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R&D Evaluation Methodology and Funding Principles

Final report 3: The Small Pilot Evaluation and the Use of the RD&I Information System for Evaluation



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INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

R&D Evaluation Methodology and Funding Principles

Final report 3: The Small Pilot Evaluation and the Use of the RD&I Information System for Evaluation

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Summary

This report is one of the three Final reports for the study designing a new R&D evaluation methodology and funding principles for the Czech republic. It reports on the outcomes of two distinct strands of analyses, i.e. the Small Pilot Evaluation and the (potential) use of the RD&I Information System (IS) as a tool for information, in particular for evaluation purposes.

The Small Pilot Evaluation

The Small Pilot Evaluation (SPE) was set up and run by the study team in the period September 2014 – February 2015. This pilot exercise aimed at testing the adequateness of the processes foreseen for the implementation of the Evaluation Methodology and the Evaluation Methodology at large. The feedback on the SPE by all actors involved and the main findings related to the SPE experience that are described in this report, has fed into the final design of the Evaluation Methodology, described in the Final First Interim Report. The readers of this report should therefore be aware that the methodology implemented during the Small Pilot Evaluation is **out-dated** and does not reflect the final version of the R&D Evaluation Methodology.

A number of conclusions can be drawn related to efficiency of the SPE processes and its effectiveness.

The SPE presented from the very start important limits that negatively influenced the *efficiency and effectiveness of the implementation process*. These regarded in particular the small-scale focus of the SPE (both in terms of number of organisations involved and focus of the research activities) as well as the stringent time frame. Also the lack of experience with similar evaluation processes among the participating EvUs played a role. Main lessons from an operational perspective are: i) the importance of a well-functioning and duly coordinated help desk; ii) the usefulness of a web-based shared system with the ability for simultaneous input and verification, as a way to speed up the process of submission and make it user-friendlier; iii) the value of the input from the RD&I IS to support the Evaluated Units in their data collection; iv) the need to define precise and rigid deadlines for the submission of the self-assessments in order to allow for a quality check and the timely transfer of the processed data to the panel members and reviewers; and last but not least, v) the importance of a quality-assurance mechanism, at the level of the Evaluated Unit and the evaluation management team.

The quality of the submitted information constituted a major issue for the panels in the SPE, in terms of its completeness as well as richness. This was caused by the time pressure on the Evaluated Units for the submission of their data, but was also due to a lack of expertise with similar exercises, an underestimation of the efforts required for the evaluation, a lack of internal coordination and quality management, and the clarity of the submission guidelines, considered not sufficiently clear and/or detailed for a number of topics.

In this context, the on-site visits (foreseen in the Small Pilot Evaluation) constituted an important opportunity for the evaluation panels to check the rightfulness of the evaluation results based on the submitted information and eventually ask for clarifications. The site visit was useful especially for the institutions that under-presented their information in the self-assessment forms or wrongly understood the information requirements. This seemed to be linked to a number of factors, ranging from lack of expertise in evaluation and an insufficient clarity of the submission

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guidelines to just simply a lack of view on the topics for which information was required, such as the description of the research strategy. In this context, the panels suggested that in case site visits were not foreseen in the full-scale EM, the evaluation management team may consider organizing a Q&A session using online tools and/or videoconferencing. Slides or even video of a presentation of the people in charge would be useful.

The experience in the SPE proved the importance of the *calibration exercise* as a first step in the panel evaluation. This regarded more than only the definition of the evaluation criteria terms and the importance of the sub-criteria. The panel members considered these calibration exercises as a “must” to reach also a proper understanding of the grading among panel members, the significance of each sub-criteria and its contribution to the overall assessment criteria, and the Evaluation Methodology in general. The calibration discussion was also useful in bringing to light contextual information on Czech RD&I structures and politics, complementing the provided background documents on the Czech RD&I system, the existing evaluation methods and funding system, as well as on the participating Evaluated Units.

The SPE panel members considered the *assessment criteria* to be clear and relevant, as well as straightforward and adequate for the assessment purposes. Their impression was that the five fields of assessment made sense also to the Czech community. However, they asked for a revision of the formulation of the criteria, as they saw ambiguities with some sub-criteria. They also suggested for the scores the use of a 5-point scale rather than a 4-point one and considered that the minimum number of submitted research outputs should be increased. The general suggestion was to at least include three papers for each RU or more in case of a larger RU and/or interdisciplinary research, and a complete list of publications.

Overall, both panel members and the participating EvUs assessed positively also the *fairness of the Evaluation Methodology* in dealing with the specifics of the scientific fields and taking into account the different missions of the Research Organisations. Some comments were made related to the limited attention for the outputs and outcomes of applied research, though, and researchers in the fields of Social Sciences and Humanities asked for an improvement of the data availability on research outputs in their fields in order to ensure a fair and robust evaluation.

The majority of the participating EvU scored the EM positively also in relation to the evaluation results, and more specifically the *rightfulness* of the panels’ judgment and the *usefulness* of the evaluation results. Critical voices were to be found only in the field of Humanities as well as some of the non-scientific research organisations. There is a discrepancy between institutions when commenting on the usefulness of the results. While some of the EvUs considered the panels’ recommendations to be unrealistic in a Czech context, several of them regarded the suggestions from the evaluation panel as beneficial and stated that the evaluation results are already being integrated in their institutional strategy.

Close to all of the suggestions made by the actors involved in the Small Pilot Evaluation have been taken up for the final design of the R&D Evaluation Methodology.

The use of the RD&I Information System (IS) as an information tool for evaluation

The Czech Research, Development and Innovation Information System (IS VaVaI) is the key element of research information infrastructure in the Czech Republic. It is an operating information system; all stakeholders have adapted to it. The IS VaVaI assists all the players on the Czech RD&I scene. It maintains information that is necessary for qualified analyses at all levels. The system has been used to monitor and partially also to support the decisions on the allocation of public funding for research, development and innovation in the Czech Republic. It is an official administrative hub of

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information about R&D in the country. As a national research information hub it supports both the professional and the broader audiences and creates an environment of transparency.

The information in the IS VaVaI is authoritative, continuously updated, and publicly displayed. The system thus contains transparent and verifiable micro-data: data about individual projects, publications, other research outputs, etc. When aggregated to a meso- or macro-level, the information is much more reliable than ad-hoc surveys. The data can (and do) serve many purposes.

The main and core recommendation is to use the IS VaVaI to the maximum possible extent to support the EM. Making use of the IS VaVaI allows to lower the indirect costs of the evaluation exercise. Information re-use will save time of the researchers and of the EvU administrative staff. The suggested extensions of the IS VaVaI will support also the re-use of the collected data for other purposes: evaluations of RD&I programmes, evaluations of applied research and innovations, and strategic analyses at the institutional, funders' and the national levels. The synergy of the primary collected data with the external ones will extend the usability of data for all the above-mentioned purposes.

This report identifies potential extensions and updates of the IS VaVaI, including

- An improved interlinking of the RD&I IS with external databases, in order to enrich the information available. Options are the bibliographic databases (WOS/Scopus) but also field-specific databases, such as PubMed for medical sciences or DBLP for computer science
- The inclusion of a standardized and dynamic register of scholarly journals, series and book publishers that allows for bibliometric analysis and a possible distinction between quality levels of publication channels
- The extension of extending existing components of the RD&I information system as well as adding new ones, such as researcher esteem indicators and profiles, data for the calculation of researchers Headcounts (HC) and FTE, or an Infrastructure Catalogue in three main categories: Facilities, Services and Equipment.
- A set of extensions in order to optimise its user-friendliness, efficiency, effectiveness, and most important, reliability.

However, a real implementation of the EM with the inclusion of stakeholders (the Council for RD&I, the Ministry of Education, Youth and Sports, the Section for Science, Research and Innovation at the Office of the Government of the Czech Republic) is bound to bring additional or modified requirements. The implementation will need to start with a technical analysis working with a finalized set of requirements.

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List of Abbreviations

ASCR	Academy of Sciences of the CR
CR	Czech Republic
CRIS	Current Research Information Systems
EM	Evaluation Methodology
EvU	Evaluated Unit
FOS	Field of Science OECD
FTE	Full-time equivalent
GACR	Czech Science Foundation (Grant Agency)
HC	Headcounts
HEI	Higher education institution
ISBN	International Standard Book Number
ISSN	International Standard Serial Number
IS VaVaI	Research, Development and Innovation Information system
OECD	Organisation for Economic Cooperation and Development
ORCID	Open Researcher and Contributor ID
R&D	Research and Development
RD&I	Research Development and Innovation

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RD&I IS	Research, Development and Innovation Information system
RIV	Register for Information on Results (CR)
RO	Research organisation
RTO	Research and technology organisations
RU	Research Unit
SPE	Small pilot evaluation
SSH	Social Sciences & Humanities
SWOT	Strengths, weaknesses, opportunities, threats
UK	United Kingdom
WP	Work package

1. Introduction

This report is one of the three Final reports for the study designing a new R&D evaluation methodology and funding principles for the Czech republic.

It reports on the outcomes of two strands of analyses, i.e.

- The Small Pilot Evaluation (SPE) that was set up and run by the study team in the period September 2014 – February 2015. This pilot exercise aimed at testing the adequateness of the processes foreseen for the implementation of the Evaluation Methodology and the Evaluation Methodology at large.
- The analyses related to the potential use of the RD&I Information System (IS) as a tool for information, in particular for evaluation purposes

We summarise the main findings of our analysis on the efficiency and effectiveness of the Small Pilot Evaluation in Section 2. Our conclusions related to the potential use of the RD&I IS are described in Section 3.

The more detailed analyses are reported in two Background reports:

- The RD&I Information System as an information tool for evaluation (Background report 9) and
- The Small Pilot Evaluation: Feedback and Results (Background report 10)

During this study, the design of the R&D Evaluation Methodology was a dynamic process by excellence. It has build upon various sources of input and feedback, improving the alignment with the needs and context in the Czech Republic. It was designed from the very start as an iterative process, in which the Small Pilot Evaluation was a key step.

As a result, the feedback on the SPE by all actors involved and the main findings related to the SPE experience that are described in this report, has fed into the final design of the Evaluation Methodology, described in the Final First Interim Report. The readers of this report should therefore be aware that the methodology implemented during the Small Pilot Evaluation is **out-dated** and does not reflect the final version of the R&D Evaluation Methodology. We report on it for the sake of completeness and for the readers to understand better the reasons for the changes that were implemented in the last phase of the methodology design.

2. The Small Pilot Evaluation (SPE)

In this chapter we first set the background for the Small Pilot Evaluation and its implementation, and then describe the SPE and its methodology, processes and results in Section 2.2.

In Section 2.3 we cover the feedback received from the evaluation panels, panel secretariats and participating Evaluated Units (EvUs) on the efficiency and effectiveness of the SPE and the implemented Evaluation Methodology (EM) in general.

2.1 Background

This section presents the objectives of the SPE and the specifications in the Terms of Reference for the SPE that set the background for its implementation, and lists the Evaluated Units that participated in the SPE, describing also the process for their selection.

2.1.1 Objectives of the Small Pilot Evaluation

The Small Pilot Evaluation was intended as a testing of the new Evaluation Methodology (EM), its concepts, processes and tools. These were tested against the following criteria:

- *Efficiency* (did the process require the minimum possible investment of time and resources for its completion, both for the institutions and the panels?)
- *User-friendliness* (were the information submission forms and their format user-friendly, e.g. taking into account the different departments in the Evaluated Unit that will supply the information?)
- *Clarity* (were the submission guidelines clear in indicating the information that is required? Have they been understood?)
- *Effectiveness* (did we collect all information needed for a fair and proper performance assessment?)
- *Fairness* (are the indicators and assessment criteria sufficiently taking into account the differences between the research organisations involved, e.g. in terms of type of research conducted?)

The SPE comprised *institutional site visits*, which was a component of the assessment process additional to the ones foreseen in the Evaluation Methodology. The objective of the site visits was to verify whether the information collected from the Evaluated Units (EvU) by means of the self-assessment report and the data based on the external sources (bibliometrics) had the capacity to convey the correct image on the Research Units' (RU) performance to the evaluation panels and guarantee a fair evaluation. Site visits typically provide evaluators with an improved understanding of the quality of the conditions in which the research takes place (research environment) and the particularities of the national RD&I system.

2.1.2 Specifications in the Terms of Reference

The Pilot Evaluation that was implemented during this study needs to be set in the context of the larger IPN Metodika project.

Taking into account the limited time frame of the study and the other activities that needed to be covered, the Tender specifications and Terms of Reference indicated a limited scope of the study's Pilot Evaluation. It was intended as a 'small' pilot, to be complemented in a second stage by a larger Second Pilot Evaluation, run by the IPN Metodika project team itself.

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The Tender specifications and Terms of Reference for this study indicated that the Small Pilot Evaluation was to cover three EvUs that were active in the same field of research for each disciplinary area. These EvUs were expected to represent different types of research organisations, i.e.:

- One EvU in the Academy of Sciences
- One EvU in the public Higher Education sector
- One EvU in any of the other types of research organisations

The Tender specifications also required for the identification – and contracting at the moment of the launch of the study – a minimum of six ‘scientific guarantors’, i.e. experts that had a broad expertise in the fields of Sciences, Engineering, Medical Sciences, Agricultural Sciences, Social science, and Humanities.

These scientific experts were expected to support the study team in the design of a field-specific evaluation methodology (specifically, field-specific indicators) as well as act as chairs for the panels in the SPE.

The requested profile of these experts was:

- University education and a PhD. degree or its equivalent,
- At least ten years of experience in research and development in the field falling within the field-specific group,
- Participation in the process of institutional evaluation of research organizations as an evaluator
- Authorship or co-authorship of at least 5 publications in the field-specific group.

The scientific experts that were proposed and contracted by the study team are listed in Exhibit 1, below.

Exhibit 1 List of scientific guarantors acting (also) as SPE panel chairs

Disciplinary Area	Scientific guarantor	Affiliation & job title
Natural sciences	Prof. Milena Horvat	Jožef Stefan Institute, Ljubljana, Slovenia - <i>Head of the Department of Environmental Sciences</i>
Engineering	Prof. Ronald Perrott	University of Oxford, UK - <i>Visiting Professor</i> Queen’s University, Belfast, UK - <i>Professor Emeritus & Chair of Software Engineering</i>
Medical Sciences	Prof. Roland Pochet	ULB Faculty of Medicine, Belgium - <i>Professor in Histology and Cell Biology</i>
Agricultural Sciences	Prof. Kenneth Thomson	University of Aberdeen, UK - <i>Professor Emeritus of Agricultural Economics</i>
Social Sciences	Prof. Christopher Edling	Lund University, Sweden - <i>Chaired Professor of Sociology</i>
Humanities	Prof. Naomi Segal	Birkbeck, University of London, UK - <i>Professorial Fellow in French & German Studies, Dept of Cultures & Languages, School of Arts</i>

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2.1.3 The Evaluated Units participating in the SPE

The process for the identification and selection of EvU candidates and finally agreement with the participating EvU took place in four steps, starting in the beginning of September until mid October 2014:

- First, the field focus of the SPE panels was clarified, based upon the specific expertise of the panel chairs. This included also the focus and expertise at the sub-field level because seeing the limited budget for the SPE, panel members needed to act also a reviewers (see also Section 2.3.2, below)
- Second, the possible EvU candidates for the SPE were identified, based on the level of publications in the fields of the panel chairs' expertise (source was the RD&I Information System). The draft proposal was sent to the IPN team
- Third, the IPN Team asked for some modifications to the proposal, changing in particular the focus for the Agriculture panel (from Agricultural economics to Botany/plant sciences) and the focus for the Humanities panel (from Literature/linguistics to Philosophy). The intent was to cover more relevant fields of activities in the Czech RD&I system
- The process for the identification of potential EvU candidates was re-launched for the Agricultural sciences and Humanities and a final list of candidates submitted and accepted by the IPN team

Exhibit 2, below, lists the EvUs that agreed to participate in the SPE.

Exhibit 2 List of EvUs involved in the SPE

Disciplinary area & Field	RO type	EvU
1: Physical sciences 1.4 Earth & related Environmental sciences	ASCR	Institute of Analytical Chemistry AS CR
	HEI	Czech University of Life Sciences Prague - Faculty of Environmental Sciences
	Other RO	T.G.Masaryk Water Research Institute, v.v.i.
2: Engineering and technology 2.3 Computer and information sciences	ASCR	Institute of Computer Science of the AS CR, v.v.i.
	HEI	VŠB - Technical University of Ostrava, National Supercomputing Center IT4Innovations
	Other RO	CESNET, z.s.p.o.
3: Medical and Health sciences 3.1 Basic medicine	ASCR	Institute of Experimental Medicine of the AS CR
	Other RO	Institute of Hematology and Blood Transfusion, Research Division
4: Biological & Agricultural Sciences 4.2 Biological sciences (agrobiology)	ASCR	Institute of Experimental Botany AS CR, v.v.i.
	HEI	Czech University of Life Sciences Prague, Faculty of Agrobiolgy, Food and Natural Resources
	Other RO	Crop Research Institute, v.v.i.
5: Social sciences 5.4 Sociology	ASCR	Institute of Sociology of the AS CR, v.v.i.
	HEI	Masaryk University, Faculty of Social Studies
		Charles University, Faculty of Social Sciences

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Disciplinary area & Field	RO type	EvU
6: Humanities, 6.3 Philosophy, Ethics & Religion	ASCR	Institute of Philosophy AS CR, v.v.i.
	HEI	Charles University in Prague, Faculty of Philosophy
		Palacky University Olomouc, Faculty of Philosophy

Notes: In the field 'Medical & health sciences', the Science faculty of the Palacky University Olomouc had agreed to participate in the SPE but had to withdraw in the month of November due to time constraints. At that time in the process, it was no longer possible to find a substituting EvU

2.2 The Small Pilot Evaluation: methodology, processes and results

As mentioned above, the core objective of the Small Pilot Evaluation was to test the Evaluation Methodology as it was defined in the Draft 1st Interim Report, its criteria and indicators as well as processes.

In this section we first set out the SPE Evaluation Methodology and then cover the SPE workflow and processes (Section 2.2.2). The results of the Small Pilot Evaluation performance assessments are described in Section 2.2.3.

2.2.1 The Evaluation Methodology

The Small Pilot Evaluation tested the Evaluation Methodology as it was defined in the Draft version of the First Interim Report.

We defined the following key principles of the Evaluation Methodology:

- The Evaluation Methodology reflects the strategic policy objectives for the Czech R&D system. Its primary function is to act as source for strategic information, at all levels in the RD&I system. It is therefore comprehensive, covering all the dimensions of the research activities and its outputs, outcomes and impact. The evaluation results will also directly inform public institutional funding for research
- The assessment of the research performance takes place at the level of field-defined Research Unit (RU) within an Evaluated Unit (EvU), i.e. a research organisation or in the case of the public HEI, a faculty. The Evaluation Methodology covers all research organisations of a minimum size, on a voluntary basis.
- The evaluation is a process of informed peer review. Partly working remote, the expert panels draw on a mix of appropriate quantitative and qualitative data to support their professional judgement. The evaluation is a fair and egalitarian system. It uses a single framework for assessment across all disciplines and Research Organisation (RO) types while allowing for a reasonable level of field- and RO typology-specific variations.
- The cost and burden of the evaluation are the minimum possible to deliver a robust and defensible process.

The following four categories of Research Organisations were distinguished in the evaluation:

- *Scientific Research Organisations*, including the HEIs, university hospitals and scientific research institutes
- *Research & Technology Organisations - RTOs*, i.e. research organisations that have as primary function to provide knowledge transfer services to the industry sector

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- *Public Service Research Organisations*, i.e. research organisations that have as primary function to provide services to government or society
- *National Resources/Infrastructure Research Organisations*, providing infrastructure to research

The evaluation panels assessed the Research Units against five main assessment criteria, taking into account a set of sub-criteria in 3 cases out of 5– as shown in Exhibit 3, below. For the assessment criterion Research excellence, the evaluation panels were expected to consider the ‘*originality, significance and rigour*’ of the submitted research outputs; for the criterion Societal relevance, the assessment took into account the ‘*reach and significance*’ of the research outputs and the RUs’ activities as such.

The panels provided judgments on the Research Units’ performance for each of the 5 assessment criteria through a scoring system, i.e. a scale of 4 to 1 starred quality levels and a score ‘Unclassified’.

The description of the assessment criteria and the indicators against which data were collected are provided in the Background Report *Results of the panel evaluations and Feedback on the SPE*.

Exhibit 3 Assessment criteria

Assessment criteria	Sub-criteria
Institutional management and development potential	The quality adequacy of the research environment
	Research strategy and management (including HR management)
Membership of the national and global research community	International research presence and collaboration
	National research presence and collaboration
Research performance	Productivity
	Ability to attract PhD students
	Overall quality
Research excellence	Peak quality, i.e. the quality of the selected ‘best’ outputs submitted by the RU
Societal relevance	Knowledge & technology transfer activities

2.2.2 Workflow and processes in the SPE

The workflow of the Small Pilot Evaluation can be divided into three phases: the Preparatory Phase, the Implementation Phase, and the Finalisation Phase.

Exhibit 4, below, lists the main activities that were implemented during these phases and their time planning. It shows that 3 months were foreseen for the Preparatory Phase, going from the launch in the beginning of September to the Panel meetings. The intent was that the EvUs would have approximately 2 months for the submission of their information, selected outputs for reviews and self-assessment. The delays in the identification of the panels’ focus and the selection of potential candidates for participation implied that this timeframe was reduced to, in most cases, 1.5 months.

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Exhibit 4 Main activities in the SPE - timing

Action	Foreseen time planning	Actual
Preparatory Phase		
Selection and recruitment of EvUs participating in the SPE	September 25	October 15
Submission forms & guidelines to EvUs	October 5	October 15
Submission of Form 1 and Form 1x by the EvU	October 23	November 10
Submission of Form 2 - 'best' research outputs by the EvU	3 weeks before panel mtg/site visit	2 weeks before panel mtg/site visit
Submission of self-assessments by the EvU (Forms 3 and 4)	2 weeks before panel mtg/site visit	1 week before panel mtg/site visit
Selection & nomination panel members	October 6	October 15
Background documentation, guidelines & report templates to the panels	October 30	November 5
Data and bibliometric reports to the panels	2 weeks before panel mtg/site visit	3 days before panel mtg/visit
Implementation Phase: Panel meetings & visits		
Social sciences	Nov 25 / 26 / 27	
Medical & health sciences	Nov 26 / 27 / 28	
Physical sciences	Dec 1 / 2 / 3	
Humanities	Dec 3 / 4 / 5	
Engineering & technology	Dec 9 / 10 / 11	
Biological & agricultural sc	Dec 10 / 11 / 12	
Finalisation Phase		
Panel reports / draft	Monday 26 Jan	
Panel reports / Comments by EvU & Feedback	Monday 9 Feb	
Panel reports / final	Monday 23 Feb	

The scientific guarantors acted as Panel Chairs, chairing the panel meetings. Technopolis consultants acted as the Panel secretariat and ensured that the rules established by the Evaluation Methodology were followed, guaranteeing consistency in the approach among different panels, handled the information transfer to the panels, took minutes of the meetings and registered the panel assessment results, and organised the logistics of the institutional visits. The Technopolis project manager of the study designing the evaluation methodology and funding principles was also present in the SPE as a 'specialist advisor' to provide clarifications related to the evaluation methodology and the Czech context during the calibration exercise and the panel evaluation.

Activities in the Preparation Phase

The preliminary activities for the implementation of the SPE included

- The identification of available reviewers for 6 fields who were to act as both referees and panel members (a total of 14 additional field experts). This process started already mid September and was concluded by mid October

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- The drafting of the contracts, including declarations on conflict of interest and confidentiality
- The organisation of travel and accommodation for the panels
- The arrangement for the site visits, including the guidance notes for the ROs on what was expected as programme for the site visits
- The development of
 - The templates for the data reports, i.e. the data from the self-assessment processed in a format that would be convenient for the panels
 - The templates for the remote review and remote assessment
 - The template for the panel report
 - The form for feedback on the SPE by the panel members
- The set-up of panel secretariats, including Technology Centre staff for the practical arrangements in the CR and Technopolis staff acting as coordinators for the panels

Support to the EvUs included

- The set-up of a help desk as a contact point for the EvU/RU
- The transfer of information from the RD&I IS in order to support the EvU in their self-assessment. This included the list of researchers in the EvU with their unique identifier, the publications by the researchers selected by the EvU as constituting the RU, and the funding received for their projects
- The development of
 - The submission forms and guidelines for the EvU participating in the SPE, including the forms for the RU to provide feedback on the SPE

Support to the panels was in the form of

- The collection of the submitted research outputs for review (implemented by the Ministry due to IP rulings) and the transfer of these outputs to the panels
- The transfer of the data on publications for the development of the bibliometric data based on the international database and the R&D IS, including the cleaning of the data
- The collection of the final self-assessments and the development of the data reports for the panels
- The development of
 - The evaluation guidelines for the SPE panels, including also an overview of the Czech RD&I system, the funding and evaluation system (Metodika), and the key principles of the Evaluation Methodology
 - Background information on the 17 evaluated EvUs for the panels, based on information available on internet and other background material
- The support during their panel meetings and site visits by the panel secretariat/coordinators, in the form of drafting of the minutes and providing additional background information and clarifications on the data provided

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The following documents and templates that were used in the SPE can be found in the Background report to the Draft version of the First Interim Report “Tools for the Evaluation Exercise Implementation”, i.e.

- The *Submission Guidelines and Submission Forms* (self-reporting by the evaluated units)
- The *Comprehensive Data Report and Data Report on Research Outputs* (data processed as information for the assessment by the panels)

The panel evaluation process

The evaluation by the panels took place in four phases:

1. Remote review and (individual) remote assessment: The publications selected and submitted by the Research Unit (RU) were reviewed remote by two panel members each. Technopolis assigned the readings to the panel members acting as referees (first reader and second reader).

All panel members also performed an individual remote evaluation of the RU, based on the information provided by the Research Unit, processed into a Data Report, and the outcomes of the bibliometric analysis.

The outcome of these remote reviews and assessments were a score and a written justification for the scores.

2. Panel meeting: During the panel meeting, the panel members performed the calibration exercise, discussed the outcomes of the remote reviews and assessments, and agreed on a *draft* quality level score for the RU against each criterion
3. Site visit and panel meeting after the visit: The site visits had the main objective to verify whether the (processed) data were sufficiently robust and complete to allow for a fair evaluation. After the site visits, the panel therefore considered whether based on the information gathered during the site visits they would score the RU in a different manner and why. This resulted in the *final* quality level score against each criterion
4. Finalisation of the panel report: during the panel meeting and visits, the panel secretariat took minutes of the discussions and decisions by the panel, including the explanation for the decisions taken. Based on these notes, the panel members prepared their final panel report. The panel chair was responsible for the finalisation of the panel report, which was then forwarded to the evaluated RU – for eventual comments

The panel meetings started with a calibration exercise. The objective was to generate a common understanding of the indicators among the panel members and their interpretation and use in the context of the field. Specific attention was dedicated to the field-specific definition of the key terms in the assessment of Research excellence and Societal relevance. In relation to the sub-criteria for the other evaluation criteria, the panels were invited to define a field-specific and RO-type specific weighting of these criteria, reflecting their perceived importance. During the discussion to define the quality scores for each RU, the secretariat reminded the panels of the importance they attributed to the sub-criteria during the calibration exercise.

The outcome of the evaluation was a panel report for each RU, showing the reached *quality levels* for each assessment criterion accompanied by an *explanatory text* describing the assessment and performance of the RU against the criterion in a qualitative manner. Each report also contained the panel’s conclusions and recommendations to the RU. The panels did *not* combine these 5 scores into a single

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score for each RU, and the link from evidence to assigning assessment scores was judgemental and *not based on arithmetic*.

2.2.3 The results of the Small Pilot Evaluation performance assessments

The final outcome of the Small Pilot Evaluation consisted in a set of 17 Evaluation Panel reports, i.e. 3 for each of the 6 Disciplinary Areas/Fields covered – with the exception of the Basic Medicine field in the Medical & Health sciences area where only 2 EvUs participated.

The panel reports consisted in

- The outcomes of the calibration exercise, and for each RU
- The reached *quality levels* for each assessment criterion accompanied by an *explanatory text*
- The panel's conclusions and recommendations to the RU
- A consideration on the input provided through the site visits
- A response to the EvUs' comments on the panel reports, wherever appropriate

As mentioned above, the small scale of the SPE does **not** allow for a drafting of robust conclusions at any aggregated level, such as EvUs, fields, types of RO etc.

Testing of the EM implementation processes was the prime objective of the SPE and the study team considered that there might have been flaws in the SPE process as well as the SPE set-up, which influenced the final judgments of the SPE panels. As mentioned in Section 2.3.2, below, these regarded in particular the small-scale focus of the SPE and the time frame and their consequences; also the lack of experience with similar evaluation processes among the participating EvUs played a role.

Under these circumstances, the study team considered that publication of the SPE evaluation results – in terms of quality scores reached and the qualitative explanations, conclusions and recommendations – required the **consent** of the EvUs participating in the SPE.

Exhibit 5, below, shows the responses by the participating EvUs on this topic. The overall majority restricted their consent for publication of the SPE outcomes to the IPN Team only. Only a handful of EvUs gave their consent for making the outcomes public.

In line with these indications, the report *The Small Pilot Evaluation: Feedback and Results* (Background report 10) contains the Bibliometric reports and Comprehensive data reports as well as the final panel reports only for the Research Units that gave their consent. The report also holds the outcomes of the panels' calibration exercises.

While fully understanding and accepting the decisions made by the EvUs, the study team hereby would like to thank the EvUs that consented in sharing the SPE evaluation panel results with the wider research community. The SPE was meant to be a learning opportunity, for all actors involved, and opening up the results to the whole community is a critical contribution to an improved understanding and consensus building on the Evaluation Methodology in the Czech research community.

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Exhibit 5 Consent for publication of the SPE results by the participating EvUs

EvU	Submission forms	Comprehensive data report	Bibliometrics report	Panel Evaluation Report
Environmental sciences				
Institute of Analytical Chemistry AS CR	Public	Public	Public	Public
Czech University of Life Sciences Prague - Faculty of Environmental Sciences	IPN	IPN	IPN	IPN
T.G.Masaryk Water Research Institute, v.v.i.	IPN	IPN	IPN	IPN
Computer & Information sciences				
Institute of Computer Science of the AS CR, v.v.i.	IPN	IPN	Public	None
VŠB - Technical University of Ostrava, National Supercomputing Center IT4Innovations	IPN	IPN	IPN	IPN
CESNET, z.s.p.o.	IPN	IPN	IPN	IPN
Basic medicine				
Institute of Experimental Medicine of the AS CR, v.v.i.	IPN	IPN	IPN	IPN
Institute of Hematology and Blood Transfusion, Research Division	IPN/None	IPN/None	IPN/None	IPN/None
Agrobiology				
Institute of Experimental Botany AS CR, v.v.i.	IPN	IPN	IPN	IPN
Czech University of Life Sciences Prague, Faculty of Agrobiology, Food and Natural Resources	Public	IPN	Public	IPN
Crop Research Institute, v.v.i.	IPN	IPN	IPN	None
Sociology				
Institute of Sociology of the AS CR, v.v.i.	None	None	None	None
Masaryk University, Faculty of Social Studies	Public	Public	Public	Public
Charles University in Prague, Faculty of Social Sciences,	None	None	None	None
Philosophy				
Institute of Philosophy AS CR, v.v.i.	IPN	IPN	IPN	IPN
Charles University in Prague, Faculty of Philosophy	IPN	IPN	IPN	IPN
Palacky University Olomouc, Faculty of Philosophy	IPN	IPN	IPN	IPN

2.3 Feedback on the SPE processes and the EM

In this section we first give an overview of the topics against which the panel members, the panel secretariat and the EvUs were invited to provide feedback against.

In Section 2.3.2 we reflect on the limits that the SPE presented from the very start and the (negative) effects that these had on the SPE implementation and its results.

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In Section 2.3.3 we draw our conclusions on the efficiency and effectiveness of the SPE and the Evaluation Methodology, based on the detailed analysis reported in the Background report. Finally, in Section 2.3.4 we indicate how the feedback has and will be taken into account in the subsequent steps of this study.

In the Background report *The Small Pilot Evaluation: Feedback and Results*, we aggregate and summarise the feedback received from the panel members, panel secretariat and participating EvU against the main criteria of

- *Efficiency*, including time and cost efficiency, the user-friendliness of the processes and the clarity of the instructions
- *Effectiveness* of the Evaluation Methodology in reaching one of its key objectives, i.e. to develop tools and methodological measures that would allow for a fair assessment (e.g. are the indicators and assessment criteria sufficiently taking into account the differences between the research organisations involved in terms of their mission for research and society?)

2.3.1 Introduction

The panel members as well as the panel secretariat were asked to provide their feedback on the SPE processes and the Evaluation Methodology implemented. We posed the following list of questions. The panel coordinators responded collectively; panel members were asked to provide their individual view.

1. Were the instructions and documentation you received prior to the panel meeting sufficiently clear? What needs improvement?
2. Is calibration prior to the panel assessment a useful exercise? Please explain why or why not.
3. Are there assessment criteria for which you found it difficult to form a judgment? If yes, which? What was not clear? Any suggestion for change?
4. Does the evaluation methodology enable a fair assessment of all types of research organisations? Please explain why or why not
5. Was your assessment of the RU, and specifically of the research environment (HR management, PhD management, research equipment, research strategy and the process for its development) radically different after the site visit compared with the one prior to the visit? If yes, which aspect had you judged wrongly? Which type of information would you have needed to form a correct picture without a site visit?
6. Was the information that was provided to you (Profile sheets of the EvU, Comprehensive Data Report, Data report on the research outputs) sufficient for you to form a judgment? If not, which information was missing and why?
7. Was any information superfluous? If yes, which and why?
8. Do you have any other suggestions for the improvement of the evaluation process?

The participating EvU received a feedback form where they were asked to score (ranged 1 to 5) the SPE process and outcomes against specific questions. For each question they could also give more extended comments. The topics and questions were:

On the SPE processes:

- User-friendliness
 - Submission forms and process: Are the information submission forms and the process to follow user-friendly? (e.g. taking into account the different offices in the institution that will supply the information)

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- Information from the RD&I IS: Is the information that is provided from the RD&I Information System (IS VaVaI) easy to handle?
- *Efficiency - usefulness of the RD&I IS as tool.* Is the input of information from the RD&I Information System useful for an easier and quicker submission of the data?
- *Clarity of the submission guidelines.* Are the submission guidelines clear in indicating the information that is required and its use? Were they easy to understand?

On the evaluation results:

- Fairness of the evaluation:
 - Field specifics: In your opinion, to what extent have the panels conducted an evaluation that took into account the specifics of your scientific field ?
 - Mission: In your opinion, to what extent have the panels conducted an evaluation that took into account the mission of your research organisation?
- *Rightfulness of the evaluation results.* In your opinion, to what extent has the panel reached a correct view on performance in your research organisation?
- *Usefulness of the evaluation results.* In your opinion, to what extent are the panel's conclusions and recommendations useful for the management of your institution?

2.3.2 The limits to the SPE and their consequences for the SPE implementation

There were two basic characteristics to the SPE that affected negatively the process for the implementation of the SPE and its efficiency and effectiveness:

- The limited scope of the Small Pilot Evaluation, from a scientific perspective as well as type of Research Organisations to include in the exercise – the former inevitably influencing also the latter (see also Section 2.1.2, above)
- The timeframe of the SPE, both in terms of the very short time available for the preparatory activities and the timing in a phase of the study when the Evaluation Methodology was still under development

Both the participating EvUs and the evaluation panels rightfully pointed at issues in the SPE that were a direct consequence of these factors. These were as follows:

The 'small-scale' scope of the SPE inevitably influenced the **depth** and scope of the assessment and the overall value of the SPE evaluation results.

- The request for the coverage of 3 EvUs active in the same field implied that in the SPE there was no room for the assessment of the overall performance of an Evaluated Unit active in more than 1 field or for the assessment of interdisciplinary research, be it within or across disciplinary areas
- The drafting of an example panel report at the EvU level and field level was impossible

Most important, the experts involved in the panel needed to act both as referees (i.e. reviewing the submitted publications) and panel members. This is in contrast to the implementation model for the 'full-scale' evaluation where reviewers work independently from the subject panels, covering sub-fields across all EvUs. In the SPE, for each panel, three to maximum four members were foreseen (including the chair) and each submitted output was to be assessed by at least two reviewers. The combination of these requirements implied that each panel could cover maximum two to three sub-fields. Exhibit 6, below, shows the consequences of this need for specific expertise: in most cases, the SPE panels essentially acted as subject panels at the sub-

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field rather than field level, which was in contrast to the overall Evaluation Methodology.

Exhibit 6 Scientific focus of the SPE panels

Disciplinary area	Field	Sub-field
1. Physical sciences	1.4 Earth and related Environmental sciences	Environmental sciences
2. Engineering & Technology	2.3 Computer & Information sciences	
3. Medical & health sciences	3.1 Basic medicine	Neuroscience
		Cell biology
4. Biological & Agricultural sciences	4.2 Biological sciences (Agrobiolgy)	Botany
5. Social sciences	5.4 Sociology	
6. Humanities	6.3 Philosophy, ethics & religion	Philosophy

While this was not a particular issue for the SPE as such because it was intended to focus on the testing of processes, it did create quite some confusion on the definition of a Research Unit. There was confusion on the number of research outputs that could be submitted for review, the identification of the researchers to be included in the Research Units, and the collection and processing of the bibliometric data.

This needs to be in the context of the timeframe for the SPE and the fact that details of the Evaluation Methodology were (not yet) always sufficiently clear. There still was a need for an improved communication and understanding of the Evaluation Methodology - among the participating EvUs as well as some of the study team members acting as SPE help desk and the Ministry. This led to multiple information requirements by the participating EvUs; at times, they were provided with contradicting (or even wrong) instructions.

The time frame for the SPE implied a high time pressure both on the evaluation management team for the preparation and set-up of the evaluation exercise and for the Evaluated Units to submit their information. This inevitably influenced the quality of the information submitted by the EvUs. Also, delays in the submission of information by the EvUs could not be calculated into the planning; as a consequence, there was no time for quality control of the submitted information and the processed data (i.e. the comprehensive data reports and the bibliometrics reports)

2.3.3 Conclusions on the SPE efficiency and effectiveness

Efficiency of the SPE and its processes

Both the participating Evaluated Units and the panel members and panel secretariat indicated the problems in the SPE implementation that we mention in the section above.

While the conditions for the SPE were peculiar and cannot be compared with those of a full-scale evaluation, it may be helpful to list the main lessons learnt from an operational perspective. The experience in the SPE highlighted in particular

- The importance of a well-functioning and duly coordinated help desk
- The usefulness of a web-based shared system with the ability for simultaneous input and verification, as a way to speed up the process of submission and make it user-friendlier
- The potential use of the RD&I IS as a tool to support the Evaluated Units in their collection of data for their self-reporting

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- The need to define precise and rigid deadlines for the submission of the self-assessments in order to allow for a quality check and the timely transfer of the processed data to the panel members and reviewers. The panel secretariats considered that 1 month prior to the panel meeting is an appropriate time frame.
- The importance of a quality-assurance mechanism so that the missing and obviously incorrect information is avoided. Throughout the evaluation, process transparency on the work and data flow is crucial, for both the reviewers and the evaluated units. It is important that errors and/or misunderstandings are detected, logged and corrected. This is an important component for building trust on the procedure and finally ensuring its efficiency and impact. Also the Evaluated Units should take up responsibility for the quality and completeness of the data submitted, though, in particular through an improved internal coordination and support for the administrative staff collecting the required data

The quality of the submitted information constituted a major issue for the panels in the SPE, in terms of its completeness as well as richness.

This was caused by a set of intertwined factors influencing negatively the attention dedicated by the EvUs to these aspects, i.e. first of all time availability (as mentioned above), but also

- A lack of expertise with similar exercises
- An underestimation of the efforts required for the evaluation
- A lack of internal coordination and quality management
- The clarity of the submission guidelines, considered not sufficiently clear and/or detailed for a number of topics

In particular personnel statistics, i.e. data on the number of staff in terms of headcounts and especially Full-Time Equivalent resulted (surprisingly) difficult to collect for some of the participating EvU. In this context, an improved matching of the staff categorisations with those used in the universities internally would have been helpful.

The panels, however, indicated also a lack of understanding among the Evaluated Units of the importance and relevance of qualitative information. The data on the time investment by the EvU for the completion of the submission forms seem to validate this impression: more time was dedicated to the collection of administrative data than to the writing out of the qualitative narratives, in contrast to the expectations. There is little doubt that (also) the understanding of evaluation as a somewhat arithmetic exercise has played a role here.

Panel members stated, “The narratives summarising crucial qualitative aspects of the RUs were often rather short and had a narrow scope.” This regarded in particular the description of the research strategies, but also the use of research infrastructure, the description of the collaborations, and last but not least, the description of the value of their research for development in R&D and society at large.

The panel members therefore strongly recommended an improvement of the submission guidelines for the EvUs, improving the description of the type of information expected from the (qualitative) self-assessments and the expected content, for example by providing examples of suitable descriptions.

They also considered, however, that those units that had, for example, a clear strategy or societal impact found their way to convey that in the self-assessment. Those that had not thought about their strategy before submitting the information ended up writing quite obscure narratives.

In this context, the panels considered that the **site visits** had as major function to provide the panels with an opportunity to check the rightfulness of the evaluation

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results based on the submitted information and eventually ask for clarifications. The site visit was useful especially for the institutions that under-presented their information in the self-assessment forms or wrongly understood the information requirements.

For the Physical Sciences and Social Sciences panels, there were no significant differences in the scores before and after the site visits. For the other panels, the site visits influenced the final scores for the Evaluated Units, in some cases even radically.

The panels suggested that in case site visits are absolutely out of the question in the full-scale EM due to cost reasons, the evaluation agency may consider organizing a Q&A session using online tools and/or videoconferencing. Slides or even video of a presentation of the people in charge would be useful.

Usefulness of the methodological processes and tools

The experience in the SPE proved the importance of the calibration exercise as a first step in the panel evaluation. This regarded more than only the definition of the evaluation criteria terms and the importance of the sub-criteria.

The panel members considered these calibration exercises as a “must” to reach also a proper understanding of the grading among panel members, the significance of each sub-criteria and its contribution to the overall assessment criteria, and the Evaluation Methodology in general.

The panel members therefore recommended that either a physical or virtual meeting is set up for the panel members *prior* to the remote evaluation and remote review process. This meeting should introduce the main documents, clarify some definitions, provide instructions and set out the calibration exercise.

The calibration discussion was also useful in bringing to light contextual information on Czech RD&I structures and politics, complementing the provided background documents on the Czech RD&I system, the existing evaluation methods and funding system, as well as on the participating Evaluated Units.

In this context, the SPE panel members highlighted also the relevance of the information and input provided during the panel meeting by the study project manager, taking up the role of “specialist advisor on context” in the SPE process, as well as the role of the panel secretariat in clarifying methodological questions popping up and supporting the panels in their evaluation process.

The panels considered that the data that was provided in the Comprehensive Data Report was relatively clear and the questions were found to cover all the important areas of the assessment. Suggestions for improvement were:

- The collection of background information allowing for an understanding of the Research Units’ positioning within their institutional environment
- The opportunity for the Evaluated Units to provide comments on some of the data presented, for example explaining some of the deviations and evolution over the last 6 years. This would allow to comments on particularities in the data which otherwise may be misinterpreted by the Panel.
- More detailed information on the collaborations allowing the panels better to judge their value and merit
- Last but not least, an alignment of the report structure with the structure of the self-assessment forms – preferably reflecting the assessment criteria in order to improve clarity

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In general, the panel members also appreciated the information provided by the bibliometric report. The shared impression was that the information efficiently covered the necessary parameters.

There were several suggestions for improvement of the report in order to enhance its clarity and user-friendliness for the panels and therefore increase its value and relevance for the future evaluation exercises. These included

- Improvements to the style and clarity of the information provided and the structure and length of the report
- Suggestions to improve the data for the Social Sciences and Humanities fields
- The request to provide the panels with the full list of research outputs (sorted and categorised)

The panels also expressed some concerns as to the robustness of bibliometric data when small research units were evaluated and stressed the need for the RUs to have a certain critical mass.

The SPE panel members assessed positively also the assessment criteria, considered to be clear and relevant, as well as straightforward and adequate for the assessment purposes. Their impression was that the five fields of assessment made sense also to the Czech community.

Also in this case, there was room for improvement:

- The panel members saw ambiguities with a number of sub-criteria that made the assessment more confusing, especially in ‘membership of the national and global community’ and ‘research excellence’.
- They saw an overlap between the assessment of ‘research excellence’ and ‘research performance’, and some confusion on the assessment and its relation to ‘productivity’
- Some panels recommended that the scale for the quality levels should not be a scale from 0-4, but from 1-5. They considered that the latter is much more common internationally and would make interpretation of the scores more adequate
- For the assessment of research excellence, the panel members found that the number of submitted publications for review should be increased. The general suggestion was to at least include three papers for each RU or more in case of a larger RU and/or interdisciplinary research, and a complete list of publications. The assessment of research excellence based on only one paper was insufficient.

Fairness of the Evaluation Methodology

Overall, both panel members and the participating EvUs assessed positively also the fairness of the Evaluation Methodology in dealing with the specifics of the scientific fields and taking into account the different missions of the Research Organisations.

Both of these actors involved in the SPE, however, made the following considerations:

- The EM is best suited for scientific (and mainly basic) research. There is too much emphasis on scholarly outputs and bibliometrics, while not sufficiently considering applied research outputs and especially, the societal value of the research activities – or in the case of the research infrastructure, the value for its service delivery

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- Efforts need to be made to improve the availability of data on research outputs in the fields of Social Sciences and Humanities in order to ensure a fair and robust evaluation

In particular in relation to the fairness of the evaluation from a scientific field perspective, the panels stressed the importance of the qualitative information and warned against too much reliance on the metrics collected.

The majority of the participating EvU scored the EM positively also in relation to the evaluation results, and more specifically the rightfulness of the panels' judgment and the usefulness of the evaluation results. Critical voices were to be found only in the field of Humanities as well as some of the non-scientific research organisations.

There is a discrepancy between institutions when commenting on the usefulness of the results. While some of the EvUs considered the panels' recommendations to be unrealistic in a Czech context, several of them regarded the suggestions from the evaluation panel as beneficial and stated that the evaluation results are already being integrated in their institutional strategy.

2.3.4 Actions taken as a result of the SPE experience

The experience gained from the SPE was intended to feed into the finalisation of the Evaluation Methodology, including the bibliometric indicators, and the set-up of the Second Pilot Evaluation, implemented by the IPN Project Team.

Significant changes were made to the Evaluation Methodology as a result of the findings listed above. The most important ones were

- A stronger focus on qualitative rather than quantitative data, stressing the importance of the indicators beyond research outputs and making a more pronounced use of self-assessment for the RU report, including an RU SWOT analysis
- The re-formulation of the assessment criteria, improving also the descriptions and sub-criteria
- The use of 5-point starred quality levels, which is a scale that is more internationally recognised than the 4-point one, allowing for a wider spread of scores in the medium range and facilitating a more adequate interpretation
- A higher minimal number of outputs submitted for review in order to avoid arbitrariness if one publication only can be selected
- The request to provide background information that highlights certain conditions for the research that is evaluated. This information will not be appraised, but it provides context and understanding to the other evaluation material
- A revision of the staff categories and proposal for solving the difficulties in identifying the number of FTE researchers in the Higher Education Institutions

We also made some changes in the proposed approach for the collection and processing of bibliometric data and propose some solutions in a longer-term perspective that will be of use particularly for the field of Social Sciences and Humanities.

3. The RD&I Information System (IS) as an information tool for evaluation

This chapter sets out the main findings of the analyses related to the potential use of the national RD&I IS, in particular for the purposes of evaluation.

Topics investigated included

- The reliability and usability of the RD&I IS (Section 3.2)
- Its connectivity and the potential use of external information sources and analytical tools (Section 3.3)
- The potential use of the RD&I IS for the evaluation implementation (Section 3.4)
- Options for the enhancement of the information system (Section 3.5)

Section 3.6 sets out our conclusions on this topic.

We start this chapter with an overview of the main features and contents of the RD&I IS architecture.

3.1 Description of the Research, Development and Innovation Information System - IS VaVaI

The Czech Research, Development and Innovation Information System - IS VaVaI¹ - is the key element of the research information infrastructure in the Czech Republic. It is an information system in operation; all stakeholders have adapted to it. The system has been used to monitor and partially also to support the decisions on the allocation of public funding for research, development and innovation in the Czech Republic. It is an official administrative hub of information about R&D in the country. The administrator of the system is the supreme state administrative body for the domain - the Council for RD&I at the Office of the Government of the Czech Republic. The information system is established and operated on the grounds of Act No. 130/2002 Coll., on the public support of research, development, and innovation.

From a national RD&I policy perspective, the information system has a double function: it acts as an operational management system

- For the public competitive funding in the Czech Republic, including information on input (funding, focus of the programmes, organisations/researchers involved etc) as well as the outputs (i.e. the related research results)
- For the public institutional funding of research organisations, including input and output data, related to the institutional research plans and for the calculation of the funding criteria defined in the PRFS (i.e. Metodika)

The IS VaVaI documents the public expenditures in the Czech Republic on RD&I and the outputs thereof. It plays an important role in the distribution and governance of public funding for research, development and innovation in the country. The information in the IS VaVaI is authoritative, continuously updated, and publicly displayed. The system thus contains transparent and verifiable micro-data: data about individual projects, publications, other research outputs, etc. When aggregated to a meso- or macro-level, the information is much more reliable than ad-hoc surveys. The

¹ In Czech: *Informační systém výzkumu, experimentálního vývoje a inovací*

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data can (and do) serve many purposes. It is one of the most comprehensive information systems of its kind in the world.

It is important to note that the IS VaVaI **does not stand in isolation**. It relies on research information feeds from funders and from research performing organisations. Also, the IS VaVaI integrates information from other information systems within the Czech Republic (e.g. the register of legal entities, data from the Industrial Property Office) and outside it (e.g. CORDIS, ISBN International). Finally, information from the IS VaVaI is being used by research information systems: mostly within, but to a growing extent also outside the country.

One of the major strengths of the IS VaVaI is in the interconnected and integrated structure of the information that it contains. Basic types of ‘objects’ that are present in the system are RD&I activity (a general notion for a type of funding that is put into the RD&I system from public funds), RD&I Tenders (Calls), RD&I Projects, Research Outputs, Organisations (both funding providers and research-performing organisations), and Persons (including person identifiers).

Based on an earlier **SWOT analysis** in the official Concept of the IS VaVaI for the years 2012-2015, which was updated with the relevant outcomes of interviews and information on the state-of-the-art in research information systems in the international practice, the strengths, weaknesses, opportunities and threats related to the IS VaVaI are

Strengths	Weaknesses
<ul style="list-style-type: none"> • An integrated environment covering the whole research management cycle • Continuously updated • Reliable macro-data (based on micro-data) • Centralized, authoritative, verified database of research outputs that comprises a broader range of research outputs than either national or commercial bibliographic resources • An effective tool for budget planning and verification • Basic data source for any evaluation of research • Clear roles and responsibilities of actors, a reliable protocol for data submission • Reliable IDs of researchers that can bridge to global initiatives • Presentation is strictly bi-lingual (Czech and English) • Cornerstone for transparency and trust in the Czech RD&I domain • Generally accepted 	<ul style="list-style-type: none"> • Only coarse-grained information on foreign financial support • The current structure of the research output record is incomplete as a bibliographic reference • No cross-checking of submitted output category against other sources • Somewhat difficult processing of the exported data for external users • Absence of an interface to allow more complex queries • Query form too complex for entry level users • Absence of support for tracking the lifecycle of research outputs • Currently insufficient support for tracking identifiers of research outputs and researchers in other data sources

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Opportunities	Threats
<ul style="list-style-type: none"> • Analytical outputs from the data • One-stop shop for information on the Czech RD&I system • Source of quantitative indicators for future evaluations • More extensive validation of the data • Improved interconnectivity with other existing systems • Refine and extend the research field classification to improve support of the EM • Support for tracking the lifecycle of research outputs • Improved search facilities 	<ul style="list-style-type: none"> • Underfinancing of further development of the system • Insufficient human resources and expertise • Inability of some funders to provide timely information on projects • Loss of motivation for the research outputs entry in the system • Research field classification manipulated to game an evaluation system • Instability caused by unpremeditated modifications

We address most of the weaknesses in the propose extensions to the IS VaVaI below.

3.2 The reliability and usability of the IS VaVaI

The main conclusion from the interviews is that all respondents recognize the IS VaVaI as an important and valuable information service.

Most large research performing organisations would be collecting the information on the outputs of the research they perform in any case, whether it was required for the RIV or not. All of the responding institutions have the collection processes in place, backed by the necessary infrastructure and qualified staff.

They supply information from their institutions, and they use the aggregated information from all other institutions for their analyses, too. In this sense the IS VaVaI is providing a service to them. Imprecisions and errors in the RIV are regarded as a relatively minor problem that could be remedied by a more thorough validation.

It is an information system in operation, all stakeholders have adapted to it. It contains authoritative, continuously updated data about Czech RD&I. The *collect once, use many times* principle of good data management is realized. The overall benefit of the IS VaVaI is mostly seen in having a publicly available one-stop shop with research information from the whole country; the key role of the information system for transparency is widely recognized.

The IS VaVaI information was found sufficiently reliable. This is the outcome of the interviews as well as of the checks that were performed alongside the Small Pilot Evaluation in line with the proposed Evaluation Methodology.

Most research output authors do not enter their records directly into the RIV. The collection rather happens in the institutional CRIS. As a rule, these institutional CRISs contain a broader range of research outputs than the RIV and use a finer-grained output typology, thus catering for their specificities. Once the data is collected in the institutional CRIS, it is used many times to satisfy various reporting needs locally.

While the RIV is the most frequently accessed component, the other parts of IS VaVaI are also actively used: most notably CEP (RD&I projects), followed by VES (calls) and CEA (other RD&I activities).

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Research organisations use the information for their day-to-day operations:

- Search of funding opportunities;
- Grant application support;
- Search for potential partners;
- Cross-checking their list of active projects and their obligations therefrom, as well as for their strategic management;
- Getting an overview of current RD&I in the fields that are relevant to the organisation;
- Benchmarking with other organisations;
- Analytical studies.

For the funders and the national strategic management bodies these parts of IS VaVaI represent a fundamental and integrated information source that reflects the funding flows in the RD&I domain and give the details on targeted funding in the Czech Republic.

Data on the research outputs produced in an organisation is collected not only in order to be reported in the RIV, there are many alternative uses of the information: for strategic management, for the evaluation of constituent organisational units, to support funding applications, and for dissemination in the expert communities and for the general public.

The quality of IS VaVaI data is regarded as adequate. Total error rates are estimated in the order of a few (at most tens of) cases per year. These are not seen as a major problem. While automated checks of the metadata are considered sufficient, some respondents would support more thorough human verifications.

3.3 Options for the use of external information and analytical tools

3.3.1 *The connectivity of the IS VaVaI*

Current Research Information Systems (CRIS) such as the IS VaVaI generally tend to be the **central information systems** in research-intensive environments. While they contain the basic information about the important objects in the information domain, they typically tend not to record every detail: instead they refer the user for detailed information to a supporting information system such as an Open Access repository, a bibliographic database, a project management system, a financial system, a human resources system, etc.

CRISs generally use the following two mechanisms to realize these links:

1. Pointers to the external systems' interface (e.g. a URL of the publication metadata page in an OA repository, a URL of a Framework Programme call detail page) in case it is directly addressable

2. **External identifiers** (e.g. the CORDIS call identifiers, project numbers, the ISBN, ISSN, DOI², etc. of a publication, or the patent number, or a researcher identifier - an ORCID³, an agency-assigned number⁴, a staff number within an institution)

The former approach provides for navigation to a particular information service, while the latter approach supports a multitude of relevant information services and leaves the choice on the user. Both approaches have their merits.

In this interconnecting function, the role of a CRIS in an organisation is largely that of an **information integration platform**. This is also true of aggregating CRIS such as the IS VaVaI.

Connectivity of the IS VaVaI information therefore means recording a wide range of external pointers or identifiers. Connected information allows users to navigate to resources that give more details about a particular object (e.g. from the generic CEP project record to the project's own website - the URL of the website is the pointer). This way the information from the CRIS can reference its context. Apart from linking, this also allows for the information in the IS VaVaI to be **enriched** with data from external sources.

3.3.2 Availability and suitability of information resources

In this section we propose the potential enrichment of RD&I IS data through the interlinking and use of data related to research outputs.

Possible extensions of the identifiers are not limited to research outputs only, though. There is a host of other identifiers to use. These include

- Funders of research are assigned FundRef identifiers
- There is the ISNI standard to identify organisations that are involved in creative activities;
- Projects receive numerous identifiers at different stages of their lifecycle
- Researcher identifiers provide persistent identities for humans

There are many standards for the identification of researchers, amongst which ORCID is aspiring to play the role of a bridge identifier. In line with the general recommendations for maximum connectivity, the IS VaVaI shall of course allow for these identifiers to be recorded. However, none of them is ready to replace the current use of the national person identifiers and its anonymized form, because of their incomplete and field-specific coverage and lower reliability.

Sources for bibliographic data

The Web of Science and Scopus citation databases are the principal candidates for integration into the IS VaVaI data. Partially this is already being done within the current Metodika. Internationally, research assessments traditionally turn to citation databases to inform on scholarly performance and excellence. Citation databases are

² Digital Object Identifier, http://en.wikipedia.org/wiki/Digital_object_identifier. The DOI is persistent in the sense that it remains fixed over the lifetime of the document, whereas its location and other metadata may change.

³ Open Researcher and Contributor ID, <http://orcid.org/>

⁴ Such as the HESA (Higher Education Statistics Agency) Number in the UK

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the most detailed databases about publications, as they include also the links in the citation network.

A first approach will therefore result in a consistent interlinking between the IS VaVaI and a bibliographic database, or both of them if that's financially viable. We refer to the result of this interlinking as an enriched RIV or interlinked RIV. This approach makes all the attributes from the bibliographic database available to the IS VaVaI as well. The RIV could contain the current number of citations of each article or proceedings paper that is matched in the Web of Science or Scopus database.

Field-specific databases, such as PubMed for medical sciences or DBLP for computer science, can also be used to enrich the information in the IS VaVaI. However, the real value of these databases is in indexing the journals and other sources than the citation ones. Enrolling each such database has also its costs, so such decisions shall be based on a cost/benefit analysis.

Specifically, we recommend

- Adding support for the *Scopus EID identifier* in order to cover both leading citation database providers. The Web of Science Accession Number has been collected as an optional field since 2009 (i.e., with research outputs published since 2008)
- Supporting also *other, discipline-specific identifiers* be supported, such as PubMed ID, SSRN Article Identifier, URL of the article page at the ACM Digital Library or in the DBLP service, etc.

Creation of a master journal register categorising publication channels

It is a known fact that the coverage of Social Sciences and of the Humanities in standard citation databases is not satisfactory for an institutional evaluation of research performance in these fields. Although national integrating Current Research Information Systems (CRIS) are being built for other purposes, one of their advantages is that they are able to give a more comprehensive and systematic representation of the scholarly output in the Social Sciences and Humanities (SSH). In our view, this advantage has not yet been fully exploited in the RD&I Information System.

It needs a **standardized and dynamic register** of scholarly journals, series and book publishers that allows for bibliometric analysis and a possible distinction between quality levels of publication channels. In the international scene, this has been achieved in the ERIH-PLUS, the VABB-SHW in the Flanders and the system adopted as the 'Norwegian model' in several countries.

Important features in the ERIH PLUS, VABB-SHW and the Norwegian model are

- A standardized register opens up for a bibliometric analysis of the publication output which has so far only been possible in Scopus, WoS and other databases that are running on top of a standardized register.
- The standardization makes it possible to identify all publications in one and the same publication channel, thereby making it possible to distinguish between peer-reviewed original research publications and other material (e.g. editorials, textbooks) in the same publication channel.

Our proposal is to create a **master journal register** for the RD&I Information system with two major purposes:

- In general, such a register is needed to enhance the analytical potential of the system for the evaluation methodology in all fields of research

- In particular, this register is needed to compensate the deficiencies in coverage in Scopus and WoS in a more systematic manner than the present categorizations in the RD&I system allow for

For this purpose we propose to combine the current List of peer-reviewed non-impacted journals published in the Czech Republic with ERIH PLUS. This would enable creating CRIS data that allow for the identification of scholarly publications versus publications aimed at a broader non-scholarly audience, i.e. the distinction between communication for research and dissemination.

Opening up the possibility of distinguishing between **quality levels** in the register of journals, series, and the (book) publishers – similar to the ERIH levels of authorship making a distinction between international, national and local authorship - provides also a basis for a more self-determined evaluation of research in the Czech Republic than the present categories provide.

Sources for data on IP outputs

Patent databases are already partially integrated in the RD&I IS. These data are currently mainly used for the verification of the reported IP outputs.

Patents, utility models, industrial designs, plant varieties, animal breeds – all of these outputs of applied research have the property of being registered by a specialized office or agency. Typically these organisations keep public databases of the IP they give protection to.

A useful extension would be the inclusion of the following types of additional information from the IPO:

- Data on when the exclusivity in reality ended i.e., when maintenance fees stopped being paid.
- Data on transfer of the rights from the patent.

These two types of additional information would make it possible to independently track the lifecycle of a patent after it was reported in the RIV.

3.3.3 Enhancing the connectivity of the information

In order to enhance the connectivity of the information, we propose to extend the IS VaVaI data structure with a generic mechanism to record any number of pointers and identifiers.

Consistency in the use of pointers/identifiers should be ensured and for this we propose a hybrid approach, i.e. not to mandate the identifier to be entered by the submitting institution, but to provide incentives for this to happen, and to establish the interlinking in a separate verification process in the RIV, after the publication metadata is submitted.

A reverse of connectivity is connectability, i.e. the feature that allows for supporting external references to information in an information system. With machine information processing agents taking off, and in line with the general trend towards Government Open Data, we recommend to extend the portal by exposing the same information in at least some of the **Linked Open Data (LOD) formats**,⁵ while

⁵ The RDF/XML is a mandatory format to support, RDFa makes it possible to embed LOD markup into standard HTML pages, while formats such as Turtle or N-Triples are conventionally used to support large-scale LOD processing tasks.

maintaining the same URL structure. This way, the information is made accessible to LOD agents.

We shall also support the possibility for **interconnections between research outputs** to better track the lifecycles and usage of outputs of applied research and research datasets, wherever relevant and adequate.

3.3.4 Machine access to the IS VaVaI data

While humans remain the prime users of information in today's IT, they rely to an increasing extent on automated agents that take up support tasks such as searching, aggregating, restructuring and combining information from different sources. Machines as users of information from the IS VaVaI cannot and should not be ignored.

We list several options for **machine-friendly interfaces** to access the data

- The CERIF API (now in development by euroCRIS) will be a standardized way of making the IS VaVaI information base accessible to the international audience.
- A light-weight API (Application Program Interface) to offer the basic information about IS VaVaI objects for a quick display on users' web page
- With machine information processing agents taking off, and in line with the general trend towards Government Open Data, extend the portal by exposing the same information in the Linked Open Data (LOD) formats

We do **not**, however, recommend an automated machine-to-machine communication to update the IS VaVaI data by the funders or the research organisations. The administrative dimension of the IS VaVaI update processes is not ready for such automation. The submission hand-over protocol is regulated by the Government Decree on the IS VaVaI. While there may be room for making the hand-over and the subsequent handling at the side of the Office of the Government more efficient, explicit actions by human actors in specific capacities cannot (and should not) be eliminated.

3.4 The use of the IS VaVaI for the Evaluation Methodology implementation

The IS VaVaI, if extended as proposed in this report, will provide integrated, verified, authoritative data about EvUs' research activities and research outputs. That will give the evaluation panels reliable and comparable input data in a unified form.

The Evaluation Methodology will be the most important use of the information in the IS VaVaI, but it is there for other purposes, too: most notably for analytical processing and strategic management at all levels of the RD&I system (research organisations, funders, the RD&I Council).

We identified several extensions that would be useful for **maximising the use of the IS VaVaI** for the proposed evaluation. To this end, the IS VaVaI shall collect the most relevant parts of the information, with continuous updates. The self-evaluation forms of the EvUs and RUs shall, to the maximum extent possible, either come pre-filled with the appropriate summaries of the information from the IS VaVaI, or offer the RUs to pick the most important N items from a list.

In order to act as an authoritative and comprehensive source of information that needs to be provided for the EM, we recommend **extending existing components** of the RD&I information system as well as adding **new ones**. The latter will regard in particular the following items and topics:

- Researcher Esteem Indicators and Profiles
- Data for the calculation of researchers Headcounts (HC) and FTE

- An Infrastructure Catalogue in three main categories: Facilities, Services and Equipment.

The yearly frequency of data updates seems to be sufficient for most uses, given the pace at which the underlying research funding processes take place. Data collection with a frequency lower than once per year would, however, result in a worse data quality due to personnel migrations and both the human and the institutional memories fading out.

Another core functionality will be a direct support in the **evaluation implementation processes**: The assistance with the draft of the structure of the subject panels, registration of EvUs into the evaluation, definition of RUs, generation and maintenance of the list of researchers, eligibility checks, preparation of data summaries and presentations for the panels, systematic collection of the self-evaluation reports (with the EvUs/RUs re-using the data already collected in the IS VaVaI), realizing the workflow and recording the conclusions drawn up by the panels, the audit of the performance agreements and preparation and implementation of the funding principles of EM. This support can either be integrated as module in the IS VaVaI, or handled by a separate system that takes data out from the IS VaVaI and eventually feeds back the evaluation outcome.

At the same time, an evaluation following the proposed EM is a large-scale **administrative process**. The right information has to reach the right participants in the process at the right times. Individual steps and their outcomes shall be recorded and archived. The outcomes of the evaluation will be published using the IS VaVaI, tailored for the various audiences: for the EvUs and RUs, for strategic planning, and for the general public.

The IS VaVaI shall also record the **Performance Agreements**, which will allow for their interim and final evaluation. The funding that is connected with performance agreements shall be tracked in the IS VaVaI, together with the basic data about the performance agreement: Its identification, dates of entering in force and the dates of funding start and end, the parties, and the performance criteria. A reference to the full text of the agreement, in case it is published, shall be provided.

3.5 Options for the enhancement of the IS VaVaI

A set of extensions to the IS VaVaI can be envisaged – and would be useful – in order to optimise its user-friendliness, efficiency, effectiveness, and most important, reliability. Possible extensions, starting with those that we consider as most relevant and important ones, are:

A refinement of the IS VaVaI classification scheme to make it seamlessly map into the OECD Fields of Science classification.

The modifications suggested below will make the IS VaVaI compatible with the OECD FOS classification which is a must for a successful implementation of the EM. This will considerably improve the general level of international comparability of research information from the Czech Republic, and the international comparability of the EM results in particular.

Improve RIV compatibility with established bibliographic conventions

While the RIV is not a bibliographic database in itself, it very much benefits from linking to bibliographic databases. To that end, it is advantageous that it actually has its content structured in a similar way. Among other goals, the RIV should be able to generate the standard bibliographic record for a publication, since that is what its users and consumers of the publication metadata are used to work with. We put forward a series of recommendations for extensions with the aim of achieving this higher degree of compatibility.

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Introduction of a RIV master list of publishing channels

The existence of a master list of publishing channels would allow for a simpler matching between incoming RIV data and external bibliographic sources the data is to be verified against. This would result in an improved linking into citation databases. It would also lower the burden on the maintainers of the institutional CRISs, as they would be able to re-use the master list instead of compiling and maintaining their own.

Revision of the RIV output types classification

We see the following two suggestions as the most pressing ones:

- Better characterise Software
- Add Research datasets

More comprehensive support for funders

Funders in the current IS VaVaI receive only a basic support. To enhance the effectiveness and efficiency of their reporting obligations, a few extensions are suggested.

- Notifications about the funders' obligations
- Support for funders in the RIV data collection process

Improved presentation of the IS VaVaI data and analytical outputs

- The search system of the IS VaVaI web portal seems not to be up-to-date with today's user expectations.
- There is a pronounced need for analytical outputs
- When implementing these changes, the graphical design should go through a refresh as well.

Tracking research output lifecycles and impacts

Ideally, one would like to follow the exploitation of the results in RIV. This is partially done for patents where a category of financial income is recorded.

This could be extended to any recorded research output. Beside the IP outputs this information could be useful for the evaluation of the applicability and the actual benefits of applied research. For publication results in SSH it is desirable to follow the most important responses, such as notable reviews. Other items to follow may be prizes and awards.

While the IS VaVaI provides the technical opportunity duly to manage information related to research outputs and their subsequent exploitation, it should be considered that keeping track of this information - over time and for all research outputs - represents a high burden on the involved organisations. Also the quality of the information provided typically is very hard to assess. Finally, there are also more methodological issues that inhibit the use of micro-data for the assessment of research impacts. These include, e.g., the concept of project fallacy and the issue of attributing specific impacts to 1 single research output or public intervention. For these reasons, impacts of research activities are typically assessed at a higher level of aggregation.

Improve support for projects with postponed ex-post evaluation

Principal investigators in grant projects tend to report their results up to two years after the project ended in order to ensure that the publications from the project actually appear and the evaluation committee gets a much fuller picture of the project. This practice forces the funder (the Czech Science Foundation) is forced to introduce

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artificial states of “temporarily suspended” with zero funding, and the information about the real end of the project gets distorted.

A possible improvement of this situation would be to extend the list of possible states with the state “finished, waiting for evaluation” and collect the date by which the evaluation is expected to take place. This would greatly improve the quality of the data from the Czech Science Foundation (and possibly from other funders as well, if they start supporting grant projects in the future).

Collect more detailed information about the cost structure of projects

The CEP finance structure has traditionally been centred around the different funding sources (the state budget funding and the total eligible costs). Only recently (from 2014) a particular detail was added: the amount of investment covered by the state budget funding. Collecting many more details would be useful and the following cost types are typical in projects and should be considered:

- Staff costs,
- External service costs,
- Travel expenses,
- Cost of material,
- Investment costs,
- Upkeep and maintenance costs,
- Other running costs,
- Overhead costs.

The refined cost planning/reporting structure would allow for a comparison and benchmarking of funders.

3.6 Conclusions

The Czech Research, Development and Innovation Information System (IS VaVaI) is the key element of research information infrastructure in the Czech Republic. It is an operating information system; all stakeholders have adapted to it. The IS VaVaI assists all the players on the Czech RD&I scene. It maintains information that is necessary for qualified analyses at all levels. The system has been used to monitor and partially also to support the decisions on the allocation of public funding for research, development and innovation in the Czech Republic. It is an official administrative hub of information about R&D in the country. As a national research information hub it supports both the professional and the broader audiences and creates an environment of transparency.

The information in the IS VaVaI is authoritative, continuously updated, and publicly displayed. The system thus contains transparent and verifiable micro-data: data about individual projects, publications, other research outputs, etc. When aggregated to a meso- or macro-level, the information is much more reliable than ad-hoc surveys. The data can (and do) serve many purposes.

The main and core recommendation is to use the IS VaVaI to the maximum possible extent to support the EM. Making use of the IS VaVaI allows to lower the indirect costs of the evaluation exercise. Information re-use will save time of the researchers and of the EvU administrative staff. The suggested extensions of the IS VaVaI will support also the re-use of the collected data for other purposes: evaluations of RD&I programmes, evaluations of applied research and innovations, and strategic analyses at the institutional, funders’ and the national levels. The synergy of the primary

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collected data with the external ones will extend the usability of data for all the above-mentioned purposes.

This report identifies the necessary extensions of the IS VaVaI. However, a real implementation of the EM with the inclusion of stakeholders (the Council for RD&I, the Ministry of Education, Youth and Sports, the Section for Science, Research and Innovation at the Office of the Government of the Czech Republic) is bound to bring additional or modified requirements. The implementation will need to start with a technical analysis working with a finalized set of requirements.

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