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R&D Evaluation Methodology and Funding Principles

Final report 2: The Institutional Funding Principles

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Summary

Introduction

This report is the one of the three Final reports of a study developing an evaluation methodology and institutional funding principles for the R&D system in the Czech Republic. It describes the new principles for the institutional funding of research organisations (RO) in the Czech Republic.

International context

Internationally, performance-based research funding systems (PRFS) operate within a hierarchical system of governance, in which there are layers of authority from government through ministries, their agencies and down to the research-performing organisations. Policymaking tends to be quite strictly separated from policy implementation. Most countries have difficulty in coordinating aspects of research and innovation policy across ministries but this is to a degree countered by having analytical resources decentralised across various organisations. The Czech Republic has an opportunity to coordinate well, through the RD&I Council.

Research organisations tend to be of five types: universities; scientific research institutes; research and technology organisations (RTOs) supporting industrial innovation; public service research organisations (or 'government labs'); and national resources or infrastructures such as libraries and museums. These are steered and funded through various combinations of unconditional block funding and performance-based funding, which may be based upon a performance contract and/or a system that counts or assess results of research. The Czech Republic is unique in attempting to use a single performance-based system to address all the different types of research organisation. It is also unusual in being among the minority of countries with a high ratio of project-based to institutional funding of research.

Internationally, the use of PRFS is believed to improve both the amount and the quality of the output from research organisations. Quite small performance-based adjustments to institutional funding lead to large changes in the behaviour of individual researchers and of the research system as a whole. PRFS can be tuned to reach different policy objectives, for example to concentrate research in a small number of institutions or to boost overall research capacity across the system. However, they also promote 'gaming' and there is evidence that they favour traditional and mainstream research approaches over unorthodox and interdisciplinary ones.

The Current Czech Institutional Funding System

The current Czech institutional funding system is rather decentralised with no official central co-ordination body. In fact, the RD&I Council, which is an advisory body of the Government without real executive power, plays this role. Currently, seven ministries and the Academy of Sciences provide institutional funding. Institutional funding distribution among providers is based rather on political negotiations and decisions than the research organisations evaluation results or to previous commitments for the funding of on-going RD&I activities.

Laws guarantee research organisations a relatively high degree of autonomy in terms of institutional funding allocation and distribution. The research organisations are not able fully to utilise their autonomy and except for the Academy of Sciences have not developed a specific evaluation methodology and strategies for institutional funding distribution.

The system for allocation of institutional funding among research organisations based on the rule of three according to evaluation results (the number of RIV-points) does

not reflect differences in the role (mission) of research organisations and types of research activities.

The recipients of institutional funding for research form a large and heterogeneous group. The increasing number and wide spectrum of the research organisations supported risks posing a problem for further fragmentation of institutional funding in the future.

Based on the comparison of institutional funding systems in international practice with the Czech institutional funding system, we can draw the following key conclusions that should be taken into account while drafting revised funding principles for the Czech Republic:

- Admitting research organisations to the institutional funding system is a policy decision and as such should be taken by policy makers at the highest level in the R&D system. An evaluation methodology or institutional funding principles cannot substitute for or replace the policy decision.
- The Evaluation Methodology and the funding principles should be designed taking into account the missions of the research organisations in the RD&I system and avoid competition between research organisations with different missions.
- Changes in institutional funding principles should be introduced incrementally in order to provide sufficient time for adjustment on both sides – principals (funding providers) as well as agents (research organisations).
- Introduction of several components of institutional funding allows combining elements of continuity, stability and incentives for a desirable change in behaviour. It also enables differentiation of institutional funding schemes for different types of research organisations.
- Performance contracts are suitable instruments for activation of a dialogue between ministries (providers), and research organisations.

The funding principles

Distribution of institutional funding for RO among research funders

A pre-requisite for the proposed funding model is that there are separate 'pots' (budgets or budget lines) for different types of research organisations: Scientific Research Organisations, Industry and Business Services Research Organisations, Public Services Research Organisations, National Resources Research Organisations. The thinking behind this pre-requisite is that different types of Research Organisations fulfil different missions and functions in society. Hence, they should not be made to compete for the same budget pot as this may lead to some research organisations not being able to fulfil their roles any more.

This pre-requisite is in line with international practice where different budget pots for different types of research organisations are normal. The distribution is generally contingent on: laws (responsibilities), history (e.g. size of budgets), politics, policies, (entrepreneurial) individuals (or the opposite).

In the end, how much money to allocate to the different pots is a policy decision. Ideally, such decisions are based on a long-term RD&I strategy or basic long-term principles for the RD&I policy accepted by all major political forces, i.e. a strategy or policy valid beyond single election periods. For the sake of transparency and stability, we suggest the following procedure for the transition from one single budget for institutional funding for RO of all kinds to different budgets for different types of Research Organisations: We suggest taking the current expenditure on institutional funding for RO as a starting point (mean values or weighted mean values over several years). This would provide continuity and stability even if it is a starting point that some may consider unfair given the re-allocations of institutional R&D funding

entailed by the application of the earlier 'coffee mill' version of the Metodika. Nonetheless, the starting point suggested is transparent and predictable, and this is important given that the definition of pots for different types of Research Organisations ultimately involves a policy decision.

For the future, ideally the responsible ministries should base their funding decisions on a thorough understanding of the Research Organisations' 'funding mix' (institutional/competitive/contract funding). On this basis it will be possible to determine better how large the pot for 'their' type of Research Organisations should ideally be.

Components of the funding system

Based on our mandate, we propose a funding system that encompasses three components: a block grant, a performance agreement and a PRFS (performance-based research funding system).

In order to ensure trust and stability, part of the institutional funding for RO will be allocated in the form of a *block grant*. While the block-grant ensures trust and continuity, the performance-based funding component reflects both (i) past performance as well as (ii) future developments and plans. Therefore, the performance-based part of institutional funding for RO will encompass:

- A *performance-based research funding system (PRFS)* which allocates funding on the basis of the new Evaluation Methodology, and is mainly based on the judgement of external peers in their respective fields of expertise and types of research organisations assessing mostly past performance but also future strategies and
- A (negotiated) *performance agreement*, mainly based on the negotiation between the government (a ministry) and the respective Research Organisation.

Figure 1 Allocation of funding by type of instrument

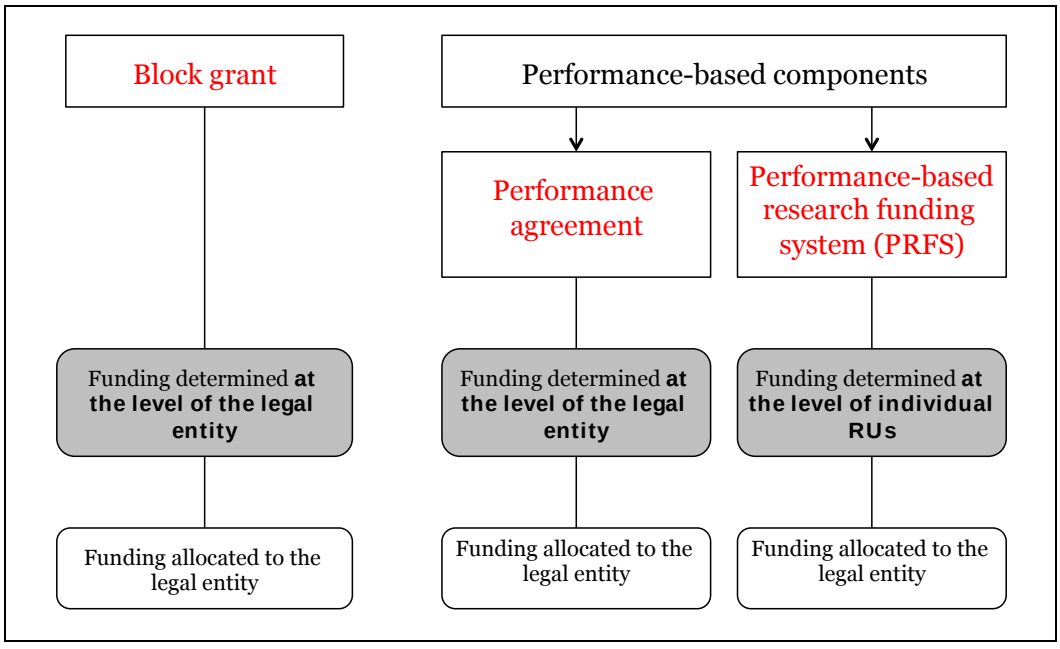

Figure 1, above, shows on what basis institutional R&D funding is determined and to whom the funding is allocated. Block grants and performance agreements are allocated to Research Organisations as legal entities and are determined on the basis of the budget allocated to Research Organisations in the preceding funding period. The thinking for PRFS money is different. The money is determined on the basis of

scores achieved by research units (RUs) and then aggregated to the level of the Research Organisation as the legal entity which receives the PRFS money.

Shares of the components of the funding

We suggest that, similar to the current system, in the first funding period after the first evaluation based on the new methodology, the *block grant* should make up 80% of the pot (or pots for the different Research Organisations) and 80% of what each Research Organisation received in the previous funding period. The previous funding period should refer to an average of what Research Organisations received over a period of 3-5 years (a 'reference funding period'), in order to take into account trends. Moreover, these 3-5 years should cover the years when institutional R&D funding was based on the evaluation methodology valid for the years 2013-2015 (or later), encompassing an 80% block grant and an 20% performance based part. Using the years before the Evaluation Methodology 2013-2015, when a higher share of institutional R&D funding was allocated by the Metodika would not make sense because fluctuations were too large.

The starting point we are suggesting for the block grant safeguards continuity with the present funding situation for each Research Organisation involved. We have developed a special treatment for RUs that achieve low scores in the new evaluation, which should somewhat mitigate the troubles associated with the starting point.

With regard to the *performance-based research funding system (PRFS),* we suggest basing 15% of total institutional funding for RO on it. Moving 15% of institutional funding for RO through a PRFS is in line with international good practice, e.g. in Norway or Denmark. The PRFS, such as it is proposed at the moment, would be run every five or six years. Experience with performance based research funding systems in other countries shows that even small shares of budgets allocated on the basis of performance indicators can have dramatic effects on the research system, not least through a psychological effect. Contrary to what might conventionally be expected, researchers' behaviour tends to be more strongly impacted by measures of esteem. Getting a bad score in the PRFS generally is an enormous incentive to perform better next time.

As to the *performance agreement*, we suggest linking 5% of funding to a 'light touch' performance agreement to promote institutional development and capacity building. The performance agreements should be negotiated between a funding provider (ministry) and Research Organisation for a period of two and half to three years, to be compatible with the PRFS periodicity. Those ministries that in the past lost their R&D budget to the Ministry of Education need also be involved in the negotiation of the performance agreement to ensure the relevance of the performance agreement. In the long term, the possibility to transfer R&D funding responsibility back to the founding ministries should also be investigated.

'Light touch' in this context means that the performance agreement should not cover the entire Research Organisation with all its activities but focus on one or several strategic projects focusing on well defined issues of institutional development. The rationale for this 'light touch' performance agreement with a 5% share in the funding system is that principals (providers/ministries) and agents (Research Organisations) are new to this instrument. This low share will give Research Organisations and ministries an opportunity to learn and introduce a cultural change, while not risking too much.

Together, the performance-based components will make up 20% of total institutional R&D funding. This may appear to be a low share although at the same level as the current system. However, given the high percentage of competitive funding (approximately 50%) in the Czech R&D system, we think that the competitive element in the institutional R&D funding system should not be too pronounced, in order to guarantee stability and allow capacity building.

In the present system, a formula-based evaluation takes place every year, based on achievements in the prior period, i.e. the preceding five years. In the future, the new peer-based evaluation is scheduled to take place every five or six years, which implies that the overall amount of funds allocated through the corresponding mechanism for institutional funding for RO is also set for the same period of five or six years

Shares of components in future funding periods

We suggest an 80+15+5 allocation of institutional R&D funding to *all* types of Research Organisations for the first funding period because they all are in need of stability. However, shares of the block grant component and the two elements of the performance based component can be changed in future funding periods. This means that the share of the funding components can be increased or decreased depending on policy requirements. Of course, this requires a policy decision that cannot be delegated to a PRFS or some other 'mechanical' system.

We suggest the following principles should be considered when thinking about increasing or decreasing the shares of the funding components.

- One prerequisite is that the PRFS is well established among stakeholders and needs to work well before its share can be increased. The same is true for the performance agreements.
- Experience in other countries shows that in countries where there is an increase in institutional funding, this increase tends to be allocated through the performance-based part, which implies that the share of the block grant decreases – while not decreasing in absolute terms, thus ensuring stability. In countries where there is little increase in institutional funding, the shares of the block grant and the performance-based part typically remain fairly stable.
- Because there are different budget pots for different types of Research Organisations, the shares of the funding components can be changed separately for each type of Research Organisation, depending on their needs. For example if a certain type of Research Organisation displays a particular need for institutional development, the performance agreement component should be given a higher weight. Similarly, if a certain group of Research Organisations displays a need for more quality and is homogeneous enough to benefit from more direct competition, the PRFS part of the funding could be increased. The guiding principle would be that changes in funding component shares need to be in line with the needs and requirements of particular types of Research Organisations, as articulated both by the Research Organisations themselves and their owners.
- Another important guiding principle is that the funding mix (institutional/competitive/contract funding) ought to be part of the decision-making on the shares of the different funding components for different types of Research Organisations. If there already is a high share of competitive funding in a group of Research Organisations, then the performance-based components, in particular the PRFS, should not be over-emphasised in order to ensure stability and opportunities for capacity building. Similarly, if the share of competitive funding is fairly low, then the performance-based components can be increased more. The share of competitive funding is typically higher in more applied Research Organisations compared to basic Research Organisations.

Performance agreements

The performance agreement component resembles an existing funding stream among HEIs called Rozvojové programy (Development Programme) administered by the Ministry of Education, Youth and Sports (MEYS), which also promotes institutional development projects. However, while the current programme for HEIs uses a funding formula based on quality indicators, the performance agreements we are proposing here will not because in the funding system the quality aspect is covered by the PRFS.

The performance agreement component, however, foresees sanctions in case the Research Organisation does not fulfil the agreement.

The performance agreements are set up individually, taking into account the specifics of each Research Organisation (e.g. role and mission, research profiles, institutional setup). They are light touch and promote institutional development and capacity building. The main idea behind this approach is that a leverage effect is expected: if the strategic projects succeed, they will have a positive influence on the whole or at least essential parts of the Research Organisation.

The performance agreement is an agreement between the ministry and the Research Organisation on a small number of strategically relevant undertakings that the Research Organisation agrees to implement in the performance agreement period in order to increase R&D capacity and to improve working conditions for research as well as for support staff.

Performance-based research funding system (PRFS)

The new Evaluation Methodology provides us with scores from 1 – 5 against five categories of indicators: scientific research excellence, overall research performance, societal relevance, research environment, membership in the (global and national) research community [1].

In order to translate the scores into funding, our proposal is to use the five categories and define "sub-pots" for them. This implies a weighting of the categories in line with the organisations' mission and in line with the PRFS's objectives. This in turn implies that the weights have to be different for the different types of organisations because they have different missions and roles in the Czech R&D system. While the weighting itself is essentially a policy decision, we can provide guiding principles on which to base the decision on how to weigh the different categories for the different type of organisations.

- The main guiding principle will be that the weights of the different evaluation criteria need to be in line with Research Organisations' missions. For example, scientific research excellence is of highest relevance for Scientific Research Organisations. Hence, this category should have a higher weight for Scientific Research Organisations than for all the other types of Research Organisations. In contrast, societal relevance is more important for Research Organisations that conduct applied R&D and serve user communities such as industry sectors (Industry and Business Services Research Organisations), the public sector (Public Services Research Organisations) or other researchers (National Resources such as archives and libraries) than for Scientific Research Organisations. Consequently, societal relevance should have more weight for these types of Research Organisations.
- Weights will also need to be in line with ministries' strategies for 'their' Research Organisations. While these strategies should be in line with Research Organisations' missions, strategies will typically go beyond the mission, emphasising certain policy objectives. For example, if it is a strategy to increase excellence in Scientific Research Organisations, then research excellence should be given a high weight. If the strategy is to improve management, then research environment needs to emphasised.

[1] See the Final Report 1 – The R&D Evaluation Methodology

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List of Abbreviations

ASCR	Academy of Science of the Czech Republic
BIS	Department for Business, Innovation and Skills
BMVIT	Federal Ministry for Transport, Innovation and Technology (Austria)
BMWFW	Federal Ministry of Science, Research and Economy (Austria)
BOKU	University of Natural Resources and Life Sciences (Austria)
CR	Czech Republic
CZK	Czech Crown
EvU	Evaluated unit
EZ	Ministry of Economics (NL)
FFG	Research Promotion Agency (Austria)
FTE	Full Time Equivalent
GACR	Czech Science Foundation (Grant Agency)
GOVERD	Government Expenditure on R&D
GTIs	Large Technological Institutes
HC	Head count
HEI	Higher education institution
HR	Human resources
KNAW	Royal Dutch Academy of Arts and Sciences (NL)
MEYS	Ministry of Education, Youth and Sports (CR)
NatRes	National resources Research Organisation(s)

NESTI	National Experts on Science and Technology Indicators - OECD Working Party
NL	Netherlands
NWO	National Research Council (NL)
OCW	Ministry of Education and Research (NL)
OECD	Organisation for Economic Cooperation and Development
PhD	Doctor of Philosophy
PRFS	Performance-based Research Funding System
PSRO	Public Services Research Organisation
R&D	Research and development
RD&I	Research, Development and Innovation
RAE	Research Assessment Excercise (UK)
RCN	Research Council of Norway
RCUK	Research Councils UK
RD&I	Research, development and innovation
REF	Research Excellence Framework (REF)
RIV	Register for Information on Results (CR)
RO(s)	Research organisation(s)
RTI	Research, Technology and Innovation
RTO(s)	Research and Technology Organisation(s)
RU(s)	Research Unit(s)
ScRO(s)	Scientific Research Organisation(s)
TACR	Czech Technology Agency
UK	United Kingdom
VINNOVA	Swedish Governmental Agency for Innovation Systems
WP	Work package

1. Introduction

This report is the one of the three Final reports in a study developing an evaluation methodology and institutional funding principles for the R&D system in the Czech Republic. It sets out our thoughts and a proposal for the new institutional funding principles for research organisations in the Czech Republic.

The report responds to the requirements in the Terms of Reference (ToR) for the Work Packages 5 to 8 in this study.

In the next chapter of this report, we give an overview of the background for the development of new funding principles, i.e. a summary of international R&D governance and institutional funding practices (Section 2.1), and the current institutional funding system in the Czech Republic, its weaknesses and strengths (Section 2.2). We conclude the chapter setting the Czech system in the international context and identifying some 'lessons learned' for the design of the new funding system.

In Chapter 3 we propose the new principles for institutional funding of research organisations in the Czech Republic.

This report builds upon a set of analyses that are reported in the following background reports (separate documents).

- The R&D governance and funding systems for research in international practice (Background report 6)
- The institutional funding system in the Czech Republic (Background report 7)
- The ex-ante assessment of the proposed funding system (Background report 8). The analyses reported there have fed - and will continue to feed - into the design of the funding principles. Currently, the use of the simulation model is therefore predominantly internal

2. The background

2.1 International organisation and funding practice

This section aims to put the Czech funding system into an international context, focusing on the five countries identified for this purpose. A fuller discussion of these countries appears as Appendix B to out First Interim Report.

2.1.1 The R&D governance system

The key parameters of the new Evaluation Method, especially those that determine funding, are components of a wider 'policy mix' for R&D. Many policy decisions such as the policy mix 'emerge' from the interplay of a complex set of drivers that are specific to the national research and innovation system. For example, the optimal balance of 'basic' and applied research funding may be influenced by the structure of industrial and social needs as much as the characteristics of science and determined by the sum of decisions made by a variety of actors, including ministries, funding agencies and Research Organisations (ROs). In this section we summarise some key aspects of R&D governance systems that need to function well if they are to produce good policy.

Figure 2 offers a framework for comparing the way the state organises, governs and coordinates the R&D system in different countries. It shows the organisational hierarchy that is usual in West European countries. Organisations at each level generally act as 'principals' to those immediately below them. The UK has long followed the 'Haldane principle' that a government ministry can direct its research funding agency in broad terms but may not interfere in specific project funding decisions. In Sweden, such micro-management (*ministerstyre*) is formally illegal. The tradition of 'new public management' increasingly means that principals everywhere set **objectives** for those below them, rather than micro-managing them.

Policy coordination matters because it provides a way to ensure the overall coherence of research and innovation policy – an aim is to make sure that one part of the system does not rely on another part to deliver something, which it turns out is not delivered. It is increasingly important as research and innovation policies have to confront the 'grand' or societal challenges such as climate change, ageing, HIV/AIDS and so forth, which cut across the needs and abilities of individual parts of the system such as ministries to deal with them.

The analytic framework in Figure 3 involves four levels. Each has a distinct set of functions and it is possible to try to organise policy coordination at each level.

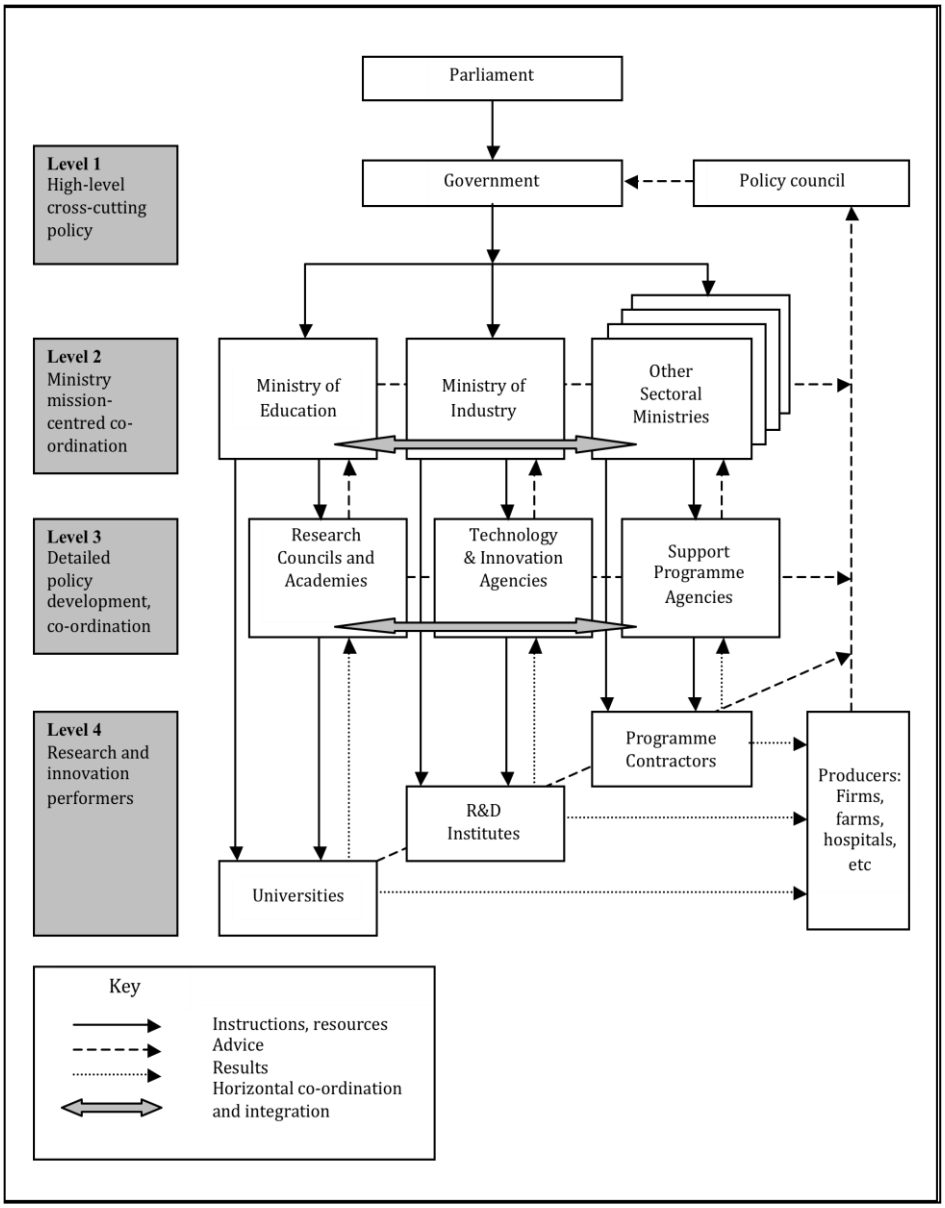
- **Level 1** is the highest level. This involves setting overall directions and priorities across the whole National Innovation System. Coordination be achieved through advice to government or by more binding means, such as decisions of a cabinet sub-committee
- **Level 2** is the level of ministries, where policies are normally set. There is a need for co-ordination among ministries, whose sectoral responsibilities otherwise encourage them to pursue independent policies. In practice this level of co-ordination may involve administrative aspects, policy issues or both.
- **Level 3** is the level of funding agencies, whose task is to translate policies into funding concrete programmes, projects and other activities. This level can involve administrative co-ordination as well as more substantive co-ordination of funding activities, such as co-programming
- **Level 4** is the level of research and innovation performers. They execute the projects and programmes funded by Level 3. Co-ordination at this level tends to be achieved through self-organisation rather than using formal mechanisms

Internationally, this four-level hierarchy tends to be reflected in four organisational levels: governments; ministries; funding agencies; and research performers. There are still examples of organisations that span more than one vertical level. For example,

some of the UK research councils operate research institutes, so their work spans Levels 3 and 4. By this kind of vertical integration is becoming less and less normal.

A key difference between this archetypal organisation structure and the Czech Republic is that the Czech Republic retains the old Soviet structure where the Academy of Science had the same status as a ministry, internalising the distinctions between policymaking, research funding and research performance that in Western systems tend to be looked after by different organisations. The Technology Agency also follows this structure, effectively having ministry status.

Figure 2 Generic Organisational Structure for Research and Innovation Policy



Source: Modified from Martin Bell, *Knowledge Resources, Innovation Capabilities and Sustained Competitiveness in Thailand: Transforming the Policy Process*, report to the National Science and Technology Development Agency, Bangkok, Brighton: SPRU, 2002

The way in which national R&D activities are governed or 'steered' by the state is complex in all countries. The private sector, of course, steers itself – though the state can use incentives such as subsidies, tax breaks and regulation to encourage certain types of behaviour. Within the state, there are multiple stakeholders – policymakers,

funders and performers – in relation to R&D, all of whose decisions affect the actual pattern of R&D activity. In such a complex system the overall characteristics of the national effort are 'emergent': they emerge from the way the different actors in the system behave.

The organisation and governance structure shown in Figure 2 is effectively the way in which the state connects R&D activities to social needs. Government is a major influence. But the individual ministries also have a strong say, with each representing a particular 'sector' of society. In principle, each ministry has an understanding not only of the overall needs of its sector but the kind of research needed to advance knowledge and develop policy. In many cases, some of this need will be expressed through a PSRO 'owned' by the ministry. In research policy as in policy more generally, therefore, the spending ministries make competing claims about their needs – and have an annual battle with the finance ministry about how many of these claims can be afforded. The relative power of government centrally and the individual ministries varies among systems but the outcome is rarely the result of a simple top-down decision. It emerges from the competition among claims – a competition that can in many systems benefit from being expressed in an 'arena' such as a policy council, where it is possible to coordinate and negotiate. Such an arena may also be helpful to focus the national effort in pursuit of a strategy, make sure all the needed parts of the system function and make it possible for the national system to change direction when circumstances change.

One of the biggest of these changes currently is the emergence of 'grand challenges' (climate change, ageing, HIV-AIDS and so on) as policy priorities. To a greater extent than earlier policy foci such as industrial development and growth, the grand challenges require joint and consistent activities across many disciplines and many sectors of society. They therefore appear to imply a need to change the way research and innovation governance is structured and the need to tackle them needs to be built into any such governance system.

For a comparatively decentralised governance system to operate well, the individual actors need to be able to analyse, express and lobby for the satisfaction of their own sector needs. This means that people with relevant skills and capabilities and the independence not only to undertake the needed analysis but also to be able to present its results to the wider policy community must populate them. 'Distributed strategic intelligence' is needed – in the sense of a wide availability of data and sources of information. Inherently, such a system will not only foster disagreements among actors, but also the transparency of information that allows wide participation in policy debate.

In summary, key characteristics of the funding and governance systems in our comparator countries are as follows. (More detailed descriptions are in the Appendix to our Second Interim Report).

Austria tends to have coalition governments, which means that there is often not a single government view on research and innovation policy. Rather, different political parties treat individual ministries as their own fiefdoms, making policy coordination harder than in some other countries. With separate policy advisory committees in the industry (BMVIT) and science (BMWFW) ministry spheres and no overall arena or 'referee' at the level of government, it is difficult to maintain a coherent and holistic policy. The ministries – especially BMVIT – also micro-manage some of the work of the agencies, for example by giving final approvals to project grants, so the space for cooperation at the agency level is also limited. The Balkansation of policy continues down to the performing level, with the two key ministries maintaining separate institute systems. Other sector ministries maintain their own labs and – in the case of agriculture – university (BOKU). There is no over-arching thematic research and innovation strategy. Thus, to the extent that the grand challenges are addressed this tends to be by single-ministry programmes rather then through more coordinated use of the state R&D system as a whole.

The Netherlands maintains separate, powerful ministries of economics (EZ) on the one hand and education and research (OCW) on the other. In the past there has been a proliferation of research and innovation policy advisory committees but now there is a single one (AWT) operating at the level of government as a whole. It advises the government on individual research and innovation issues rather than on overall strategy. Separately, the Royal Dutch Academy of Arts and Sciences (KNAW) offers research policy advice to government. EZ maintains a research and innovation policy focused on funding 'top sectors' defined in industrial terms, while OCW operates a fairly traditional set of education and research policies focusing on the higher education sector. The NL Agency implements EZ programmes in the business sector but has little responsibility for strategy or policy. The national research council NWO focuses largely on academic research, though it has a small sub-council for innovation (STW), which it funds together with EZ. At the level of research performance, EZ supervises TNO (the national RTO) but also two other chains of institutes: the Large Technological Institutes (GTIs) and the DLO institutes, both of which can been seen as spanning the PSRO and RTO functions. OCW and NWO maintain their own scientific research institutes. Other ministries – notably agriculture and defence – have large institutes of their own. As in Austria, however, the mechanisms that would enable horizontal coordination in areas such as the grand challenges appear weak.

Norway has separate industry and education ministries, with responsibilities respectively for innovation and research. It maintains a large number of PSROs serving individual sector ministries. It has at various times had advisory councils for research and innovation combined and separately, both at the level of the government as a whole and latterly at the level of the education and industry ministers. Generally, these have proved ineffective and the current government has abandoned any attempt to use such structures. The Research Council of Norway – a combined research council and innovation agency – was set up in 1993 in response to the inability of the existing R&D funding organisations to implement the government's cross-cutting R&D priorities. Its ability to coordinate across the strong boundaries between the sector ministries has been limited but in recent years ministries have been forming small clusters in order to generate cross cutting strategies in areas like climate and nanotechnology that are implemented chiefly through RCN programmes. The education ministry takes the lead in coordinating other ministries' research policies and in the last decade or more has succeeded in establishing national thematic priorities through a series of research bills.

Sweden took a policy decision in 1942 to avoid fragmenting its scarce national R&D resources and therefore to use the universities not only for basic research and higher education but also to cover many of the roles played by PSROs and RTOs in other countries. This would therefore appear to be a natural place for coordination to take place, were the university system not at the same time so fragmented. The industry ministry runs the major innovation agency (VINNOVA) and owns most of the small RTO system. In recent years, it has launched an innovation policy, separate from the national efforts elsewhere in research. The education ministry operates the Swedish Research council, focusing on basic research, and shares ownership of two more specialised councils (FORMAS and FORTE) with other sector ministries. Boards containing a majority of people elected from the research community run all the research councils, so they are difficult to steer any wider government strategy. There has been for many years a group of academics advising the education minister on research policy, but this has not generated any thematic strategy. The education minister chairs all discussion of research in the cabinet, with the intention in that way of creating a holistic policy but this appears to have had few results. The lack of strategy and coordinated effort is exacerbated by the presence of the Wage Earner Foundations (Strategic Research, MISTRA, Knowledge and a number of smaller ones), which are organisationally separated from the state and lie outside the normal policymaking mechanisms. Recent governments have tried to impose overall strategy by allocating research funds to the universities, earmarked to specific areas of research and innovation. However, with over 20 priorities in each case, it is hard to see these as

either effective or strategic – though they do in a number of instances address the grand challenges.

The **UK** has over the years centralised its higher education, research and innovation policies into a single ministry, currently called the Department for Business, Innovation and Skills (BIS). BIS has published a national research strategy for innovation and growth and recent BIS policy announcements point to the prioritisation of certain key and enabling technologies – although the research councils and universities are expected to set their own priorities. The Council for Science and Technology advises the government on research and innovation policy – but like the Dutch AWT this provides advice on individual issues rather than strategy or overall policy. In parallel, the Chief Scientist provides the Prime Minister with science-based advice on policy – but this essentially is 'science for policy' rather than 'policy for science'. In recent years, all the departments of state have taken up this idea of having a Chief Scientist to provide science-based policy advice. Outside BIS, four departments of state (defence, health, international development, and environment, food and rural affairs) spend large amounts of money on research. Several departments fund so-called public sector research organisations (ie PSROs), some of which are operated by private sector companies. While the work of the seven research councils is coordinated by their umbrella organisation RCUK, there is no clear coordination mechanism or 'arena' for defining cross cutting strategies in the UK. To some extent this may be because the funding system is so big compared with the other countries discussed here, that issues like climate change can be handled within the research council system.

In the **Czech Republic**, the main national policy document is the RD&I Policy 2009 – 2015. The Council for Research, Development and Innovation (RD&I COUNCIL) is the first level body that advises the Government on the priorities, budget and the overall organisation of the RD&I System in the Czech Republic. It is the key 'arena' in which overall research and innovation policy can be coordinated. A member of the Government - currently the Deputy Prime Minister - acts as the Chairman of the RD&I COUNCIL, thus enforcing its legitimacy. Besides the CRDI, there is a set of ministries and three agencies (the Science Foundation, the Technology Agency and the Health Agency[2]), responsible for the implementation of the RD&I policy, that constitute the second 'intermediary' level. Apart from the Ministry of Education, Youth and Sports, there is the Ministry of Industry and Trade, Ministry of Health, Ministry of Defence, Ministry of Culture, Ministry of Agriculture and the Ministry of Interior. These ministries act as providers of institutional support. Three Ministries, i.e. the Ministry of Defence, the Ministry of Health, and the Ministry of Agriculture were assigned responsibility for sector-specific RD&I. All of these Ministries manage the national institutional funding for the research organisations – public or private non-profit – in their area of competence; most of them also develop and manage competitive R&D programmes. Other sector ministries lack (or have been deprived of) budgets to fund institutional R&D costs – and therefore to maintain a body of research capabilities and evidence relevant to developing their policies.

Among the countries discussed, the Czech Republic might appear to be the best placed organisationally to coordinate research and innovation policy because it has an over-arching RD&I council closely linked to government. However, a key weakness of the RD&I COUNCIL is the fact that it comprises almost entirely members of the research community, as opposed to incorporating wider stakeholder interests inside and outside government. The apparent lack of coordination in most of the other systems, however, seems to be compensated in the short term by the ability to take comparatively decentralised decisions based on decentralised absorptive capacity and

[2] Established only in mid 2014

strategic intelligence about policy in research and innovation systems that are somewhat mature. In Norway, this ability to self-organise extends to creating new constellations of ministries to make strategy. But most of these systems are poorly adapted to taking major changes in direction – in particular to reorganising the national effort in a way that addresses the grand challenges. In general, overall policy or the policy mix 'emerges' as the sum of many decentralised decisions rather than being decided. Those places that lack an 'arena' like the Czech R&DI Council also lack a place in which it is possible to address systemic issues, like the balance between institutional and competitive funding, the relative investments in basic and applied research or the degree to which it makes sense to reorient parts of research and innovation policy to the grand challenges.

2.1.2 Governance of public research performers

Research-performing organisations have become increasingly autonomous from government and the state over time. This means in practice that principals micro-manage them less than before and to a greater extent use incentives to encourage them to implement policy, while recognising that there are also many aspects of their behaviour that the state simply does not need to regulate. Perhaps the most important limitation on universities' autonomy is that most countries use a central agency to accredit degree courses. In the UK, the Quality Assessment Authority uses peer review to monitor degree standards and advises on which organisations should be allowed to grant degrees.

In all the countries considered, the universities now effectively set their own strategies and control their internal budgets. In particular, they are free to use their institutional research funding as they themselves choose. The academies and research councils that control most of the scientific research institutes set their own policies while the RTOs have always needed a high degree of autonomy in order to be flexible enough to serve their largely industrial markets. The spread of the new public management means that PSROs are increasingly managed by objectives, leaving them to decide for themselves how to reach these objectives. In many cases, governments also want to see the labs winning industrial income in addition to fulfilling their tasks for the state, so this is another factor encouraging autonomy.

For the purpose of this comparison, we distinguish among five different types of research-performing organisation. At some points in this report we refer to the first two collectively as 'scientific research organisations'.

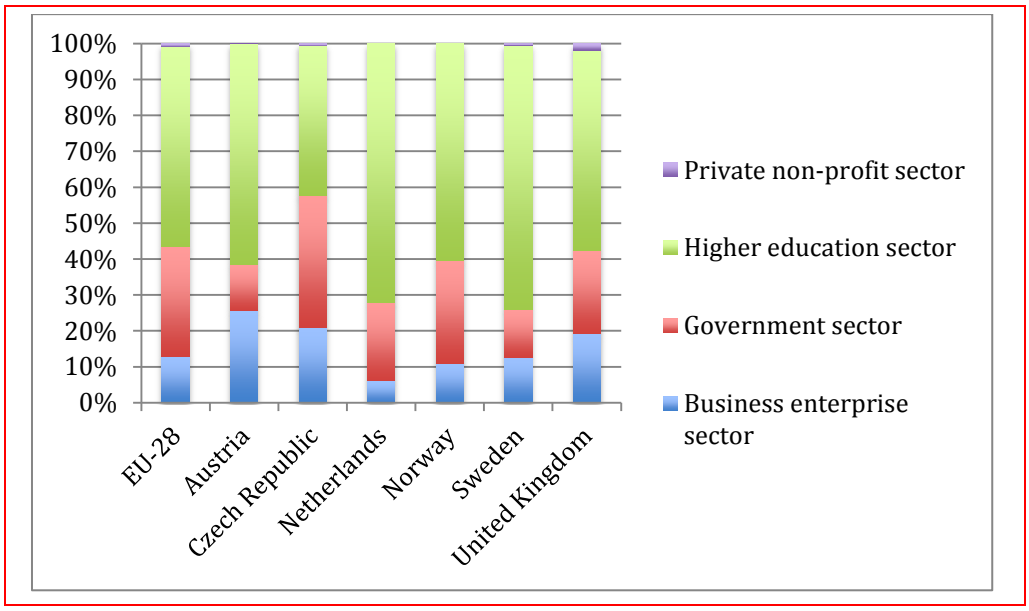
- Universities – or, strictly, research universities (since some universities only teach and do not do research)
- Scientific research institutes – which, like research universities, conduct fundamental or applied research but either have no teaching responsibilities or only provide education at PhD level (alone or in combination with a university)
- Research and technology organisations (RTOs) – which conduct applied research and experimental development and provide technical services to support industrial innovation. These can be distinguished from technical consultancies in that they receive institutional funding from the state
- Government labs – known as 'public service research organisations' in the Czech Republic, these do research and provide technical services on behalf of government. They produce knowledge the government needs in order to legislate or regulate or they produce 'public goods' such as standards, certification or weather forecasts that society needs but that private companies lack the incentives to make. Some PSROs are run by private companies on behalf of government
- National resources or infrastructure – such as libraries and museums, which enable others to do research and which may otherwise be needed for social, educational or cultural reasons. Normally, these need to do some research of their own in order to support their infrastructural function

Some of these organisations may do quite a limited amount of research, so they are not all always considered in discussions of research policy. For example, the Austrian PSROs tend to be ignored in literature on Austrian research policy. Few research policy documents take account of libraries and museums.

While there are important overall similarities in the types of research-performing organisations present in different countries, especially if they are considered in terms of their roles and processes, their relative importance, governance, funding and quality control mechanisms vary.

Figure 3 shows that higher education dominates government expenditure on R&D in all the countries compared. It is especially high in Sweden because of the national focus on using universities as all-purpose research institutions and in The Netherlands. The government sector is especially important in the Czech Republic because the ASCR is in this category, while the other countries considered do the equivalent research in the universities and do not maintain large academy systems. In The Netherlands and Norway the national RTOs fall into the government sector, together with the public service laboratories. In the Czech Republic, Austria and Sweden, the RTOs are organised as limited liability companies so they are classified as belonging to the 'business sector', despite the fact that their mission is essentially public. The high proportion of Austria's GOVERD spent in the business enterprise sector is also influenced by that country's unusually high rate of R&D and innovation subsidies to industry. The UK figures are influenced by the fact that many of the public service laboratories have been privatised or are operated by private companies on behalf of the state. There is probably also a legacy from the UK's historical high level of expenditure on defence R&D in both the public and the private sectors.

Figure 3 Government Expenditure on R&D (GOVERD), 2011



Source: Eurostat

Figure 4 gives some basic information about research-performing organisations in the comparator countries. Where individual organisations are shown these are examples – the lists are not always exhaustive.

Figure 4 Research-performing organisations in the comparator countries that receive institutional funding (not exhaustive)

	Universities	Scientific research institutes	RTOs	PSROs
Austria	22 public universities	Austrian Academy of Sciences Ludwig Boltzman Institutes	Austrian Institute of Technology Joanneum Research Salzburg Research Upper Austrian Research	Institute for Advanced Studies (HIS) WIFO BEV (metrology) AGES (health and food safety) ZAMG (meteorology)
Netherlands	14 public research universities	KNAW – 18 research institutes NWO – 9 research institutes	TNO 4 Large Technological Institutes (GTI) 9 DLO institutes (agriculture)	12 PSROs attached to 5 'sector' ministries
Norway	39 public universities	See PSROs box and the main text for explanation	13 'technical-industrial' research institutes	38 mixed-purpose institutes • 23 social science • 8 environment • 7 'primary industry'
Sweden	46 public universities	None	RISE – comprising 16 RTOs grouped into 4 technological divisions	FoI Swedish Defence Research Agency SSMHI Swedish Meteorological and Hydrological Research Institute SMI Swedish Institute for Infections Disease Control SSI Swedish Radiological Protection Authority
UK	154 public universities	About 50 institutes belonging to various research councils	7 Catapult Centres	About 100 public research establishments (including museums and libraries)
Czech Republic	29 public & state universities	54 institutes	33 RTOs	34 PSROs

Note: Grey shading indicates the use of a PRFS. Yellow shading denotes performance contracting. Blue shading denotes a mixture of the two. The 29 public & state universities in the Czech Republic include the Institute for Postgraduate Medical Education

We have not included centres of excellence or competence centres in Figure 4. These are usually organised as funding programmes by research councils or innovation agencies – even in cases where (as in Austria) the individual centres are legal persons. Austria is unusual too in operating some small competence-centre like activities through the Christian Doppler Society, though the main effort in this area is a programme funded through the innovation agency, FFG.

Naturally, all the countries considered have research universities. The numbers of universities shown in Figure 4 are inflated in the Swedish and Norwegian cases by the treatment of 'universities and colleges' as a single category. Only in the Czech Republic are private universities routinely eligible for state institutional research funding. In recent years, Sweden has been experimenting with university legal form by allowing Chalmers to become a foundation rather than a state agency. The education ministry contracts with Chalmers to buy certain numbers of degrees and to provide institutional funding for research so that it effectively competes on an equal basis with the state universities.

In most countries public universities are agencies of the Education Ministry or can otherwise be instructed by the government. Each public university in the UK has a 'charter' granted by the monarch, under which it is self-governing and can essentially pursue the purposes for which it was established as it sees fit.

All but one of the cells in Figure 4 is populated: Sweden does not have any scientific research institutes, since as a matter of policy scientific research is the job of the universities. The other comparator countries' scientific research institutes are almost all associated with academies or academy-like structures such as research councils. But unlike in the Czech Republic where the ASCR is a major block in the research performing system, these are mostly small and are often historical legacies rather than being a mainstream way to organise research. Some of the UK research council institutes were set up to establish new fields, in the expectation that their role will later be transferred to the university system. Some other countries not considered here do have large scientific institute sectors – notably Germany, Spain and France, though in the latter case almost all the institutes now 'cohabit' with university departments.

With the exception of the UK, the comparator countries all have at least **some** large RTOs – even though (as in Sweden and Austria) RTOs may constitute a modest part of the total research-performing system. The government withdrew institutional funding from the British RTOs in the 1980s, so the former generation of RTOs (made up mostly of branch-based research associations) either collapsed or became technical consultancies. In 2010 the UK government decided to re-establish an RTO sector and started to build a network of 'Catapult Centres' based loosely on the Fraunhofer model. So the small size of the individual Czech RTOs is distinctive.

RTOs and PSROs may generally receive institutional research funding irrespective of their legal form – but those that are organised as private companies must in practice operate as not-for-profit organisations (typically in the sense that they do not distribute dividends to their shareholders) and must recognisably be serving a pubic rather than a private purpose. Thus, while the large Austrian AIT institute is organised as a private company (and is 49% owned by industry), it receives institutional research funding. However, Austria also has a number of research associations organised under the umbrella of Austrian Cooperative Research. The pharmaceutical industry owns the Institute of molecular Pathology. AVL is an internationally very successful contract research organisation working for the vehicles industry. All of these are privately owned and serve private purposes. None receives institutional funding from the state.

All the countries considered have dedicated public service research organisations (PSROs). (In fact, the only country of which we are aware that does not have some such organisations is Denmark, which integrated its labs into the university system in 2007 but left the 'GTS' RTO system outside the university sector.) Austria has a

considerable number of PSROs, though the sector is poorly documented. Sweden has very few, on the local principle that the universities should do research.

2.1.3 PRFS and Performance Contracts

The comparator countries have rather stable systems of research performing organisations. Changes are introduced by government policy – for example, as part of a decision to set up a new university or to privatise a PSRO – though in practice these are rare events. Entitlement to institutional funding generally follows automatically as a consequence of the policy decision. Dutch, Norwegian and Swedish universities have to be accredited in order to qualify. In the Norwegian institutes' PRFS, the Ministry of Education and Research decides case by case whether to place institutes under the stewardship of RCN and therefore to make them eligible for institutional research funding via RCN.

The Czech Republic's institutional structure is less stable, in the sense that there have been many changes since the change of political system and there is still a process of readjustment in progress between the Academy and the universities. Like Latvia and Lithuania, the Czech Republic permits a bottom-up process where research organisations can apply to become eligible for institutional funding. The experience in all three countries is that this fragments the research performing system.

Figure 4 shows where PRFS and performance contracts are used in institutional research funding.

Since the 2002 university reforms, Austrian universities, scientific research institutes and RTOs have generally been funded via performance contracts. Austrian PSROs and infrastructure tend to be funded directly, with few performance requirements. Swedish PSROs are steered using the local form of a performance contract, namely a 'steering letter', which is an annual letter from the responsible ministry that sets out the specific tasks required of the agent in the short term and allocates the overall budget. Dutch universities received funding based on performance agreements from 2012 on. The large Dutch RTOs (TNO and the GTIs) have a different kind of performance contract. This provides some basic funding more or less without conditions but then provides a second tranche of institutional funding that has to be devoted to work in specific fields or themes, specified by the responsible ministry as a representative for society. This is intended to influence the developmental trajectory of the RTO, so it is exposed to social needs through the institutional funding and to industrial requirements through its external contracting. UK PSROs are steered using 'service level agreements', the local form of performance contract.

The status of the UK universities (based on a royal charters) means the government cannot tell them what to do, so they are steered using incentives in a PRFS rather than through contracts or letters of instruction. The Czech Republic is unique – not only among the comparator countries but also more widely – in using a single PRFS to allocate research funding across all kinds of research performing organisations.

The Norwegian and Swedish university systems effectively use both performance contracting and PRFS. The bulk of their institutional funding is allocated through formulae and specific requirements made of them by their parent ministries. However, a small proportion is allocated through PRFS. Both elements are under the control of the education ministry. The Norwegian institute system is altogether more complex. The Norwegians make little conceptual distinction between scientific institutes, RTOs and PSROs. Any ministry can provide institutional funding to any institute through an annual letter of instruction. The Research Council of Norway (RCN) is responsible for the stewardship of the research institutes through evaluation, special funding instruments and a PRFS. RCN recommends to the Ministry of Education and Research **which** specific institutes perform sufficient research of sufficient seriousness to be admitted to this stewardship. (About 50, mostly small, institutes are excluded in this way.) The criteria are no more precise than this, so the Ministry decides case by case.

Not all PSROs are part of the RCN system, which contains examples of scientific research institutes (especially in the 'soft' sciences), RTOs and PSROs. The institutes can each address scientific, industrial and government markets so they can in practice configure themselves as multifunctional organisations. RCN organises the institutes into four 'competition arenas' and operates an indicators-based PRFS within each arena. While the rules of the PRFS are uniform, separating the institutes into different arenas is intended to minimise unreasonable competition caused by field differences. Many institutes are highly dependent upon project funding in competitive markets, so the PRFS may provide the bulk of their institutional funding. The greater the extent to which institutes operate as PSROs, however, the more institutional funding they receive directly from the parent ministry. As Figure 5 suggests, the PSROs are concentrated in the 'primary industries' (agriculture, fisheries, etc) category.

Figure 5 'Competition arenas' in the Norwegian research institute sector

Arena	Core/PRFS Funding	Direct ministry funding	No of Institutes
Social science	14%	6%	23
Environment	14%	4%	8
Primary industries	15%	34%	7
Technical-industrial	6%	3%	13

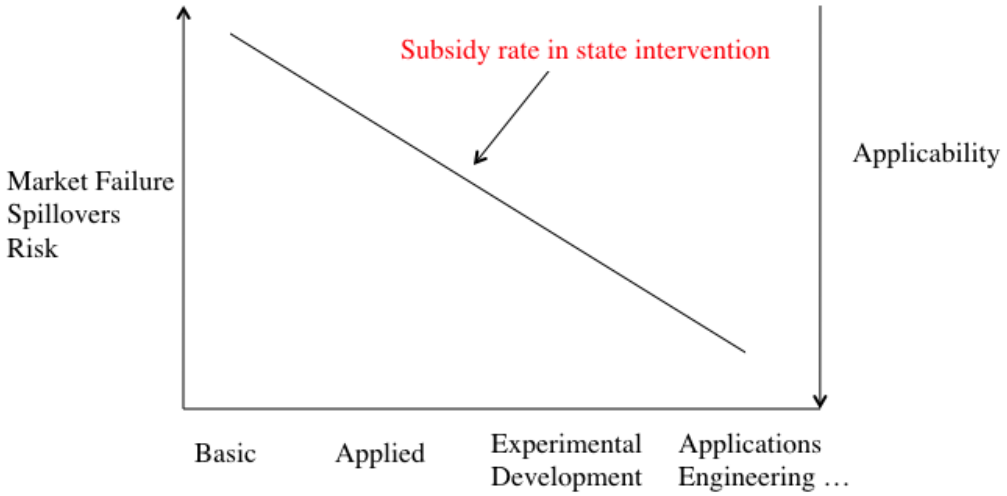
Source: RCN, Instituttsektoren: Forskningsrådets Strategi, Oslo: RCN, 2014

2.1.4 Institutional funding budgets

A key part of the logic of institutional research funding is based on the economics of knowledge, which in turn determine why the state needs to be involved in research funding and knowledge production. In economic theory, knowledge is 'non-rival' in the sense that it can be used by many people without being consumed. This is quite unlike the normal case of physical goods. Once a cake is eaten it is gone. A machine gradually wears out as it is used. But knowledge once made does not disappear. Knowledge is also 'non-excludable' in the sense that it is difficult to prevent people from getting hold of it. Non-rival, non-excludable goods are known as 'public goods'. They are unattractive for private organisations to produce because they cannot get money for them. This is often referred to as 'market failure'. The market can therefore not produce them. Since they nonetheless are socially useful, the state tends to fund their production.

A direct consequence is the pattern of funding illustrated in Figure 6. The closer knowledge gets to market application, the more companies are able to monopolise aspects of the knowledge and secure economic returns. So the state plays a big role in funding basic research (usually paying all the costs) but invests a far smaller proportion in those cases where it intervenes in more applied areas that are closer to market. The logic maps in a simple way across to different types of RO. Scientific ROs tend to produce rather fundamental knowledge where there is a high level or most failure, so the state pays all or most of the cost. PSROs largely produce knowledge needed only by the state or that are public goods, so they are normally also heavily subsidised as are infrastructure, for which private funders are unlikely to be found. In contrast, RTOs work close to market with industrial problems whose solution will enable one or more companies to make money. The need for subsidy is therefore smaller, so RTOs internationally tend to get 10-33% of their income as core funding whereas the other types of organisation considered here get a great deal more.

Figure 6 Implications of the economics of knowledge for state research and innovation funding



The general way to fund state universities in the post-War period was through a single block grant – what the OECD called the General University Fund. Historically, the trend has been for the ratio of competitive project funding to institutional funding to rise, increasing the external competitive pressure on quality. Research councils initially dominated the external research-funding stream, responding to investigator-initiated ('bottom up') proposals. However, most changes seem to have been incremental and uncoordinated. Typically, decisions to increase external funding are made and implemented separately from decisions about institutional funding, so the funding mix can change significantly without there being an explicit decision to change it.

Explicit decision-making about the use of institutional funding – or, indeed, about the overall funding of specific research-performing sectors – is rare in the comparator countries. In general, the countries rely on external, competitive funding as the main way to influence the thematic priorities of the research-performing system. Some countries incorporate feedback mechanisms from the amount of external funding to the amount of institutional funding in their PRFS.

Sweden and Norway have a practice of publishing Research Bills every four years. This means that there is automatically a periodic process of reviewing research and innovation policy. While these two countries have only weak coordination structures, the Research Bill discussions force a process of considering priorities. Norway has periodically specified national thematic priorities since the late 1990s while Sweden has done so since the Research Bill of 2008. However, these are not coupled to specific budgets or instruments. Austria's new RTI strategy (2011) underlines the need to develop national thematic research and innovation strategies that cut across ministry boundaries, not least to tackle the Grand Challenges, but does not yet appear to have devised specific strategies. The Netherlands and the UK have not set thematic priorities. The Czech Republic has set a number of priorities, which it is the job of the RD&I COUNCIL to implement.

A debate has raged in Sweden for many years about the balance between institutional and project funding in the universities. The 2008 Research Bill finally took an explicit position on this, providing an increase in institutional research funding. The same Bill accepted that the RTOs' institutional funding was too low and set an objective of increasing it from some 10% to about 15% of their turnover, in order to strengthen their underpinning scientific and technological capabilities. Similar discussions take

place in Norway about institutional funding for both universities and institutes, but so far without a change in policy.

Generally, governments fund the majority of R&D through institutional rather than project-based funding. Figure 7 shows the division between institutional and project-based R&D funding for a number of countries overall government spending on R&D. (The distinction between institutional and project funding has only recently been introduced in Eurostat and OECD statistics, so these are incomplete and not as reliable as some of the more established R&D indicators. Nonetheless, they are probably good enough to show broad trends.)

Figure 7 Government budget appropriations or outlays for research and development (2013; million EUR)

Country	Institutional Funding	Project Funding	Total	Share IF : PF
Austria*	1804.787	668.79	2452.955	73.6 % : 27.3 %
Czech Republic	472.75	532.554	1005.303	47 % : 53 %
Germany	15997.2	9356.8	25114.836	63.7 % : 37.3 %
Greece	445.93	265	710.93	62.7 % : 37.3 %
Iceland	99.338	23.485	122.823	80.9 % : 19.1 %
Ireland*	477	283.4	760.4	62.7 % : 37.3 %
Luxembourg	275.42	16.84	292.261	94.2 % : 5.8 %
Netherlands	3257.785	1344.013	4601.798	70.8 % : 29.2 %
Norway	1684.182	1417.436	3132.143	53.8 % : 45.3 %
Portugal	1231.65	347.35	1579	78 % : 22 %
Slovakia*	231.985	62.721	294.706	78.7 % : 21.3 %
Turkey	1425.625	457.091	1882.716	75.7 % : 24.3 %

Source: Eurostat; *data for 2012

A similar pattern is visible at the level of Higher Education (Figure 8), which shows how the part of the institutional funding (General University Fund) for research relates to project funding in the universities. The published statistics used in the Figure do not include data for The Netherlands or the Czech Republic. However, the NESTI project of the OECD suggested that the share of institutional funding in Dutch universities was 79% in 2008[3], while the National Statistical Office places the Czech share of institutional funding at 50% in 2012. Most of the funding systems involve a high proportion of institutional funding in the overall mix. The UK, French, Flemish and Czech systems stand out as only providing 50% or less of institutional funding for research to the universities.

[3] OECD, Working Party of National Experts on Science and Technology Indicators (NESTI) project on public R&D funding, 2009

Figure 8 Share of GUF versus direct government funding of R&D expenditure in the Higher Education Sector, 2009 (in millions of €)

	PRFS used?	Government sector funding	General university funds (GUF)	Government competitive research project funding
Belgium	Flanders	1,117	36%	64%
Denmark	X	1,653	72%	28%
Ireland		704	31%	69%
Germany		7,575	71%	29%
Spain	X	3,012	66%	34%
France		7,972	50%	50%
Italy	X	5,204	85%	15%
Austria		1,669	76%	24%
Finland	X	1,033	58%	42%
Sweden	X	2,041	57%	43%
United Kingdom	X	5,545	48%	52%
Iceland		55	51%	49%
Switzerland		2,000	82%	18%
Norway	X	1,380	73%	27%

Source: Statistics from Eurostat

Figure 9 indicates that most PRFS make up a small component of the overall funding system for research and higher education – a trend that is clearly visible also among other PRFS-using countries not considered here. Also noteworthy is that a considerable proportion of many institutional funding systems remains unconditional.

Figure 9 Current university institutional funding systems

Country	Overall institutional funding	Sub-components	
Austria	Block grant (unconditional)	80%	
	Formula funding	20%	
		Degree exams	60%
		Graduates	10%
		External funding	14%
		Donations	2%
		Cooperation	14%
Netherlands	Teaching	45%	
	Research	55%	
		Bachelors and masters degrees awarded	16%
		No of PhDs awarded	22%
		Block grant	62%
Norway	Block grant (unconditional)	60%	
	Teaching	25%	
	PRFS	15%	
		No of PhD candidates	30%
		EU R&D funding	18%
		National R&D grants	22%
		Publication points	30%
Sweden	Block grant (unconditional)	90%	
	PRFS – bibliometrics	5%	
	PRFS – external funding	5%	
UK (England) 2013-4	Teaching formula	51%	
	PRFS	36%	
		RAE/REF	67%
		PhD supervision	15%
		Charity support	13%
		Business support	4%
		Research libraries	<1%

Country	Overall institutional funding	Sub-components	
Czech Republic	Formula funding	77.5%	
	PRFS	22.5%	

Notes: Where universities charge fees, these are not included in the table. In the UK case, charity and business support are incentives intended to compensate universities for the fact that research charities and business tend to be reluctant to pay university overheads.

The introduction of PRFS in the comparator countries has normally resulted in only marginal changes to the funding mix. The PRFS are generally seen as useful ways to add an element of competitive pressure to institutional funding – but only at the margin. The big exception is the UK, where the RAE started partly because of the massification of higher education[4]. Government upgraded the polytechnics and eventually renamed them as universities but lacked the budget for them all to be research universities. In fact, it cut the research budgets of the universities and the research councils in the early 1980s. The university cuts were very uneven, with the 'establishment' universities tending to suffer least. This led to a lot of public criticism and the RAE was in effect introduced in order to make future allocation and reallocation of institutional funding transparent and therefore defensible.

Experience in the comparator countries indicates that performance contracting brings with it a significant need for monitoring. The research performers need to report at least yearly and there tend to be monitoring or 'dialogue' meetings at regular intervals so that both the principal and the RO are clear about the extent to which the requirements of the contract are being fulfilled. None of the countries that use performance contracts appears to have clear expectations about the consequences of sub-standard performance. The use of performance contracts in principle provides the principal with opportunities to manage the portfolio of activities taking place across the ROs. However, this ability to manage is generally constrained by the autonomy of the ROs – especially the universities. For some years, therefore, the Norwegian education ministry has tried to encourage thematic coordination among the universities through a dedicated coordination process (SAK), involving dialogue with and among the universities.

PRFS appear to reduce the need for monitoring, since the principal is in principle only interested in results, rather than the processes through which the RO produces the results. However, for those PRFS that – like the UK REF – are only operated at extended intervals, this does mean that the responsible ministry can only periodically understand the research performance of the universities.

2.1.5 Effects of funding systems

Performance contracting is generally an incremental change to previous systems for funding and steering. It therefore tends not to attract a great deal of evaluative attention. The Austrian system's initial period of university performance contracting between 2007 and 2012 has been evaluated. Key findings are that the indicators used were too complex to have a steering effect. They have since been simplified, giving the universities a clearer understanding of the behaviour required so that it is simpler for them to translate this into action.

The Swedish PRFS has yet to be evaluated.

[4] Martin, B., Whitley, R. 2010. The UK Research Assessment Exercise: a Case of Regulatory Capture?, in: Whitley, R., Gläser, J., Engwall, Reconfiguring knowledge production: changing authority relationships in the sciences and their consequences for intellectual innovation. Oxford University Press, Oxford, pp. 51-80

An evaluation of the Norwegian university PRFS[5] found that

- Defined in terms of indicators of journal quality, the quantity of research publication has gone up (during a time when the Norwegian HE system was in any case expanding rapidly) but average quality has not
- The proportion of HE faculty publishing has increased rapidly and the share of publication points going to organisations with an historically weak publication record has increased – suggesting that the biggest effects of the PRFS have been to boost research performance in the weaker parts of the university system, rather than to increase the performance of the leading organisations
- Since the number of publications has been rising faster than the funding distributed through the system, the 'price' of a publication has declined, so the researchers have to run faster in order to stand still in economic terms

The coverage of the system was extended (with modifications) to the regional health authorities and research institutes in 2008. An evaluation in 2012[6] found that

- The volume of papers published in the scientific literature by the institutes grew rapidly (10% per year) between 2007 and 2011
- There were significant changes in research and human resource management within the institutes, aiming to achieve such an increase in publication volume. These included publication incentives for individual authors
- Institutes regarded these changes as leading to increased research quality – but at the time of the evaluation it was not possible to support this proposition with harder evidence
- While international income was rewarded by the new funding system, this did not grow – suggesting that other factors are more important than the funding incentive in determining the level of this income
- The new system provided incentives for research cooperation with universities, but these appeared to have no effect on a level of cooperation that was already rather high

So the effects on the Norwegian system have been more capacity building than redistributive. At the level of behaviour and management, there have been big effects on processes intended to increase publication, but apparently no effects on research quality or on structural aspects of the research system, such as inter-linkages.

The UK RAE is seen as having increased the quality of UK university research, encouraged universities to develop research strategies and maximised research returns for limited funding. A reason for the RAE's success is said to be that there was a gap of several years between successive exercises, allowing time for universities and individual researchers to change their behaviour.

The RAE has evolved. In each round, the formula connecting performance to money was revealed after university submissions were assessed, making it harder to 'game' the system. Universities therefore tried to obtain the highest possible grades in all units of assessment. The proportion of institutional research funding distributed through the RAE rose. Funds allocation has become non-linear, so that high-ranking groups get much more money than medium-ranking ones while low-ranking groups get nothing. Over time, fewer papers had to be submitted per researcher and the universities could decide which members of staff to include in their submissions, so

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[5] Aagaard K, Bloch C, Schneider J. W, Henriksen D, Kjeldager T. R, & Lauritdsen P. S. (2014) Evaluering af den Norske Publiceringsindikator. Aarhus: Dansk Center for Forskningsanalyse

[6] DAMWAD (2012) *Evaluering av basisfinsnsieringen til norske forskningsinstitutter som omfattes av rettningslinjene for basisfinansiering,*. Oslo: DAMWAD

university research managers were increasingly able to influence faculty organisation and work patterns. Efforts to include industry in panels failed, owing to the high workload involved[7]. Pressure of work meant that, even though panellists ostensibly reviewed articles submitted by the universities in order to judge quality, they increasingly relied on journal impact factors as indicators of the quality of articles submitted for review[8].

The RAE has had a number of potentially problematic effects. The RAE made intensive use of learned societies, subject associations and professional societies to nominate potential panelists. More broadly, those who publish in and edit high impact factor journals dominate panels. High impact factor journals are used either directly or via the intermediate use of a list of highly regarded journals as evidence of high quality for the purposes of selecting submissions to the RAE. University recruitment and promotion criteria then adjust towards publication in these journals and, in the case of the UK, it appears that a 'transfer market' of people publishing in such journals develops ahead of each Research Assessment Exercise.

The bias of the RAE in favour of monodisciplinary, 'basic' research is widely acknowledged. Rafols et al[9] show statistically that interdisciplinary research (in this case innovation studies, which is part of the same 'unit of assessment' as management) is systematically excluded from the highest impact-factor journals, which are dominated by monodisciplinary management papers. Lee[10] shows statistically that heterodox economics is adjudged poorly in the RAE in competition with the mainstream, neoclassical school to which members of the Royal Economic Society and the editors of leading high impact factor journals tend to adhere.

Sastry and Bekhradnia[11] demonstrate an almost perfect correlation (0.98) between the way research funding was distributed in the RAE and through the research council system, arguing that the same institutions dominate both systems. Barker[12] shows that the relative outcomes of the UK RAE rounds have been rather stable, largely reinforcing the established order. In the 1996 RAE, 26 of the 192 submitting institutions got 75% of the money. In the 2001 RAE, 174 institutions submitted returns and 24 of them secured 75% of the money. Overall university rankings have changed little. Especially the former polytechnics have not been able to emerge from the 'tail' of the RAE system's funding distribution. This has meant a reduction of the proportion of overall university teaching in the UK that is research-led, as those institutions at the tail of the funding system struggle to raise research funding and thus become teaching rather than research institutions.

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[7] Martin and Whitley, *Op Cit*

[8] Bence V & Oppenheim C (2004) The influence of peer review on the research assessment exercise. *Journal of Information Science , 30* (4), 347-368

[9] Rafols I, Leydesdorff L, O'Hare A, Nightingale P & Stirling A (2012) How journal rankings can suppress interdisciplinary research: A comparison between Innovation Studies and Business Management. *Research Policy, 41* (7), 1262-1282

[10] Lee, FS, Pham, X and Gu, G, (2013) 'The UK Research Assessment Exercise and the narrowing of economics,' *Cambridge Journal of Economics,* 37, 693-717

[11] Sastry, T and Bekradnia, B (2006) *Using metrics to allocate research funds,* Oxford: Higher Education Policy Institute

[12] Barker K. E. (2007) The UK Research Assessment Exercise: the evolution of a national research evaluation system. *Research Evaluation2007 , 16* (1), pp. 3-12

2.1.6 Some lessons

Evidence from the international context suggests that both the UK PRFS and the evaluation methodology being implemented in the early 2010s in the Czech Republic were outliers in terms of their radicalism. The Metodika 2013-2015 is in some respects a more mainstream solution.

The comparisons in this section suggest that

- The decentralised nature of innovation systems and their governance means that the mix of policies and funding instruments of systems tends to be emergent'. That is, it generally results from the interplay of many independent policy actors' decisions. It is generally hard to coordinate at any level, despite the fact that there is a genuine need for coordination
- Correspondingly, changes such as the introduction of a PRFS tend to be incremental. They generally affect only a small part of the overall mix. Our impression is that the systems that only drive a small part of the institutional funding nonetheless are effective at changing behaviour and performance. They are likely to be less contentious because design flaws only has small effects on the system as a whole
- All the research systems we consider are dominated by the Higher Education sector. This is less so in the Czech Republic because of the continuing and large role of the ASCR and this provides a rationale for maintaining a research assessment and funding system that spans both the university and the scientific institute sectors
- Elsewhere, RTOs and PSROs do not receive institutional research funding through the same type of PRFS as other actors. These have rather different research missions compared with the university and scientific institute sector. Bringing them together in a single PRFS must be done with some care. Even in the Norwegian system, which combines all three types of institute, they tend to be separated into separate 'competition arenas' within a uniform PRFS
- Performance contracting is widespread – not only on its own but also in combination with a PRFS. This involves a burden of monitoring but that is also part of a necessary dialogue between ROs and their principals and supports the principals in the implementation of policy
- The comparator countries chosen for this study have well-established research performance systems and do not have to struggle with the changes needed in transition states such as the Czech Republic. Transition means that more decisions have to be made about which new institutions to admit to the institutional funding system. The international experience is that a bottom-up approach to admission fragments the research-performing system. Admitting a new RO to the institutional funding system is inherently a policy decision which should therefore be taken by the policy system (ministries and Council) that acts on behalf of society
- Beyond this, however, the need for institutional autonomy implies that principals should as far as possible use incentives to encourage their agents to attain goals, rather than try to micro-manage them
- International experience with PRFS is that they tend to increase both the quantity and the quality of research outputs. It is nonetheless easy to encourage perverse effects

2.2 The current institutional funding system in the Czech Republic

This chapter summarises the main findings of our analysis of the current governance system and funding principles in the Czech Republic (CR), including a SWOT analysis, conclusions, recommendations and main lessons learned from comparison of the Czech system with above mentioned countries. The full analysis is in the Background report on the Institutional funding system in the CR (separate document).

2.2.1 Governance of the institutional funding for research system

The institutional funding for research system is rather decentralised with a high degree of autonomy for both funding providers and recipients (i.e. the research organisations).

The RD&I Council is the central co-ordination body. Legally, the Council is an advisory body of the Government. The International Audit considered that the Council is increasingly taking the role of executive authority in the RD&I system. Compared to international practice, the Council has a high degree of autonomy and covers a wide range of activities, from setting the draft of the total amount of the state budget for R&D to the formulation of a long-term RD&I policy and strategic support to the Government in the field of R&D. In international practice, entities similar to the Council have as major task to establish a general framework and principles for the national RD&I system, while the implementation of specific actions is the task of other (lower) government/state authorities. In the CR, instead, the Council lays down the general principles and takes up also their implementation.

The adoption of the Reform of the RD&I system in 2008 reduced the number of providers of institutional funding and currently, seven ministries are responsible for this task. In addition, the Academy of Sciences (ASCR) currently acts as the funding provider for its own research institutes.

The recipients of the institutional funding for research form a heterogeneous group. In 2013, 158 research organisations received institutional funding for research. The increasing number and wide spectrum of the research organisations supported risks posing a problem for further dispersion of institutional funding in the future. Currently, the system for allocation of institutional funding does not reflect the type and different missions of research organisations.

2.2.2 Methods of institutional funding allocation

Institutional funding is a component of the RD&I state budget expenditures. Two expenditure chapters determine the annual public RD&I state budget:

- The expenditure for competitive funding, i.e. the funding of on-going and approved new programmes
- The 'institutional funding expenditures' chapter, covering the institutional funding for research, defined by the results of the 'Evaluation Methodology' (further called: Metodika); the obligations for co-funding of EU programmes and other international obligations; rewards for exceptional research results; and the operational costs for the agencies, the ministries and the RD&I Council

In 2014, institutional funding for research accounted for about 73% of the total institutional expenditures chapter and 35% of the total public RD&I state budget expenditures. Supposing that 20% of the institutional funding for research was distributed based on the results of ROs evaluation (application of the Metodika) carried out in 2013 (according to RIV points, that sum amountedat CZK1.88bn., i.e. 7% of the total public RD&I state budget expenditures.

The preparation of the RD&I state budget expenditures, done by the RD&I Council, is a political process by nature. According to the Section 5a of the Act No. 130/2002 Coll., the proposal for the total expenditure package for research, development and innovation is based on an evaluation of the results attained by research organisations over the past 5 years, on the National Research & Development and Innovation Policy of the Czech Republic and on the results of an international assessment of research and development in the Czech Republic. Nevertheless, interviews with representatives of all providers and the Government Office[13] showed that the total amount of institutional funding allocated to each provider is based more on political decisions (i.e. on the basis of negotiations within the RD&I Council, between providers and the Ministry of Finance, among providers as well as between rectors, the President of the ASCR and the Prime Minister)[14] than on the aggregate research outputs (RIV points generated by the research organisations). This contradiction between the act's section and the actual process of the RD&I state budget expenditures drafting has been intensively discussed within The Council of Higher Education Institutions[15] of the Czech Republic and the Czech Rectors' Conference. Both associations have requested the Government to draw up the RD&I state budget expenditures in line with the Act and in a transparent manner so that the level of institutional funding corresponds with the results of the research organizations evaluation (the number of RIV points)[16].

According to Act No. 130/2002 Coll., providers of institutional funding have a relatively high level of autonomy for the allocation of institutional funding to the research organisations within their competence. They may decide on the amount of institutional funding for 'their' research organisations based on the outcomes of their own assessment methodology. However, in most cases providers do not make use of this power. The reason is that either they have not created their own methodology for evaluating research organisations, or they do not have the personnel, financial and time capacity for conducting their own evaluation activities. Except for the Academy of Sciences (ASCR), the funding providers claim that they often use the system of RIV points for the redistribution of institutional funding to the research organisations within their competence (based on the proportion principle – "rule of three").

The ASCR has its own methodology for internal evaluation of its research institutes. The results of the latest internal evaluation in 2011 were used for the allocation of institutional funding among the research institutes of the ASCR in 2012 and 2013. For each institute, institutional funding consists of the base funding (three quarters of the funding) and the PRFS, i.e. funding allocated on the basis of the evaluation results (quarter of funding).

2.2.3 The amount, distribution and utilisation of institutional funding

The system of institutional funding for research has undergone significant changes in recent years as a result of the Reform of the RD&I system in the Czech Republic in 2008, including the transition from a research intentions funding system to the current performance-based model. One of the main consequences of the Reform and

[13] Their list is in an annexe of the Background report on the Institutional funding system in the CR

[14] For more information on RD&I state budget negotiations between the RD&I Council and providers see e.g. RD&I Council background reports http://www.vyzkum.cz/FrontClanek.aspx?idsekce=711410 (the budget for 2014) or http://www.vyzkum.cz/FrontClanek.aspx?idsekce=674265 (the budget for 2013).

[15] Minutes of the 20th meeting of the Board of The Council of Higher Education Institutions taking place on October 23, 2014 http://www.radavs.cz/clanek.php?c=1637&oblast=16

[16] Information on the 9th meeting of the Assembly of the Council of Higher Education Institutions from November 20, 2014, and the main resolutions adopted http://www.radavs.cz/clanek.php?c=1648&oblast=17, http://crc.muni.cz/resolutions/128.html

the National RD&I Policy (Measure A3-2) was a relative decrease in institutional funding, while competitive funding has become more important.

Eight providers distribute institutional funding for research. The Ministry of Education, Youth and Sport and the ASCR provide the largest amount of institutional funding; these providers together distribute more than 85% of total institutional funding.

The total amount of institutional funding has grown (in the absolute value) in recent years with some differences among providers. Except for the Ministry of Industry and Trade, the institutional funding of all providers increased considerably in 2011-2014. In 2013-2014, there was an inter-annual decline of institutional funding allocated to the ASCR, while the institutional funding assigned to other providers increased.

At the research organisations level, the lion share of institutional funding for research goes to universities (52.4%), followed by the ASCR institutes (34.2%).

The Act No. 130/2002 Coll. gives research organisations a high level of freedom in terms of institutional funding utilisation. Generally, institutional funding aims at funding the long-term development of research organisations. Specifically, the funding can be used for different types of RD&I cost set by the Act, i.e. personnel cost, investment cost, operational cost, cost of external services and overheads. In reality, the institutional funding is used for many activities; the key activity is stabilisation of research teams (it covers in particular personnel costs).

Institutional funding plays different roles in different types of research organisations. As for the significance in the total funding, it is the most important public funding instrument for the public research institutes (organisational units of the Czech Republic - 59% of their public funding) and for the ASCR institutes (48% on average).

Since the institutional funding is for many of the research organisations a significant funding stream, there is a general effort to maximise the number of RIV points, which establish the basis for computation of institutional funding. This effort could affect strategic behaviour of research organisations negatively, as it could fosters gaming and an adoption of the behaviour of many researchers towards simple maximisation of RIV points.

The analysis of data on research organisations funding (data from the RD&I Information system) shows that the amount of institutional funding allocated to individual research organisations may vary considerably between years as a result of the annual evaluation of research organisations. Smaller research organisations are especially vulnerable to such fluctuations.

2.2.4 Evaluation and control mechanism

Although the former research intentions system was criticised because of the very formal nature of annual and ex-post evaluation, the control and evaluation mechanisms of the current funding model seem to be problematic as well. Main weaknesses can be summarised as follows:

- The evaluation and control system is insufficiently and ambiguously defined in the national legislation.
- The evaluation of institutional funding at the highest (governmental) level is missing.
- Many providers complain of insufficient personnel capacities for developing and implementing their own evaluation system.

2.2.5 Impact of the transition from the research intentions system to the current institutional funding system

Impact is identified on the basis of interviews with representatives of providers and research organisations.

The following key impact on providers was found out during interviews.

- Fewer employees were needed to deal with the institutional funding
- Increased autonomy in terms of evaluation and distribution of the institutional funding
- No power to influence the research topics at research organisations
- Limited decrease of administrative requirements (in terms of yearly evaluation, assessment of research intentions, etc.)

Impact on recipients can be summarised as follows.

- Limited decrease of administrative requirements (in terms of elaboration of research projects proposals, reporting, etc.)
- Increased degree of autonomy in terms of how to use the institutional funding
- Increased level of freedom to define research topics and find funding for them
- Increased competition among supported research organisations as well as within them
- The strategic actions and behaviour of many research organisations and the researchers aim at simple maximisation of RIV points

The quality and scope of RD&I activities are outcomes of the complex RD&I system, whose development has been formed by the Reform of the RD&I system, increased total RD&I budget and the decisions of many stakeholders. Thus, the impact of the current institutional funding system cannot be seen in isolation from this broader context. Taking these factors into consideration the following impact was identified:

- Increase of the number of research organisations supported;
- Research organisations gradually increase the quality of their research;
- Modernisation of research facilities (new equipment, modernisation of laboratories, etc.);

2.2.6 SWOT analysis

The SWOT analysis summarises and sorts out the main conclusions. For better clarity the analysis is divided into two parts. The first one deals with the overall governance of the institutional funding system and the roles and power of the funding providers. The second part focuses on the research organisations as institutional funding recipients.

Figure 10 R&D Governance

Strengths	Weaknesses
• The existing institutional funding system is simpler in comparison with the previous research intentions funding model and peer review-based systems used abroad. • The current institutional funding system is slightly less administratively demanding than the previous research intentions funding model. • The Act no 130/2002 Coll. (amended the Act no 211/2009 Coll.) gives providers a high degree of autonomy in terms of institutional funding distribution (including evaluation). • There is only one research evaluation methodology valid for all providers (with the exception of the ASCR). • Financial and accounting control of institutional funding is defined by law (Act. 320/2011 Coll., Act no 130/2002 Coll). • Existence of a national RD&I Information System, which contains information about all RD&I outputs generated thanks to RD&I public support (institutional as well as competitive). • The current institutional funding system creates a competitive environment stimulating research organisations to higher performance.	• There is no official central co-ordination of the institutional funding system (no executive body is responsible for co-ordination). • The size of the institutional expenditures budget chapter does not match the results of the evaluation and previous commitments, and is tstrongly influenced by negotiations with the Ministry of Finance and within the Government. • Methods for the evaluation of research organisations and distribution of institutional funding (according to the Metodika) do not reflect differences among scientific fields, research organisations (including different missions), RD&I outputs generated, providers, etc. • Not all rules, responsibilities and activities of providers are defined by law - or only in a very general way. • Providers do not have internal strategies for their distribution of institutional funding. • Frequent changes of the RIV point numbers assigned to individual types of research results used in the Metodika have negatively affected the stability of the whole system. • Due to the low personnel capacity in R&D departments, the providers have only limited resources to develop their own methodologies for evaluation and distribution of institutional funding, although the Act no 130/2002 Coll. gives them this power. • The RD&I Information System does not contain detailed information on ROs supported by RD&I public expenditure (e.g. no information on numbers of researchers). • Information sources on RD&I public funding and ROs provides information, which are not identical and comparable in many cases (e.g. there are some differences between the same data from the RD&I Information System, annual reports of ROs and data provided by the Czech Statistical Office). . • Unusual use of single evaluation methodology and funding principles for universities and other research organisations. • In comparison with foreign countries, the number of institutional funding recipients (supported research organisations) is relatively high in the CR, and their variety is very large in terms of size, mission and types of RD&I activities performed.

Opportunities	Threats
• Upcoming amendment of the Act no 130/2002 Coll. could create an opportunity for improving the institutional funding system. • The "IPN Metodika" project will develop a new evaluation methodology and propose new funding principles for institutional funding of research organisations.	• Lack of political will to change the funding system. • Demands of individual ministries (providers) and political discussions could negatively affect the upcoming amendment of the Act no 130/2002 Coll. in terms of setting up a more effective institutional funding system. • Unsystematic interventions of politicians and ministries in RD&I budget drafting. • The need to reduce public spending may reduce the amount of institutional funding. • The need to reduce employment in the civil service will not allow for employing staff responsible for improved management of institutional funding at the providers' level.

The current institutional funding system shows a number of **strength** factors. Compared to the previous research intentions funding system, it is relatively simple and slightly less administratively demanding. It creates straightforward rules for providing institutional funding. First of all, institutional funding is provided to all research organisations that meet the criteria for being recognised as research organisations, which are rather formal. Second, research organisations do not have to elaborate any project proposals; instead, institutional funding is provided on the basis of evaluation of their research outputs. Therefore, no need for the providers to invest in, e.g., the appraisal of the project proposals (research intentions) or changes in the projects, the definition of eligible activities, expenditures, and results expected, or the involvement in the annual assessment.

Act No 130/2002 Coll. guarantees providers a relatively high degree of autonomy in terms of institutional funding allocation and distribution. The providers can develop own evaluation methodologies and set up their own funding principles. However, with the exception of the Academy of Sciences (ASCR), all providers use the Metodika for the evaluation of their research organisations and the computation of institutional funding. The Metodika constitutes a relatively simple institutional funding system with uniform rules for all providers on the one hand and all recipients on the other. The Metodika uses information on RD&I outputs generated thanks to RD&I public support, which is collected in the national RD&I Information System. Compared to other countries, the information system contains more complete information on RD&I public support.

These strengths are accompanied by many **weaknesses**, which have affected negatively the whole institutional funding system. The crucial weakness of the institutional funding system, as defined in the Act, is the absence of de-jure central co-ordination body. There is no official body responsible for governance of the whole system. In fact, the Council plays this role; it is an advisory body of the Government without real executive power. However, the Act gives the Council a relatively extensive power, since it is in charge of drafting RD&I state budget expenditures, the development of the research organisations' evaluation methodology, and the implementation of the evaluation.

The fact that the Council is only an advisory body, without strong political backing, is reflected in the negotiations on the amount of RD&I state budget expenditures, their distribution among providers, and more specifically in the amount and distribution of institutional funding. Consequently, the negotiations with the Ministry of Finance and within the Government result in the definition of an amount of institutional funding and allocation to individual providers that does not correspond to the evaluation results or to previous commitments for the funding of RD&I activities. If institutional funding were distributed proportionally according to the evaluation results (RIV points), some providers would receive more funding (the Ministry of Education, Youth and Sport and the Ministry of Health), while the allocation for the other providers

would be lower.[17]. At the recipients level, it means that some ROs receive lower institutional funding that they should get according to the number of RIV points they generated (e.g. although universities generate 63% of RIV points, their share on institutional funding reaches only to 55%).[18] Nevertheless, as regards drafting of RD&I state budget expenditures including the distribution of institutional funding, the Act No. 130/2002 Coll. does not explicitly say that institutional funding should be distributed among providers proportionally according to the RIV points. Thus, it creates space for various political discussions and negotiations.

The providers are not able to fully utilise their autonomy and have rarely developed specific strategies for institutional funding distribution. This is mainly due to an underemployment in the providers' departments responsible for RD&I support and a lack of financial sources for purchasing specific services (or for the employment of experts). In most cases, providers only carry out activities that are strictly defined in the Act, as they do not have human as well as financial resources for other activities (especially for conceptual tasks and evaluation).

Another weakness is that many activities are defined only in a general way. This relates to monitoring and evaluation carried out by providers. Although financial and accounting controls of institutional funding are rigorously carried out (control is well defined in the laws), monitoring and evaluation activities are in some cases done only formally or not at all (again because of the lack of personnel capacities). Only the ASCR has created a system for monitoring and evaluation, which corresponds to international standards.

The system for allocating institutional funding among research organisations based on RIV-points does not reflect differences in the role (mission) of research organisations and types of research activities. Moreover, there have been almost yearly changes of the Metodika namely in terms of the number of RIV points assigned to individual types of research results (e.g. RIV points numbers assigned to proceedings papers published in the English language changed from 4 in 2006, to 0.2 in 2007, 8 in 2008 and 8-60 in 2013) and their definitions. In addition, the RIV point value of some types of results (e.g. cultivars) may be questionable, as some interviewed stakeholders stated. The Metodika influenced individual scientific fields in a different manner. Preferences of publications and papers in scientific journals indexed in the Web of Science in general encourage fields whose main results are scientific papers in Web of Science indexed journals (in this sense ROs and especially faculties of natural sciences performing higher quality research outputs received higher institutional funding), whilst the influence on medical and technical sciences (characterised by different types of results) is rather problematic. The Metodika has a negative impact on the quality of the results[19] in social sciences and humanities.

The Metodika uses only data from the RD&I Information System, which contains relatively detail information on public funding and all research results created through the RD&I public support. (The system also provides some information on providers, ROs, programmes and completed research intentions.) Nevertheless, the system does not contain information on a number of researchers (work-loads, FTE numbers) in evaluated ROs. This information can be obtained from ROs' annual reports and the

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[17] Prof. Opatrný's presentation on funding of research, 20th meeting of the Board of The Council of Higher Education Institutions taking place on October 23, 2014, http://www.radavs.cz/prilohy/20p5_EIPRVS231014.pptx

[18] Minutes of the 20th meeting of the Board of The Council of Higher Education Institutions taking place on October 23, 2014 http://www.radavs.cz/clanek.php?c=1637&oblast=16

[19] Münich, D. (2014): Dobrý a zlý kafemlejnek II, http://metodikahodnoceni.blogspot.cz/2014/12/dobry-zly-kafemlejnek-ii.html

Czech Statistical Office's surveys (databases). However, usage of these data for potential ROs evaluations or setting of an amount of institutional funding is rather limited, because the data from these sources (not only data on researchers' numbers but on funding as well) differ substantially compared with other sources, probably due to different reporting methodologies or some mistakes in reporting.

Other weaknesses appear when comparing the Czech system with international practice:

- In international practice, there are different evaluation methodologies and funding principles for universities and other research organisations.
- In international practice, research organisations focused on basic research activities have higher share of institutional funding (Max Planck institutes, NIH, Austrian Academy of Sciences), whereas organisations aiming at applied research and cooperation with a private sector have lower shares of institutional funding and the majority of their financial sources comes from projects and contracts (Fraunhofer institutes, VTT Technical Research Centre of Finland).

Figure 11 Recipients

Strengths	**Weaknesses**
• The current institutional funding system has created a more competitive environment stimulating researchers and research organisations to higher research performance. • Research organisations have developed their own internal mechanisms for distribution of institutional funding. • By law, research organisations have a relatively high degree of autonomy in terms of management, distribution and use of institutional funding. • Some research organisations (large organisations and universities) have their own internal audit units and carry out evaluation of research.	• Short (annual) cycle of research organisations evaluation and distribution of institutional funding does not allow for developing long-term strategic plans within research organisations. • Usage of the outcome that come out from the evaluation based on the Metodika for strategic managements of research organisations is rather limited because of the general and summative character of the evaluations. • The Metodika and its funding principles had negative impact on the behaviour of researchers, who adapted their outputs to the Metodika in order to maximise the number of RIV points. • Usage of institutional funding is bound to year-long state budget cycles.
Opportunities	**Threats**
• The upcoming amendment of the Act no 130/2002 Coll. and the Higher Education Act can create favourable conditions for use and distribution of institutional funding within research organisations (including internal evaluations of research and research teams). • Research organisations will implement principles of professional management at all levels. • Research organisations will develop an evaluation and monitoring system resulting in more effective use of institutional funding. Foreign experts will be involved into the evaluation. •	• Ongoing conservative attitudes of researchers towards changes may create resistance towards a new evaluation methodology, or cause delays and tensions with possible negative impact on the actual research.. • The need to reduce public expenditures may negatively affect the amount of institutional funding. • Providers may lay down too detailed or rigid conditions for the allocation and use of institutional funding. •

Compared with the research intentions funding system, the existing institutional funding system has created a more competitive environment, which stimulates research organisations and researchers to produce higher quality and/or more RD&I outputs. Nevertheless, the Metodika is often used not only at the level of the research

organisation but at the lowest level – the level of individual researchers – as well. In this case researchers are rewarded according to the number of RIV points they generate.[20] Consequently it affects their behaviour in a direction of adaptation of their outputs to match the Metodika; it also creates a drive for gaming.

Frequent changes of the Metodika have resulted in a situation where the research organisations management do not know, up to the very last moment, the amount of institutional funding for the next year. This creates a barrier for elaboration and implementation of long-term strategic plans. Use of institutional funding for long-term activities (including large investment activities) is limited because the funding is bound to the year-long state budget cycles.

Only some universities, ASCR institutes and some large research organisations have own internal mechanisms for institutional funding distribution. Some research organisations (namely ASCR institutes and large research organisations) have own internal audit units and carry out own evaluation of research and research units. Very comprehensive evaluation system is in ASCR institutes. The ASCR evaluation system covers all institutes and is carried out centrally in five years cycles. The ASCR has also an attestation system, which assesses each researcher (this is organised at the level of institutions).

Institutional funding is provided in good synergy with other funding sources of research organisations, especially with operational programmes (co-funded by EU Structural Funds). Whilst institutional funding concentrates rather on stabilisation of research teams (wages) and operational costs, operational programmes ensure capital expenditures (purchase of new equipment, modernisation, new buildings, etc.).

Future development of institutional funding will depend on the upcoming amendment of the Act no 130/2002 Col. and the Act no 111/1998 Coll. (Higher Education Act). The amendment could remove or at least reduce uncertainty about the amount of institutional funding for the respective organisations. One of the Metodika project's outputs is a proposal about what should be changed in the acts and how the new evaluation and funding system should be incorporated.

In any case research organisations could implement principles of professional management, develop monitoring and evaluation systems corresponding to international standards and benefit from synergies arising from new operational and international programmes.

Based upon the SWOT analysis, the following recommendations should be taken into account when developing the new evaluation methodology and funding principles:

1. The amount allocated to providers should be in line with the centrally defined funding principles, common to all providers.
2. Institutional funding should not be provided based on an annual evaluation. The evaluation and the resulting amount of institutional funding should be arranged and provided for a longer period. Similarly, the evaluation methodology and funding principles should not change each year (or every two years) but be fixed for a longer period.
3. The evaluation methodology and funding principles should consider qualitative aspects of RD&I activities performed and take into account the different missions of the research organisations. In this sense, a combination of performance-based funding and research contracts could be desirable.

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[20] Žížalová, P., Čadil, V., Pokorný, O., Kostić, M. (2011): Podpora vytváření strategií zaměřených na realizaci výsledků VaV v praxi a ochranu duševního vlastnictví a motivace spolupráce s aplikačním sektorem. Studie TCAVČR. http://www.vyzkum.cz/storage/att/18C0C6E0BEDC982432D14A62BD739099/A_4-1_4-2_Strategie_a_motivace_TT.pdf

2.2.7 The Czech institutional funding system in international comparison – main lessons

Based on the comparison of institutional funding systems in five countries with the Czech institutional funding system, we can draw following key conclusions that should be taken into account while drafting revised funding principles for the Czech Republic.

- Unlike the comparator countries with rather stable research performance systems, the Czech Republic struggles with an increasing number of ROs eligible for institutional funding and also with a high fragmentation of the whole research system. This situation results from the bottom-up approach to admission to the institutional funding system that is in place in the Czech Republic where research organisations irrespective of their type can apply to the RD&I Council through the respective funding provider to become eligible for institutional funding. Eligibility is currently assessed against the definition of RO set by the European and Czech legislation. Although the eligibility of ROs for institutional funding does not formally entitle them to this type of funding, in fact all eligible ROs receive institutional funding according to their past research performance.

Lesson 1: Admitting ROs to the institutional funding system is a policy decision and as such should be taken by policy makers at the highest level in the R&D system, i.e. ministries and the Council. An evaluation methodology or institutional funding principles cannot substitute for or replace the policy decision.

- Despite the fragmentation of the Czech research system and heterogeneity of ROs in relation to their mission, there is one single evaluation methodology and set of funding principles for universities, institutes of the Academy of Sciences and for other research organisations – all are evaluated according to the same methodology and funded according to the same principles. This is a rather unique system in international comparison. In addition, the current system in the CR mirrors a system that is typically applied for research councils (and thus, scientific research), i.e. a primary division of the overall budget into scientific fields. In the five comparator countries, universities, governmental labs and RTOs do not receive institutional research funding according to the same principles. In the case of PRFS there is a strict differentiation between different types of ROs in order to ensure competition among ROs with the same (similar) function in the research system.

Lesson 2: The Evaluation Methodology and the funding principles should be designed taking into account the missions of the research organisations in the RD&I system and avoid competition between ROs with different missions.

- The fundamental purpose of institutional funding is a long-term strategic development of ROs. Therefore, the institutional funding systems in comparator countries are by nature stable and the introduction of any changes tend to be incremental. The Czech institutional funding system has undergone several rapid changes over the last 10 years that have negatively affected the stability and predictability of the funding, especially in smaller-sized ROs. Only recently, following the International Audit, dampening factors have been introduced in order to avoid major annual differences in institutional funding.

Lesson 3: Changes in the institutional funding principles should be introduced incrementally in order to provide sufficient time for adjustment on both sides – principals (funding providers) as well as agents (ROs).

- Institutional funding systems in comparator countries tend to consist of several components combining PRFS with other schemes of funding like performance contracts or block grants. The performance contracts may not even be linked to funding. Although the significance of single components tends to differ among different types of ROs the PRFS component is typically relatively small and consequently it affects only a small part of the total funding for a given RO. The PRFS is nonetheless effective in changing behaviour and performance of ROs. In

the Czech Republic, there is a single system to allocate institutional funding across all types of ROs. This system consists of a funding component based on past level of institutional funding and a PRFS component. The uniformity of criteria for PRFS component of the Czech institutional funding scheme for all types of ROs does not take the different role and modus operandi of ROs into account. In addition, it cannot distinguish the role of the institutional funding for ROs of different focus (i.e. highly important for basic research, far less so for applied research ones).

Lesson 4: Introduction of several components of institutional funding allows combining elements of continuity, stability and incentives for a desirable change in behaviour. It also enables differentiation of institutional funding schemes for different types of ROs.

- Performance contracts play an important role in the institutional funding systems in the comparator countries as instruments for dialogue between ROs and their principals. They are used to encourage ROs to achieve agreed goals that are in line with the principal's policy goals. Inevitably, the performance contracts require monitoring activities from the ministries/funding providers. The institutional funding providers in the Czech Republic play a less active role compared to similar funding organisations in the comparator countries, when it comes to defining long term strategic directions for research conducted by ROs that the funding providers are responsible for. Except for the ASCR the providers allocate institutional funding among the ROs solely based on previous results (RIV points) and without any future perspective on desired research goals.

Lesson 5: Performance contracts are suitable instruments for activation of a dialogue between ministries / funding providers, and ROs. Especially, they enable to align the ROs' goals with the principal's policy goals.

3. The revised funding principles for the Czech Republic

This section provides answers to a set of research questions drawn up in the terms of references. We list them in the following table and direct the reader to the chapter where we answer these research questions.

Figure 12 Research questions and location of answers

Research question	Chapter with (main) answers
Establish principles for deciding the amount and distribution of institutional research funding among research funders so as to remove cross-subsidy to or from other sources of institutional funding (eg for education)	3.2.1, 3.1.4
Establish coordination mechanisms among research funders to ensure adequate field coverage and efficient sharing of national and international research infrastructures	3.1.5, 3.1.6, 3.1.7
Establish principles for funding to reflect changing national priorities while maintaining some stability of institutional funding	3.1.8
Recommend how much money to distribute by formula funding versus performance contracts	3.2.2, 3.2.3, 3.2.4
Draft rules for allocating formula funding, based on the results of EuV assessments (WP2)	3.4
Draft a template for performance contracts for different types of Research Organisation	3.3.1
Determine how the reporting will work and what sanctions the ministry can use in order to enforce the contracted performance	3.3.2
Specify a procedure and criteria for deciding when and how to allow new Research Organisations to enter the funding system	3.5
The role of capital resources and the method of their planning and allocation.	3.1.6

As can be seen from the study questions, we were tasked to design a funding system based on the new Evaluation Methodology, and devise a funding formula based on the results of the assessments. The new funding system is to be applied for the "institutional support of the long term conceptual development of Research Organisation on the basis of an evaluation of the results" which is one of several institutional research funding streams in the Czech Republic. Hence, our concrete suggestions and recommendations for a funding system to be applied in the Czech Republic cover this part of institutional funding only (called "institutional funding for RO" for the sake of brevity). When we speak of institutional funding more generally, e.g. about its function in the research system, we use the term institutional funding.

In addition to a funding formula based on the results of the assessments, we were also asked to include performance agreements. Like the new Evaluation Methodology, the new funding principles are to be valid for all types of Research Organisations. Based on this brief, in this chapter we are suggesting funding principles for all, while taking into account the specifics of different Research Organisations.

The framework we are suggesting can accommodate various scenarios i.e. different priorities of R&D policies related to institutional funding for RO. Our basic scenario is geared towards increasing overall research quality, and giving every Research Organisation (and research unit) a chance to get better. This is against the background that Research Organisations and research units (RUs) may not do well in the first evaluation round for various reasons, not least among them that they are unfamiliar with peer-review based evaluation, and that these reasons ought to be looked into.

However, the framework we are suggesting can also accommodate a scenario for increasing excellence and societal relevance and a scenario for phasing out institutional funding for RO to weak Research Organisations.

In chapter 3.1, we describe the context to the principles for institutional funding for RO, discussing general concepts for institutional funding (3.1.1), the categories of RO and the principles for their institutional funding (3.1.2), the specific starting point in the Czech Republic (3.1.3), cross-subsidies between different sources of institutional funding (3.1.4), adequate field coverage (3.1.5), efficient sharing and use of national and international research infrastructure (3.1.6), the funding of existing and emerging large R&D infrastructures (3.1.7), and the need for stability of institutional funding against the background of changing national priorities (3.1.8). We then go on to present the core funding principles (3.2), before discussing performance agreements (chapter 3.3) and the performance-based research funding system (chapter 3.4) in more detail. Chapter 3.5 describes how new Research Organisations can enter the funding system.

3.1 Context to the principles for institutional funding for RO

3.1.1 General concepts for the institutional funding for RO

Institutional funding can be conceptualised as a long-term working relationship between two organisations: a funding body or provider (the principal) and a research organisation (the agent). In other words, public institutional funding expresses responsibility by the state, with the state taking an interest and a stake in the research organisations it (co-)funds. This aspect seems to be particularly important in the Czech Republic where the public sector's 'ownership' of Research Organisations can be weak. This also implies that context and history have to be taken into account and that institutional memory is important on both sides, the principal's and the agent's.

Rationales commonly cited for granting institutional funding are that it allows research organisations to behave in a strategic, long-term oriented fashion, reducing the risk of converging on 'hot areas' with a consequent loss of diversity in the wider research system. It also provides space for researchers to develop ideas which may not be ready yet for exposure to external competition. In many countries, institutional funding also pays for equipment and support services of generic benefit that would not be easily attributable to individual grants.

The most common understanding for institutional funding is that it needs to provide continuity, stability, sustainability and resilience for institutional development, and that a long term shortfall of institutional funding leads to a 'hollowing out' of research organisations. [21]

In contrast, competitive funding ensures quality and relevance of research through a peer review or other quality-based selection process and allows the implementation of selectivity strategies (i.e. only funding the best or certain topics) and can be adapted to influence behaviour in particular directions such as collaboration or towards thematic priorities. It has a shorter timescale and increased granularity and thus allows flexible application of resources as science develops. It incentivises researchers and prevents senior hierarchy from dominating resources. An advantage of competitive funding is its straightforward line of accountability for use of resources. However, it is generally

[21] Luke Georghiou, Effects of Public Funding Systems on Research in the United Kingdom. Presentation at 'The Impacts of Impact Measurement', Vienna, 25 September 2014

more expensive to allocate than institutional funding as grants involve high transaction costs in preparation and review.[22]

The significance of the different sources of funding (institutional, competitive) differs for different types of research organisation because they have different missions and their research is embedded in different contexts, addressing different user communities (other researchers, industry, public sector etc.). Furthermore, for these and a number of additional reasons such as location or subject specialisation, different research organisation do not have equal access to competitive funding. Hence, an important principle must be that the funding system needs to take into account the different missions and specifics as well as the whole funding situation of Research Organisations. Ideally, the responsible ministries base their funding decisions on a thorough understanding of the Research Organisations' 'funding profiles', i.e. a complete overview and analysis of the various funding sources per research institution (including competitive funding). This is necessary to understand how changes in institutional funding for RO affect a Research Organisation's budget as a whole.

The share of institutional funding in relation to the overall budget is different for different types of organisations. The rule of thumb is: the closer a research organisation is to the market, the less institutional funding it receives (see for example the Fraunhofer Society compared to the Max Planck Society in Germany). In the end, it is a policy decision what share of institutional funding a research organisation should get. In many countries, there are various arrangements at work, making the institutional funding landscape quite 'messy'. However, in most countries this is considered the normality of a differentiated multi-level and multi-actor science and research system.

Experience from other countries shows that any reform of institutional funding takes time: a preparation phase is followed by the first implementation of the new funding system, and this leads to a transition period of new experiences and learning, which most probably leads to a revision of the funding system based on the experiences made in the first period. This is followed by the second implementation of the new funding system etc. All together it will easily take two to three funding periods before the new system can operate smoothly, meaning that patience and persistence are key prerequisites of a successful public governance of institutional funding for RO.

3.1.2 Categories of RO and principles for their institutional funding

The report *Typology* of *Research Organisations and the Effects of the EM Thresholds* (Background report 2) discusses the different type of RO in the Czech Republic at some length, describing the categories and sub-categories involved and discussing the effects of eligibility thresholds for the new EM on them and the evaluation methodology.

The categories employed are shown in Figure 13. For the purpose of this report, the sub-categories shown are for illustration. (They are discussed in some detail in the background report).

[22] Luke Georghiou, Effects of Public Funding Systems on Research in the United Kingdom. Presentation at 'The Impacts of Impact Measurement', Vienna, 25 September 2014

Figure 13 Categorisation of ROs in the Czech Republic

RO Category	RO Category Abbreviation	RO sub-category
Scientific Research Organisations	**ScRO**	ASCR
		HEI - private
		HEI – public & state
		Research Infrastructure
		Research hospitals
Industry & Business services Research Organisations	**IBRO**	AgriFood RTO
		Industry RTO
		Business services RO
Public Services Research Organisations	**PSRO**	Government Lab
		Policy services RO
National Resources	**NatRes**	Cultural services RO

The principles according to which various countries provide ROs with institutional funding are based in the economics of knowledge – discussed in section 2.1.4. These principles are simple and apply in most countries. Central are, first, the production of public goods and, second, whether the state appoints an organisation to produce such knowledge on its behalf.

Research conducted in **Scientific Research Organisations** is generally expected to produce knowledge that is public goods. Inherently, the market cannot produce these so the state has to pay. That implies a need to provide institutional research funding – either on its own or these days more usually as one component in a wider funding mix that includes external, project-based income won in competition. It is the business of the state to decide which organisations it regards as SROs for this purpose. 'Free entry' would imply a loss of budgetary control, the reshaping of national research capabilities in directions not necessarily consistent with policy and give rise to issues of quality and measurement. Hence, very few countries provide institutional funding to SROs, except where these have been chosen by the state. The legal form of SROs varies. That does not matter. For example, in Sweden the state universities and Chalmers all get institutional research funding, despite the fact that Chalmers is a private foundation. What matters is that the state has decided that Chalmers will be part of the national SRO capacity and has chosen to treat it in the same way as the state universities. Key here is that Chalmers' purposes are education and research – it is not a for-profit organisation but serves the same function as the state universities.

Provided the dominant purpose of an SRO is the production of public goods, it does not normally matter for the purpose of institutional funding that it may also do other things. Most universities do some contract research for the state or industry, for example, on which they may even make some surplus. Institutional funding is not provided for this activity, since it does not create public goods. SROs are not-for-profit organisations in the sense that they do not pay dividends to shareholders. In some years they may generate surpluses but these are reinvested in the main activities of the SRO.

Industry and Business services ROs also produce public goods – but usually only on a fraction of their overall activity. Conceptually, they are provided with institutional funding to help pay for public goods production. This is best understood by considering the business model of an RTO such as VTT or the Fraunhofer Institutes. These organisations receive institutional funding so that they can develop knowledge and capabilities that are one step ahead of industry's needs. Generally this research is published, since it has the character of public goods. The subsidy or

institutional funding distinguished the IBRO from a commercial consultancy in two ways. First, it enables the production of public goods that would not be possible in a fully commercial organisation. Second, it marks the IBRO as having been chosen by the state to play a particular role in the national innovation system. Based on these public goods, the IBRO then engages in support activities (RD&D, training, testing etc etc) for industries, which are normally priced so they at least cover their costs. Thus the IBRO has two types of activities: research; and the exploitation of research for the benefit of industry. A technical consultancy only has the latter and has no subsidy.

Like SROs, IBROs are not-for-profit organisations. In practice, some of them may own for-profit organisations – for example, Fraunhofer Ventures develops start-up companies – but any profits eventually accrue to the IBRO and are reinvested in the IBRO's activities. Shareholders (if there are any, for many IBROs are foundations) do not benefit.

Public Service Research Organisations are set up by the state in order to provide it with services and/or to generate public goods. A public health research institute for example provides the state with information that is used in devising and implementing health policy. There tends to be no other customer than the government for such services so the state normally owns such organisations. Especially in the UK and USA, such organisations may also be private: some are 'government owned, company operated' where a private company runs them based on a service contract; some are 'company owned, company operated', where the PSRO is fully privatised. Whatever the form of ownership, the state pays through institutional funding (and often additionally through a contract for non-research services). Some PSROs, notably for example metrology labs or geological institutes, sell services to industrial and consumer customers. These are not subsidised through institutional funding. Indeed, in some cases the state expects profits from these activities to cross-subsidise the PSRO's activities for the state. Whatever the model, the part of the activity that is institutionally funded is not expected to generate a surplus except in the case of company operated PRSO's which may generate a normal level of profit and pay this to their shareholders. However owned, PRSOs have some kind of performance contract or operating contract with their owning ministry. This reflects a decision by the state to have and to operate a particular facility. Companies cannot simply set up as PRSOs and ask for institutional funding.

National resources such as libraries and museums are not normally given institutional funding for research. Often the owner is part of the central or regional state but they may also be private. While it may be beneficial for them to conduct some research, this is not their dominant activity or their main purpose. Instead, their owners fund them in full.

Since July 2014, a new EU Commission Regulation (GBER) is in force, which defines an RO, as follows:

> *"Research and knowledge-dissemination organisation' means an entity (such as universities or research institutes, technology transfer agencies, innovation intermediaries, research-oriented physical or virtual collaborative entities), irrespective of its legal status (organised under public or private law) or way of financing, whose primary goal is to independently conduct fundamental research, industrial research or experimental development or to widely disseminate the results of such activities by way of teaching, publication or knowledge transfer."*

This is in line with the discussion above. One case can arise, where an organisation purporting to be an RO in fact has private purposes that are not reflected in the payment of dividends to its owners but in the provision of privileged access to publicly funded goods. According to the regulation

> *"Where such entity also pursues economic activities, the financing, the costs and the revenues of those economic activities must be accounted for separately. Undertakings than can exert a decisive influence upon*

> *such an entity, for example in the quality of shareholders or members, may not enjoy a preferential access to the results generated by it."*

This means that a company cannot spin its research department off into a subsidiary organisation in order to get institutional subsidy if it intends to monopolise the knowledge produced. In most countries such organisations would not in any case be recognised or appointed as one that should produce research public goods on its behalf.

Some cases do in practice arise in the Czech Republic that, in our view, violate some of these principles – almost entirely in the case of certain IBROs.[23] Of course, provided it follows prevailing law the Czech state is fully within its rights in doing whatever it wants. Nonetheless, our advice would be to make use of these principles in deciding which organisations should be considered for institutional research funding.

3.1.3 The specific starting point in the Czech Republic

Beyond the principles explained above, we have taken into account some key issues that emerged from an earlier study[24] in the design of the funding principles:

- Lack of good governance in the public sector, on the principal's side
- Lack of 'ownership' on both sides but especially the principal's, but also at many agents (visible in weak management)
- Lack of trust of citizens in public institutions

The role of institutional funding for RO for the different (types of) Research Organisations differs for several reasons: (i) due to their different missions research plays different roles within their portfolio of activities, e.g. in an Academy institute it is the primary activity whereas at a museum it is just one of many activities, and certainly not the most important, (ii) not all (types of) Research Organisations have access to the same funding streams, e.g. universities also have teaching funds and special university funds for PhD training, which the Academy does not have as it does not award PhDs. Furthermore, the Academy of Sciences has a separate funding stream for equipment (coming from the "Expenditure related to the activities of the RD&I Council, the GACR, the TACR and the Academy of Sciences of the Czech Republic"). In contrast, Industry and Business Services Research Organisations, Public Services Research Organisations and National Resources Research Organisations have to use institutional funding for RO for buying research equipment (see section 3.1.4) unless they use other funding streams for the procurement of equipment which is needed for their main activities.

However, there have already been some positive experiences with negotiating performance agreements, in the context of the 'Regional Research Centres' and 'Centres of Excellence', funded from the Structural Funds programme "R&D for Innovation". These are, of course, different from the institutional funding for RO we are dealing with in this report, but we want to point to the fact that the process of negotiating, concluding and implementing performance agreements is feasible also in the Czech environment – which some players have questioned.

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[23] See the report *Typology of Research Organisations and the Effects of the EM Thresholds (Background report 2)*

[24] See Erik Arnold, Barbara Good, Fritz Ohler, Brigitte Tiefenthaler, Niki Vermeulen, The Quality of Research, Institutional Funding and Research Evaluation in the Czech Republic and abroad. Thematic Report No. 3, International Audit of Research, Development & Innovation in the Czech Republic, 2011.

3.1.4 Cross-subsidies between different sources of institutional funding

The first reaction of the external observer is one of wonder. Why is this question being asked? Why is this a problem in the Czech Republic? Are there any legal constraints or requirements? Is it just a formal problem or a real problem, and if it is a real problem, what exactly is the problem? Or is it a perceived problem which is based on a variety of other problems?

Based on the interviews we conducted, there appears to be a link between the issue of cross-subsidies and the fact that different sources of funding are available for different types of Research Organisations or even within types of Research Organisations (e.g. universities and the Academy of Sciences). The main problem seems to be the (alleged) cross-subsidy of teaching through research (and vice versa).

According to interviewees, non-research units tweak research outputs in order to get RIV points (and ultimately institutional funding for RO), which they then use for teaching; for example they are said to register textbooks as scientific output. The new Evaluation Methodology will contribute to solving the problem as such RU will be evaluated through peers. If they do not conduct any research and use institutional funding for RO for teaching, then this will come out in the peer review and the RU will get low scores.[25] The low scores will translate into low funding and warrant special attention by the university (see below section 3.4.3).

Another example where 'cross-subsidy' may possibly occur is that universities are said to use teaching funds for paying for research equipment while the Academy of Sciences has its own budget for research equipment. The rest of the Research Organisations have to use institutional funding for RO or (if available) income from other sources to pay for research equipment[26].

Another example is that universities receive special university funding for PhD students. PhD students write papers which are put into the RIV system and give the university additional institutional funding for RO through the Evaluation Methodology.[27] The Academy does not receive funds for PhD students as it does not award PhDs; hence, it does not normally receive points based on publications by PhD students[28]. With the peer review-based evaluation system we are suggesting this issue will disappear, in case it is an issue at all.

Another angle to look at the issue is to identify how it is solved in other countries and whether it is considered to be a problem at all. For example, in Austria and the Netherlands, institutional funding for universities is typically in the form of a block grant both for teaching and research, so cross-subsidies with respect to institutional funding are no issue. In the Netherlands, each research university receives a formula-based lump sum (block grant) for teaching and research; this allocation consists of a teaching component and a research component but this distinction is for calculation purposes only. The Executive Boards of Dutch universities and research institutions

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[25] In the case of RU that have too few publications to participate in the evaluation, this fact alone may be an indication that „something could be wrong", especially if the unit is a large one. In that case the unit warrants special attention by the university management.

[26] Background report 7 - *The institutional funding system in the Czech Republic*.

[27] The same logic applies to competitive funding. Research organisations can win competitive funding based on which they can write papers or produce other outputs. In the current system, this will give them more RIV points and therefore more institutional funding for RO.

[28] If PhD students add their institute's affiliation to the publication, the Academy (or other research organisations where PhD students are employed) do receive points for publications written by PhD students. However, it appears that this does not happen very often.

have a large degree of autonomy for research and are also free to allocate the funding as they wish (even across teaching and research activities). In Sweden, cross-subsidy between research and teaching may occur in HEIs but it is not considered to be a problem that would require action. In Norway, within limits, universities can use teaching funds for research, and vice versa. However, this is not seen as a problem. The universities are encouraged to make these priorities themselves, as they do not have specific budgets for teaching and research. Some institutions get more research funds than other, but the balance internally between teaching and research is up to each institution to decide for itself[29].

In fact, in the light of international practice, we think 'cross-subsidy' is not a real problem as long as institutions use the money in line with their missions and in compliance with the law. After all, the degree of Research Organisation's autonomy with respect to the internal allocation of funding is very high and is not significantly limited by Acts or providers. We have shown that some of the issues that appear to be considered a problem will be mitigated through the use of the new peer-based Evaluation Methodology. Other issues such as the apparent insufficiency of teaching funds cannot be solved through a new funding system for *research* as this is outside the research funding system's scope.

3.1.5 Ensuring adequate field coverage

In the countries we looked into, the concept of adequate field coverage does not exist. The typical pattern is that the universities and other Research Organisations themselves decide on the thematic foci of their research as long as it is within their overall mission and specialisation[30]. So, in line with international practice, we would recommend abandoning the idea of adequate field coverage at the overall level in relation to the PRFS. The normal practice is to address policy-driven needs to change field or problem coverage through competitive project or programme funding.

However, there is an issue of coverage related not to fields or scientific disciplines but to "tasks that need to be done" in the R&D system, such as the training of young researchers. One way to address such issues are the performance agreements (see chapter 3.3), especially with Scientific Research Organisation.

Moreover, some institutions, especially Public Services Research Organisations and National Resources Research Organisations often and typically fulfil tasks "that need to be done" in a state, such as investigating and monitoring invasive species and mitigating their adverse impact on the native flora and fauna or maintaining cultural memory. In many such organisations, research is the primary task and serves the public sector, typically ministries, and/or user communities that do not commission research themselves (e.g. apple growers, pedestrians, drivers etc.), providing them with applied research results to improve the public sector's and user communities' way of doing things. Other Public Services Research Organisation's primary task is the provision of services (e.g. forensic investigations, measuring of radioactivity, water management etc.) but research is central to updating their methods, keeping abreast of current developments and developing their capabilities. It is the responsibility of the ministry in charge of the subject, typically the founding ministry, to provide the basic conditions for the tasks to be fulfilled in a satisfactory manner.

If ministries would like specific fields to be covered more (e.g. research addressing societal challenges or promising technologies), there is always the possibility of setting up a thematic programme using targeted funding, similar to the Alfa or the Epsilon

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[29] Background report 6 - *R&D governance and funding systems for research in international practice*

[30] See Background report 6 - *R&D governance and funding systems for research in international practice*

programme implemented by the Czech Technology Agency. This is the way it is done in other countries as well, e.g. in Norway or Austria[31].

3.1.6 Efficient sharing and use of national and international research infrastructure

Research infrastructure can in general be categorised by size in terms of costs and scope[32]

- There is **small equipment**, like microscopes or data sets that need to be bought. In most countries, an institute's or research group's 'petty cash' covers the costs for such equipment.
- Then there are the **large items of research equipment**, e.g. machinery that may cost several hundred thousand Euros (these are termed "infrastructure" in the Czech legislation[33]. Internationally, various patterns emerge: research groups/institutes may receive some funding from the research council (as part of project funding or within specific programmes for the funding of research infrastructure.) or they have to negotiate receiving part of the institutional funding budget within their own research organisations. A growing number of countries have special funding programmes in place for this, recognising that it has been a problem that has for too long been ignored. In relation to medium sized pieces of equipment, in most countries, institutional funding or competitive funding or a mixture of both funds are available.
- Then there are the really **large research infrastructures**, e.g. particle accelerators (termed "major infrastructure" in the Czech legislation)[34]. In the Czech Republic (like in most other European countries), there is a national road map for such large-scale research infrastructures, and there is a separate fund for funding them, giving out long-term competitive funding. We cover these research infrastructures and their funding in the next section below

In most countries the funding of research infrastructure tends to be discontinuous and inconsistent. There are periods with large investment followed by periods with low investment.

In the Czech Republic, the funding of research infrastructure in the sense of **research equipment** is patchy. Universities normally use teaching funds for paying for research equipment while the Academy of Sciences has its own budget for research equipment.[35] Many Research Organisations located outside Prague could apply for funding new infrastructures through the Structural Funds (Czech Operational Programme for RD&I). The rest of the Research Organisations have to use institutional R&D funding or (if available) income from other sources. Hence, there is a situation of inequality. Given this situation, the guiding principle ought to be that the ministries in charge of the last group of Research Organisations have to deal with the issue of research equipment in their Research Organisations. The prerequisite is that the responsible ministries make a full analysis of the funding situation of their Research Organisations (see also Section 3.1.1). Moreover, any funding mechanism for

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[31] See Background report 6 - *R&D governance and funding systems for research in international practice*.

[32] This categorisation excludes National Resources Research Organisations such as museums, archives etc., which are Research Organisations in our context and are treated as a separate type of Research Organisation

[33] See Background report 7 -: *The institutional funding system in the Czech Republic.*

[34] See Background report 7 - *The institutional funding system in the Czech Republic.*

[35] See Background report 7 - *The institutional funding system in the Czech Republic.*

research equipment should be designed in such a way as to make sure that large investments for research equipment are well founded on a research strategy.

Efficient use of research infrastructure can be more important than sharing. This applies typically to research infrastructures that are mainly used in-house, especially the first two categories listed above. There is evidence that the most efficient use of research infrastructure is characterised by a large share of internal use. On the other hand, efficient use is characterised by the existence of (i) attractive research programmes in the organisations where the research infrastructures are located and (ii) qualified and active key staff working at and with the research infrastructure, and (iii), if there is capacity for sharing, a clear understanding of how and under which conditions others should have access to a research infrastructure. Thus, research infrastructure has to be discussed in the context of attractive research programmes, credible staff and sound management (see for instance the evaluation criteria applied in the Czech Operational Programme for RD&I).

The availability and the use of research infrastructure is addressed in the new Evaluation Methodology, where it is an indicator under the assessment criterion "Research Environment".

3.1.7 Funding of existing and emerging large R&D infrastructures

Definition

The Act no. 130/2002 Coll. defines large (major) research infrastructure as "a unique research facility, including its acquisition and related investment costs and the costs of ensuring its activities that are essential for comprehensive research and development with heavy financial and technological demands and which is approved by the Government and established by one Research Organisation for the use of other Research Organisations." This definition is in line with an internationally common concept of research infrastructures used for example by the European Commission (see ESFRI Roadmap).

For the purpose of evaluation of existing and emerging research infrastructures in the Czech Republic an evaluation methodology was designed in 2014. This evaluation methodology specifies the definition of the Act no. 130/2002 Coll. and considers research infrastructures (RIs) "unique facilities or virtual platforms established in any research field that are providing the research community with resources and services required for cutting-edge research and development. Such RIs may be 'single-sited', 'distributed' or 'virtual', integrated in transnational networks and may have various legal forms. RIs are established also to be used by other Research Organisations and other users under pre-defined and transparent terms." Compared to the definition of the Act no. 130/2002 Coll., this concept covers all research infrastructures regardless their approval by the Government. This enables evaluating all existing as well emerging research infrastructures.

In the following text we use the term "large research infrastructures" in accordance with international practice and the two above mentioned definitions. We use this term for existing as well as emerging infrastructures, i.e. not solely for the ones approved by the Government. We use the term "large research infrastructures" in order to distinguish them from the research equipment of any size as described in the chapter 3.1.5.

Present situation

The latest National Roadmap for Large Research, Development and Innovation Infrastructures in the Czech Republic from May 2011 identifies 34 priority large research infrastructure projects in the Czech Republic and 11 priority large research infrastructure projects located abroad with the Czech participation. Next to that it identifies 18 promising projects for becoming large research infrastructures in the future.

In 2014 a thorough two-stage evaluation of all existing as well as planned projects of large research infrastructures was performed. This evaluation was based on information submitted by the Research Organisations, which registered their projects on a voluntary basis. Totally, 119 projects were evaluated and out of that 58 successfully passed the evaluation. These 58 projects will be included into the update of the National Roadmap for Large Research, Development and Innovation Infrastructures, which is currently (March 2015) under preparation.

Currently, there are two main types of funding sources for large research infrastructures. The construction cost of the emerging large research infrastructures have been covered mainly by the Operational Programmes – RD&I and Prague-Competitiveness. Although construction of new large research infrastructures will be very restricted in the future, the new Operational Programme Research, Development and Education for 2014 – 2020 will support completion of the construction phase of already running large research infrastructure projects (e.g. ELI-Beamlines). Running costs of the large research infrastructure projects approved by the Government have been dominantly funded by the long-term competitive funding of the MEYS since 2010. In 2010 – 2015 nearly CZK 4bn has been allocated among 35 projects.

Regarding the legal form, large research infrastructures in the Czech Republic are integral parts of one or more Research Organisations that are legally responsible for their acts. It is however envisaged that some of the large research infrastructures might become single legal entities in the future (e. g. ELI-Beamlines).

Proposed schemes of funding

The funding scheme for large research infrastructures present in the Czech Republic is in line with international practice. The construction cost are usually separated from the running cost and from the cost of research conducted in the large research infrastructures. From the conceptual point of view we do not envisage any substantial changes.

For the construction of large research infrastructures the EU Structural Funds seem to be the most appropriate source of funding. Taking into account the large infrastructural investment expended in 2009 – 2013 we consider desirable a judicious approach in future Czech research policy with respect to investments in new large research infrastructures.

The present mechanism for funding of operational cost of large research infrastructures seems to be appropriate and in line with the international practice. The thorough evaluation of existing and emerging large infrastructure projects executed in 2014 is a good base line for the strategic policy approach to funding of large research infrastructures in the Czech Republic in the future. A competitive funding scheme related to the National Roadmap for Large Research, Development and Innovation Infrastructures enables selection of projects that are in line with the policy objectives.

Finally, the research conducted in large research infrastructures is envisaged to be funded similarly to the research conducted by Research Organisations. In this respect the large research infrastructures or their parent Research Organisations can apply for national or international competitive funding and get institutional funding.

In the new institutional funding system the large research infrastructures can be either organisational units of existing ROs or newly created single legal entities. In the former case the large research infrastructure enters into the institutional funding system as a part of a RO, where the management of RO is responsible for allocating the institutional funding among the organisational units. In the latter case when a large research infrastructure enters into the new institutional funding system as a new single legal entity, the general rules for entering the funding system described in Section 3.1.6 apply. This means that primarily the founder will be responsible for the funding of the new large research infrastructure before the responsible policy makers decide about the eligibility of the new large research infrastructure for institutional funding.

3.1.8 Changing national priorities and the need for stability of institutional R&D funding

In a first step, we need to distinguish different types of priorities, especially making a distinction between thematic (e.g. nano, energy, life sciences…) and systemic (e.g. science-industry links, HR development) priorities.

In the countries we investigated institutional funding is not linked to national priorities or strategies and research organisations can use it freely, within their mission of course, and set their own priorities. National thematic priorities are (and should) be mainly funded via competitive funding (programmes).

Systemic priorities are very much linked to institutional development, and the International Audit of RD&I in the Czech Republic clearly showed that institutional development should be a priority in the Czech Republic. It is one of the Czech policy goals to create stable conditions for a conceptual development of the Research Organisations[36]. This means that (some) stability of institutional R&D funding in this context is in no contradiction to national priorities, as it serves a systemic priority, i.e. the institutional development of Czech Research Organisations. Other research policy goals are immediately linked to this issue, especially improving the quality of R&D governance at the national level and strengthening of research excellence

National systemic priorities can also be funded via competitive funding (e.g. Research Centres funded from Structural Funds, Centre-of-Competence-programmes, cooperation programmes, doctoral schools). Systemic priorities with strong institutional implications should be subject to institutional governance and will typically be addressed in performance agreements (e.g. HR development) (see Section 3.3).

In the long run, we suggest strengthening the link between competitive R&D (project) funding and institutional development. This means that in the applications of projects for funding, applicants need to provide strong answers to the question “How will this project help your organisation achieve its overall goals?”.

3.2 The core funding principles

In this section we present the core funding principles underpinning the new funding system.

As outlined above (see Section 3.1.1) we conceptualise public institutional research funding in the context of a long-term working relationship between a ministry in charge and a Research Organisation. Public institutional funding expresses responsibility and ownership by the state, with the state taking an interest and a stake in the Research Organisations it (co-)funds. Institutional funding in this context provides a reliable basis for institutional development and therefore it must not be subject to short-term policy making. Ideally, public institutional research funding and its basic principles should be laid down in a long-term RD&I strategy which is supported by all major political forces and thus holds beyond election terms.

[36] See the Final report 1 -The R&D Evaluation Methodology

3.2.1 The distribution of institutional funding for RO among research funders

A pre-requisite for the proposed funding model is that are separate 'pots' (budgets or budget lines) for different types of Research Organisations: Scientific Research Organisations, Industry and Business Services Research Organisations, Public Services Research Organisations, National Resources Research Organisations (see the Background Report *Typology of Research Organisations and Effects of the EM Thresholds*). The thinking behind this pre-requisite is that different types of Research Organisations fulfil different missions and functions in society. Hence, they should not be made to compete for the same budget pot as this may lead to some Research Organisations not being able to fulfil their roles any more. This is a break with the current funding system where all Research Organisations compete for institutional funding for RO irrespective of their type, a practice criticised in the International Audit of RD&I in the Czech Repunlic.

What needs to be understood is that that typology is based on the function of organisations, not on their legal form. This ensures that only organisations with the same function are put in competition with each other. If we use a typology based on legal form, we start mixing functions in one typology and make Research Organisations with one function compete against Research Organisations with another function.

This pre-requisite is in line with international practice where different budget pots for different types of Research Organisations are the common practice. The distribution is generally contingent on: laws (responsibilities), history (e.g. size of budgets), politics, policies, (entrepreneurial) individuals (or the opposite). For example, in Austria the public universities and the non-university research organisations are not funded from the same budget: There are separate budgets for the public universities (one common pot), for research organisations such as the Austrian Institute of Science and Technology and the research institutes of the Austrian Academy of Science (individual pots), for applied research organisations such as the Austrian Institute of Technology, Joanneum Research (individual pots)[37] etc. This is similar in other countries.

In the end, how much money to allocate to the different pots is a policy decision to be made by policy-makers[38]. We suggest the following procedure for the transition from one single budget for institutional funding for RO of all kinds to different budgets for different types of Research Organisations: We suggest taking the current expenditure on institutional funding per Research Organisation as a starting point (mean values or weighted mean values over several years). This would be a starting point which provides continuity and stability although a starting point that may be considered unfair given the re-allocations of institutional R&D funding entailed by the application of the Metodika. Nonetheless, the starting point suggested is transparent and predictable, and this is important given that the definition of pots for different types of Research Organisations ultimately involves a policy decision.[39]

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[37] See Background report 6 - *R&D governance and funding systems for research in international practice*.

[38] Policy decision does not only mean decisions by politicians, it also includes decision by the civil service/ministries.

[39] This means that the current evaluation methodology („Metodika") will not be used in the funding system we are proposing. Also, for calculating the starting point, we propose using the current expenditure on institutional RO funding rather than RIV points.

Box 1 – The category 'Scientific Research Organisations'

Scientific Research Organisations – ScRO – are institutions that have as primary function to conduct research to the benefit of the research community. This includes institutions that have as primary activity the conduct of research (the ASCR institutes) and/or the teaching and training of future researchers, i.e. the public and private HEIs, and the research hospitals. It also includes institutions that conduct research in order to improve their services to the research community, i.e. the research infrastructures (see the Background Report *Typology of Research Organisations and Effects of the EM Thresholds*).

Hence, our suggestions to define one funding pot for institutional research funding for this type of RO implies that there is a common funding pot for the ASCR institutes and the universities – which has been contested in the public debate.

We argue to fund these RO from the same pot basically for one reason: Although the ASCR and the universities differ in their overall roles, they perform the same kind of research. This justifies competition between these RO.

However, one could also argue in favour of two pots:

- **Because** the ASCR and the universities differ in their overall roles in the research system, they need to be protected against direct competition for funding. Although they perform the same kind of research, they do so in different institutional contexts.
- They also operate under different funding conditions (see e.g. Section 3.1.6).
- Consequently they should not be put in direct competition for funding.

Therefore, in the one-pot-solution, universities and the ASCR institutes would compete directly with each other, while in the two-pot-solution, ASCR institutes would only compete among themselves.

Ultimately, the decision whether or not to have one pot for all Scientific Research Organisations or to have two pots, one for the ASCR and one for all other ScRO is a policy decision which cannot be taken within the funding system itself.

As outlined in the previous Section 3.1.1, ideally the responsible ministries should base their funding decisions on a thorough understanding of the Research Organisations' 'funding profiles'. There is no such thing as 'the right funding profile' for the different types of RO. However, it is important to analyse and understand the funding situation of each (type of) Research Organisation and to assess whether or not this situation enables the RO to fulfil its role and mission in the research system and in society. On this basis it will be possible to determine better how large the pot for 'their' type of Research Organisations should ideally be.

The responsible ministries are the Ministry of Education, the Ministry of Industry, the Ministry, of Interior, the Ministry of Health, the Ministry of Agriculture, the Ministry of Culture, the Ministry of Defence and the Academy of Sciences which has the status of a ministry. Those ministries that lost their R&D budget for their Public Services Research Organisations (e.g. the Ministries of Environment and Transport) and whose R&D funding went to the Ministry of Education should also be consulted in the decision making on the size of the 'pots' to make sure that the interests of 'their' Research Organisations are adequately represented.

3.2.2 Components of the funding system

Based on our mandate, we have designed a funding system that encompasses three components: a block grant, a performance agreement and a PRFS (performance-based research funding system) (Figure 14).

In order to ensure trust and stability, part of the institutional funding for RO will be allocated in the form of a *block grant*, like in the current funding system based on the evaluation methodology valid for years 2013-2015 (see 2.2.2).

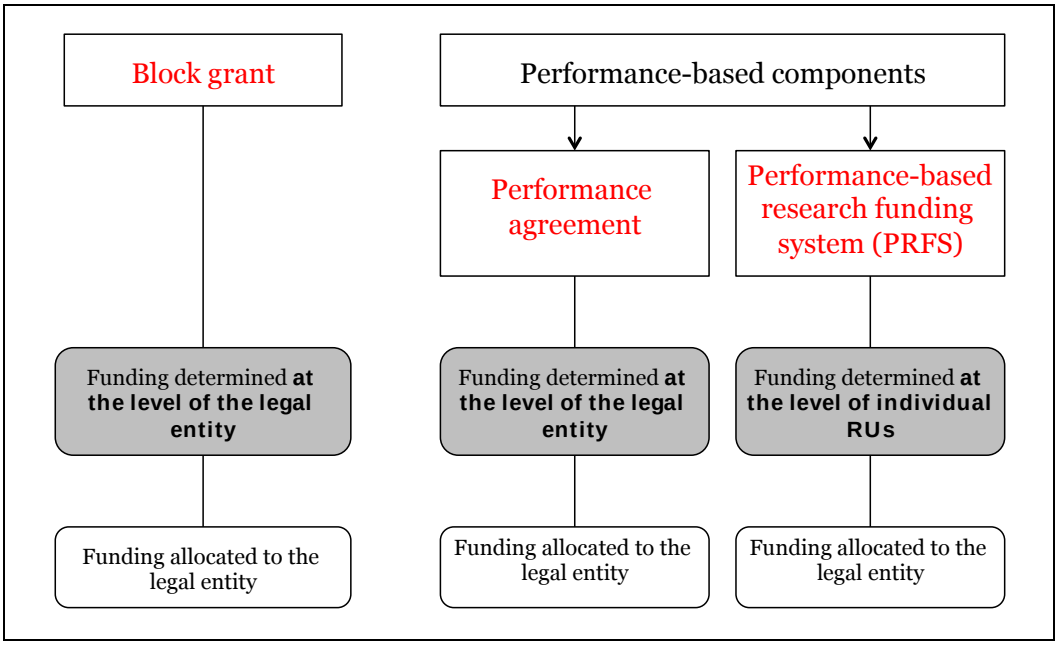
While the block-grant ensures trust and continuity, the performance-based funding component reflects both (i) past performance as well as (ii) future developments and plans. Therefore, we propose two elements for the performance-based part of institutional funding for RO:

- A *performance-based research funding system (PRFS)* which allocates funding on the basis of the new Evaluation Methodology[40], and is mainly based on the assessment of external peers in their respective fields of expertise and types of Research Organisations assessing mostly past performance but also future strategies and
- A (negotiated) *performance agreement*, mainly based on the negotiation between the government (a ministry or a specialised agency) and the respective Research Organisation.

Figure 14 shows on what basis institutional R&D funding is determined and to whom the funding is allocated. Block grants and performance agreements are allocated to Research Organisations as legal entities and are determined on the basis of the budget allocated to Research Organisations in the preceding funding period. The thinking for PRFS money is different. The money is determined on the basis of scores achieved by research units (RUs) and then aggregated to the level of the Research Organisation as legal entity which receives the PRFS money.

[40] See Final report 1 – The R&D Evaluation Methodology

Figure 14 Allocation of funding by type of instrument



Source: Technopolis Group

3.2.3 Shares of the components of the funding

Block grant

We suggest that, similar to the current system, in the first funding period after the first evaluation based on the new methodology, the block grant should make up 80% of the pot (or pots for the different Research Organisations) and 80% of what each Research Organisation received in the previous funding period.[41] The previous funding period should refer to an average of what Research Organisations received over a period of 3-5 years (a 'reference funding period'), in order to take into account trends. Moreover, these 3-5 years should cover the years when institutional R&D funding was based on the Metodika valid for the years 2013-2015 (or later), encompassing an 80% block grant and an 20% performance based part. Using the years before the Metodika 2013-2015, when a higher share of institutional R&D funding was allocated by the Metodika would not make sense because fluctuations were too large.

The starting point we are suggesting safeguards continuity with the present funding situation for each Research Organisation involved. We have opted for it for the sake of transparency and stability while being aware that the Metodika, through its own specific problems, has led to an allocation of funding among research providers and Research Organisations that some may consider deformed or unfair[42]. Later on in this chapter (section 3.4.3), we are suggesting a treatment for RUs that achieve low scores in the new evaluation, which should mitigate any problems associated with the starting point.

[41] There is a precedent for this in the UK where in the beginning of the RAE only a small share of institutional funding was allocated based on the RAE, comment by advisory board, 10 November 2014.

[42] See Erik Arnold, Barbara Good, Fritz Ohler, Brigitte Tiefenthaler, Niki Vermeulen, The Quality of Research, Institutional Funding and Research Evaluation in the Czech Republic and abroad. Thematic Report No. 3, International Audit of Research, Development & Innovation in the Czech Republic, 2011.

Performance-based research funding system (PRFS)

We suggest basing 15% of total institutional funding for RO on the PRFS. Moving 15% of institutional funding for RO through a PRFS is in line with some international practice, e.g. in Norway[43] or Denmark. The PRFS, as it is proposed at the moment, would run every six years. Experience with performance based research funding systems in other countries shows that even smaller shares of budgets allocated on the basis of performance indicators can have dramatic effects on the research system.

Experience from other countries shows that the PRFS steers behaviour through two channels: funding and esteem. Contrary to what might conventionally be expected, researchers' behaviour tends to be more strongly impacted by the measure of esteem. Getting a bad score in the PRFS generally is a enormous incentive to get better. Hence, a 15% PRFS component is not only in line with practices from other countries, experience shows that it will have an impact on behaviour.

Performance agreement

We suggest linking 5% of funding to a 'light touch' performance agreement to promote institutional development and capacity building. The performance agreements can be negotiated between a the funding provider (ministry) and Research Organisation for a period of two and half to three years, to be compatible with the periodicity of the PRFS. Those ministries that lost their R&D budget to the Ministry of Education need also be involved in the negotiation of the performance agreement to ensure its relevance. Therefore, both the funding and the founding ministry will represent the principal and both will sign the performance agreement on the ministerial side. In the long term, the possibility to transfer R&D funding responsibility back to the founding ministries should be examined.

'Light touch' in this context means that the performance agreement should not cover the entire Research Organisation with all its activities but focus on one or several strategic projects focusing on well defined issues of institutional development which will have a leverage effect on the Research Organisation as a whole.

The rationale for this 'light touch' performance agreement in the funding system is that principals (providers/ministries) and agents (Research Organisations) are new to this instrument. They will need to build up capacity to negotiate, implement, report on and supervise the performance agreements. How this can be done in practical terms, we show in more detail below (section 3.3). Moreover, this approach focuses the performance agreements on projects that are manageable on both sides, i.e. by the ministry and the RO and the actual persons involved.

We have suggested a 5% share of this funding component because performance agreements are an instrument that is new to the Czech Republic; this low share will give Research Organisations opportunity to learn and introduce a cultural change, while not risking too much. We have proposed the same share of 5% for all types of Research Organisations because all are in need of institutional development.

Together, the performance-based components will make up 20% of total institutional R&D funding. However, given the high percentage of competitive funding (approximately 50%) in the Czech R&D system[44], we think that the competitive element in the institutional R&D funding system should not be too pronounced, in order to guarantee stability and allow capacity building.

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[43] Background report 6 - *R&D governance and funding systems for research in international practice*.

[44] See Background report 7 - *The institutional funding system in the Czech Republic*.

In the present system, a formula-based evaluation takes place every year, based on achievements in the prior period, i.e. the preceding five years. In the future, the new peer-based evaluation is scheduled to take place every five or six years, which implies that the overall amount of funds allocated through the corresponding mechanism for institutional funding for RO is also set for the same period of five or six years[45]. Increases in salaries and inflation have to be taken into account, e.g. by taking into account inflation and increases of wages in the annual instalments of all three funding components.[46]

3.2.4 Shares of components in future funding periods

We suggest an 80+15+5 allocation of institutional R&D funding to *all* types of Research Organisations for the first funding period because they all are in need of stability. However, it goes without saying that the shares of the block grant component and the two elements of the performance based component can be changed in future funding periods once the PRFS and the performance agreement system are well established. Moreover, because there are different budget pots for different types of Research Organisation, the shares can be varied for different types of Research Organisations according to their needs and depending on policy requirements.

However, this requires a policy decision that cannot be delegated to a PRFS or some other 'mechanical' system (or foreign consultants for that matter). The policy decision has to be taken by the responsible ministries. We suggest the following guiding principles are considered when thinking about increasing or decreasing the shares of the funding components.

- Because stability is the most important function of institutional RO funding, the state budget available for that purpose should not be subject to radical cuts. The block grant ought to be the largest of the three funding components.
- One prerequisite is that the PRFS needs to work well[47] before its share can be increased. The same is true for the performance agreements.
- Experience in other countries shows that in countries where there is an increase in institutional funding, this increase tends to be allocated through the performance-based part, which implies that the share of the block grant decreases – while not decreasing in absolute terms, thus ensuring stability. In countries where there is little increase in institutional funding, the shares of the block grant and the performance-based part typically remain fairly stable.
- Because there are different budget pots for different types of Research Organisations, the shares of the funding components can be changed separately for each type of Research Organisation, depending on their needs. For example, if a certain type of Research Organisation displays a particular need for institutional development, the share of the performance agreement could be increased in order

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[45] But careful: the UK experience shows that one needs to think about the new round early!

[46] This means that by the end of the funding period the total amount of the block grant spent would reach a total of the original 80% increased by inflation adjustments and wage increases - this needs to be taken into account in the state budget!

[47] Introducing a peer review based evaluation system will be new to some research organisations. For them, it will primarily mean that they will need to learn how to write a self-assessment report. At the level of the people administrating the new Evaluation Methodology it will mean that they will have to learn how to put together panels etc. For the Methodology itself, it means it needs to be tested, for example to make sure that the indicators are suitable for all types of research organisations, which is being done now and in the next year. Therefore, enough learning has to occur in the system before the PRFS share of the funding is increased. This means at least one round of the new evaluation methodology has to be done before increasing the PRFS share is considered.

to set an incentive for such Research Organisations to focus on institutional development. Similarly, if a certain group of Research Organisations displays a need for more quality and is homogeneous enough to benefit from more direct competition, the PRFS part of the funding could be increased. The general guiding principle would be that changes in funding component shares need to be in line with the needs and requirements of particular types of Research Organisations, as articulated both by the Research Organisations themselves and their owners.

- This is linked to the fact that the size of the shares should be in line with ministries' strategies. If ministries' strategy is to increase competition in a group of Research Organisations, then the PRFS share should be increased. If ministries' strategies is to maintain stability, then the block grant should be left at 80%. If ministries' strategies is to promote institutional development in a group of Research Organisations, then the performance agreement component should be increased. If several ministries are responsible for a group of Research Organisations, their strategies should be aligned in a process of negotiation. For any change of strategies one has to consider that institutional development takes time.
- Another important guiding principle is that the funding mix (institutional/competitive/contract funding) ought to be part of the decision making on the shares of the different funding components for different types of Research Organisations. If in a group of Research Organisations there already is a high share of competitive funding, then the performance-based components, in particular the PRFS, should not be over-emphasised in order to ensure stability and opportunities for capacity building. Similarly, if the share of competitive funding is fairly low, then the performance-based components can be increased more. The share of competitive funding is typically higher in more applied Research Organisations compared to basic Research Organisations.
- The PRFS part is the dynamic component of the funding system and leads to (desired) change in the funding of Research Organisations (see Box 2). If a Research Organisation consists of only few RUs, this change may possibly be quite large (the assumption being that if a Research Organisation has many RUs, their scores will even out to some extent, preventing sudden fluctuations of funding). For Research Organisations that the ministries need to maintain in any case as they produce knowledge the government needs in order to legislate or regulate, or produce 'public goods' such as standard, certification etc. or cultural public goods that society needs but that private companies lack the incentives to make, that is Public Services Research Organisations (PSRO) and National Resources RO (NatRes), such instability may be unwelcome. Under these circumstances it may make sense to put to the PRFS component to zero, and to base institutional RO funding on the block grant and performance agreement components only. Quality would then be assured through the performance agreement whose share would be increased. Of course, the Research Organisation would still participate in the new Evaluation Methodology but the results would not be translated directly into funding (the PRFS component); rather the results would inform the negotiations of the performance agreement.

Box 2 - Some words about percentages

In this chapter we often talk about different percentages. This might be confusing because in absolute numbers, some percentages are the same but they refer to different things, namely to one of the following:

- *At a national level, on the expenditure side,* we talk about total funding pots available for each type of Research Organisation. This is what the 80+15+5 formula refers to. 80% of the funding available will be allocated through block grants, 5% on the basis of performance agreements and 15% through the PRFS.

- *At an institutional level, on the income side,* we compare the sizes of institutional R&D funding and its three components to the amount of institutional R&D funding received in the preceding funding period. For the sake of stability we suggest that each Research Organisation will receive 80% of the amount it received in the preceding funding period as a block grant plus 5% if it enters into a performance agreement with the responsible ministry/funding provider. Moreover, each Research Organisation can receive money through the PRFS, depending on the results of the evaluation according to the new Evaluation Methodology. This means that 15% of the pots available per type of Research Organisation will be redistributed among those research organizations.

As a result, at the level of Research Organisation, the share of the PRFS money will vary among Research Organisations: in the extreme case of an Research Organisation that scores "0" throughout its RUs, the PRFS component of funding will be zero, i.e. in total such an Research Organisation would receive 85% of the institutional R&D funding it received in the preceding funding period. On the other side, a Research Organisation whose RUs all perform outstandingly well will receive a relatively large amount through the PRFS, i.e. in total, their institutional R&D funding will grow to more than 100% compared to the preceding funding period.

What has just been said is based on the assumption that the pots of budgets per type of Research Organisation are the same size as in the preceding funding period. If these pots were larger (e.g. due to index alignments), the block grant and performance agreement component allocated to each RO would be adjusted accordingly. The PRFS pot as a whole would be larger but allocation of funding would be based on the scores achieved.

3.3 Performance agreements in more detail

The performance agreement component resembles an existing funding stream among HEIs called Rozvojové programy (Development Programme) administered by the Ministry of Education, Youth and Sports (MEYS), which also promotes institutional development projects. However, while the current programme for HEIs uses a funding formula based on quality indicators, the performance agreements we are proposing here will not because in the funding system the quality aspect is covered by the PRFS. The performance agreement component, however, foresees sanctions in case the Research Organisation does not fulfil the agreement (see below).

As mentioned above (see Section 3.2.4), if the Research Organisation enters into a performance agreement with the relevant ministry, 5% get added to the block grant.

The performance agreements are set up individually, taking into account the specifics of each Research Organisation (e.g. role and mission, research profiles, institutional setup). They are light touch and promote institutional development and capacity building. Light touch means that the performance agreement does **not** aim at grasping and comprehending the Research Organisation as a whole but that it focuses on one or several well defined strategic projects in order to support institutional development[48]. The main idea behind this approach is that a leverage effect is expected: if the strategic projects succeed, they will have a positive influence on the whole or at least essential parts of the Research Organisation.

The performance agreement is an agreement between the ministry and the Research Organisation on a small number of strategically relevant undertakings that the

[48] The opposite would be a comprehensive agreement, trying to cover "everything" the research organisation should do and achieve during the funding period. Comprehensive agreements (e.g. in Austria) tend to weaken the agreement (and the idea behind) as neither the research organisation nor the ministry are able to oversee the broad range of issues in depth.

Research Organisation agrees to implement in the performance agreement period in order to increase R&D capacity and to improve working conditions for research as well as for support staff. Some Research Organisations were founded by one ministry and are now being funded by another (the MEYS). As a rule, the agreement is between the funder and the Research Organisation. If funder ≠ founder, then both ministries represent the principal and both will sign the performance agreement.

For example, performance agreements can stipulate that

- a university improves its doctoral training by linking it better with the research priorities of the university or the procedures of recruitment, supervision and career development
- a university should enter a new field or tackle a new set of problems in a way likely to result in the creation of a new RU over time
- a Research Organisation needs to set up an internal quality assurance system, or in case a Research Organisation already has an internal quality assurance system, has it audited by an external evaluation panel, e.g. a foreign quality assurance agency
- a Research Organisation designs and implements an attractive, internationally compatible career path for research staff, modernising its career management structure (e.g. through introduction of tenure track positions)
- a Research Organisation designs and implements a programme to reconcile work and family life for men and women
- a Research Organisation implements and funds a continuing education scheme for their administrative staff or for external user groups.
- etc.

If Research Organisations do not want to negotiate a performance agreement with the responsible ministry, or if the two involved parties do not manage to negotiate an agreement, the Research Organisation will not receive the 5% top-up to the block grant[49].

The performance agreements are negotiated between a Research Organisation and the responsible ministry for a period of three years (i.e. half the total funding period of 6 years). The Research Organisation reports on progress made in the strategic undertakings agreed on in the performance agreement on a yearly basis. After three years, the implementation of the performance agreement is evaluated, and based on the results of the evaluation, a new performance agreement is negotiated. Substantial strategic projects may take more than three years; therefore it will also be possible to conclude agreements for 6 years with a half-term assessment of interim results after three years.

In the following two chapters we present a more detailed description of the performance agreements and the processes involved in setting them up and implementing them. These chapters are based on our experience with and knowledge of performance agreements (PA) in several countries, esp. Luxemburg, Austria, the Czech Republic and Switzerland. As outlined above, each performance agreement as such takes into account the specific situation of the Research Organisation concluding

[49] This would raise a question: What happens to the money that does not get distributed because some research organisations do not want to or manage to have a performance agreement? We recommend moving the money to the pot of the PRFS.

the agreement with its ministry (or ministries[50]). Therefore, there we do not have to distinguish between different types of Research Organisations in the following explanations.

3.3.1 Scope and content of a light touch performance agreement

In this chapter we provide guidelines for the process of preparing, negotiating and concluding a performance agreement between a ministry and a Research Organisation. Moreover, we provide guidelines and the basic template for the issues to be covered in the light touch performance agreements we are suggesting.

Basics

- Parties concluding the agreement are the ministry in charge of the Research Organisation and the Research Organisation. There are cases where the founding ministry is not the funding ministry, in particular for a number of Public Services RO (e.g. Water Research Institute, Transport Research Centre). For such cases we suggest that the founding ministry, i.e. the ministry with an actual working relationship to the Research Organisation is involved in the process as well, representing the principal together will the funding ministry.
- The performance agreement is light touch, i.e. it focuses on a small number of well defined strategic projects in support of institutional development[51].
- The performance agreement makes promises for future performance. They have to be based on sound analysis and an understanding of the starting point (including the awareness that this may be missing), on credible past achievements of key staff, and on suitable governance and management systems. The report by the peers can serve as an indication where the starting point is and what issues might need attention in the performance agreement.
- Objectives agreed in the performance agreements need to be manageable and realistic yet ambitious, and whether this is the case will be assessed on the basis of past performance. Manageable means that objectives must be attainable with the resources (money, hierarchy, trust, information, leadership/orientation) available in-house.
- The performance agreement is binding for both parties, although, strictly speaking it is not a contract in the legal sense of the word.
- Through the performance agreement a Research Organisation will receive a 5% top up to the block grant of institutional funding for RO (see Section 3.2.3). Unlike grant-funded projects, the strategic projects do **not** necessarily have to account for exactly this amount of funding. They can also cost less (or more) than the 5% top-up to the block grant.
- The first funding period in particular will be a period for learning for both parties. Although there is some experience in the Czech research system with similar agreements, not all ministries and not all Research Organisations can draw on such experience. Moreover, it will be necessary to improve mutual understanding.

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[50] Some research organisations were founded by a specific ministry and are now being funded by another (mostly the MEYS). As a rule, the agreement is between the founder and the research organisation. If founder ≠ funder, then both ministries represent the principal.

[51] The opposite would be a comprehensive agreement, trying to cover "everything" the research organisation should do and achieve during the funding period.

- Most likely some projects agreed upon in the first period will turn out to be either too ambitions or too simple, i.e. both parties will get a better understanding of what can and should be included in the following performance agreement.
- All parties involved have to be aware that it will most likely take more than one funding periods before the new tool is made best use of.

The process

- The ministry in charge invites the Research Organisations to present a proposal for the strategic project(s) they want to include in the performance agreement. In this invitation, the required content (and format) for these proposals is specified (see below).
- Each Research Organisation submits its proposal for the strategic project(s) to the ministry.
- Both parties meet in order to discuss the proposal.
- In the negotiations, both parties need to be represented by persons authorised to conclude a performance agreement and, on the ministry's side, who are familiar with the Research Organisation.
- If a major revision of the proposal is needed, one or several follow-up meetings may be necessary. Minor revisions will typically be feasible in a written procedure.
- Optionally, an external facilitator can support the negotiations. This should be a person familiar with research and research management at the respective type of Research Organisation. If needed, the facilitator mediates between the two parties as the "advocate" of an agreement that is both ambitious and feasible. Involving a facilitator may be especially helpful for those ministries that have little experience with negotiations or feel they are unfamiliar with performance agreements.
- Finally, the performance agreement is signed.

Basic template for the performance agreement[52]

The performance agreement will be set up on the basis of a template issued by the ministry in charge. Of course, performance agreements are individualised, tailored to the specific issues of a RO; nonetheless, they should all include the following content[53].

- Parties concluding the performance agreement (names and contact details of the institutions and the persons in charge)
- Description of the strategic project(s):

  – Starting point: What is the problem to be solved, or the issue to be addressed, or the opportunity to be grasped? Provide evidence to support this point!

  – Overall objective: What would be different at the Research Organisation if the problem were solved, or the issue addressed successfully, or the opportunity grasped? How does this relate to the strategy of the Research Organisation?

  – What does the Research Organisation propose to do in order to reach the overall objective? This is the strategic project/these are the strategic projects. A

[52] For a more detailed template see the template in the Appendix

[53] This basic template focuses on the content to be covered in each performance agreement. Ultimately, the actual templates will have to be designed and formatted according to the regulations to be applied by each ministry.

strategic project may take more than the three years of one performance agreement period. In this case distinguish between the overall strategic project and the strategic subproject(s) for the three years of the performance agreement period.

– How will the strategic project be implemented? Give a work plan including milestones and estimated timetable.

– Who will be involved? Key staff involved including their relevant qualifications, roles and tasks in the project.

– Which resources will the strategic project need? Cost estimate (personnel cost, other costs).

– How will these resources be financed?

– What are the indicators (e.g. interim results, milestones) used for monitoring of the strategic projects(s) and what is their timing. What are the deliverables which should be reached after three years? In case of projects scheduled for more than three years: Brief outlook for the period beyond the first three years.

– What happens after the strategic project(s) in order to safeguard its sustainability?

– Which are the most relevant risks of failure? What would the impacts be? How are risks mitigated?

- Rules for reporting: frequency and modes of reporting (see guidelines in the following chapter)
- Rules how extraordinary situations will be handled (e.g. radical change of the institution's situation, significant non-achievement of agreed interim and/or final milestones, loss of key staff, … , embezzlement of funds)
- Amount of funding (block grant and top-up), funding period, and regulation of instalments
- Signatures

Criteria for the ex-ante assessment of strategic projects

Both, the Research Organisation (in preparing) and the ministry in charge (in assessing) shall be guided by the following criteria:

- Does the Research Organisation have a convincing overall set of goals and related strategies? Are these goals / strategies based on sound analysis of the current situation?
- Are the proposed strategic projects most relevant to support the stated goals / strategies (fit-for-purpose)? Are they feasible in terms of resources and timing?
- Is the key staff credible to successfully implement the proposed projects?

3.3.2 Reporting and implementation

In this chapter we describe how the reporting and monitoring of the performance agreement will work. We also explain how to deal with deviations from the performance agreement, including sanctions.

- Research organisations will present a written annual progress report to the ministry in charge. The progress reports contain information about the work done and the results achieved to date, and a cost statement as well as a comparison of the progress made against the intended objectives of the strategic project(s) including information on and an analysis of deviations from plan.
- The progress report will be discussed during an annual progress meeting between the head of the Research Organisation and the ministry (or ministries in case the founding ministry is not the funding ministry) in charge. In the case of unexpected events that affect the progress of the strategic project severely, an ad hoc meeting has to be held.
- Deviations from the agreement (e.g. delays beyond the agreement period) need to be discussed in progress meetings, with a possibility to agree on a changed agenda for the project at stake (if there are good reasons!).
- The final progress meeting of a performance period will be used to assess the results achieved with the strategic projects as well as the experience that have been made during their implementation. An external assessment may be necessary, depending on the content of the performance agreement. This could be the case if the representatives of the ministry feel they are not capable of assessing whether or not an agreed project has actually reached its objectives. In this case the project and its results could be assessed by an external expert supporting the ministry. However, generally the ministry and the Research Organisation should be capable of assessing the success of the strategic projects.
- The first round of performance agreement is for learning and capacity building on both sides, therefore no negative consequences will follow if goals are not achieved[54]. The ministry has to stick to the agreement! This is a strong incentive for the Research Organisations because they cannot blame the ministry if they fail to fulfil their part of the agreement.
- From the second round on sanctions can be applied by the ministry if the Research Organisation infringes the PA and if the ministry itself has stuck to the agreement.
- After the first period, sanctions need to be defined in the performance agreement, the most obvious being a decrease of the 5% top up, e.g. down to 2.5% for the following period.

[54] With the exception of wilful underachievement.

3.4 Performance-based research funding system (PRFS) in more detail

The key results of any peer review-based funding system PRFS are (i) a set of scores according to a given set of criteria, and (ii) a verbal description and justification[55] of the respective scores by the peers. This chapter describes how the scores are transformed into funding for the different types of Research Organisations.

Changes in the scores of the PRFS will lead to changes in the PRFS funding. These changes – both increases and decreases – after a new evaluation round can be implemented gradually over the funding period in order to avoid too large shifts for Research Organisations that they would not be able to accommodate. Large shifts in funding are particularly likely if a Research Organisation consists of few RUs only. For example, if a Research Organisation consists of three RUs only and if all RUs score zeros in the evaluation, their institutional funding for RO may decrease by 15%. In contrast, if a Research Organisation has many RUs (e.g. a university), most likely their scores will even out to some extent. Large increases and large decreases are both difficult to accommodate, so Research Organisations may need to be given time to cope with the lower or higher level of funding.

This is particularly true if institutional funding for RO makes up a large share of a Research Organisation's funding. In contrast, if institutional funding for RO makes up only a small share of a Research Organisation's total funding, e.g. 10%, then a drop in institutional funding for RO of, say, 15% can easily be accommodated as in total the change only accounts to -1.5% of the Research Organisation's total income.

Hence, we are proposing the guiding principle that if changes in PRFS funding exceed 5% of a Research Organisation's total funding after the new evaluation round, the new level of PRFS funding should be implemented gradually over the years of the funding period. If figures on Research Organisations' total income are not available, a gradual implementation of the new funding level may be introduced in case total institutional funding for RO is smaller than 92% or higher than 108% compared to the previous funding period.

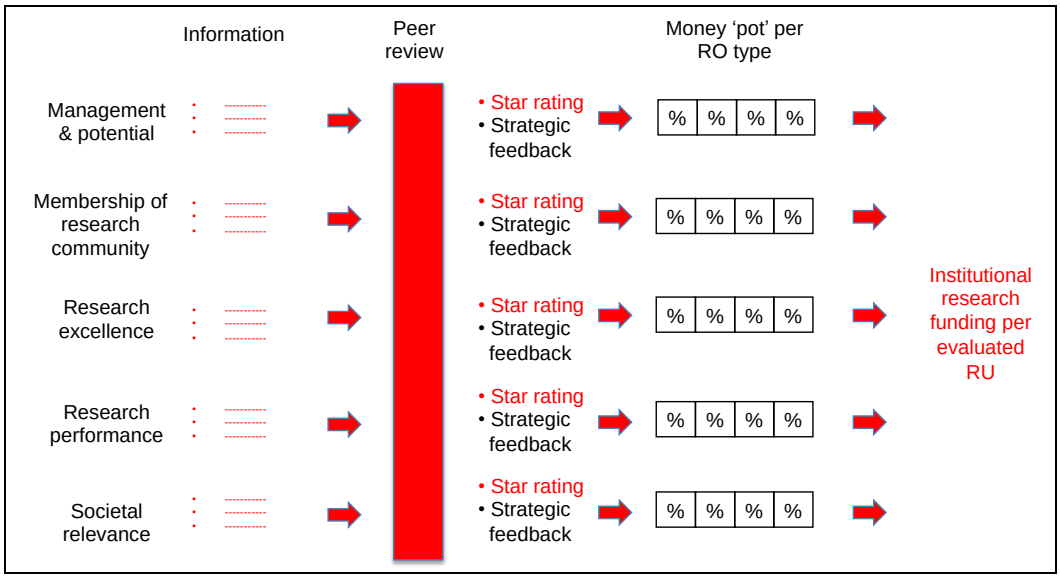
3.4.1 Weighting the evaluation criteria for different types of Research Organisations

The new Evaluation Methodology provides us with scores from 1 to 5 against five categories of indicators:, research environment, membership in the (global and national) research community, scientific research excellence, overall research performance, societal relevance (Figure 15)[56].

[55] To put it in a formula: While the scores are *eminence*-based (relying on the experience, knowledge and reputation of peers), the description should be *evidence*-based (relying on facts and figures, and arguments).

[56] See the Final report 1 - The R&D Evaluation Methodology

Figure 15 Overview of the translation of EM scores into funding



Source: Technopolis Group

In order to translate the scores into funding, our proposal is to use the five categories and define "sub-pots" for them. This implies a weighting of the categories **in line with the organisations' mission and in line with ministries' strategies.** This in turn implies that the weights have to be different for the different types of organisations because they have different missions and roles in the Czech R&D system.

The following table shows how the 'PRFS pot' for Scientific Research Organisations gets divided into 'PRFS sub-pots' by category. This gives us the sum of money to be allocated by criteria (i.e. 5 sub-pots). We have used a fictional example to make the table more intuitive.

Figure 16 Evaluation criteria and their weights for Scientific RO (default scenario)

Criteria and their weights	CZK
Scientific research excellence: 10%	10,000,000
Overall research performance: 50%	50,000,000
Societal relevance: 10%	10,000,000
Membership of the research community: 10%	10,000,000
Research Environment: 20%	20,000,000
Total ('PRFS pot')	**100,000,000**
Each sub-pot gets allocated to RUs based on the way outlined below in section 3.4.2.	

Source: Technopolis Group

While we can provide guiding principles on which to base the decision on how to weigh the different categories for the different type of organisations, the weighting itself is essentially a policy decision that has to be made by policy-makers. Hence, the decision-making authority will need to undertake a top-down weighting of the five criteria according to policy priorities, missions of Research Organisations and, not least, their history. The decision-making authorities will be the responsible ministries.

We suggest the following guiding principles should be taken into account when determining weights.

- The main guiding principle will be that the weights of the different evaluation criteria need to be in line with Research Organisations' missions.
- In line with their mission, scientific research excellence is of highest relevance for Scientific Research Organisations. Hence, this category should have a higher weight for Scientific Research Organisations than for all the other types of Research Organisations.
- Overall research performance is a multi-dimensional category and refers to productivity and quality. Both are essential to the good functioning of Research Organisations, be they Scientific Research Organisations or more applied R&D actors that serve user communities. As the International Audit of RD&I in the Czech Republic has shown, quality and productivity are important issues in the Czech Republic (and anywhere else) and for all types of Research Organisations, that is why they should have a high weight. Therefore, we would give overall research performance a fairly high weight.
- Societal relevance is different and in the context of evaluation more important for Research Organisations that conduct applied R&D and serve user communities such as industry sectors (Industry and Business Services Research Organisations), the public sector (Public Services Research Organisations) or other researchers (National Resources Research Organisations such as archives and libraries) than for Scientific Research Organisations. For Scientific Research Organisations, societal relevance lies mostly in the teaching and training of (PhD) students. Consequently, societal relevance should have more weight for Industry and Business Services Research Organisations, Public Services Research Organisations and National Resources Research Organisations
- Membership of the national and global research community is most important for Scientific Research Organisations because science is a globalised undertaking and reputation is the 'key currency' in the science community. Hence, the category should have a higher weight for Scientific Research Organisations than for the other types of Research Organisations which often work primarily with and for more local communities of partners and users.
- The criterion "research environment" also covers research management. This is important as it is a typical bottleneck in the Czech Republic[57] (and in other countries). Since management is currently often not perceived to be important by many Research Organisations, it should not get too much weight in order not to discourage and penalise Research Organisations too much. However, it should still have enough weight so as not to be treated as a 'quantité négligeable' by Research Organisations.
- The five evaluation criteria are not independent. A (good) research environment, in particular (good) management, is the basis for (good) overall research performance while overall research performance is the basis for societal relevance and scientific research excellence. Societal relevance requires (good) overall research performance because societal relevance based on low-quality research is useless. Scientific research excellence may occasionally thrive without good overall research performance but this is rare and not normally sustainable. Finally, overall research performance and scientific research excellence are the basis for

[57] See Erik Arnold et al., The Quality of Research, Institutional Funding and Research Evaluation in the Czech Republic and abroad. Thematic Report No. 3, International Audit of Research, Development & Innovation in the Czech Republic, 2011.

membership in the research community. The interconnectedness between the evaluation criteria may guide thinking in setting the weights. In particular, it shows the fundamental role of research environment, in particular management, and overall research performance.

- Weights will also need to be in line with ministries' strategies for 'their' Research Organisations. While these strategies should be in line with Research Organisations' missions, strategies will typically go beyond the mission, emphasising certain policy objectives. For example, if it is a strategy to increase excellence in Scientific Research Organisations, then scientific research excellence should be given a high weight. If the strategy is to improve management, then research environment will need to emphasised.
- As a fallback option in case no policy decision can be reached, all evaluation criteria can be given the same weight.

The weights shall be used solely for the purpose of funding. They will be decided before the evaluation exercise but they will not be published until after submission of the self-assessment report in order to avoid gaming by Research Organisations. This is because if Research Organisations know that a certain category has a particularly strong weight for them, they will do (almost) anything to show themselves in the best light in that category.

It is our understanding that the separate budget pots for different types of Research Organisations and the different weights attached to the criteria will sufficiently reflect and take into account the differences between the different types of Research Organisations as long as the new Evaluation Methodology does do justice to the different types of Research Organisations. What is more, as explained above, since there are different budget pots for different types of Research Organisations, in the future the shares of the components of the funding system (block grant, PRFS, performance agreement) can be varied for different types of Research Organisations, thus further reflecting differences between Research Organisations.[58]

Figure 17 underlines that the PRFS funding system we are proposing is two-dimensional, with one dimension being the types of Research Organisations and the other being the different evaluation criteria. The different evaluation criteria have different weights for the different types of Research Organisations. This is symbolised by the different sizes of the spheres in the cells.

[58] As we have explained above, we have not done so in our proposal because at the moment all types of research organisations are in need of stability, therefore we have set the shares for the funding pot at 80% (block grant), 15% (PRFS) and 5% (performance agreement).

Figure 17 The two dimensions of PRFS funding system (default scenario)

	Scientific Research Organisations (ScRO)	Industry & Business Services RO (IBRO)	Public Services RO (PSRO)	National Resources RO (NatRes)
Scientific research excellence	o	o	o	o
Overall research performance	O	O	O	O
Societal relevance	o	O	O	O
Membership of the research community	o	o	o	o
Research Environment	O	O	O	O

Source: Technopolis Group

Below we are giving examples of how the weights could be set for the different types of Research Organisations in order to accommodate the different roles and missions of the different types of Research Organisations. We will also show how the weights can be used to implement different R&D policy priorities, presenting three scenarios below. These are suggestions only; the actual weights have to be discussed and agreed on in a policy-making process. Of course, our suggestions may serve as a starting point for discussion.

In this context policy-makers should take into account that the ex-ante analysis showed that that setting weights to evaluation criteria in the funding mechanism will have important implications for the distribution of the institutional funds to ROs. In particular the so-called Radical scenario, putting a dominant emphasis on one criterion, may cause a significant differentiation in institutional funding and have important consequences for the future of the ROs.[59]

Default scenario – increasing overall quality in Research Organisations

Our default scenario aims to increase overall quality in Research Organisations, irrespective of the type. That is why overall research performance has been given the highest weight (50%), and the same weight across all types of Research Organisations.

Figure 18 Weights in the default scenario

Default scenario	ScRO	IBRO	PSRO	NatRes
Scientific research Excellence	**10%**	**5%**	**5%**	**5%**
Overall research Performance	**50%**	**50%**	**50%**	**50%**
Societal Relevance	**10%**	**20%**	**20%**	**20%**
Membership of the research community	**10%**	**5%**	**5%**	**5%**
Research environment	**20%**	**20%**	**20%**	**20%**
Total	**100%**	**100%**	**100%**	**100%**

ScRO=Scientific Research Organisations; IBRO=Industry & Business Services Research Organisations; PSRO=Public Services Research Organisations; NatRes=National Resources Research Organisations

[59] See Background report 8 - *Ex-ante Impact Assessment of the Proposed Funding System*

These weights translate into the following shares of *total* institutional funding for RO. In other words, Figure 19 shows how much funding is attached to each criterion. While a sizeable share is attached to overall research performance, other criteria carry less weight. However, it has be borne in mind that there is also a psychological effect attached to the criteria, encouraging RUs to have good scores in a criteria because if they do not it is a matter of (bad) reputation to them.

Figure 19 Translation of weights into shares of total institutional funding for RO, by type of Research Organisation

Default scenario	ScRO	IBRO	PSRO	NatRes
The share of PRFS	15%	15%	15%	15%
Scientific research excellence	1.5%	0.75%	0.75%	0.75%
Overall research performance	7.5%	7.5%	7.5%	7.5%
Societal relevance	1.5%	3.0%	3.0%	3.0%
Membership of the research community	1.5%	0.75%	0.75%	0.75%
Research environment	3.0%	3.0%	3.0%	3.0%

Source: Technology Centre. ScRO=Scientific Research Organisations; IBRO=Industry & Business Services RO; PSRO=Public Services RO; NatRes=National Resources RO

Scientific Research Organisations: The main rationale for the weights for Scientific Research Organisations in the default scenario is that for them 'scientific research excellence', 'overall research performance' and 'membership in the research community' should make up the bulk of the funding because the define quality from different perspectives. Research environment, in particular management, is also important, as it is a typical bottleneck in the Czech Republic[60] (and in other countries), while for Scientific Research Organisations societal relevance lies mainly in training of young researchers and the publication of papers addressed to peers (i.e. other academic researchers) and is thus of lesser importance.

The weights for the more applied Research Organisations are all the same in the default scenario because quality and societal relevance are important to all of them. However, societal relevance has to be conceived differently for the different types of Research Organisations.

- **Industry & Business Services Research Organisations**: IBROs will mostly be Industry RTOs and AgriFood RTOs. Given their mission, quality and relevance appear to be the most important categories for IBROs.[61] Societal relevance of IBROs must be conceived in terms of their target groups, which are mostly industry and industry sectors (e.g. famers), but also public institutions / authorities. Research environment is important as well, as it always is. Scientific research excellence is of less importance for IBROs than for Scientific Research Organisations; nonetheless applied research can be excellent as well, which is why we have taken into consideration scientific research excellence as a category but given is less weight than in the case of Scientific Research Organisations.

[60] See Erik Arnold et al., The Quality of Research, Institutional Funding and Research Evaluation in the Czech Republic and abroad. Thematic Report No. 3, International Audit of Research, Development & Innovation in the Czech Republic, 2011.

[61] When composing the panels and selecting the panel members attention and care has to be taken not to rely on university professors as a default solution. The evaluation of Industry and Business Services Research Organisations (like the evaluation of all other research organisations) must be done by people who are peers not only in the research subject but also in terms of institutional background, i.e. by representatives from other IBROs (e.g. the director of a foreign IBRO) because only peers are able to truly understand the mission and role of an IBRO.

- Public Services Research Organisations: PSROs are typically governed by specific ministries (such as the Ministry of Defence or the Ministry of Interior). In the Czech Republic, some of them have been transferred to the responsibility of MEYS. Given that public service Research Organisations have the public administration as key target group, they ought to be tied more closely to 'their' specific ministry again[62]. This also means that they ought to be appropriately funded and governed. The funding system proposed here does not define an appropriate level of funding for Research Organisations because that is a decision that can only be made policy-makers. So it is up to the founding ministries to make sure that their public Research Organisations receive a level of institutional funding that ensures their long-term sustainability and institutional development.

  PSROs fulfil a specific mission in the Czech system which goes beyond the 'pure' production of research. Typically, their primary task is to provide expert services essential to the state (e.g. criminal fire investigations), and research is done for capability development. Other Public Services Research Organisations do primarily conduct research but have as beneficiaries/applicants the public sector and/or user communities that would never commission research on their own (e.g. people living in flood areas). Hence, to some extent, Public Services Research Organisations ought to be protected from science policy considerations. This does not mean that they do not have to comply with quality standards in research! On the contrary, quality and relevance are the most important considerations for Public Services RO and has been reflected as such in the weights.

  Societal relevance of Public Services Research Organisations must be conceived in terms of their target groups, which are ministries and other public administration bodies. The specific role of Public Services Research Organisations implies that other relevant activities aiming at the use of research results need to be taken into account, often more so than commercialisation activities. For Public Services Research Organisations, membership in the world research community may have to be re-interpreted to take into account that they may (and need to) be members in more professionally oriented rather than research communities. Finally, the way scientific research excellence is defined in the new Evaluation Methodology is less relevant for Public Services Research Organisations.

- National Resources Research Organisations: NatRes encompass organisations like museums, libraries, archives or galleries.[63] Often research is not their main activity, and the research they conduct is predominately linked to the overall quality of their service delivery. As in the case of the other types of Research Organisations, quality and relevance are key. National resources ROs are primarily resources for other researchers, to a lesser extent to other users. Hence, societal relevance has to be understood in terms of their user communities, and interaction and collaboration with other researchers is key.

The medium scenario – increasing overall quality while more strongly emphasising the specificity of types of Research Organisations

In this scenario, overall research performance still has a highest weight among all criteria, thus pushing towards an overall increase in quality in Research Organisations. At the same time, the specificity of different types of Research Organisations is

[62] This is in line with policy objective no. 8 of the National RD&I Policy of the Czech Republic 2009 – 2015, according to which "the compatibility and linkages of the National Policy with other sectoral policies [should be] ensured." This implies in particular that the definition of what is a public service research organisation should not be left to public service research organisations themselves, the ministries should be involved in the definition as well.

[63] See the Final report 1 – The R&D Evaluation Methodology

emphasised more strongly. In particular, more weight is given to scientific research excellence in Scientific Research Organisations while societal relevance is more strongly emphasised for the Public Services Research Organisations and the National Resources Research Organisations as for the latter public service is their primary task.

Figure 20 Weights in the medium scenario

Medium scenario	ScRO	IBRO	PSRO	NatRes
Scientific research excellence	20%	5%	5%	5%
Overall research performance	50%	50%	40%	40%
Societal relevance	5%	20%	30%	30%
Membership of the research community	10%	5%	5%	5%
Research environment	15%	20%	20%	20%
Total	100%	100%	100%	100%

ScRO=Scientific Research Organisations; IBRO=Industry & Business Services Research Organisations; PSRO=Public Services Research Organisations; NatRes=National Resources Research Organisations

Figure 21 shows the share of total institutional R&D funding each criterion has. The simulations below will show how large the differences in funding are between the default and the medium scenarios. While our expectation is that differences will not be large, the psychological effect must not be underestimated.

Figure 21 Translation of weights into shares of total institutional funding for, by type of Research Organisation

Medium scenario	ScRO	IBRO	PSRO	NatRes
The share of PRFS	15%	15%	15%	15%
Scientific research excellence	3.0%	0.75%	0.75%	0.75%
Overall research performance	7.5%	7.5%	6.0%	6.0%
Societal relevance	0.75%	3.0%	4.5%	4.5%
Membership of the research community	1.5%	0.75%	0.75%	0.75%
Research environment	2.3%	3.0%	3.0%	3.0%

Source: Technology Centre. ScRO=Scientific Research Organisations; IBRO=Industry & Business Services RO; PSRO=Public Services RO; NatRes=National Resources RO

The radical scenario – pushing scientific research excellence and societal relevance respectively

Our last scenario emphasises much more strongly the specificities of types of Research Organisations. In effect, this means that scientific research excellence is strongly emphasised for Scientific Research Organisations while societal relevance is strongly emphasised for the applied Research Organisations. The rationale behind this scenario is that there should be a strong push towards achieving the policy objectives of excellence for Scientific Research Organisations and relevance for the applied Research Organisations.

For the applied Research Organisations the second most important criterion is quality; this is an important added aspect of the radical scenario because relevance without quality is worthless. For IBROs quality consists of scientific research excellence (5%) and overall research performance (10%) while for Public Services Research Organisations and National Resources quality is solely based on overall research performance (15%).

The radical scenario has the added advantage of showing the sensitivity of the weights in the simulations.

Figure 22 Weights in the radical scenario

	ScRO	IBRO	PSRO	NatRes
Scientific research excellence	70%	5%	0%	0%
Overall research performance	10%	10%	15%	15%
Societal relevance	5%	70%	70%	70%
Membership of the research community	5%	5%	5%	5%
Research environment	10%	10%	10%	10%
Total	100%	100%	100%	100%

ScRO=Scientific Research Organisations; IBRO=Industry & Business Services Research Organisations; PSRO=Public Services Research Organisations; NatRes=National Resources Research Organisations

Figure 23 shows that more than 10% of total institutional funding for scientific Research Organisations will be governed by scientific research excellence, i.e. more than two thirds of the PRFS part of the funding; hence the radical scenario will have a strong effect of concentrating funding on the most excellent Scientific Research Organisations. As for the applied Research Organisations, their institutional funding will be strongly influenced by how relevant their work is, concentrating funding on the most relevant Research Organisations.

Figure 23 Translation of weights into shares of total institutional funding for RO, by type of Research Organisation

Radical scenario	ScRO	RTO	PubSL	NatRes
The share of PRFS	15%	15%	15%	15%
Scientific research excellence	10.5%	0.75%	0.0%	0.00%
Overall research performance	1.5%	1.5%	2.3%	2.3%
Societal relevance	0.8%	10.5%	10.5%	10.5%
Membership of the research community	0.8%	0.75%	0.75%	0.75%
Research environment	1.5%	1.5%	1.5%	1.5%

Source: Technology Centre. ScRO=Scientific Research Organisations; IBRO=Industry & Business Services RO; PSRO=Public Services RO; NatRes=National Resources RO

3.4.2 Options for translating scores into funding

In this section we explain what algorithms can be used for translating the scores into funding. We present two options, showing their pros and cons at the end of the section. The two options are:

- Option 1: Allocation of PRFS based on size in terms of FTE researchers, i.e. person scores
- Option 2: Allocation of PRFS based on relative scores

Initial simulations suggest that the first option can address some weaknesses of the previous system but that it is very sensitive to the accuracy of data on the number of full-time equivalent researchers engaged at each research unit being assessed. It may benefit from a non-linear transformation of scores into funding. The second option will reward good performance and penalise weak performance, but suffers from its strong dependence upon the funding status quo and will therefore only very slowly correct past anomalies or misallocations. Option 2 is easy to implement while Option 1 will require substantial fine-tuning, which in return might allow for higher flexibility.[64]

[64] See Background report 8 - *Ex-ante Impact Assessment of the Proposed Funding System*

Since the translation of scores into funding is quite technical, we will use examples to illustrate the two options.

Option 1 – Allocation of PRFS based on size (person scores)

As an example, we take a fictional pot XY which represents the institutional R&D funding for Scientific Research Organisations. This pot contains a certain amount of money, say 100,000 CZK.

Now, institutional R&D funding has different components, which in turn have different shares of the budget to be allocated (see above):

- Block grant: makes up 80% of total institutional R&D funding
- Performance-based research funding system PRFS: 15%
- Performance agreement: 5%

If the PRFS makes up 15% of institutional R&D funding, this gives us 0.15 * 100,000 crowns to distribute through the PRFS: 15,000 CZK, i.e. the PRFS pot. The evaluation methodology suggested for the Czech Republic in the Final report 1 – *The R&D Evaluation Methodology* gives us scores from 1 - 5 against five evaluation criteria.

The basic idea is to allocate the PRFS pot among RU based on the scores they obtained, and taking into account RU size. With regard to normalisation of RU size, we can use a measure of the number of researchers that work at the RU. In the following we are presenting two options how this can be done.

Central register

Ideally, a central register of researchers in public institutions and private institutions that receive public funding would be (re-)installed, specifying who is employed to what extent at a certain organisation (e.g. 80% at XY, and 60% at AB) and to what extent they conduct research (rather than teach or provide services). This would allow to calculate the research FTEs (full time equivalents) per RU and rule out gaming with FTEs. However, this is an ideal state which presumably will not be achieved in a short time because it would require a huge effort on the part of all stakeholders to put together such a central register.

While from our perspective this is the preferred option because it is the most accurate and rules out gaming, we are also presenting an option that is less demanding.

Using data from the evaluation

The second option deals with the following main issues related to the use of FTE researchers as an indicator for the size of the RO in the formula for PRFS

- The reliability of the data
- The multiple contracts per researcher and related risk of gaming
- The calculation of research versus teaching time (and other tasks)

Since there are no reliable official statistics on FTE researchers available at the level of Research Organisations/evaluated units (EvU), this option suggests obtaining the data directly from ROs/EvUs in course of the evaluation process. Specifically, the EvUs will be asked at the time of registration of RUs to specify for each researcher (head count (HC)) the time spent on research within the particular EvU (FTE). Alternatively, stakeholders can reach a consensus based on Czech Statistical Office data (see Figure 24 below), which specifies the amount of time spent on research at sector level. By way of example, the 0.5 division in the higher education sector (50% teaching, 50% research) is very much in line with divisions in other countries (e.g. Norway).

Figure 24 FTE parameter at sector level

	HC	FTE	FTE per HC
Business Enterprise sector	16.698	13.958	0.8
Government sector	8.220	6.235	0.8
Higher Education sector	20.732	10.289	0.5
Private Non-Profit sector	251	199	0.8
CZ total	45.902	30.682	0.7

Source: Czech Statistical Office

Names of researchers together with their working capacity spent on research will be matched with unique identifiers that have already been introduced in the RD&I IS (as an alternative the open researcher identifier ORCID can be used). This enables to track multiple contracts for each researcher as well as to distinguish between the time spent on research and teaching (especially at higher education institutions).

The data on HC and FTE researchers submitted by EvUs will be used for both the evaluation as well as the formula for calculating the PRFS component of institutional R&D funding. This set up has a built-in correction mechanism against gaming since there are two opposite forces that discourage EvU from over- or underestimating the number of FTE researchers. On one hand, overestimation of FTE researchers poses a risk of penalty for dishonesty in evaluation (zero score) and of a lower score for overall research performance (the more FTE researchers for the same research output, the worse the score for performance). On the other hand, underestimation of FTE leads to lower institutional R&D funding as well as again to the risk of penalty. Thanks to the easy control of multiple contracts on the national level, the authorised body for decision-making (RD&I Council) can be also be notified in cases of multiple 100% FTE researchers. The authorised body can then take decisions about financial consequences as a result of any oddness in the evidence of multiple contracts.

Definition of researcher

Both options – the central register and using data from the evaluation – will need to work with a definition of what a researcher is and what categories of staff are included as researchers. The first thing to keep in mind is that the PRFS focuses on research, research quality and research performance; hence its focus is on researchers. The second point to keep in mind is that institutional funding is about funding the establishment - what is established. This has three implications:

- PhD students are still in research training, so they are not fully fledged researchers. Also, as researchers in training they are not part of the establishment and will normally leave the RO after completing their PhD. Therefore, PhD students will not be counted as researchers. This convention is in line with international practice; other PRFS do not count PhD students as researchers either.
- Technicians have a support and assistance function in research rather than conducting research themselves. Hence, they should not be counted as researchers. Again, this convention is in line with international practice as the large majority of PRFS does not include technicians towards the counting of researchers. The only exception is the Italian PRFS[65]. Some disciplines have more

[65] The Italian VQR 2004-2010 is the only national PRFS where technicians were also included; however, this regarded only technicians that had published in the evaluation period (as authors or co-authors) and excluded those whose tasks were uniquely administrative and/or for service delivery. The body responsible for the evaluation (ANVUR) explained the inclusion by stating that technicians in research institutions are normally involved in research activities and therefore appear as (co)authors of publications. The decision has created quite some problems for the Italian research community and was heavily contested. The main reasons were:

technicians than others (e.g. the technical sciences compared to the humanities), which is not reflected by the proposed definition of researcher. Indeed, institutional R&D funding is granted to cover parts of the costs, and disciplines that require technicians tend to be more expensive than those that do not. However, this should be covered by the block grant rather than the PRFS component of the funding system, which focuses on research quality and research performance.

- Researchers and technicians that have an employment contract as researchers will be counted as researchers irrespective of the degree they hold (or do not hold). This follows the logic that it is function that counts.
- We will use a census to determine the affiliation of a researcher. This will take care of cases of affiliation change when a researcher is for example employed four years of the evaluation period at RO A and two years at RO B.

In the end, whether or not to include PhD students and technicians is a convention. Two questions need to be considered in this context: a) is the solution agreed upon more or less fair to all parties concerned? And b) what are the impacts of the solution agreed upon? For example, will it contribute to more gaming?

Because the issue of FTEs is fairly tricky, we have devised a second option of translating scores into funding, which does not use FTEs to calculate the funding (see the next sub-section below).

Example[66]

Below is an example of how the PRFS pot (15,000 CZK) is divided among two research units with different FTEs and scores.

RU1: 10 R&D FTE x score of 4 = 40 [weighted R&D FTEs)

RU2: 18 R&D FTE x score of 2 = 36 [weighted R&D FTEs]

This implies that total weighted R&D FTEs = 76

Share of PRFS pot RU1 gets: 40/76 → translated into money = 15,000 * 40/76 = 7,894 CZK

Share of PRFS pot RU2 gets: 36/76 → translated into money = 15,000 * 36/76 = 7,105 CZK

Institutional R&D funding for RU1 + institutional R&D funding for RU2 = 7,894 +7,105 =15,000 CZK

- The title of "technician" was introduced some years ago and implies that these employees have a different role in the institution and their activities lead to different outputs than the ones of researchers.
- Second, the academic profile of technicians is different depending on the institutional context and needs: while in principle technicians do not have a PhD, in some institutions it includes employees with and without PhDs
- Third, there are substantial differences in different fields as well as in research institutes versus universities of the role and function that technicians have, for research and for the institution as such (in some universities and depending on the field of science, they also have teaching functions)

In the Italian system, technicians fulfil tasks of review of analyses and technical collaboration related to technological or professional activities.

66 In this example we use only one score to clearly illustrate the basic allocation principle. Below (see scenario 1) we will describe an allocation mechanism for the five criteria suggested in the new Evaluation Methodology, based on the mechanism in this example.

Figure 25 Translation of scores into points

	No. of R&D FTE	Evaluation score	Weighted R&D FTE	Share of PRFS pot	Amount of money from PRFS pot
RU 1	10	4	40	40/76	7,894
RU 2	18	2	36	36/76	7,105
Total	28		76		15,000

Source: Technopolis Group

Unclassified RU (i.e. RU with a score "0") do not get any money from the PRFS pot as 0 x n = 0.

As we have shown above (section 3.2.2), the recipient of the money is the legal entity, i.e. the Research Organisation. However, how large the "PRFS pot" is for the Research Organisation is determined at the level of the RU. Thus, for each RU we can calculate the amount of money its scores are equivalent to; this amount of money can then be added up at the level of EvU (e.g. a faculty) and then at the level of entire Research Organisation (e.g. a university). In other words: the money from the PRFS pot is allocated to e.g. a university (= governance unit) and the amount of money it receives is the total of PRFS funds earned by all RU of this particular university together (Figure 14).

Option 2 - Allocating PRFS funding based on relative scores

The outcomes of the evaluation will be scores for individual RUs in five evaluation criteria. For example:

Figure 26 Examples of scores of RUs, by evaluation criteria

	Crit. 1	Crit. 2	Crit. 3	Crit. 4	Crit. 5
RU1	2	4	1	3	2
RU2	3	2	1	5	2
RU3	4	3	2	2	2

Scores for Research Organisations can be calculated as a weighted average of scores achieved by individual RUs, where the weights are set based on number of FTE researchers in that particular RU. Scores for Research Organisations will not be made public.

Following the example:

Figure 27 Examples of average scores of Research Organisation, by evaluation criteria

	Crit. 1	Crit. 2	Crit. 3	Crit. 4	Crit. 5	FTE
RU1	2	4	1	3	2	20
RU2	3	2	1	5	2	8
RU3	4	3	2	2	2	50
RO1	**3.38**	**3.15**	**1.64**	**2.56**	**2.00**	**78**

We can do the same aggregation at the national level for each type of Research Organisation with respect to their mission, so that we can get an average "mission-based" national score (weighted average) for each criterion.

Following the example:

Figure 28 Example of aggregating scores at national level, by evaluation criteria

	Crit. 1	Crit. 2	Crit. 3	Crit. 4	Crit. 5	FTE
RU1	2	4	1	3	2	20
RU2	3	2	1	5	2	8
RUx	…	…	…	…	…	…
RUz	…	…	…	…	…	…
National – ScROs*	2.35	3.07	1.89	3.65	2.19	14 000**

*ScRO=Scientific Research Organisation; ** This is sum of FTE researchers for all RUs at ScRO in the Czech Republic. The number 14.000 is only an example, the actual sum will probably be higher.

This average national score for the four types of Research Organisations sets a basis for decision about the increase, decrease or no change of the PRFS component at individual Research Organisations in a particular group. The decision about increase, decrease or no change is ultimately a policy decision that needs to be made by policy-makers.

Below we give an example of how the increase, decrease or no change can be implemented. The actual shares have to be discussed and agreed on in a policy process. Of course, our suggestions may serve as a starting point for discussion.

- RO scores less than 50% of the national average: it gets 50% less than in the previous period
- RO scores more than 50% but less than 75% of the national average: it gets 25% less than in the previous period
- RO scores more than 75% but less than 125% of the national average: it gets the same as in the previous period
- RO scores more than 125% but less than 150% of the national average: it gets 25 % more than in the previous period
- RO scores more than 150% of the national average: it gets 50% more than in the previous period

Following our example the funding implications for the RO1 would be as follows:

Figure 29 Example of funding implications, by evaluation criteria

	Crit. 1	Crit. 2	Crit. 3	Crit. 4	Crit. 5
RO1 (ScRO*)	3.38	3.15	1.64	2.56	2
National (ScRO*)	2.35	3.07	1.89	3.65	2.19
RO1/National	1.438298	1.026059	0.867725	0.70137	0.913242
Funding implication	+25%	Same	Same	-25%	Same

*ScRO=Scientific Research Organisation

As stated in the fundamental principles the total institutional funding for RO is separated into four pots according to the mission-based classification of Research Organisations (Section 3.2.1). Furthermore, according to the principles the decision makers at the national level set weights for different criteria and different types of Research Organisations (Section 3.4.1).

This enables us to allocate the total PRFS institutional support in each pot (mission-based) to sub-pots (evaluation criterion-based). Each Research Organisation then gets the respective amount (same/higher/lower) of institutional support from each sub-pot (Figure 30). In the end these amounts of institutional funding for RO will be adjusted according to the total available PRFS component in each pot by multiplying the

calculated amounts by coefficient c = amount of PRFS in the pot for period 2/ amount of PRFS in the pot for period 1 times result of evaluation (Figure 30).

Figure 30 Example of funding implications for Research Organisations

	Funding in period 1	Results of evaluation	1x (funding in period 1 x result of evaluation)	Budget adjustment coefficient	Funding in period 2
RO1	20	+25%	25		30.3
RO2	180	+25%	225		272.7
RO3	70	-50%	35		42.4
RO4	80	-25%	60		72.7
RO5	100	+50%	150		181.8
Total in pot	450		495	1,212121	600

An important feature of option 2 is that we do not use FTE for calculating funding. The funding is based, first, on the previous PRFS part of funding, second, on relative scores of Research Organisations compared to the national average in respective groups of Research Organisations and, third, on the total amount of PRFS funding. FTE are used only for the purpose of weighting scores achieved by individual RUs, i.e. calculating average scores for Research Organisations. If FTEs are not quite precise, this will only have a small effect on average scores. Therefore, the space for gaming with FTEs is negligible and we can simply use the FTEs showed by the RUs in the evaluation forms (in SPE it is the form 3b). However, because the second scenario relies on relative changes with respect to the current situation, it is likely to engender less change than the first scenario (see also simulations below).

Compared with option 1, option 2 requires an additional decision by policy-makers about the increase, decrease or no change of the PRFS component at individual Research Organisations in a particular group of Research Organisations (see list above Figure 29). It needs to be decided what the limits of the bands are (e.g. between 50% and 75% from the national average) and how large the changes relative to the previous funding period in these bands are (e.g. if RO scores more than 50% but less than 75% of the national average, it gets 25% less than in the previous period).

What is more, scenario 2 does not take into account research active FTEs in the calculation of funding; hence the growth of Research Organisations during a funding period (e.g. through competitive funding) is not considered in the following funding decision. In contrast, scenario 1 takes into account research active FTEs in the calculation of funding. Therefore, if a RU grows from one evaluation round to the next based on competitive funding, the increased number of research active staff will be used for calculating PRFS funding for the second funding period.

In both scenarios, we are presenting a linear allocation of funding. A non-linear allocation of funding would of course also be possible. In the case of non-linear money allocation, as in the British Research Excellence Framework (REF), the top band gets a larger share of money than the ones below, which leads to a concentration of funding on the best performing Research Organisations. Whether or not to use a non-linear allocation, is a policy decision because it has strong effects on the R&D system as this leads to a concentration of funding on the best Research Organisations. For the first funding period, we would advise using a linear allocation in order to allow for stability,

continuity and in particular organisational capacity building, which is needed for improved governance of institutional R&D funding.[67]

3.4.3 The issue of RUs with low scores

RUs that receive low scores, in particular 0 ('unclassified'), in one or several evaluation criteria ought to get special attention as the low scores are indicative of a problem. The immediate consequence is, of course, that the RU with low score will contribute little or nothing to the PRFS share of funding allocated to the Research Organisation it belongs to. This is already an incentive for the management to get active.

If RUs belong to a university then we would recommend the university management to take a closer look at the RU. The evaluation report by the peers will explain why they have given a RU a low score in a certain area. So this will be the starting point for the university management. The range of options the university management has in reaction to bad scores is large, ranging from better funding the RU (because its low scores might be due to lack of funding) to phasing out the RU. In other words, there is no single reaction to low scores. The same holds for RUs which are one of several RUs at larger Research Organisations.

If a RU is equivalent to a Research Organisation, for example an RTO, and receives low scores in the evaluation, then we would invite the principal – the responsible ministry (or founding ministry) – to take a closer look at the Research Organisation. Again, the evaluation report would be the starting point. As in the case of university management that is faced with a RU with low scores, the principal can react in a variety of ways.

However, as a guiding principle we would recommend Research Organisations' management and principals to answer the following questions before they take action of any kind:

- Does the RU play a specific and unique role in the Czech Republic? This might be the case e.g. for the only Czech Research Organisation dealing with indispensible issues ("somebody has to count the fish") or for the only institution providing tertiary education in certain subjects in a remote region or for an institution which plays a special role in regional development.
- If yes: Does this specific role require (i) public (ii) institutional (iii) research funding? If yes again, it makes sense to give the RU a chance.
  - If the RU=Research Organisation, we would suggest that the problems be addressed in the performance agreement that the principal (ministry) and the agent (the Research Organisation) negotiate. The performance agreement should specify measures (including organisational / managerial actions as an option) that will "change the course" of the RU. This agreement needs to be based on an analysis of the reasons behind the poor performance, taking into account the findings of the peers. After three years the RU should be evaluated

[67] In a second funding period, a non-linear allocation for funding could be used for scientific research organisations if the policy objective is to boost excellence in scientific research organisations. However, one should be aware that there are two parameters that can be influenced in order to support excellence: a) a stronger weight of the evaluation criterion 'research excellence' (see the radical scenario in section 0); and b) a non-linear allocation of funding favouring the top-performers. We have presented two options for translating scores into funding, the first based on person scores and the second on relative changes. We have illustrated both with examples using a linear allocation of funding. Of course, a non-linear allocation of funding can be used too. In the first scenario this would for example mean that a score of 4 would count double. In the second scenario, this would mean that the group of scientific research organisations in the highest band would get a overly large share of the PRFS pot. We strongly recommend to simulate any possible effects beforehand.

again. If the assessment is still 'unclassified', then we would recommend more drastic measures, such as phasing out the institutional funding for RO.

- If the RU is part of a larger organisation, e.g. a university, then the university management should negotiate measures with the RU and/or take action that would "change the course" of the RU. Again, this pre-supposes an analysis of the reasons behind the poor performance, taking into account the findings of the peers. After three years the RU should be evaluated again. If the assessment is still 'unclassified', then we would recommend more drastic measures.

The special treatment of RUs with low scores will also take care of RUs that did and do well in the Metodika – that is RUs that under the current regime produce many outputs and therefore achieve many RIV points, which however does not necessarily equate with high quality research – but do badly under the new Evaluation Methodology. If they achieve unclassified or 1 scores, the special procedure applies to them, sorting out discrepancies between the results of the Metodika and the new Evaluation Methodology.

Box 3 – Scenario for phasing out institutional funding to weak Research Organisations

We have heard voices in favour of phasing out institutional R&D funding to weak Research Organisations. In line with these voices, we are sketching a scenario that foresees a strict treatment for RUs with low scores. We believe our default scenario (Section 3.4.3) is already a fairly strict system but of course it can be made stricter.

Of course, RUs gets scores for five evaluation criteria. So a decision needs to be taken to which RUs the strict treatment applies. We suggest the following procedure:

- If a RU gets 'unclassified' or 1 in more than one evaluation criteria, or
- If a RU receives 'unclassified' or 1 for overall research performance, or
- If a RU in a Scientific Research Organisation receives 'unclassified' or 1 for scientific research excellence, or
- If a RU in a IBRO, a Public Services RO or a National Resources RO receives 'unclassified or 1' for societal relevance,

it should get into the group of RUs to whom the 'strict treatment' applies.

We would suggest conducting a first evaluation round and giving weak RUs with scores 'unclassified' and 1 a chance to get better during the first funding period.

After three years the RU will be subject to an additional evaluation. If the assessment is still 'unclassified' or 1, institutional R&D funding – the PRFS part, block grant and performance agreement – to the weak RU (or more precisely its Research Organisation) will be phased out by the provider *if* the RU=Research Organisation. Two rounds of evaluations are necessary in order to have sufficient evidence and more political legitimacy to phase out institutional R&D funding to weak RUs and their Research Organisations.

The scenario needs to respect Research Organisations' autonomy in terms of allocating institutional R&D funding internally. If RUs belonging to a larger Research Organisation have low scores in the second round of evaluation, they will not receive any PRFS money. However, the Research Organisation's autonomy means that its management cannot be forced to phase out internal institutional R&D money to weak RUs. However, providers can decide to reduce the block grant allocated to a Research Organisation whose majority of RU(s) have had low scores in two evaluations in a row.

The difference between this scenario and the default scenario is

a) that phasing out of (parts of) institutional R&D funding to weak RUs (or their Research Organisations) occurs mandatorily after two evaluation rounds and

b) that this treatment applies to both RUs which are 'unclassified' and those that get scores of 1. Whether or not this treatment should be extended to RUs with scores of 1, also depends on available resources and on the overall distribution of scores across the same type of Research Organisations, thus on the average performance of similar Research Organisations in the Czech Republic.

3.4.4 The issue of small Evaluation Units (EvU)

One question is still open: How to deal with EvUs which are too small to participate in the new Evaluation Methodology exercise and thus do not have any access to the PRFS pot of money? Small in this context means that the researchers of an EvU have published fewer than 50 outputs in the five or six years preceding the evaluation according to the new Evaluation Methodology[68]. Based on data related to the period 2009-2013, this holds for a total of 61 EvU out of 380 EvU (16%), including 28 Research Organisations (see the Background Report *Typology of Research Organisations and Effects of the EM Thresholds*).

Small EvUs will not participate in the evaluation, which implies that they will not have access to the PRFS pot of money. Without any regulation beyond those outlined above, these EvU will lose a potential 15% of their institutional funding for RO.

Setting a minimum threshold for EvUs to participate in the Evaluation Methodology is sensible because it contains the cost of the assessment and creates an incentive for EvUs to grow or to merge.

That said, we suggest the following approach, distinguishing between two different cases:

- Case 1: There is only one EvU in the Research Organisation. Typically, this is the case for National Resources RO like archives or museums, Public Services Research Organisations and Industry & Business Services Research Organisations, i.e. organisations where research is not the main task and activity and where research is often done in order to develop their capabilities and to serve the main purpose of the institution (e.g. providing services). Here, research staff is often small and academic publications are not their number one priority.

  We suggest that in the first funding period of the new system, these organisations start with a block grant of 80% of their institutional research funding for RO of the preceding period (calculated in the same manner as the 80% block grant for EvU participating in the evaluation) plus 5% if a performance agreement is concluded with the provider. Moreover, within a period of three years, the Research Organisation and the funding provider in charge analyse the situation. We propose that the Research Organisation fills in the self-assessment template used in the new Evaluation Methodology (or a simplified variation thereof), which the provider will then check and discuss with the Research Organisation. If the provider feels it does not have enough expertise to check and discuss the self-assessment report, it can call in an external expert. Together the Research Organisation and the provider develop a strategy for the future, including the future of the public institutional funding for RO (e.g. switching to performance agreement altogether, growing into the new Evaluation Methodology within a certain period of time). This strategy for the future should mandatorily be included in the performance agreement, as described above (Section 3.3). This

[68] See the Final report 1 - The Evaluation Methodology

approach together with the minimum threshold for EvUs to participate in the Evaluation Methodology help ensure the minimum effective funding related to the cost and benefits of the PRFS component.

- Case 2: The EvU is part of a larger Research Organisation, e.g. an institute or department of a university that also comprises other, larger RUs that do participate in the evaluation. In this case the allocation of institutional R&D funding happens like in case 1, (i.e. 80% or 85% in case the Research Organisation concludes a performance agreement with the ministry), with the management of the Research Organisation and the EvU analysing the situation within a period of three years and developing a strategy for the future. While this strategy for the future cannot be in the form of a performance agreement (because there are no performance agreements between Research Organisation management and EvUs), it should be laid down in writing. The issue of the small EvU is mandatorily addressed in the performance agreement concluded between the funding provider and the Research Organisation.

In both cases, the specific situation of "small subjects" has to be taken into account in order not to unintentionally reduce subject coverage or variety in the Czech R&D system[69].

Box 4 – Which parameters can be varied in the funding systems

To recapitulate, the following parameters can be varied in the funding system

- The shares of the different funding components (block grant, PRFS, performance agreement. These can be varied for the different types of Research Organisations. For the first funding period, we have suggested an allocation of 80% through block grant, 15% through PRFS and 5% through performance agreements for all types of Research Organisation because after the changes entailed by the Metodika all Research Organisations are in need of stability.
- The weights attached to the different evaluation criteria. These weights have a direct impact on funding and need to be set in line with the missions of Research Organisations and in line with policy objectives. We have suggested three scenarios above: the default scenario aiming to increase overall research performance in Research Organisations; a radical scenario pushing scientific research excellence in Scientific Research Organisations and societal relevance in applied Research Organisations; and a medium scenario located in the middle between these scenarios aiming to increase overall research performance while more strongly emphasising scientific research excellence for Scientific Research Organisations and societal relevance for applied Research Organisations.
- A linear or non-linear allocation of funding. For the first funding period we recommend a linear allocation of funding in order to allow for stability, continuity and in particular organisational capacity building. For the second funding period, a non-linear allocation of funding may be considered for Scientific Research Organisations in order to boost excellence and concentrate funding on the top performers.
- Treatment of RUs with low scores. We have suggested a default scenario and a stricter scenario. While we prefer the default scenario because it does not mandatorily prescribe phasing out of institutional R&D funding, given the problems in the Czech Republic (e.g. fragmentation of funding, deformation of

[69] This could also affect emerging fields and supporting disciplines. See also the German debate on „Kleine Fächer" („small subjects"): http://www.kleinefaecher.de/

funding allocation due to the problems of the Metodika) the stricter scenario may also be applied.

In other words, we have proposed three scenarios – default, medium, radical, with different weights attached to evaluation criteria. In these scenarios the rest of the parameters are the same: 80% of available funding distributed through block grant, 15% through PRFS, 5% through performance agreement; linear allocation of funding and default treatment of RUs with low scores.

The setting of these parameters in the future needs to be in line with Research Organisations' needs and requirements and with ministries' strategies for Research Organisations.

3.5 How can new research organisations enter the funding system

What happens if a new research organisation enters the stage? A new research organisation could be e.g.

- A new public university
- A new public service research organisation
- A new private not-for-profit research institute
- Etc.

'New research organisation' in this context means a research organisation that is a legal entity not eligible for public institutional R&D funding at the moment.[70]

The first guiding principle we are proposing is that the **founder** of a new research organisation will be responsible for the funding of the new organisation (including institutional R&D funding), either by funding the organisation or by providing access to other funding sources or by a combination of both. This holds for any founder of new research organisations, be it a ministry, the Academy of Sciences in its role as a funding provider, a private company or a university. The advantage of this guiding principle is that it creates responsibility and ownership for the founder.

This is the normal case in most countries. For example, in Austria, the federal government together with the regional government of Lower Austria decided to set up the graduate research institute IST Austria (Institute of Science and Technology Austria), with both governments providing funding to the research organisation; the new institute has been set up by a new law.

As a second guiding principle we propose that the decision of whether or not a new research organisation should receive public institutional R&D funding has to be taken outside the system established for allocating this institutional R&D funding (i.e. outside the PRFS). In fact, a PRFS system cannot accommodate the exit and entry of new research organisations as PRFS systems in other countries show. For example in the UK, if a university closes a research unit the university gets funding for it until the new assessment takes place. In a similar logic, organisations that newly enter the

[70] We do not consider new units within existing research organisations: If an existing research organisation establishes a new unit (e.g. a university establishes a new institute), this lies in the autonomy of the research organisation. The same rules apply as outlined for RU too small to participate in the new Evaluation Methodology from the beginning: As soon as a (new) small RU has grown enough to pass the size limits it can participate in the new Evaluation Methodology (see 3.4.4). Moreover, we do not consider the 'Regional Research Centres' and 'Centres of Excellence', funded from the Structural Funds because they are not independent research organisations and are funded from other sources than the institutional R&D funding also in the current period (2014 – 2020).

research system are ignored in the UK performance based system until the next exercise when their research performance is assessed. Before they enter the UK PRFS, they are funded from special grants as the REF cannot accommodate the entry and exit of research units or organisations.

The second guiding principle means that a procedure and criteria have to be set up by which to decide about the **eligibility** of a research organisation for public institutional R&D funding. In the Czech Republic at present there is an existing two-step procedure defining the eligibility of research organisations to receive institutional R&D funding, with the first step assessing the formal features to be recognised as Research Organisations and the second step assessing the scientific features of research organisations which should decide on eligibility for institutional funding. This is quite an open procedure developed by the RD&I Council together with the Office for the Protection of Competition. However, the second step is not yet operational. [71]

Either this procedure (perhaps in an adapted version) will be followed under the new funding system to check the eligibility of research organisations or a new procedure will replace it. Eligibility would, of course, have to be verified for existing RO as well at the beginning of each funding period.

In Section 3.1.2, above, we defined some principles that could set the basis for a decision-making on the needed characteristics of ROs and their activities in relation to the eligibility for institutional funding. It is our opinion that in some cases, the eligibility for institutional funding for research may have to be reconsidered.

A third guiding principle is that policy makers need set up **guidelines** as to how and when a new research organisation enters the system of institutional funding for RO (after having passed the eligibility test). For example, a new research organisation might come into the new Evaluation Methodology once it has passed the threshold of 50 outputs in the preceding five years. Thus it would enter into the new system of institutional R&D funding we propose and it would have access to PRFS money (while the block grant will be covered by the founding ministry). The state budget (or the relevant chapters respectively) might need to be adjusted accordingly if the institutional R&D funding available to the research organisations that are already in the system is to be stable.

The country case studies show that states need to make a choice in terms of which research organisations should receive institutional funding. More specifically, in the countries we studied the decision how new organisation enter the institutional funding system is decided outside the (performance-based) funding system by policy decision. The case studies also show that guidelines set up are typically for one type of organisation only.

- For example, in Norway, the Ministry of Education and Research has set up guidelines for the research institute sector which specify that national institutional funding can only be given to institutions which fulfil a list of requirements, some of which are performance-related (e.g. income from national and international commissioned projects must represent at least 25 per cent of total R&D income). For the higher education system, there is a separate accreditation system.[72]
- In Sweden, in the higher education sector, all public HEIs receive institutional funding whereas non-public HEIs must be approved by the government. In order to be approved, HEIs must be accredited according to the Higher Education Act

[71] The requirement that the research organisations generated at least 1,500 RIV points in the last five years was relinquished in early November 2014. See the Background report 7 - The institutional funding system in the Czech Republic.

[72] Background report 6 - *R&D governance and funding systems for research in international practice*

and offer education free of charge for students. There are examples of new HEIs in Sweden, both private and public. Those which were accredited receive institutional funding, and those who were not been accredited do not. [73]

- In the Netherlands too, there is an accreditation system for higher education institutions which entitles them to institutional funding. The universities that are entitled to receive public institutional funding are mentioned in the Law on Higher Education and Research. There are no other bodies, e.g. centres of excellence, competence centres that receive institutional funding. [74]

[73] Background report 6 - *R&D governance and funding systems for research in international practice*

[74] Background report 6 - *R&D governance and funding systems for research in international practice*

Appendix A - Template for the performance agreement

Performance agreement between

Ministry YX, represented by (names and contact details of the institutions and the persons in charge)

And

Research Organisation XY, represented by (names and contact details of the institutions and the persons in charge)

The parties agree that

1. Description of the strategic project(s)
   - Starting point: What is the problem to be solved, or the issue to be addressed, or the opportunity to be grasped? Provide evidence to support this point!
   - Overall objective: What would be different at the research organisation if the problem were solved, or the issue addressed successfully, or the opportunity grasped? How does this relate to the strategy of the research organisation?
   - What does the research organisation propose to do in order to reach the overall objective? This is the strategic project/these are the strategic projects. A strategic project may take more than the three years of one performance agreement period. In this case distinguish between the overall strategic project and the strategic subproject(s) for the three years of the performance agreement period.
   - How will the strategic project be implemented? Give a work plan including milestones and estimated timetable.
   - Who will be involved? Key staff involved including their relevant qualifications, roles and tasks in the project.
   - Which resources will the strategic project need? Cost estimate (personnel cost, other costs).
   - How will these resources be financed?
   - What are the indicators (e.g. interim results, milestones) used for monitoring of the strategic projects(s) and what is their timing? What are the deliverables which should be reached after three years?
   - What happens after the strategic project(s) in order to safeguard its sustainability?
   - Which are the most relevant risks of failure? What would the impacts be? How are risks mitigated?
2. Rules for reporting: frequency and modes of reporting
   - Written annual progress report by research organisation to the ministry in charge. The progress reports contain information about the work done and the results achieved to date, and a cost statement as well as a comparison of the progress made against the intended objectives of the strategic project(s) including information on and an analysis of deviations from plan.
   - Annual progress meeting between the head of the research organisation and the ministry (or ministries in case the founding ministry is not the funding ministry) in charge where the progress report will be discussed.

  - Deviations from the agreement (e.g. delays beyond the agreement period) need to be discussed in progress meetings, with a possibility to agree on a changed agenda for the project at stake (if there are good reasons).
  - Ad hoc meeting in the case of unexpected events that affect the progress of the strategic project severely
  - The final progress meeting of a performance period will be used to assess the results achieved with the strategic projects as well as the experience that have been made during their implementation. An external assessment may be necessary, depending on the content of the performance agreement.

3. Rules how extraordinary situations will be handled (e.g. radical change of the institution's situation, significant non-achievement of agreed interim and/or final milestones, loss of key staff, … , embezzlement of funds)
4. Amount of funding (block grant and top-up), funding period, and regulation of instalments

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Signatures

For the Research Organisation

- Names, functions, place, date

For the funding Ministry (and, if applicable, the founding Ministry)

- Names, functions, place, date

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