as compared to the other institutions.

### **Evolution over time of scientific publications**

Scientific production has been growing in all the institutional sectors of the Czech Republic. Universities' production has grown more rapidly than that of the pure Research organisations, outperforming their production from the year 2000 onwards.

Publications impacts have also risen over time for all the main institutional sectors in the Czech Republic. There has been remarkable growth in average publication impact, although this *is still below the international level*. Only the Institute of Physics of the Academy has occasionally exceeded the international level.

### **Co-publications**

To study collaboration patterns, we analysed three main types of cooperation: International cooperation, National cooperation (where only Czech institutions are involved) and Single institute (when the publication is authored by one or more researchers from just one single institution).

In all sectors, the field-normalized impact of all sectors is higher for publications in international collaboration, while the lowest scores are found for the production without collaboration.

Co-publication among Czech institutions and between Czech institutions and others abroad has increased; the number of publications from single institutions has stagnated. Other important findings were:

- Publications involving international collaboration tended to have a normalised impact factor of about '1'. Hospitals is the only sector with a normalized impact well above that, reaching the international level
- While the output of most institutions focused on international collaborations certain of the regional universities were more focused on national collaborations
- The growth of international collaboration as well as the level of production in international collaboration is higher for Universities and Research organizations (mainly the Academy of Sciences), while national collaboration has a major importance for Hospitals, Governmental institutions and especially Companies
- Some universities and institutes have for a long time been well linked into international R&D networks so their share of international collaboration does not change much over time (this is the case of the Academy of Sciences as a whole, the

Charles University in Prague or the Institute of Physics of the Academy of Sciences). Other institutions, instead, show a remarkable growth in the share of international collaborations during the period of analysis, such as for example the Czech Technical University in Prague. This university saw a large increase in the impact of its papers in international collaboration during the last years of the period.

### Research profile (main fields)

We analysed bibliometric data for the main institutional sectors and individual scientific institutions of the Czech Republic along the major scientific fields. Normally the Academy of Sciences (as -global- or its institutes) together with the Charles University in Prague are the leading institutions in terms of production in almost all the fields. Exceptions worth mentioning include:

- The fields of 'Economics and Business' and 'Political Science and Public Administration' where the leading institution in terms of *production* is the University of Economics in Prague, although with a very low field-normalized
- 'Energy Science and Technology', 'Instruments and Instrumentation' and 'Mechanical Engineering and Aerospace' where the Czech Technical University in Prague has the largest number of publications

Three Czech organizations lead in sponsoring internationally collaborated Czech research – the Ministry of Education Youth and Sport of the Czech Republic, the Czech Science Foundation (GACR), and the Academy of Science of the Czech Republic. While international institutions are also important sponsors (especially the EU), this suggests that there is capability (real or latent) within the Czech research system to influence the direction and nature of Czech international R&D collaboration.

## 4.2 Quality of Research Management

In this section we draw lessons from our analysis of the quality of research in the Czech Republic and on the factors contributing to research quality, and give recommendations about how to improve the quality of research.<sup>13</sup>

The lessons are mainly based on panel assessments, but survey and interviews results have been used too, primarily to verify our findings.

1. The quality of research in terms of international visibility (publication, strategic partners) was generally appreciated. Czech research teams are well-recognised members of the international research community. The units under consideration were judged to be from 'good' to 'competitive'. In the context of what can sometimes be quite unstable and even adverse institutional environments, the reviewers were impressed by the quality of many of the groups.
2. Using a limited number of solid criteria for testing the quality of research. The existence and number of high level academic publications, a good scientific standing of the key staff in the more academic types of research; a clear understanding of users and the access to users in more applied environments, were all important elements. Coherence and compactness of the research portfolio was another important criterion. From a procedural point of view the question of whether or not a unit displayed good research quality was settled within a fairly short time and in all cases without much dispute.
3. A tendency towards small units. Mainly in the field of natural sciences, medicine, and technical sciences a tendency towards small units has been observed,

---

<sup>13</sup> The full analysis is available in Annex 3 – Section 5 to this report

particularly in larger institutes. This tendency is to a large extent determined by a number of rather persistent behavioural patterns, mainly rooted in the institutional and political trajectories of the research institutions. Regarding the institutional background it is mainly cultural, as academic institutions delegate a high degree of autonomy to their key staff, the professors. The selection of research topics is mainly bottom-up. Political trajectories, particularly from the communist period, also support the tendency to create small research niches (which, in communist times, were perceived as niches of relative freedom to work, to exchange ideas, to travel, etc.).

4. Missed opportunities from limited capability of the research units to re-orient themselves. The tendency towards small entities leads them to miss opportunities as they typically face problems when in entering into interdisciplinary research, orientation towards application, long-term development, or strategic partnering. All these activities require firmly established competences in the core fields as well as free resources for exploring new topics. Small units typically do not have enough resources for both, which systematically prevents innovation (particularly in the absences of leadership at higher hierarchical levels).
5. Limited awareness and incentives for entering into interdisciplinary or application oriented research. In the reviews a rather peculiar attitude has been observed, namely the low level of awareness of, a relative absence of and sometimes reluctance to enter into inter-disciplinary research and application orientation **within** academic research. This observation is not about a sometimes politically motivated claim for commercialising academic research; rather it is about systematic interaction and exchange between different fields of academic research. Modelling is a good example. On the one hand, modelling is a core topic in mathematics. On the other hand, modelling is applied in fields like advanced materials, complex energy systems and finance. It is indispensable for mathematicians and researchers in the fields of application to work together systematically. This type of collaboration typically requires a minimum number of staff (> 50), long-term orientation and stability (up to ten years), adequate organisational settings, and a strong, visionary leadership. In institutional terms it requires interaction between, say, two Institutes of the Academy of Sciences or a faculty of a university and an institute of the Academy of Sciences. Currently, there is not enough awareness of such opportunities, nor are there incentives, not to mention adequate funding schemes supporting interdisciplinary research<sup>14</sup>. As research at the interface of established research fields often turns out to be a source of breakthroughs, the lack of interdisciplinary research is a missed opportunity of considerable long-term significance.
6. Little awareness and room for manoeuvre in human resource issues. While the some of units evaluated had staff well balanced in terms of age and experience as well as access to young researchers, quite a high share suffered from an unhealthy age structure, problems in recruitment, and mobility. A closer look reveals a number of specific issues. Most of them are missed opportunities rather than institutional barriers. Experience shows that there is always at least one unit that has found a proper solution to a problem with which others are still struggling.

---

<sup>14</sup> There is one remarkable exception: The Operational Programme Research and Development for Innovation, funded within the Structural Funds Programmes provides excellent opportunities for this type of interdisciplinary research. Unfortunately, this opportunity was hardly ever perceived as most of the centres have put different research programmes side by side, each of them striving for their own goals. However, one may expect closer interaction in the course of the roll-out of the respective programmes in the years to come.



- *Age structure.* If a stone were to fall on the head of the typical director, his team would face serious problems in terms of leadership and relationships to the (outside) scientific community. This structural problem is systematically related to small size and hence to limited room for division of tasks, responsibilities and risks.
  - *In-breeding through recruitment.* Even in groups with a strong international reputation, many careers are characterized by a Master thesis, PhD thesis, research position and professor position within the same group. These internal careers do not only limit the perspectives of researchers but also limit the number of solid external contacts of a group and therefore their options for participation in international projects (which are often based on personal networks). The present recruitment policy aimed at hiring the best PhD students from one's own group for staff positions should thus be linked with open recruitment policies.
  - *(International) mobility.* The 'closed loop' recruitment policy prevents an explicit mobility policy. Moreover, the small size of many units typically causes another systematic problem: they have difficulties managing a 'portfolio' of projects in which both young and more experienced staff are involved. Accordingly, stays abroad are mostly restricted to a couple of weeks and at best months, limiting the opportunities for learning and discovering new horizons. Thus it should be a high level goal to promote young researchers earlier and make more intensive contact with foreign research teams, funded e.g. by foreign exchange scholarships and the participation of Czech researchers in EU mobility programmes. However, senior people have to play their role in establishing these international relationships. Mobility has to be rewarded in the appraisal and career development schemes.
  - *Limited collaboration between universities and Academy of Sciences.* Universities do have a monopoly in awarding academic degrees. Some (mainly Academy of Sciences institutes) perceive this division of labour as a massive barrier, while others, in the same type of institutes, consider it a cheap research workforce. However, it is hardly ever resolved in a creative way, e.g. by implementing joint programmes. The implementation of 'research schools'<sup>15</sup> could be such an opportunity and a giant step in the training of young researchers in the Czech Republic.
7. Funding policy as a major cause for short-termism. Many research institutes suffer from the 'funding regime'. It is not primarily the limited availability of funding in general – there should always be certain level of complaints about limited resources as it is an indicator of a productive research environment. The major problems arise from two main sources: national public funding, both institutional funding and targeted funding, as well as the handling of funding within the research institutions.
- *Missing continuity.* This has essentially two aspects. One is the missing continuity due to fast changing rules for institutional funding at the level of national policy institutions. The other one is weak leadership at the level of the research institutions in terms of internal funding allocation. In practice this means that annual budgeting at national level is often more or less passed on to the sub-units.

---

<sup>15</sup> A research school is defined by the following features: a well defined curriculum (possibly at the cross-roads of disciplines) including hands-on research and formal training, an external ex-ante evaluation of both the curriculum **and** the qualification of the faculty, and a limited duration of typically 10-12 years



- *Small size and short term.* Obviously, the dominance of small-scale project funding hampers the running of bigger research projects or programmes over longer periods. Likewise, the allocation of institutional funding based on the annual measurement of past achievements systematically drives out long-term large-scale considerations. This type of short-termism is caused not only by the funding policy at national level (institutional funding, grant agencies) but also within research institutions, where annual appraisals are mainly based on last years' achievements rather than on the assessment of future plans, with past achievements considered an indicator not of only performance but also of credibility.
- Not surprising, the Evaluation Methodology has been perceived with mainly negative feelings both by the research groups visited as well as by the reviewers. While it was acknowledged there was a need to allocate funds on evidence based transparent criteria, the practical implication of this was criticised for the following main reasons: short-termism, backward orientation, negation of disciplinary differences and differences between types of institutions, and encouragement of perverse behaviour.
- Poor participation in EU programmes. The reason for this is rather obvious: weak linkages due to poor experience. Putting participation in international programmes on the top of the agenda – at the level of institutions, not necessarily of the teams – is thus an immediate advice, including the provision of support and training.

## Recommendations

- The assessment of research performance was in all cases related to leadership, organisational, and institutional factors. Even more, the evaluators actually devoted most of their attention and time to organisational issues, which, in the perception of the reviewers, should deserve more attention by the research managers and policy makers alike: leadership, management, recruitment, career development, mobility, age structure and composition of staff. While their leaders can influence some of these factors at the level of teams or departments, others, including funding policies, are determined by the 'wider system', i.e. the organisation and the R&D policy framework.
- To increase the quality of research, first of all the organisational performance of the research institutions has to be improved. The major recommendation here is to stabilise expectations over longer periods. Accordingly, it is proposed to determine and justify funding (i) not only on past performance, but also on future plans, and (ii) to enlarge the period under consideration to up to 3-5 years. The instruments should thus be performance agreements between funders and performers. Performers are well advised to perform peer-based evaluations of their sub-units on a regular basis. The Academy of Sciences can be considered a case for learning.

## 4.3 Research Evaluation and Institutional Funding

In the last 5 years, the policy approach to the evaluation of R&D in the Czech Republic saw several fundamental changes:

The 2004 Methodology introduced the concept of a metrics-based quantitative results evaluation, seen as a tool – and only **one** of the main criteria – to assess the quality of research performance. The 2009 version marks the adoption of the metrics-based evaluation of R&D results as a Performance-Based Research Funding System - albeit only at the level of funding bodies. The 2010 Methodology explicitly recognizes the possibility to use the metrics-based evaluation of R&D results as a mechanism for allocating institutional funding to individual research organisations.

Currently, the Evaluation Methodology has therefore a two-fold role: evaluating and developing the quality of research and allocating institutional funding on the basis of performance. Of course, there is a close link between these two roles: at its 'practical level', the Evaluation Methodology defines what results are eligible, how the data are collected and how they are converted into points values, which then form the basis for allocating institutional funding.

The scope of the evaluation guidelines has been restricted progressively: while the 2004 Methodology covered all the different layers of the research system, the 2009 and 2010 Methodologies focus almost exclusively on the quantification of research outputs for the evaluation of research organisations and research programmes.

Similarly, the scope of the envisaged evaluations themselves has been narrowed down substantially: the 2004 Methodology stresses the importance of evaluating research programmes in terms of their results and effects in the socio-economic sphere, taking into account their specific socio-economic objectives; the 2009 and 2010 Methodologies focus exclusively on counting R&D outputs. Ex-post impact analysis is no longer mentioned - either in the Methodology nor in other policy documents.

Curiously, the Czech Evaluation Methodology seems to have been developed in almost complete isolation from developments going on in other places. Other countries have been struggling with the same questions, and most have come up with different answers. Hence, important differences can be noted between the current Evaluation Methodology in the Czech Republic and international practice.

#### *4.3.1 The Evaluation Methodology ("Metodika Hodnocení") in the eyes of the Czech research community*

The surveys we conducted among the Czech research community show that both researchers and research organisation management (rectors, deans, directors) view the Evaluation Methodology in a rather unfavourable light. In general, respondents from the Academy of Sciences view the Evaluation Methodology less favourably than their counterparts in other research organisations and especially in universities. This may be due to respondents' perception that Academy institutes would fare worse with the Evaluation Methodology.

The disciplines also differ in perception of the Evaluation Methodology. Most importantly, mainly respondents from the Social Sciences and Humanities field (SSH) feel that the EM does not do justice to the differences between the disciplines. This may be due the fact that researchers from different disciplines rate the importance of different types of outputs differently. Moreover, there is a widespread feeling that the SSH would lose out the most as a result of the EM.

We also asked respondents about the importance of a number of research outputs irrespective of the Evaluation Methodology. Researchers and research organisation management assessed research outputs quite similarly. Interestingly, but not surprisingly, most research outputs are assessed differently by respondents from different disciplines. In most cases, the SSH differ dramatically in their assessment from the natural sciences and life sciences, with engineering/technical sciences situated somewhere between the two. Similarly, different types of organisations assess research outputs differently. Generally, the more applied research results are more important to 'other research organisations' and to some extent also to the universities but less so to the Academy.

A large majority of the survey respondents thinks that the Evaluation Methodology makes researchers and research organisations behave more opportunistically. This was confirmed in our interviews: we were given various examples of such opportunistic – also often called illegitimate – behaviour, which can be synthesised into a number of patterns, e.g. adapting outputs to make them 'countable' (e.g. publishing textbooks as monographs), going for 'cheap points' (with utility models as the most frequent examples), or producing outputs for outputs' sake although they

might be irrelevant for the institution / discipline. The Evaluation Methodology creates incentives to 'play the system'. Those who don't risk being out-competed by those who do.

Elsewhere in the Czech Republic, however, there is already substantial experience with state-of-the-art procedures and methods of research evaluation and for allocating research funding. This is demonstrated in our Czech case studies about (i) research evaluation at the Czech Academy of Sciences and (ii) the evaluation and contract negotiations made in the Operational Programme "Research and Development for Innovation". We will come back to these experiences in our recommendations.

#### *4.3.2 Summary assessment of the Evaluation Methodology*

We have analysed the "Metodika Hodnocení" in the light of international practice, based on an analysis of the literature on the subjects of research evaluation and Performance-based Research Funding System (PRFS) as well as on a number of country case studies. In line with the study proposal, we use the structure of a SWOT analysis to summarize our assessment

#### **Strengths**

##### The idea of a transparent system for allocating institutional funding

The Evaluation Methodology with its reliance on quantitative indicators is driven by a desire to de-politicise and de-personalise the funding process. By relying only on (proven) past achievements, it aims to act against nepotism, corruption and lobbying.

##### Clear signal

The Evaluation Methodology sends out a clear signal. To put it simply, its message is: "no outputs, no institutional funding" addressing the issue of low productivity in some research organisations in the Czech Republic. At the same, it is intended to improve the quality of research outputs, which is as such a justified and relevant policy objective for the Czech research system. However, while the Evaluation Methodology may be the right tool to increase the *number* of research outputs it is not necessarily the right tool to increase the *quality* of research outputs.

##### The idea of linking evaluation to decision making and policy making

Evaluation needs to have consequences if it is not to be an empty exercise, all the more so as evaluation is resource-intensive. The EM has defined a link. However, the way in which the Evaluation Methodology evaluates research and the way it is linked to allocating institutional funding are flawed.

#### **Weaknesses**

##### Reductionism

Both as an evaluation tool and as a mechanism for allocating institutional funding, the Evaluation Methodology is reductionist because it only considers outputs. It counts them and awards points with the only target of maximising the number of outputs. As an evaluation tool, it ignores key factors, such as research management, research strategy, and human resource policy – these are factors that any evaluation worth its name needs to take into account. The same is true for benefits and impacts of research. By focusing on countable outputs only, it is not in line with international good practice. As a mechanism for allocating institutional funding, it only considers past performance, not leaving room for institutions to build up capacity and venture into new research directions. This is exacerbated by the "automatic" translation of evaluation results (i.e. the point scores) into the amount of funding allocated. Moreover, at a political level, the Evaluation Methodology fails to take into account other relevant (thematic) policy priorities in the Czech Republic or in effect even contradicts them. Again, this is not in line with international good practice. Hence, our conclusion is that the existing Evaluation Methodology is inappropriate for both the evaluation of research quality and the allocation of institutional funding.

#### Not addressing differences between disciplines sufficiently

The EM has tried to take into account differences between disciplines by including different research outputs, by introducing separate point ratings for National Reference Framework of Excellence (NRRE) specialisations and in 2010 by introducing 'dampening factors' among ten disciplinary groups. However, disciplines are still treated unequally: unequal treatment occurs when defining what counts as research result and how many points this research result gets. The present system ignores important (legitimate) differences between disciplines: they differ significantly in their publication patterns both in terms of publication type and frequency, and not all types of results defined in the EM are equally achievable for all disciplines (e.g. patents). Moreover, there are still considerable differences between disciplines within the ten disciplinary groups. Also, as a basis for funding decisions, the EM does not take into account that some disciplines are more expensive than others. In short, the differences between disciplines cannot be captured in a formula, no matter how complex it becomes.

#### Not differentiating among different types of organisations

The Evaluation Methodology treats all research organisations in the same way, ignoring their different missions, goals, roles and tasks. In the current EM each type of research output is awarded a certain number of points. This number is the same for all institutions without regard to the importance this particular output has (or should have) for a given institution. As a result, unequal treatment occurs when defining what counts as research result and how many points this research result gets. In other countries, evaluation systems as well as performance-based research funding systems take care to make a distinction between different types of research organisations to account for their different missions (e.g. emphasis on research, teaching or application). In fact, performance based *research* funding systems have almost exclusively been tried for universities. There are also PBRFs for universities of applied sciences, but *in line with their mission*, they mostly focus on teaching, and PBRFs for applied research institutes typically emphasise contract research. The Czech EM lumps together different types of research organisations despite their different missions and roles in the Czech RDI system – missions and roles that have not even been subject to debate in the development of the Evaluation Methodology.

#### Eligible outputs and their value partly arbitrary

The outputs that count as well as the number of points given to those outputs are arbitrary. There is no explanation why certain outputs are chosen and others not. What is more, there is an implicit funding decision embedded in the points given to outputs, in particular regarding the value of applied (industry-oriented) research versus basic research. This decision has not been made explicit.

#### **Opportunities**

Researchers and policy-makers both felt that a new system was necessary to evaluate research and to allocate institutional funding. The introduction of the Evaluation Methodology has been an intervention that brought the change needed, but it has not brought the proper change. Nevertheless, it has opened the floor for the introduction of a more appropriate system that is closer to good international practice.

#### Opening up a debate

The widespread dissatisfaction with the Evaluation Methodology provides an opportunity to start a debate about institutional funding and its purpose. It is not always clear for research-performing actors what the respective purposes of institutional and project funding (targeted funding) are. A debate could also open a window of opportunity for debating research evaluation and how to build up an evaluation culture. Last but not least, this debate should take into account international experience and learning from others.

## **Threats**

### Widespread opportunistic behaviour

The Evaluation Methodology provides incentives for opportunistic behaviour, that is unintended behaviour that perverts the intention of the Evaluation Methodology (ie to increase research quality) and encourages cheating. As a result of widespread opportunistic behaviour, the Evaluation Methodology is unable to distinguish between good ‘gamblers’ and good researchers, or, put more prosaically, between weak and strong research groups.

### Unpredictability of institutional funding

Simulation of the effects of the Evaluation Methodology has shown that it can cause large – and unpredictable – changes in institutional funding, making institutional funding unreliable and planning for an institution difficult. Furthermore, as research organisations do not know how much money they will earn for their points in the following year, they have an incentive to hunt for as many points as possible. Of course, this results in inflating the total number of points, with the result that a point is worth less and less.

### Instability of research system

Big changes at an institutional level have a big impact on the stability of the research and innovation system as a whole. Therefore, all other systems of allocating institutional funding that we looked at have built-in mechanisms to make sure that the RDI system maintains stability, moving only modest amounts of money in any one exercise.

### Short-term thinking encouraged, long-term planning discouraged

Because of the instability and the unpredictability of institutional funding, institutes start to focus on short-term solutions to solve immediate problems. However, long-term planning is important to create high-quality research results, especially in a research environment where time horizons are long. For example, it takes years to set up a PhD programme that delivers highly qualified researchers and the publications of a new research project will only appear years after the project started.

### No room for improvement and building up of capacity

Because it is purely retrospective, looking at past performance only, the Evaluation Methodology does not leave room for improvement and building up of capacity – one of the purposes of institutional funding. As a purely retrospective mechanism, it is also very sensitive to initial conditions, i.e. an organisation’s performance at the point of introducing the EM. If an organisation was having a good, successful period, this was frozen and possibly reinforced by the Evaluation Methodology. If it was in a weak trajectory, this was frozen and reinforced too. What is more, the Evaluation Methodology does not give feedback, e.g. on research management, research strategy or human resource policy, which we identified as *the* key issues for the development of Czech R&D. Thus, the Evaluation Methodology does not support learning and development of institutions, research groups, and researchers.

### Patching up the Evaluation Methodology

The Evaluation Methodology has been changed annually, mostly to correct the most obvious imbalances. The changes often represented detailed refinements or restrictions. We have found that the frequent changes of the EM cause confusion, with researchers no longer being sure what counts and what does not. Patching up the EM only makes it more complicated and cannot remedy the more fundamental problems.

### Weak ownership

The Evaluation Methodology has little support among researchers and research leaders as well as policy-makers. This can lead to frustration and low morale among

researchers, which is not conducive to research quality and productivity. Ultimately, it can also lead to brain drain – researchers either leaving research or leaving the country. Needless to mention that it takes 15 years to train a researcher.

#### Using the Evaluation Methodology within institutions

All the threats are exacerbated when the EM is applied within institutions because opportunistic behaviour, unpredictability, instability and short-termism will then increase within the walls of institutions, causing a research environment that is not conducive to improving research quality. A lack of good leadership and professional management in many Czech research organisations exacerbates this threat even further. Perversely, however, failure to allocate funds internally in line with the Evaluation Methodology can lead to short term sub-optimisation – shifting income away from those who are earning it and towards those whose activities generate less income.

#### Unknown effects

Not all the effects of the Evaluation Methodology on the scientific community are well understood. This is because effects take time before they become apparent, and the EM has not been in operation for very long yet. What is more, there typically are different forces at play that make the prediction of effects difficult. For example, the survey shows that the Evaluation Methodology is not conducive to collaboration. This makes sense as individual publications deliver more points than co-publications. However, it might be argued that in time collaboration will increase as collaboration normally leads to more publications. As features such as collaboration - but also others like interdisciplinary research - are important aspects of scientific practice, the intended and unintended effects of new measures should be carefully considered before implementing a new system.

### 4.4 Conclusions & Recommendations

#### *4.4.1 Publication*

Bibliometric results presented in our earlier report show

- The increasing international visibility of the output of researchers from the Czech Republic and a remarkable improvement in the quality of the scientific publication output of the Czech Republic over time –especially in the last decade
- The increasing trend in international and especially national cooperation – the latter indicating an improvement of the internal cohesion in the Czech science system

The comparison with a number of benchmark countries made clear that the Czech Republic still has a long way to. However, it is bridging the gap, especially in terms of output development.

Our new results relate to analysis of publication performance at the institutional level. Publication output is dominated by the Academy (both as a whole and at the level of large Academy institutes), Charles University and a handful of other universities. In general, institutional performance remains below the average international level, though a handful of Academy institutes come close. Overall, both the volume and the impact of Czech publication is increasing, so it is reasonable to expect it to intersect with average international performance soon and reasonable to suppose that there are already some groups working at or above this international level. National collaboration is increasing, improving the cohesiveness of the Czech research system. International co-publication is also increasing, driving up quality as Czech authors increasingly cooperate with the global research communities.

#### *4.4.2 Research Quality*

In discussion with our steering committee we invited a number of research groups to participate in a peer-review based exercise intended to understand the quality of some of the better research in the Czech Republic and in particular what were the drivers of quality that could be addressed in order to raise standards overall.

There was near universal agreement that the Evaluation Methodology is a poor tool for raising quality, addressing past performance but failing to help groups do things that would enable them to raise standards. In fact, many of the research groups that volunteered to take part were of a good or an international standard. They were well published, had good scientific standing and understood the demands of both the research communities and (where relevant) of knowledge 'users'.

Significant problems included the tendency of research groups to be small and therefore to lack the strategic resources to change direction when necessary. This problem would tend to be exacerbated by the Evaluation Methodology. Small group size also discouraged interdisciplinarity, which is easier to achieve from a larger disciplinary base. Lack of mobility, over-dependence on a single senior researcher and a tendency towards in-breeding in the recruitment pattern slowed groups' rate of development and made them less competitive than could have been the case. The lack of group-spanning graduate schools combined with the improving but still inadequate degree of cooperation between university and Academy research groups reinforced the tendencies to fragmentation. The small group size and occasional inward orientation undermined their ability to participate in the Framework Programme.

The implications of this analysis are

- Research performance is strongly driven by leadership, organisational and institutional factors, which need to be addressed directly, not through the use of a retrospective Evaluation Methodology
- The organisational performance of the research performing institutions has to be improved, in order to drive up research quality. Funding needs therefore to be based on a mixture of past and prospective performance
- Wider reforms touching on mobility, creating graduate schools and enabling larger groups to form are required to improve quality

#### *4.4.3 Institutional Funding and Research Evaluation*

Our analysis shows that the current Evaluation Methodology does not reach international good practice in evaluating the quality of research and that, used as a basis for allocating institutional funding, it introduces significant threats to the Czech RDI system. The problems both of the Evaluation Methodology as a tool for evaluating the quality of research and as a mechanism for allocating institutional funding are so fundamental that they cannot be solved simply by modifying and adapting the Evaluation Methodology. Hence, we recommend that the Evaluation Methodology should be discontinued and replaced by a new system.

These are the fundamental ideas and recommendations for the allocation of institutional funding, for the evaluation of research and for how to link the two:

##### **Stability**

The transition from one funding system to the other should be organised in such a way that the budgets of the individual institutions affected do not change dramatically from one year to the other.

Indeed, we think that the Czech system is in need of continuity. The allocation of institutional funding has been changed repeatedly over the last years. As a result, some organisations have experienced dramatic changes in the amount of institutional funding they have received. The previous system of 'research intentions' was also flawed, resulting for example in some groups failing to get institutional funding.

Therefore, a first aim is to stabilise the system, and to make funding more predictable – this is the basis for serious planning and this is the basis of institutional development.

We recommend introducing multi-annual funding periods rather than annual allocation of budget. Moreover, we recommend establishing the new funding system stepwise over at least one or several transitory funding periods. In the ‘steady state’, a funding period should not be shorter than four years, but during an initial transition phase, the periods can be shorter (2-3 years). Finally, we suggest limits to budget cuts within the regular allocation of funding.

### **Performance and Achievements**

It appears that an important motive for introducing the present Metodika hodnocení was the observation that some organisations receiving institutional funding had not reported any outputs in the RIV database, often for several years. The EM has been set up to tackle this issue of low productivity in the Czech R&D system.

We support the basic idea of linking institutional funding with performance, but other than the EM we recommend taking into account not only the performance accomplished in the past but also the performance agreed on for the future. To assess performance it is necessary that the principal (the ministry) and the agent (the institute) have a shared understanding of what the performance is which has to be achieved with institutional funding. Hence, the fundamental question that will have to be asked is: What do we want to achieve? We do, however, suggest a less mechanistic and uniform approach to research productivity across disciplines and institutions.

### **Building Institutional Capacity**

Our ultimate aim is to base institutional funding mainly on performance contracts. We would welcome performance contracts immediately but think that the Czech administration is not yet professionalised enough to implement them. Hence, institutional capacity needs to build up slowly. Ministries and research organisations alike will have to go through a learning process.

There is already a basis for this learning process in the Czech Republic: The Operational Programme ‘R&D for Innovation’ allocates the funding for ‘Centres of Excellence’ and ‘Regional Research Centres’ through performance contracts. In other words, there already is some knowledge about performance contracts in the Czech RDI system and there will be more as these Centres move on. We recommend actively sharing this – and international – experiences.

### **Transparency**

The Evaluation Methodology with its reliance on quantitative indicators is driven by a desire to de-politicise and de-personalise the evaluation and funding process, while in other countries the interest in indicators reflects a desire to simplify and reduce the cost of assessment. For both these reasons, we refrain from recommending a peer review based system *for allocating institutional funding* like in the UK or in New Zealand.

Instead, we recommend introducing two complementary systems – a formula budget and performance contracts. For the formula budget, we recommend using a variety of (simple) indicators instead of just research outputs as is currently the case; this is the retrospective element in the allocation of institutional funding. As every funding system also needs to have a prospective element, to build up and develop capacity and venture into new research directions, we also recommend introducing performance contracts in the long run. We are aware that performance contract negotiations can be prone to nepotism and ad hoc solutions, so we recommend introducing them step by step and putting in place a number of safeguards. The advantage of the mixed funding system we are suggesting is that it combines a prospective (performance contracts) with a retrospective element (formula).



As for *research evaluation*, we do not think that it can be done without peer review, as the examples from other countries show. We recommend putting safeguards in place to make sure that the peer review process is transparent, fair and as objective as possible.

### **Different models of governance and funding for different groups of organisations**

The present Evaluation Methodology has some validity for three different groups of institutes: universities, the Academy of Sciences, and research institutes (both public and private). There is also a string of other organisations that receive institutional funding such as hospitals, museums etc, for which the Evaluation Methodology is wholly inappropriate. These have very different missions and tasks and also access to other funding sources and research is not always their key activity.

In the current Evaluation Methodology each type of research output is awarded a certain number of points. This number is the same for all institutions without regard to the importance this particular output has (or should have) for a given institution.

Different governance and funding systems need to be established for different types of organisations because organisations fulfil different roles in the Czech R&D systems and therefore they differ in their missions and activities. These roles need to be discussed and agreed upon explicitly.

### **Evaluation as a tool for learning and institutional development**

Evaluation should not be used for funding decisions between ministries and research organisations but as a tool for institutional development. It can and should be used to inform and support decision making about and within institutions, but not in a linear and mechanistic way. Setting up quality management, including evaluation, will be a task for all research organisations, and building the required ‘culture’ and capacities will take some years.

In the full report, we have sketched more detailed recommendations on how to build a new system of institutional funding step-by-step. Moreover, we recommend to develop an ‘evaluation culture’ in the Czech research system, involving all stakeholders – policy makers, the administration, research performers of all kinds, and to support policy learning (see Annex).

## 5. The Intellectual Property Rights System in the Czech Republic

In this section we summarise the findings of our assessment of the main elements of an IPR system: legislation adopted on the topic of IPR, usage and up-take of IPR by Czech industry and the scientific system; and key policies, institutions and programmes/services in place to secure and foster qualified usage of IPR.<sup>16</sup>

*The full analysis is reported in Annex 4 to this Second Interim report.*

### 5.1 Summary of the Key Findings

Formal IPR instruments, in particular patents, are used only at low levels in the Czech Republic. Several factors contribute to this situation: traditions from communist times, industry structure and stage of economic development but also framework conditions such as the particular design and usage pattern of the European (EPO) patent system which makes IPR to an extent also irrelevant for Czech businesses. Of course, also barriers such as the costs of IPR and weak enforcement, which are commonly identified as barriers to IPR up-take, play a role.

The common thread through our enquiries (especially the interviews with IP experts and intermediaries) is that of an overall **low awareness on IPR issues** in the Czech innovation system. It is in particular the management level of the various institutions of the innovation system where there is necessity to improve IPR know-how. This is to be underlined especially for the university and research sector where our interview partners noted lack of interest in IPR issues at management level – which of course has implications for the way IPR is handled. IPR should be understood as a management topic offering a portfolio of different formal instruments and informal tools whose specific use is to provide ways of doing business.

There appears to be only a small core group of experts savvy in the field of IPR and IP management in the Czech Republic. A one moves away from this group, knowledge about IPR declines very steeply – more so than in other countries. The implications are manifold: The support services in place and the existing intelligence are barely demanded. Networking between institutions (such as referral activities or other types of collaboration) is very low, creating additional barriers to successful outreach to target groups or even the creation/commercialisation of IPR necessitates communication between several types of institutions. Several types of institutions that should provide at least basic referral and information services do not have such offerings, the most prominent being the majority of chambers of commerce and business associations.

Low awareness of IPR and IP management principles gives also rise to **ambiguous incentive systems** for researchers in the Czech Republic when it comes to valuing IPR. The evaluation methodology of 2010, in interaction with Act No. 211/2009 on the support of research and development, is very rigid and output oriented. Without prejudice to other issues, the IPR metrics hardly provide a commercial incentive (in the sense of 'let's get rich') for the researchers and research institutions primarily involved. There are also coherence issues in the way points are distributed among various IP instruments. Support structures at the universities and CAS (i.e., Technology Transfer Offices – TTOs) are very young and need to climb the learning curve. The non-interest about IPR observed by our experts at executive level has been

---

<sup>16</sup> The full analysis is available in Annex 4 to this report.

described already above. A lighthouse example of successful TTO is, however, the Institute of Organic Chemistry and Biochemistry (IOCB).

The **legal system** is in line with international treaties and is based on what one may consider ‘state of the art’ IP legislation. Developments in the educational sector and innovations such as the educational programmes on industrial property at the Metropolitan University Prague are promising. On the positive side, one may also say that the Czech Republic’s IPR performance is among the best in former Eastern European countries (or at least in line with those of other peers of similar stage of economic development).

Developments such as the likely introduction of a Community Patent and the overall economic development path indicate that the usage of IPR will (have to) increase. This requires a policy response.

In any way, discussions observed where academic and industrial representatives blame each other for low patent filing activities in each other’s sector are not warranted. Both sectors have issues of their own to work on.

## 5.2 Conclusions & Recommendations

Against this backdrop, we recommend the following:

- *Foster the creation of awareness in the system:* The main recommendation is to elaborate on activities and policies that aim to increase awareness on IPR and IP issues in the innovation system. Awareness on IPR necessitates knowledge not only of legal and technical aspects of IPR, but also on business aspects (IP management issues). We have seen that know-how already exists, e.g. in the Czech IP Office, but urge that important institutions should adopt the role of intelligent customers and increase demand for this expertise, accordingly. The key issue is institutional empowerment and entrenching IPR know how at the management level of organisations such as universities, CAS, chambers of commerce, business associations and ministries. We also recommend further strengthening IP management education at universities at undergraduate, graduate and PhD/post-graduate level.
- *Create personal responsibility on IPR for the innovation system at ministry level (installation of an ‘IPR representative’):* While the general thrust should be to increase awareness on IPR in the system, it stands to question whether the needed learning will happen all by itself. In order provide guidance and foster such learning, we recommend installing a person at ministry level who is i) responsible for IPR issues overall and ii) has also the means, power and willingness to pursue an IPR agenda. We are sceptical about writing IP strategies. Many such strategies turn out to be only paper exercises and lead to no implementation. A person committed and in charge can make the difference, however.
- *Define key tasks for the ‘IPR representative’:* The key tasks of such an ‘IPR representative’ would be, on the one hand, to improve the networking of the actors of the innovation system on IPR issues and develop activity profiles for them. This can be achieved by organising networking events on specific IPR topics. We recommend that the representative should monitor the outcome of IPR filing activities in selected areas from a commercial point of view and provide systemic learning opportunities. Such a monitoring would go beyond the counting of outputs and patent applications and necessitates closer (and also more qualitative) observation and reporting of IPR commercialisation activities. One would be to closely examine and reflect on the commercial outcomes of the IPR filings expected in the course of the ‘operational programme research and development for innovation’. The outcome of such activities would be a much better understanding of the role of IPR in the commercialisation process, specific to the situation of the Czech Republic, and a much more fine-tuned design of IP policies, strategies and monitoring systems.

- *Re-consider the role of IPR in the evaluation system of publicly funded R&D and Act No. 211/2009*: In line with the recommendations on the evaluation system in the dedicated report of the Audit on this subject, we recommend, from an IPR point of view, re-considering the role of the IPR for assessing R&D results in various ways. First, utility models undergo no examination process in terms of the technical quality of the applications and are mere registrations of documents. Utility models should not be used to assess research output or quality. Secondly, therefore, we recommend focusing more on commercial utility derived from patenting, and not the counting of patents. Inconsistencies between the values given to various types of patents should be explored with IP professionals and corrected accordingly. Overall, a much more specific approach is warranted, which takes account of 'commercial incentives' for the involved researchers and research institutions to introduce inventions onto the market. Against this backdrop, Act. No 211/2009 should be reviewed and any ambiguities in interpreting the law should be removed. The EC's IP Code of Practice provides some good (though at times very general) guide for further implementation of TTO and IP policies, in line with many of the current findings on TT. We therefore recommend considering these recommendations for the further development of evaluation methodologies and for enhancing TT performance in the Czech Republic.

## 6. Preliminary Findings on Co-operation in Research

*Preliminary work on the potential for research-Industry links* confirms that there are significant opportunities for links in some of the ‘heartland’ industries such as vehicles, machinery, chemicals and office machinery/ICT. This confirms that while there are opportunities for the state to lead the development of ‘science push’ industry (for example around life sciences) it is important not to neglect the perhaps less fashionable but economically important industries, in which R&D and innovation remain key sources of competitiveness.

As in other countries, large companies are more likely to have scientific links than small ones. The cooperation patterns of the multinationals suggest that while some have ‘bedded down’ in the Czech innovation system, there is scope to encourage others to develop more local scientific links. There is considerable international experience in fostering science-industry links, but our initial impression is that these techniques are underused in the Czech Republic.

International R&D cooperation with the Czech Republic is increasing, partly – but far from only – via the Framework Programme. Many Czech researchers have worked abroad, and this is a strong basis for building the networks needed for collaboration. Internationalisation is coming onto the agenda of many research managers but a lot of the real internationalisation happens ‘bottom-up’ at the initiative of the individual researchers. This implies there are opportunities for policy measures to increase the rate at which Czech researchers enter international networks – something that should, for example, feed back to improved quality of research. As in many countries, responsibility for internationalisation is fragmented and internationalisation has yet to be ‘mainstreamed’ across a wide range of funding instruments.

At this stage it is not appropriate to provide recommendations in these areas – work is at too early a stage.

*The full analysis on research-industry links is reported in Annex 5 to this Second Interim Report; Annexes 6 and 7 report on the analyses related to international co-operation.*

### 6.1 Research-Industry Links

The data and evidence collected so far in relation to the science-industry links in the Czech innovation system allows for the following observations:

- *Industry specialisation and R&D patterns as background for potential (Science Industry Links –SIL):*
  - “Manufacturing” accounts for about 62% of business expenditures on R&D, but only for approximately 28% of gross value added while for “Services”<sup>17</sup> it is almost vice versa.
  - Another observation shows that the largest share of BERD is not invested in industries with highest contributions of gross value added, but in industries with lower growth rates in R&D
  - “Manufacture of motor vehicles, trailers and semi-trailers” appears as the most important industry – being amongst the highest contributors to income and R&D, however, not in terms of highest growth rates. Other important

---

<sup>17</sup> Including “Research and development” and “Computer and related activities”

industries regarding share of BERD are “Manufacture of machinery and equipment” and “Manufacture of chemicals”. All three together accounting for one third of BERD – but not representing highest growth rates in BERD.

- Another interesting industry is “office machinery and computers” contributing only with small amount to value added and BERD but with the highest growth rates in BERD.
- Based on their contribution to R&D, these industries are amongst the main candidates and potential for SIL
- R&D funding from industry is quite low for institutes in higher education sector, while funding from industry for R&D performed in government sector are above EU average - with both observations pointing to specific structures in Czech Republic’s innovation system (compared to other countries). But then the remark is to be made that the classification of institutes differs between countries (e.g. in Austria Academy of Sciences is included in higher education sector, while in Czech Republic ASCR is included in government sector).
- Furthermore, engineering and natural sciences are those scientific areas attracting the largest shares of business R&D funding in public sector – however with reduced shares of funding in engineering between 2001 and 2008.
- *Innovation cooperation and public support*
  - Concerning the support of SIL it appears that funding from government for business R&D is above EU average, but programmes to foster and support SIL are still rare exceptions.
  - Cooperation patterns between innovative firms and universities are at the average level in international comparisons, but below average in case of public research organisations.
  - Cooperation with public research organisations (universities and government research institutes) in innovative activities is less often than with other actors – consequently expressing innovative relations are in most cases a kind of non-R&D activities – and therefore reducing the importance of SIL
  - SIL are characterised by a size effect – large enterprises are more likely to collaborate – and an industry effect – some industries have higher degree of connectivity with R&D in public sector.
  - Foreign enterprises (MNU) constitute less collaboration with universities/government institutes, depending also on their origin.

Consequently there may be some potential for development towards more R&D intensive and hence innovative industry structures – which in consequence increase opportunities for future competitive advantage by intensified SIL.

## 6.2 International Co-operation in R&D

In this last Section, we summarise the preliminary findings of our analyses related to international dimension of the research system of the Czech Republic. Also in this case, the analysis is still ongoing, so the findings are to be considered tentative.

*Annex 6 to this report contains the analysis related to international co-operation. This analysis was supported on a bibliometric analysis, the outcomes of which are reproduced in Annex 7 to this report.*

The **bibliometric analysis** of the 85,600 science, social sciences, and arts and humanities journal article records from the Web of Science published between 1980 and mid-2010 reveals that Czech international R&D collaboration is strongly

European and has grown more during the transitions of recent decades. Internationally collaborated Czech publications are generally of higher citation quality than purely domestic papers. Czech international R&D collaboration is greatest (by absolute numbers of papers) in the fields of physics and material science, chemistry and chemical engineering, basic life sciences, clinical medicine, biomedical sciences and biological sciences. International collaboration in several social science disciplines is weak compared to this subject group's national significance. Two institutions dominate international research collaboration through co-authorship, the Academy of Sciences of the Czech Republic (ASCR) and Charles University (UK). These institutions are also powerful nationally in research, but there are other Czech research institutions that collaborate less internationally than their national ranking would suggest. While international institutions are also important sponsors (especially the EU) of international publications, the fact that three Czech institutions dominantly fund international collaboration suggests that there is capability (real or latent) within the Czech research system to influence the direction and nature of future Czech international R&D collaboration.

The **surveys of researchers** is based on 689 respondents, 41% ASCR, 45% University, 13% other organisations (1% industry). It found that international collaboration is an important feature of the Czech researcher community and it is not seen to be a bottleneck for better RTI activities in the Czech Republic. Two thirds of all projects that are done in collaboration have at least one international partner. The main partners are of course researchers from European countries, 92% of all researchers that collaborate internationally have collaborated with a partner from the EU 27 / EFTA, and 16% with a partner from North America.

The Czech research community appears – on the basis of the survey data – considerably mobile, 83% of all Czech researchers have been abroad in the context of their research at least once. Interestingly, more than one third of the respondents claim to have been employed by a foreign organisation, for senior staff (e.g. rectors) the share is above 50% (58%). The respondents also indicate that re-integration is not a major problem. Having been abroad obviously increases attractiveness, and problems reported are of a personal rather than a systemic nature. The motivation to internationalise, in general terms, is to enlarge networks and to pursue personal research agendas, leading to a better publication profile. The researchers are, by and large, content with the achievement of the goals related to international collaboration and mobility. A reason of less importance is links to foreign firms; however those who have collaborations with foreign industry report it as being an important industry related activity. By and large, the majority of Czech researchers feel that their organisations recognise international activities and support them. Overall, for the system, the level of support and recognition for international activities is perceived to be poor, especially as for collaboration support with European and even more with non-European partners. As researchers see a future increase in collaboration, there is a policy and support gap. Moreover, researchers regard the integration of foreign actors in national programmes as poor.

A second **survey** was geared towards **directors of research organisations** (74 respondents, 45% of which from Universities, 31% from ASCR institutes and 24% from other organisations). Less than 40% of all organisations have an explicit internationalisation strategy, but 49 % plan to have one in the next three years, indicating an overriding importance of internationalisation in the future. This corresponds very closely to the availability of dedicated funds and the plan to have those funds in the future. ASCR institutes are slightly less likely to have an explicit strategy and dedicated budgets.

International collaborations in the project portfolio of organisations as well as the share of international funding in their budgets are both of relatively low importance. There are only a few organisations that report a considerable share of their projects are international, with the share in ASCR institutes being slightly higher. However, two thirds of the directors say they have strategic inter-organisational partnerships

elsewhere, mainly with EU 27/EFTA and the US, and this number is supposed to grow further. Those partnerships are used both to provide platforms for cooperation and to enhance visibility and reputation more generally. In terms of selection of public research partners, Universities tend to link mainly with other Universities, while ASCR institutes are slightly broader. Collaboration with international firms is still less common, here: ASCR institutes are less active than Universities.

A further measure of internationalisation in organisations is the level of foreign staff. Compared to outward mobility, this is under-developed; the vast majority of organisations have below 10% international staff, with shares at ASCR institute being slightly higher. The share of organisations recruiting internationally is only 14%; again, ASCR institutes are more international in their recruitment than other organisations. However, there is a strong tendency to change this practice across the board, and to recruit more internationally. When it comes to advisory board membership, the picture is different, here ASCR institutes are much less likely to have international members than Universities, most of their boards are purely national, while 70% of Universities have some international membership in their boards.

The international activities in organisations are clearly driven by human resource considerations, i.e. to increase the attractiveness for Czech researchers and – more important in the future – to recruit international talent. Further, international activities are oriented towards getting additional research funds and getting access to excellence abroad. As to the latter, requiring funds, the actual importance of international funds is very low, 84% of all directors say they have zero or minimal income from international sources.

Like the researchers, the directors – notably from the ASCR – regard their organisations as largely supportive of international activities. The benefits of internationalisation far outweigh the costs, and the risks of international activities (knowledge loss, strengthening competitors) are perceived as being low for most organisations. The major issue of concern appears to be brain drain and the need to increase the attractiveness of the Czech system for Czech and foreign researchers alike.

In our additional **interviews with research organisations**, not surprisingly, we found that there is variation in the extent to which research and teaching activities are internationalised across subject areas and between but also within sectors. International collaboration and international mobility are increasingly accepted as necessary to ensure the excellence of Czech research. There is use of international assessment committees periodically to evaluate the research performance of ASCR institutes. Vacancies in leading institutes (and leading university departments) are increasingly open to international competition and we did find evidence that the international collaboration profile of applicants is considered, if not always systematically.

In the past the Czech Republic may have been a convenient “stopping off” point for researchers from Eastern Europe and the Former Soviet Union countries heading West. There is still much bottom-up research interaction with (and mobility from) these countries. However the Czech Republic is now a destination of choice in itself for these researchers, and researchers increasingly come from a wider range of countries.

The most dramatic success story in recent years is probably that of infrastructure. The Czech Republic has worked to shift the emphasis in research infrastructure planning eastwards towards the new member states, and as a result has successfully mobilised structural funds to support the development of an Extreme Light Infrastructure presence in the Czech Republic.

Most internationalisation within both the university sector and the academy institutes sector is bottom-up rather than driven by top-down strategy. Longstanding barriers relating to culture but also structure and incentives remain. The principal barrier remains funding. Inward mobility of foreign researchers for visits or to take up positions is limited by the funds available. Lack of openness of national grant programmes to foreign participants can also be a barrier. Finally, high teaching loads,



even in leading university departments, can present a barrier to international research collaboration and medium-term mobility. There are also barriers to teaching internationalisation, especially the legal requirement to teach in the Czech language. There remains a perception amongst many researchers that national funding is 'easier' to obtain than EU funding. This may be compounded by barriers to closer co-operation between the university and institute sectors.

The bottom-up international activity of Czech researchers is likely to continue to grow organically. Younger researchers coming through are more likely to be exposed to internationalisation as an integral part of research and those researchers are likely to collaborate internationally as long as they are suitably supported/enabled to do so.

The **policy and funding** for R&D internationalisation is in hands of quite a number of ministries and agencies. However the key actor is the Ministry of Education, Youth and Sports (MEYS). This Ministry is responsible for policy formulation, strategy development and the implementation of almost all programmes for international R&D cooperation including those for industry.

The core of the policy instruments for internationalisation is focused at the European Community. Funding for participation in international organisations such as ESA, ESO, COST, EMBC, EUREKA and CERN have the majority of the budget funding. Other major initiatives are related to several Joint Technology Initiatives (Artemis, Eniac, IMI and Eurostars). The Czech Republic also has some active bilateral co-operations with non-European countries (Russia, S-Korea, China, Japan, Israel, Argentina and the US) that include funding for research projects on the basis of an open competition. The emphasis of S&T collaboration policies is on establishing links for the public research organisations. Industry oriented R&D collaboration through funded programmes is relatively small and focused on the Eurostars programme.

The political importance of international R&D cooperation has grown considerably in the last years and national budgets have increased. Nevertheless some of the bottlenecks according to policy makers remain, particularly an inward oriented culture in the research community, a lack of experience with international networking particularly for those in research management positions. Some scientific domains are considered to have such a good reputation that they manage to attract foreign researchers. This is however not monitored systematically.

The evaluations done as regards international activities are somewhat limited to the Framework Programme. This analysis so far has been very focused on the participation, financial return and impact of the European Framework programmes.<sup>18</sup> A challenge that policy makers want to tackle is a better coordination between the various Ministries and Agencies from different policy domains. Another future development is to increase the pressure on initiatives such as competence centres and science parks to become more pro-active in their internationalisation activities and networking.

---

<sup>18</sup> Albrecht V., Vaneček, J. (2008): Assessment of Participation of the Czech Republic in the EU Framework Programmes; Prague, [http://www.fp7.cz/dokums\\_raw/eufordia-konverze\\_1236765864.pdf](http://www.fp7.cz/dokums_raw/eufordia-konverze_1236765864.pdf)



Second Interim Report

April 06, 2011

In Brighton, 06/04/2011



Erik Arnold  
Technopolis Limited  
Managing Director

technopolis |group|

JOANNEUM  
  
RESEARCH

MANCHESTER  
  
The University of Manchester  
Manchester  
Business School

cheps  
Center for  
Higher Education  
Policy Studies

 Universiteit Leiden

PERITUS

