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Partial effectiveness of scientific projects financed through public funds

Introduction

There are two forms of funding science in the public sector - institutional funding and funding projects. The first mode consists in transferring grants to beneficiaries on the basis of performance indicators or based on negotiations, or direct selection of projects as well as programmes which are to be carried out. Second form - funding projects, consists in transferring grants to researchers or research teams in a limited size, budget and time, usually on the basis of submitted project proposal describing anticipated research activity in terms of competition. In contrary to institutional funding, funding projects gives organizations greater control. The current increase in financing projects at the cost of institutional financing is justified by the conviction that it results in increased return of produced knowledge as well as better adjustment of research to social and economic needs. [1]

The objective of the article is an analysis of tools used for monitoring of partial effectiveness in a scientific project. A fundamental hypothesis is the statement that on-going evaluation determines partial effectiveness of a research project. For the needs of the study, one will analyse selected evaluation tools, used by the National Centre for Research and Development at the stage of carrying out a research project.

1. Financing scientific projects through public funds

The word project comes from the Latin word *proiectus* "before an action". It is translated as presentation of description of solution for some tasks which will be performed in the future. According to the definition provided by Project Management Institute a project is temporary and its aim is to create a unique product [Stabryła 2006].

According to the definition of T.L. Young the term project a specific set of operations designed to accomplish a singular goal, managed in an organised way, it has a defined beginning and end in time, for obtaining specific results which fulfill needs of an

[1] MSHE, *Polityka naukowa, słownik encyklopedyczny*, Department of Innovation and Development, http://www.nauka.gov.pl/g2/oryginal/2015_02/75745082fb8845f570c6c60d435a5259.pdf [23.03.2017]

organisation arising from its on-going business plans as well as general concept of development [Drobniak 2005].

In the broad sense, a project is connected with base solution (innovation), constituting a product characterized by an innovative form and construction, which will enable completion of anticipated undertaking and the investment, operational and public task [Stabryła 2006]. According to another definition, a project is a network of actions with precisely defined beginning and end in time [Spinner 1992].

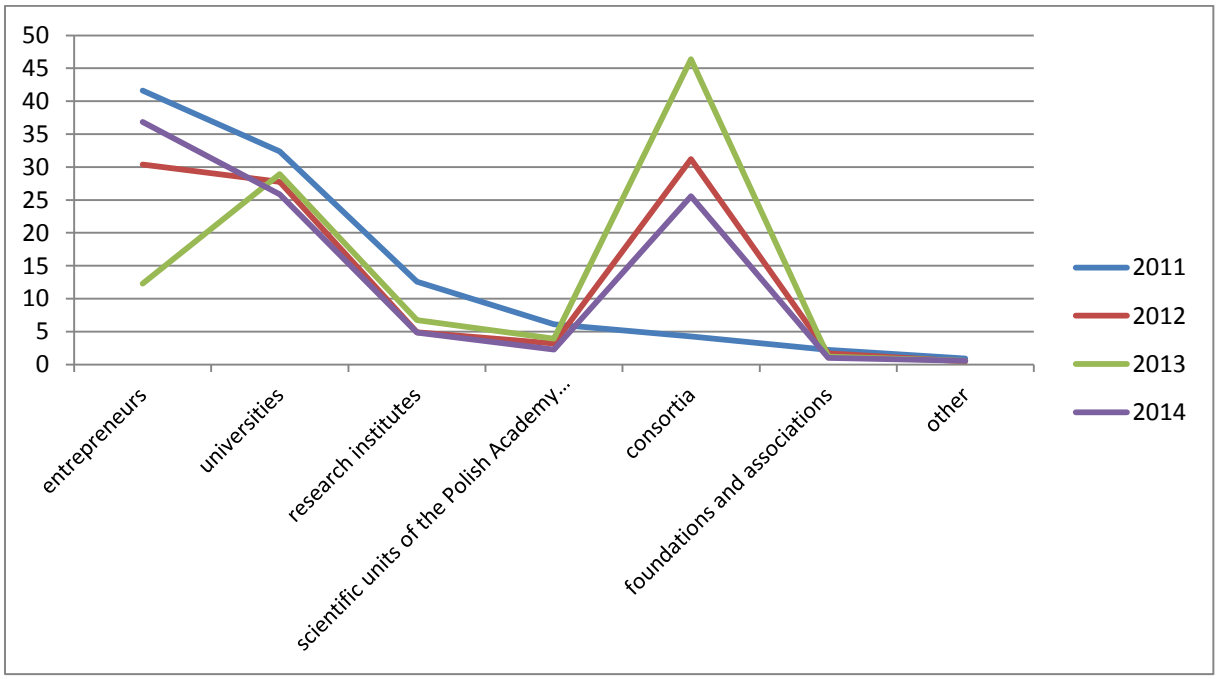
A project should serve the purpose of e.g. [Pereginus 1990] :

- providing essential infrastructure services, serving further development of an institution;
- an increase in value to the goods through producing or processing it into more valuable product,
- development f national natural resources.

According to the concept of M.D. Rosenau, a project is characterized by four features which distinguish it from the other anticipated and managed kinds of activity which include: three-dimensionally defined objectives, uniqueness, use of resources, implementation within an organization. Determination of three-dimensionally objectives refers to equivalent perception of the project results, the time schedule and budget. A project in its scope covers anticipated and deliberate use of financial resources as well as the ones materially combined with human engagement. G.D. Oberlander defined a project as activity undertakes to achieve specific results by its beneficiary [Gorlewski 2015].

A scientific project as an undertaking being the subject of a grant agreement between executive agencies (National Centre for Research and Development, National Science Centre) and a beneficiary, is a fundamental tool for financing science.

Figure 1 Share of scientific projects carried out by individual beneficiaries in total number of scientific projects implemented over period 2011-2014 (in %)

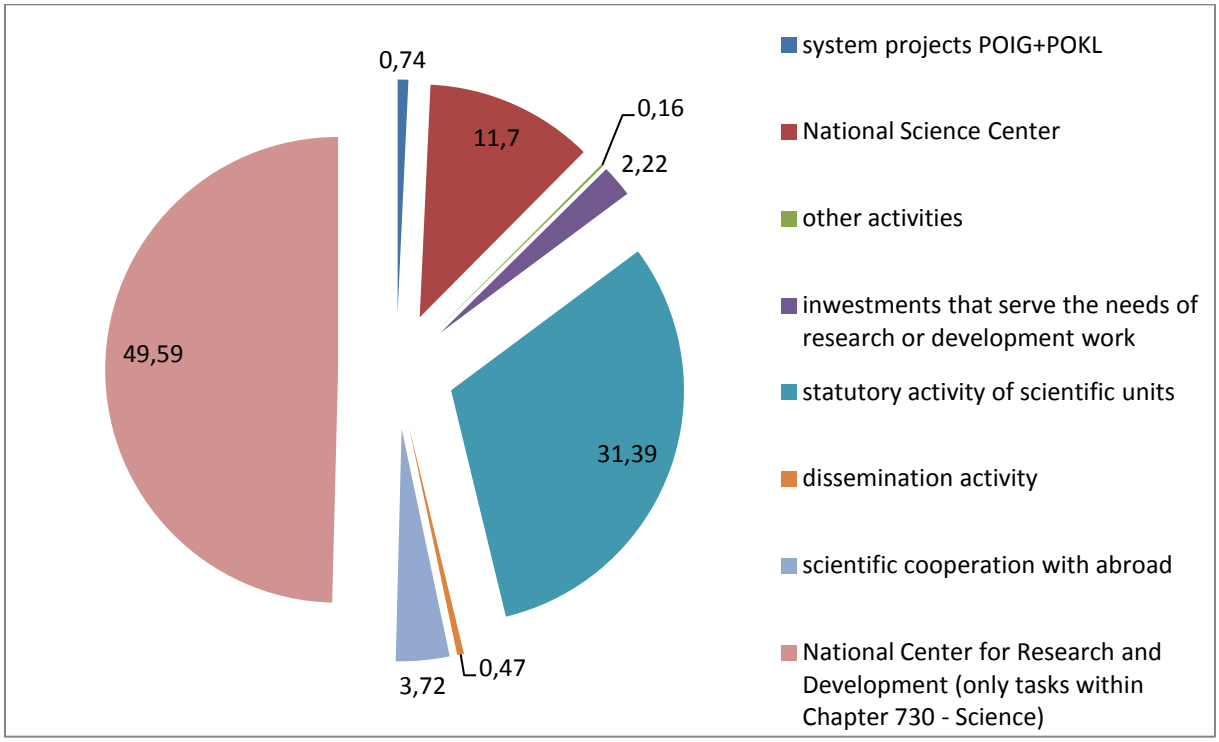


Source Own studies on the basis of activity of NCRD for 2014, Warsaw March 2015 p. 71

According to the data presented in Figure 1 it appears that in 2011 as well as 2014 entrepreneurs constituted the greatest group of beneficiaries of project financed by the National Centre for Research and Development, while over period 2012-2013 the greatest group were consortiums.

The resources alloted for financing science as one of categories of public tasks have been distinguished in the Budget Act in section 28 - “Science”. In the Figure 2 one presented the amount of budget resources spent in Section 730 in 2014 according to the tasks.

Figure 2 Budget expenses in Section 730 - Science in 2014 in division according to the tasks carried out (%)



Source Own studies on the basis of the report on operations of NCRD for 2014 Warsaw March 2015 p. 18

In 2014 expenses of the National Centre for Research and Development constituted the greatest group of budget expenses in Section 730 - approximately 50%. One spent 32% of resources for statutory activity of research units. The third largest category were expenses of the National Centre for Science.

2. On-going evaluation vs. partial effectiveness

In the source literature there are various approaches to interpretation of the effectiveness notion [Puczkowski 2014]:

- **in economic perspective** - a relation between results and expenditures expressed through basic measures such as: productivity, efficiency, profitability,
- **in target perspective** - evaluation of the degree to which the organisational objectives were attained, taking into account the economic perspective,
- **in system perspective** - evaluation of the use of organisational expenditures as well as creation of specific relations with environment,
- **in comprehensive perspective** - a capability of organisation to reach its operational objectives.

The term effectiveness has various meaning which results in emphasizing the necessity for defining its subject in the literature in the scope of analyses on effectiveness. The ambiguity of the notion of effectiveness was stressed by Zbigniew Kowalski who stated that one could not to ascribe explicit empirical content. Every single time a method of defining effectiveness is dependent on the context of analysis or additional comment, e.g. effectiveness of substitution, effectiveness of investment. One may notice a similar view in studies of another authors - Ernest Pasour claimed that the notion of effectiveness was always subjective as well as it should have been measured and defined in relation to a determined objective of an analysis.[2]

Jan Zieleniewski in deliberation on effectiveness of scientific research emphasizes that it may constitute a subject of an analysis in the scope of intended and on-going scientific activity: "Which we can have influence on as well as which is determined as ex ante view" [Zieleniewski 1966]. One may perceive every action as consisting of partial actions in relation to which Jan Zieleniewski distinguishes the following forms of effectiveness:

- general integral - integral due to costs and results,
- relative integral - partial due to results but integral due to costs.
- general partial - general due to results, partial due to costs,
- relative partial- partial due to both results and costs.

For the purpose of the analysis, one adopted the above form of effectiveness - relative partial.

The notion of evaluation means "assessment of value". In the practice of Polish administration in the middle 1990s, this term was defines as 'assessment". However evaluation is the process which constitutes one component of assessment. As Stern notices it is also the field of knowledge combining applied science and practice of public policies. [Olejniczak 2008]. In practice of international organizations and institutions of the public sector, evaluation is defined through its practical objective - improvement of the quality of public interventions. [3] For successful evaluation it is fundamental to determine precise and logically cohesive the object and subject of evaluation, key questions for which one is looking for answers as well as criteria which will be used during the evaluation of its subject.[4] A fundamental function of evaluation is correcting possible disturbances which may appear in the course of carrying out tasks.

[2] E. Szymańska, *Efektywność przedsiębiorstw, definiowanie i pomiar.* *http*://www.wne.sggw.pl/czasopisma/pdf/RNR_2010_T97_z2_s152.pdf [1.04.2017]
[3] ibid., p. 20
[4] PTE evaluation standards- http://pte.org.pl/standardy-ewaluacji-pte/ [21.08.2017]

On-going evaluation is characterized by the following features: [5]

- Is its carried out in the middle of implementation of intervention,
- The products and results reached at this stage of analysis are analysed,
- It conducts the first assessment of quality of completion of a project/programme,
- It assesses premises made at the programming stage (objectives, rates),
- It evaluates the context of implementation of a project,
- May contribute to some modifications in implementation of interventions as well as updating the adopted assumptions.

Based on the above mentioned features of the on-going evaluation, one may state that there is a relationship between the on-going evaluation and assessment of partial effectiveness of a project. Performance of the on-going evaluation provides information on reached product's rates.

3. Monitoring partial effectiveness tools used by the National Centre for Research and Development

Within on of the field of activity conducted by the National Centre for Research and Development, scientific research serving practical implementations are used. This field has been divided into six actions which have been presented in Chart 1. For the purposes of an analysis of on-going evaluation, one has chosen the STRATEGMED programme which has been classified to the first action introduced in Chart 1 - financing applied research. The main objective of the STRATEGMED programme is obtaining fundamental development in the scope of elimination of diseases of affluence and regenerative medicine on the basis of scientific research results and developmental works carried out in four fields: cardiology and heart surgery, oncology, neurology and senses, regenerative medicine[6]

[5] http://pte.org.pl/o-ewaluacji/ [21.08.2017]
[6] http://www.ncbr.gov.pl/programy-strategiczne/profilaktyka-i-leczenie-chorob-cywilizacyjnych---strategmed/ [24.08.2017]

Chart 1 Financing an action taken within the field of scientific research serving the practical use in 2015

Item no.	Name of action	2015 scheme (Thousand PLN)	Performance in 2015 (thousand PLN)
1	Financing applied research	663,181	660,904
2	Financing R+D research and commercialization of their results in subjects which have a capability of application of their results in practice	1,632,619	1,178358
3	The development of R+D staff competences and increase in awareness of a role of science in economic development	26 948	24 139
4	R+D support in the scope of the national defence	348,737	346,953
5	Financing the "Improvement of the working and safety conditions"multiannual programme - Stage 3	10,500	10,500
6	Support creation of common infrastructure of research units	1,850,252	1,748,471

Own studies on the basis of the report on operations of NCRD for 2015 Warsaw March 2016 p. 102-126

3. 1 Partial effectiveness in relation to the NCRD programmes

Cohesion and effectiveness are the most important criteria in evaluation of the NCRD programmes. The first criterion is examined in internal aspect as the evaluation of a programme in the scope of transparency, clarity of a concept as well as functionality of the proposed solutions, as well as in the external one as the evaluation of premises of the programme in relation to objectives of national scientific policy and innovative policy determined, inter alia, in the National Research porgramme. The second criterion - effectiveness concerns a possibility of reaching objectives of a programme, assessment of its qualifications and proposed rates system. [7]

Within the first action defined within the field of scientific research serving for practical use - financing applied research, NCRD described the main objective as an increase of intensity of the research used for the purpose of economic sector. One has also defined the main rate of the first action in a form of the number of enterprises carrying out projects in the scope of applied research in cooperation with research units. The anticipated value of rate at the end of 2015 was 380, while performance was 502. Higher performance was caused by

[7] http://archiwum.opolskie.pl/docs/9._prof._kurzydlowski_x_n.pdf [24.08.2017]

redeployments in timetable for the implementation of the project. As well as higher, compared to the assessed value, number of enterprises which participated in new projects.
Financing applied research was accomplished in 2015 through:[8]

- Preparation of contest documentation,
- Announcing the competition,
- The call for applications,
- Evaluation and selection of applications to be covered with financing,
- Concluding agreements with development contractors,
- Supervision over carrying out and financing projects,
- Settlement of projects,
- ex-ante, on-going, mid-term, ex post.

Within the resources alloted to service, supervision, dissemination of information on announced competitions as well as popularization of effects of the performed actions within applied research as well as evaluation, one spent in 2015 the amount of 14.272 PLN. [9]

3.2 Partial effectiveness in relation to beneficiaries of resources

A fundamental project document which includes obligatory guidelines in the scope of on-going evaluation is the financing agreement between beneficiaries of resources and the National Centre for Research and Development. In accordance with its content, for the purpose of evaluation of the project within the period of its realization, a beneficiary is obliged to cooperate with the Centre or an entity authorized by the Centre as well as to provide information concerning the implemented project, particularly to submit information about economic effects and other benefits occurred as a result of its implementation.[10]

Within the period of implementation of the project the Contractor is obliged to submit to NCRD annual reports whose assessment is particularly to determine whether:[11]
1) implementation of the project is in line with the agreement,
2) continuation of implementation of the project leads to reaching the expected results and objectives.

[8]The activity report of NCRD for 2015, NCRD June 2016 p. 102-106
[9]The activity report of NCRD for 2015, NCRD June 2016 p. 102-106
[10]http://www.ncbr.gov.pl/gfx/ncbir/userfiles/_public/programy_strategiczne/strategmed/ii_konkurs/wzor_umowy_strategmed_iikonkurs.pdf [23.08.2017]
[11] Ibid.

In the event basic, industrial research or development works results indicate lack of possibilities for reaching project objectives, the contractor is obliged to inform NCRD on this fact immediately along with an application for ceasing continuation of the project. [12]

Chart 2 Selected product rates within STRATEGMED programme

In 2015

Rates	Target value	The value planned In 2015	Reached value In 2015
Number of publications concerning the R+D works of the programme whose authors are members of research teams in periodicals included in Science Citation Index.	200	15	6
Number of new research teams formed for implementation of projects within the programme	40	9	56
Number of the patent applications in PCT and EPO mode	50	1	3

Source Own studies developed on the basis of The activity report of NCRD for 2015, NCRD June 2016 p. 102-106

In chart 2 one presented demonstration product rates reported at the stage of implementation of the project in the annual report by a beneficiary. In case of occurrence of deviations from the planned value, it is necessary to explain their causes.

The scientific project is implemented according to the schedule and activity-based budget - every research task has distinguished budget as well as the scope of substantive works to perform. In partial settlement reports (annual), the beneficiary of a scientific project is obliged to indicate the level of performed works based on rates which are defined at planning stage in the application for grant. The indicated mechanism of evaluation of the on-going project in material and costs scope allows for an analysis of partial effectiveness of a scientific project.

[12] Ibid.

Conclusion

The National Centre for Research and Development performs on-going evaluation at two levels - the first one concerns directly the beneficiaries in the scope of assessment of advancement of works as well as incurred costs. The second level is characterized by holistic assessment of effectiveness of all programmes implemented by the National Centre for Research and Development. At both first and second level within the sector programmes, the Centre adopts indicators for a product are adopted which are usually determined in periodic reports.

Effectiveness is one of the criteria of effectiveness. In this aspect, effectiveness focuses on an analysis of relationship between expenditures, costs, resources (human, financial, administrative) and effects achieved. On-going evaluation of a project allows to make an analysis of partial effectiveness. Within one of the NCRD programmes - STRATEGMED, one has clearly defined product indicators, while indicating the planned annual and target value.

The on-going evaluation result allows to assess a risk related to non-using the conceptual design. Therefore, monitoring of partial effectiveness of a scientific project constitutes some kind of protection against a risk of recovery of financing due to lack of implementation in whole the operational objectives.

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