Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 00 (2014) 000–000

Procedia Computer Science

www.elsevier.com/locate/procedia

CRIS 2014

System of evaluation of research institutions in the Czech Republic

Jiři Málek[a,b], Viera Hudečková[a]*, Martin Matějka[a]

[a] *The Office of the Government of the Czech Republic, Nábř. Edvarda Beneše 4, 118 01, Praha, Czech Republic*
[b] *University of Pardubice, Studentská 95, 532 10 Pardubice 2, Czech Republic*

Abstract

Research, experimental development and innovation receive support from public funds in accordance with Act No. 130/2002 Coll., on the support of Research and Development from Public Funds. Since 2009, the Council ensures the preparation of the Methodology and submits it for approval to the Government of the CR. Results obtained over the past 5 years are evaluated. The new 2013 Methodology is based on three pillars, which combine a peer-review evaluation and software algorithms. The positive aspects of the overall process include an increase in the number of research activities.

Peer-review under responsibility of euroCRIS.

Keywords: Evaluation; Methodology; Pillars;

1. System of state aid for R&D

Research, experimental development and innovation (R&D&I) receive support from public funds in accordance with the Act No. 130/2002 (R&D Act), on the support of Research and Development from Public Funds. This Act regulates: the rights and obligations of subjects involved in R&D&I, the conditions for state aid, the provision of information on R&D&I through the research, experimental development and innovation information system (R&D&I IS) and tasks for R&D&I bodies[1].

The Research, Development and Innovation Council (the Council) is the expert and advisory body of the Government for the area of R&D&I and performs the following tasks: formulation of the National R&D&I policy, formulation of the Methodology of Evaluation of Results of Research Organizations, drafting of the regular annual analyses of R&D&I in the Czech Republic and their comparison with those from abroad, the role of administrator

* Corresponding author. Tel.: +420 224 002 541; fax: +420 234 003 534.
E-mail address: hudeckova.viera@vlada.cz

Peer-review under responsibility of euroCRIS.

and operator of the R&D&I IS and preparation of proposals for the overall amount of aid for R&D&I. The Council has 17 members and in organizational terms it reports to the Office of the Government of the CR. The Chairperson of the Council is the Deputy Prime Minister of the Czech Government [2]

State aid for R&D – is divided into targeted funding of grant projects for both basic research and applied research as well as the institutional block grants financing the long-term strategic development of research organizations. The main basis for this funding is the results of the evaluation of research institutions. These financial tools were modified by the significant organizational changes in the Czech R&D system since 2008.

Reform of research since 2008 – the aim was to improve the level of benefit provided by research, development and innovation for the Czech economy and society, to simplify aid for R&D, to support institutions based on their results, to significantly reduce the number of budgetary chapters involved (from 22 to 10) and to promote research excellence. The Czech R&D reform should be viewed in historical context. The first state R&D budget was set in 1993 after the split of former Czechoslovakia.

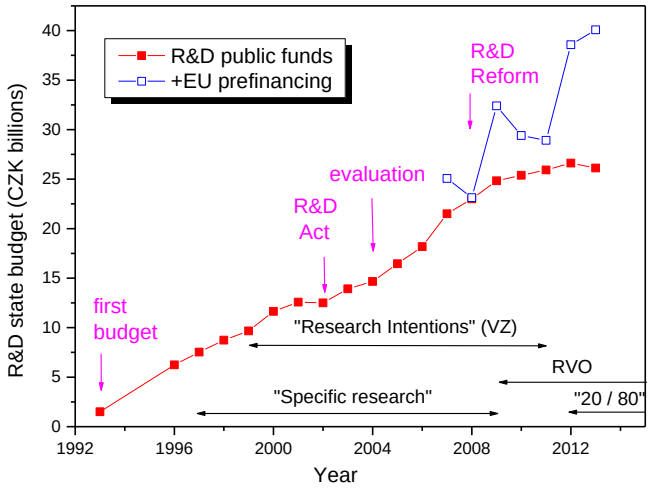

Fig.1. R&D State budget development and tools used for funding research institutions

Fig.1 shows the development of the R&D State budget during the last 20 years as well as the major tools used for institutional funding. There were several tools designed for funding research institutions such as “Research Intentions (VZ)” in the form of relatively large block grants that were awarded on a competitive basis. However, there was a little room for newcomers as well provided by the reallocation of funds depending on the research performance. The so called “Specific Research” was used to support university research conducted together with graduate and PhD students.

The most important change took place between 2009 and 2012. The Evaluation Methodology has been used as a new tool for budgeting. It defined acceptable categories of results of R&D activities (both basic and applied). Certain number of points was ascribed to these defined categories. This provided ranking to all research institutions according to the number of points, consequently giving a formula for institutional block grants (RVO) based on this evaluation. This system was since 2012 used to determine 20% of RVO, the remaining 80% was taken according to the medium-term plan of the State budget (the “20/80” rule). The most important changes introduced during the last 20 years are shown in Fig.1.

2. History of the evaluation

Under Governmental Resolution No. 644 of 23 June 2004, the Council was instructed to evaluate the results of research and development activities. The aim of the evaluation was to assess the effectiveness of R&D institutions and to evaluate all the results from a given institution in relation to overall expenditure from the state budget for the given institution during the period monitored. The evaluation takes place on a regular basis, the evaluation criteria

are known in advance and are binding, measurable, and ratable. An evaluation Methodology has been developed, which was approved by the Council. The output was the effectiveness of the research entities = the ratio of the point evaluation and the financing paid out from the state budget. Research institutions were divided into 4 groups – institutions whose results provided high (119), average (417), below average (166), or no (150) returns on the funds invested. A proposal to increase, maintain or reduce the level of state aid was submitted. The evaluation system was further developed over subsequent years. Since 2009, the Council ensures the preparation of the Methodology and submits it for approval to the Government of the CR. Only research institutions which can be beneficiaries of institutional support are included in the evaluation of the results. Results obtained over the past 5 years are evaluated, results that have already been evaluated in previous years are not reassessed. The individual result types have been defined, the criteria for their verifiability established and their point values set. National and international reference databases, including Thomson Reuters, Scopus, EPO, OHIM etc. are used. A list of Czech peer-reviewed journals which publish articles that are important for the national identity has been developed.

The evaluation takes place in 4 stages, including 1) listing of all results discarded from R&D&I because of their inconsistency in the data records, 2) an assessment of the professional level (meeting the definition of the type of result), 3) conflict resolutions and reactions to reports from submitting organization regarding discarded results, and 4) a final approval of the results of the evaluation by the Council. In the case of results which can be shown to include fundamental errors (false information), the proposed reduction in aid can be up to 100% (sanction). In 2012 sanctions amounting to 7 million EUR were applied (out of a total aid package of 330 million EUR). Three basic conditions, set out in the Methodology, are applied to the resultant evaluation:

- Adjustment of the ratio of institutional expenditures by Research institutions on basic (85%) and applied (15%) research, development and innovation (± 1.5%)
- Determination of institutional expenditures by Research institutions according to the proportion of disciplinary groups (with an adjustment up to ± 15 %)
- Determination of the ratio of institutional expenditures by Research institutions assigned by different groups of types of results – maximum increase of 1.5 times
- Based on these correction coefficients the source file for data from the 2010 evaluation is recalculated, i.e. the individual point values for all the results evaluated are adjusted and a final result is generated.

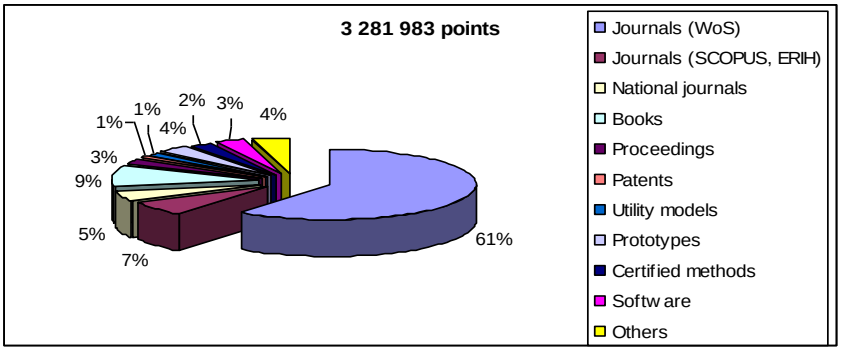

Fig.2. Distribution of points related to the results of Research institutions in 2012

The pie-chart in Fig.2 shows the distribution of points into categories in 2012. About 85% of total number of points related to research results declared by Research institutions correspond to publication results such as Journals, Books and Proceedings. About 15% correspond to non-publication results such as patents, utility models, prototypes, certified methods, software, etc. The majority of results of all Research institutions is published in scientific journals.

3. Strengths and weaknesses of the evaluation

The positive aspects of the overall process include an increase in the number of research activities. During the period 2000 – 2012 the share of total global production taken by Czech scientists increased by 117% and the relative

citation index in 2012 exceeded the global average by 7% (source Thomson Reuters). The overall increase of papers indexed on Web of Science for former Czechoslovakia and both states formed after its splitting, e.g. Czech Republic and Slovakia is shown in Fig. 3, indicating introduction of both R&D Act and the evaluation system.

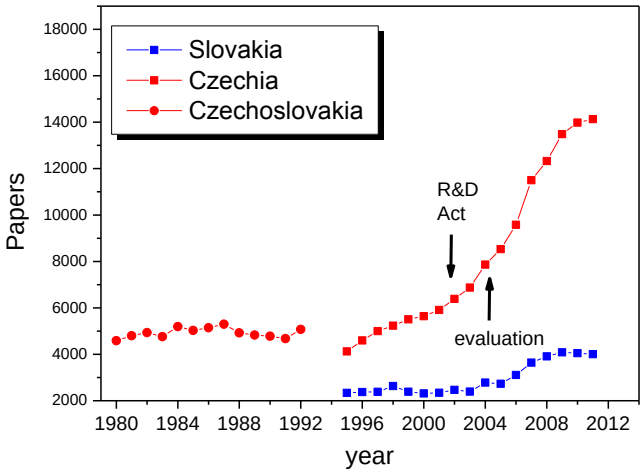

Fig.3. The number of papers published indexed on Web of Science in Czech Republic and Slovakia. Arrows indicate R&D Act and start of evaluation of Research institutions.

In fact the ranking of Research institutions based on this evaluation methodology changes little with time. The first place is held by the Faculty of Mathematics and Physics of Charles University, the second place belongs to the Institute of Physics of the Czech Acad. Sci., and the third one to for Faculty of Science of Charles University.

Weak elements were the indiscriminate evaluation of books, with no regard to their quality, and the induced production of "soft" results in applied research (patents, verified technology, functional model, medical procedure, maps etc.), which are not put into practical use and bring no financial benefit, but are created solely for artificial improvement of evaluation results.

It should be pointed out, however, that the evaluation methodology has been designed mainly for budgeting purposes. So it is suitable for allocation of institutional funds among budget chapters. It is less suitable for allocation of block grants among research institutions within budget chapters. It is not designed for the evaluation of research performance of individuals or small research groups. At the institutional level the evaluation methodology in some cases has been used to assess the research performance of individual researchers. This was probably the reason behind resulted in criticism from part of the research community [3].

4. The improved 2013 Methodology

The R&D Act requires that the Council distribute the institutional research funds according to the results achieved, which means that an evaluation must take place. Nevertheless, it is not so easy to evaluate scientific activities by bibliometry, i.e. counting journal impact factors, number of citations, etc. Detailed peer review may be biased in small countries and it is also quite expensive. Since 2012 there was an effort to modify current evaluation methodology that would reflect comments made by Council members, expert and advisory bodies of the Council, individual ministries, professional associations and research institutions, etc. The possible solution was a combination of bibliometric and peer-review approach. On June 19, 2013, the Government of the Czech Republic approved the improved 2013 Methodology for the period from 2013 to 2015.

The improved evaluation 2013 Methodology introduces peer-review of results in some areas such as the Social Sciences and Humanities. Research institutions select their best results to be peer-reviewed. Applied research is evaluated on the basis of patents and overall income obtained from competitive applied research projects. Proportion of publication results then slightly decreases from 85% to 82.5%. These concepts are incorporated into three parts of the improved evaluation methodology that are described below.

- Part I: Combines current system of evaluation of R&D results based on bibliometric indicators with peer-review. The bibliometric indicators such as impact factors of journals indexed e.g. by Web of Science are used in research fields where this is generally acceptable such as Chemistry, Physics, Biology or Medical Sciences. Peer-review plays more important role in the Social Sciences and Humanities where books or papers published in national journals are common. Every book or book chapter will be evaluated at least by two independent reviewers. Scopus database is newly included in the similar way within the evaluation system. There is a certain number of points assigned to research results categories as shown in Table 2 and 3. The research fields are defined as follows:
  Social Sciences and Humanities a, b and c, Technical Sciences and Informatics, Earth Sciences, Agricultural Sciences, Mathematics, Physics, Chemistry, Biological Sciences, Medical & Health Sciences.
  The number of points assigned to bibliometric indicators depends on type, categories and quality of research result. In some cases the number of points is assigned by evaluation panels. The point values are summarized in Table I.

Table 1. The number of points assigned to research results in 2014 and 2015

Result category			Soc. Sci. a, b[1)]	Other fields
Jimp	Paper indexed in Web of Science [2)]		10 – 305[3)]	
Jsc	Paper indexed in Scopus [4)]		10 – 305[4)]	
Jneimp	Paper indexed in ERIH	INT 1	30	12
		INT 2	20	11
		NAT	10	10
Jrec	Paper in listed national journal [5)]		10[7)]	0
B	Scientific Book		4 - 120[8)]	
D	Proceedings [6)]		8 - 60[6)]	

1) Social Sciences and Humanities in subcategories A and B

2) Papers published in journals indexed in the database Web of Science (WoS), Thomson Reuters: Science Citation Index Expanded (SCI-EXPANDED) – 1945 – present; Social Science Citation Index (SSCI) – 1980 – present; Arts & Humanities Citation Index (A&HCI) – 1980 – present; Index Chemicus (IC) – 1993 – present; Current Chemical Reactions (CCR-EXPANDED) – 1986 – present. If the impact factor of the journal is not available the paper will be counted with lowest impact factor Jimp

3) Evaluation Jimp = 10 + 295 × Factor, where: Factor = (1 - N) / (1 + (N / 0,057)), where N is a normalized position, N = (P - 1) / (Pmax - 1), P = position of the journal in a given field according to the Journal Citation Report in the descending list of IF. Pmax = is total number of journals in a given field according to the Journal Citation Report

4) Papers listed in database SCOPUS will be evaluated in the similar way as Jimp according to citation index SJR2.

5) The list of reviewed journals is available at www.vyzkum.cz.

6) Proceedings should be listed in SCOPUS as Book Series or Conference Proceedings or in Conference Proceedings Citation Index of Thomson Reuters (Proceedings Paper, Conference Paper or Conference Review with ISBN, or ISBN and ISSN

7) All the Jrec results will be verified by the evaluation panels

8) The number of points will be assigned by the evaluation panels

- Part II: This part of the evaluation system is focused on high-quality results. Awardees of European Research Council projects (ERC) will receive premium of extra 2000 points. Every research institution selects certain number of high-quality results obtained in any above mentioned research field. The number is derived from the overall institutional block grant allocated in the last year (every CZK 10 million corresponds to one selected result). These results will be peer-reviewed and compared for every institution. The top 20% will be selected from all fields and receive extra points. This part of the evaluation corresponds to 10% of overall points allocated.
- Part III: Evaluation of non-publication results will take place as follows. First the research results such as patents, plant varieties or breeds will be counted and corresponding point value assigned for each research

institution (100 points for an EPO, USA or JPN patent, 50 points for a licensed CZ patent, 25 points for a plant variety or breed). In the next step the remaining part of points allocated for non-publication results (17.5%) will be redistributed in proportion to the overall income from applied research projects (apart from investments) and industrial collaboration for a particular research institution: $\sum \text{Total} = \alpha \sum \text{Projects} + \beta \sum \text{Collaboration}$ ($\alpha = 0.9$; $\beta = 0.1$)

The relative proportion of the three parts of the improved evaluation methodology is shown in Fig.4.

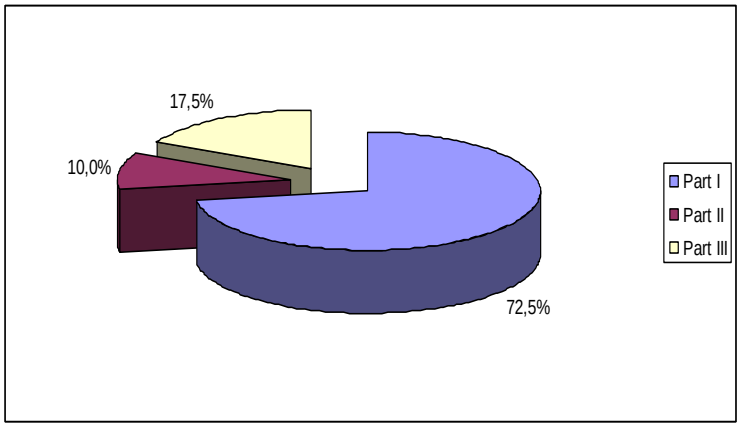

Fig. 4. The relative proportion of the three parts of the improved evaluation methodology

5. Technical and organizational support for the implementation processes

The important part of the improved 2013 Methodology is a system of Professional and expert panels. These panels, composed of both Czech and foreign experts, have been established for peer-review evaluations and to assess the quality of results. The result of the evaluation will be point scores, with a 75% share for all publication results, 10% for the quality of results and 15% for the results from applied research. The experience from the first year of implementation will be presented at the CRIS conference in May 2014.

6. Conclusions

The 2013 Methodology makes no claim to impose a definitive evaluation system. It has been designed as a solution for a transitional period. No major changes in the evaluation of research institutions are expected. Experience from previous years has shown that even when the method of evaluation changes, the ranking of major research institutions remains practically unchanged.

It is expected that a new methodology will be adopted after 2015, which will be the result of the Individual national project for tertiary education, research, development and innovation (IPn Metodika). Its aim is to make provision for prior experience and to deepen the disciplinary specificity (each group of scientific disciplines has its own characteristics). This approach was recommended[4] by the international audit of research, development and innovation in the Czech Republic carried out by Technopolis Group in 2011.

References

1. R&D Act (in Czech): http://www.vyzkum.cz/FrontClanek.aspx?idsekce=858
2. Statute of the Council: http://www.vyzkum.cz/FrontClanek.aspx?idsekce=10117
3. J. Konvalinka et al., Nature 460 (2009) 1079.
4. E. Arnold, Synthesis Report of The International Audit of Research, Development & Innovation in the Czech Republic, Technopolis Group (2011).