FET_TRACES

Tracing impacts of the FET programme

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Deliverable D 2: How do other FET-like funders measure impact and what can be learned?

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About FET_TRACES

FET_TRACES is a research project for the European Commission which analyses and measures the impacts of the research funding scheme “Future and Emerging Technologies Open” (FET Open and FET Proactive). Within the European research funding landscape, the FET scheme acts as a pathfinder for new ideas and themes for long-term research in the area of information and communication technologies and beyond. Its mission is to promote high risk research, offset by potential breakthrough with high technological or societal impact (see http://cordis.europa.eu/fp7/ict/fet-open/home_en.html).

In the FET_TRACES project we will investigate and measure direct and indirect impacts of these two schemes on the science and technology landscape and its perception by individual researchers who are potential proposers for FET Open and FET Proactive projects. Results from innovation research will be used to develop a targeted indicator set covering central aspects of the FET mission (novelty, trans-disciplinarity, innovation-ecosystem). For the data collection we use sophisticated impact assessment methods like bibliometrics, patent analysis and online surveys. In addition to the impact assessment we will analyze selected breakthrough-projects to find out about necessary components for “breakthrough”-research. The study will also include insights from FET-like funders on national levels in Europe.

Terms of use

This document was developed within the FET_TRACES project (see www.fet-traces.eu), funded by the European Commission within Horizon 2020, by a consortium consisting of two partners, the Fraunhofer ISI in Karlsruhe, Germany (coordinator) and AIT in Vienna, Austria.

Document history

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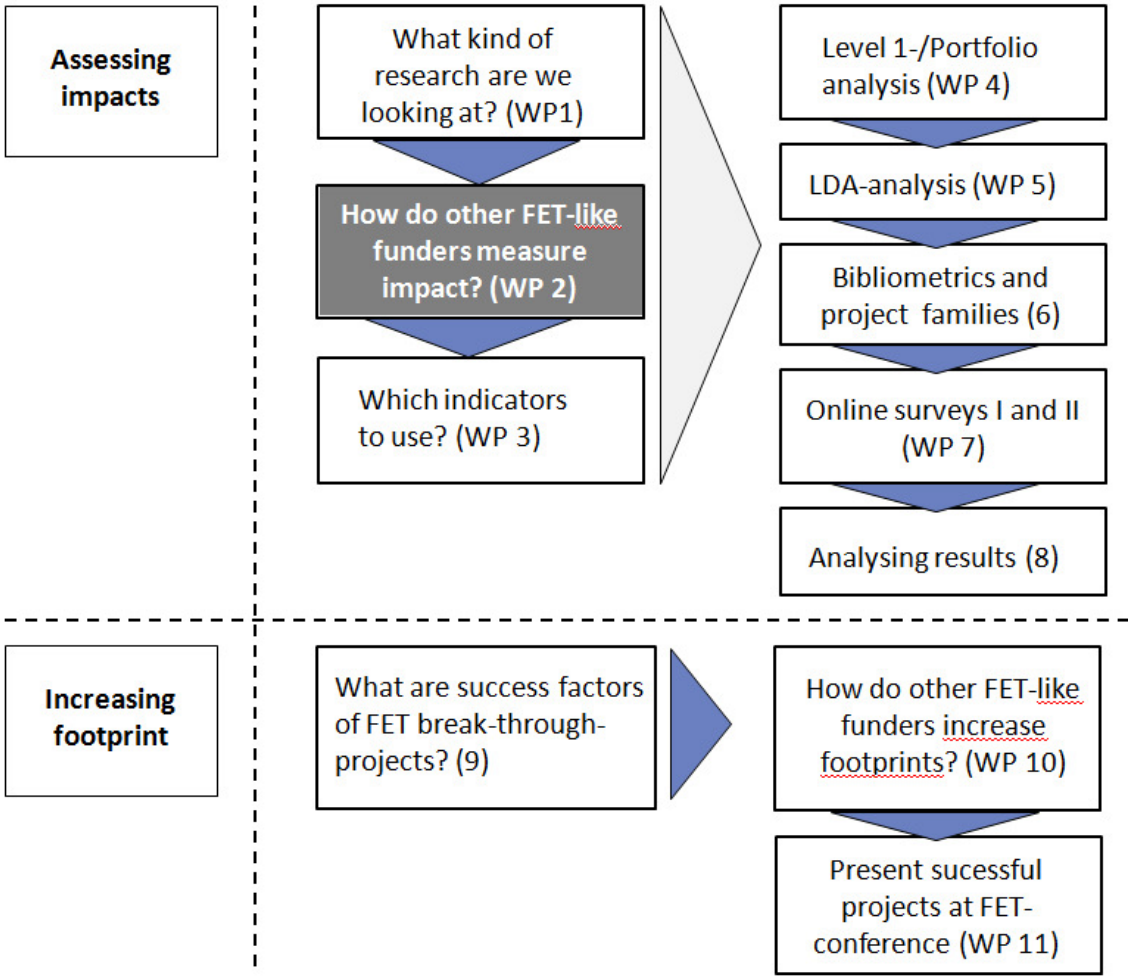
1.0	July 18, 2016	

Contents

Background

Objectives	Location	Output
Contact FET-like funders on national levels in Europe and find out about their approaches to measure the impacts of their programmes.	WP 2	Analysis and suggestions of FET-like funders feeding into the development of our indicator set.



1 Introduction

Whereas theoretical and conceptual insights concerning Future and Emerging Technologies were gathered to guide our impact assessment in WP1, in this WP we will look at existing impact assessments of other research programmes which are comparable to FET Open and FET Proactive.

In a first step we have identified 11 European research programmes which appear comparable to the FET scheme of the European Commission. The selection was based on the analysis in the project "Boosting the exploratory power of open research in Future and Emerging Technologies (FET)" (2010-2012) which Fraunhofer ISI, AIT and TNO have carried out on behalf of the FET Unit of the European Commission. In this project, 19 international research programmes have been analyzed in so-called minicases.[1] From this list, the following European research programmes were selected for a further examination:

Country	**Name of the programme**
Germany	Reinhart Koselleck projects within the German Research Foundation (DFG)
Denmark	Centres of Excellence of the Danish National Research Foundation (DNRF)
Finland	Centres of Excellence of the Academy of Finland
Sweden	The Strategic Research Area (SRA) funding scheme
United Kingdom	IDEAS Factory by the Engineering and Physical Sciences Research Council (EPSRC)
The Netherlands	Free Competition (Vrije Competitie) by the Dutch Organisation for Scientific Research (NWO)
France	"Blanc" and "Blanc International"programmes of the Agence Nationale de la Recherche (ANR)
Austria	Austrian Science Fund FWF
Switzerland	Swiss National Science foundation (SNSF)

[1] See Part B: The minicases of the final report of the study "Boosting the exploratory power of open research in Future and Emerging Technologies (FET)", March 2012, SMART 2010/0055, www.isi.fraunhofer.de/isi-de/t/projekte/bb-fet_open.php.

Slovenia	Slovenian Research Agency (ARRS)
Scandinavia	Top-level research initiative

We decided to focus on European programmes because of practical reasons: One results of the analysis shall be that we get in contact with one expert of each of these programmes and invite this person to our workshop where we will discuss impact assessment practices and strategies to attract the best researchers in WP10.

In the second step we have analysed these national research funding programmes according to the following lead questions:

- Which kind of impact assessments do they carry out? (self-assessments by funded researchers or external assessments, annual or sporadic, publicly available results or results only internally available,
- What impact dimensions are covered? Which methods are used?
- Which concrete indicators are used for the impact assessments (number of publications, citation rates, prizes won by funded researchers, follow-up-funding acquired by funded researcher, patent applications, etc.)

The purpose of this examination was to inform our own indicator building, which has been going on in parallel in WP 3.

The following analysis of the national programmes is structured in the following way: First we provide a short description of the programme, second we document whether or not a structured evaluation of the programme takes place and if yes, we list the respective documents. Third, we describe the relevant success indicators used in the impact assessments and fourth we name the persons contacted via mail or by telephone.

Finally, where ever available, we point to the source containing names of researchers being awarded projects or grants from the respective programmes. These persons are candidates for the control group survey which we will carry out in WP7. We suppose that these researchers are potential proposers to FET but have not done this. Instead they have asked their national research agencies for funding. We will ask them whether or not they know of funding opportunities at the European level and if they do, what reasons they had for not applying for a FET-project.

2 Country analysis

2.1 Germany: Reinhart Koselleck projects within the German Research Foundation (DFG)

Short description

To prove its openness for new and innovative approaches and research topics (DFG 2014), the German Research Foundation DFG (Deutsche Forschungs Gemeinschaft) introduced the so called Reinhart Koselleck programme in 2008 (Lübbert 2006, p 18f). "With our Reinhart Koselleck project funding we aim to promote outstanding researchers who have adventurous ideas and are willing to undertake higher-risk research," said Prof. Matthias Kleiner, President of the DFG, at a Committee session in 2009 (see DFG 2009).

Proposals for a Reinhard Koselleck project requires only a five-page project outline. By this, DFG acknowledges that it is usually more difficult to plan especially innovative and high-risk research than is the case for "normal" research work. In addition to the ambitious project ideas, the applicants' proven track records play a crucial role in the review process. "We are after the bold idea, and individuals who are able to realise them. The high-risk character of the research can be in the bold idea, the original hypothesis or in a new or newly applied method", said president Kleiner (Finetti 2008).

Eligible for Reinhart Koselleck projects are researchers who hold or are eligible to hold professorships, especially at universities, and who have an outstanding scientific biography and great scientific potential. A central requirement for the proposal is that it is "exceptionally innovative or higher-risk (...) that cannot be funded within the scope of other DFG programmes or within the framework of the applicant's own institution" (DFG Website describing the programme at www.dfg.de/en/research_funding/programmes/individual/reinhart_koselleck_projects/in_brief/index.html).

Applicants can request funding from € 0.5 to 1.25 million, for five years. There are no submission deadlines.

The Reinhard Kosseleck projects are part of the DFG's larger effort to update its funding instruments and make them more flexible. "This is an on-going task for us. We want to support excellent researchers during each stage of their career, as well as redesign our processes to minimise the time they have to spend on administrative matters", said DFG President Kleiner (see DFG 2009).

Thematically, the Koselleck Projects cover the whole range of disciplines and research fields covered by the DFG. Koselleck Projects were granted in the following areas:

- Social-psychology (models for decision making),
- Psychology and brain research,
- Brain research (auditive orientation)
- Material sciences ,
- Chemistry (mechanochemistry),
- Molecular medicine (cancer research),
- Quantum physics, and
- Nanotechnology (see Finetti 2008 and DFG 2009)

Unit May 2016, altogether 71 projects were granted.

It has been noted that the researchers awarded Koselleck Projects were all in their mid 40ies, which of course has to do with the track-record being the central criterion for selection. For younger researchers, there are different programmes within DFG (for example the "Graduiertenkollegs" in which Ph.D.-projects are financed). However, there are exceptions which are cited by DFG´s Koselleck representatives as an indication that also young people might already have impressive track records. One of these examples is Prof. Triantafyllos Chavakis from the Medical Department of the Technical University of Dresden. He had finished his Dr. med in 2001 and was awarded a Koselleck Project in December 2010, his "scientific age at the time of the award thus was comparatively young", concludes Sarah Holthausen, who is in charge of the Koselleck Projects at DFG (Holthausen 2011).

Evaluation reports

An evaluation or impact assessment of the Koselleck-programme has not been carried out sofar. An ex-post evaluation is done for each individual projects after the end of the project in the context of an external evaluation. Also, project extensions are being assessed by external reviews (e-mail communication with Sarah Holthausen, May 2016) .

For its other programmes, DFG runs a continuous evaluation process which deals with the outcomes and effects of its supported research projects. Here different topics are covered, like:

- Evaluation in National Research Funding Agencies: Approaches, experiences and case studies (2009)
- Study: Evaluation of the DFG's SFB/Transregional Collaborative Research Centre Funding Programme (2009)

- Study: "Evaluation of the Excellence Initiative" (2008) (source: www.dfg.de/en/dfg_profile/evaluation_statistics/programme_evaluation/studies/ index.html)
- Study: New Modes of Training – Different Careers? (2009)
- Study: Early-Career Researchers in DFG-Funded Projects (2009)
- Female Scientists in the DFG 2005 to 2008 (2010)

Success indicators

As there is currently no systematic impact assessment of Reinhard Koselleck-programme, no specific success indicators can be named.

2.2 Denmark: Centres of Excellence of the Danish National Research Foundation (DNRF)

Short description

The vision of the Danish National Research Foundation (DNRF) is to “support frontier research that is potentially groundbreaking and may change the state of the art within its field.” (Danish Agency for Science, Technology and Innovation 2013, p.19). To achieve this objective, the DNRF aims at identifying and funding outstanding researchers with ideas that have the potential for scientific breakthroughs. The Centres of Excellence (CoE) scheme is the main funding instrument of the DNRF.

According to the 2013 evaluation report of the Danish National Research Organisation (Danish Agency for Science, Technology and Innovation 2013, p.19ff), “a Centre of Excellence aims at building a creative research environment and strengthening the exchange of ideas across generations and areas. Many CoEs combine a number of different research fields or disciplines, searching for new insights in the gaps between the traditional disciplines or within emerging areas. In this way, CoEs want to provide excellent training environments for the next generation of researchers. The CoEs try to attract young and talented PhD students and top researchers from Denmark and abroad, and to serve as role models and as inspiration for national and international colleagues. The DNRF intends the CoE programme to remain its main funding mechanism and will continuously monitor, develop, and optimize the programme.

CoEs can be established within and across all research areas. The majority of the CoEs lie in the fields of the natural sciences and the life sciences (…). However, the vast majority of the CoEs can be described as cross-disciplinary and, therefore, does not readily fit into the usual categories such as humanities, social sciences, natural sciences, life sciences, and engineering sciences.

The DNRF states that in the selection of new CoEs it is willing to take risks since in order to achieve cutting-edge and surprising discoveries, researchers and funding agencies alike must venture into novel ways of thinking about the scientific approach and method. The quality and potential of a proposed research idea are the criteria that the DNRF emphasises most in its selection processes. The DNRF also believes that the proposed centre leader is of crucial importance to a centre's success. His or her scientific merits and ability to lead and assemble a team of colleagues with the most relevant competences and profiles are essential. Finally, the envisioned structure of the proposed centre and the nurturing environment in which it is placed play an important role in the selection of new CoEs.

CoEs are seen as individual units or entities with their own distinct identities, but they are established at and co-funded by existing research organisations (primarily universities), where they interact closely with the surroundings. The four biggest universities in Denmark host more than 90% of the CoEs (…). The University of Copenhagen and Aarhus University have been particularly successful in obtaining CoE grants. The CoEs play an important role at the host institutions through participation in teaching, training of PhD students and the ability to attract and recruit top researchers and talents from around the world. The CoEs are supposed to have a catalytic effect on their surroundings, and serve as a role model for the host institutions. (…)

So far, the DNRF has established 88 CoEs with a total amount of 5.4 billion DKK. Of these, 43 are receiving funding from the DNRF, as of April, 2013. CoEs are established in so-called application rounds or competitions. The first application round was in 1992/93. The latest round was the 7th round in 2010/11, when eleven new CoEs were established. An 8th application round has been announced, and a call for proposals was launched in June and remained open until November 25, 2013. The new CoEs from this round will be up and running from January 1, 2015. The next call for new CoEs – the last one under the current financial framework – will be announced in mid-2015.

Calls for new CoEs are announced approximately every two-and-a-half years, and they involve a two-stage application process. In the first stage, prospective centre leaders are invited to submit short outline proposals. In previous application rounds, the DNRF has received between 140 – 200 proposals. All board members assess all proposals prior to

the meeting by employing an A – C scoring system with an additional P-score (for Potential) having been added in the 7th application round in order to maintain a focus on proposals that can potentially deliver transformative or groundbreaking results, even though the proposed endeavour may be considered a high risk. Each proposal is discussed at the meeting, and the board formulates a reason for each rejected proposal to be communicated to the applicant.

In the second stage, selected applicants submit full proposals. Each full proposal is sent to three high-level international experts within the relevant scientific area(s) for external peer review. Both the applicant and the reviewers are aware of each other's identity. Prior to the final selection, the DNRF board conducts a short interview with each applicant (proposed centre leader).

All applications compete against each other, there is no up-front allocation of the budget to specific areas or disciplines. The overall success rate from submission of outline proposals to establishment of a centre has been 6% in the previous application rounds. 13 – 20% of the outline proposals have moved on from the outline stage one to stage two and about 30 – 40% of those applications have resulted in new CoEs.

Until 2009, CoEs were established for a five-year period with the possibility of an additional five years, provided the centre received a favourable midterm evaluation. Starting with the 7th round of applications (2011), the DNRF decided to change this time structure by extending the first period to six years while maintaining 10 years as the maximum length of a centre's grant. By providing more time in the first period, the DNRF hopes to encourage the CoEs to venture into truly novel and scientifically daring projects that might lead to groundbreaking results.

In the last application round, the average grant for a six-year period amounted to 53 million DKK. However, grant sizes vary considerably within the same application round, depending on the centre's mission and structure. The grants are very flexible, and the DNRF puts a large degree of trust in the centre leader's ability to spend the money best. The centre leaders are charged with fulfilling the research plan. They make decisions on how to spend the funds and are responsible for following the centre budget and for meeting any financial obligations vis-à-vis the host institution. (…) The DNRF provides funds for the CoEs to hire an administrator or coordinator to assist and relieve the centre leader of some of the administrative and coordination burdens.

Evaluation reports

The latest evaluation of DNRF projects is the 2013 evaluation already mentioned (Danish Agency for Science, Technology and Innovation 2013, p.16) which uses results from a bibliometric impact assessment carried out by Schneider and Costas (Schneider; Costas 2013).

Success indicators

The main focus of the analysis of Schneider and Costas was the proportion of highly cited publications, assuming that they can be linked to excellence in research. The follow g sections report details of the impact assessment as it was summarized in the evaluation report (Danish Agency for Science, Technology and Innovation 2013, p.29-32):

In order to provide national and international context for the indicators calculated for the CoE publications, two sets of benchmark units were used for comparison: 1) the CoE's contribution to the national performance of Denmark; 2) 10 European and American universities specifically chosen among the top-performing strata in different fields of the Leiden Ranking. It should be noted, however, that only publications published in journals indexed by the citation database Web of Science were analysed. CoEs with poor publication coverage in the Web of Science, such as CoEs working in the field of the humanities or computer science, or CoEs that have been funded after 2009/10 are excluded from the analysis. Altogether 66 CoEs were included. Furthermore, assigning publications to funding organisations is problematic. This is especially true for the CoEs which have a high proportion of external funding in addition to the DNRF grant. Hence, when counting papers there is a tendency to overemphasise the relative contribution of the CoE's core funding.

Citation rates

Despite of these caveats, the analysis supports the conclusion that with respect to highly cited publications, the DNRF CoEs perform at a very high level, comparable to the highest-performing universities in Europe, and often better. It can also be concluded that given the relative size of the CoEs, the DNRF-publications contribute notably to the overall Danish impact. More than 20% of the DNRF-publications qualify as highly cited, i.e. among the 10% most cited publications in the database (compared to 14.6% of all Danish publications). For the whole period analysed (1993 – 2011), DNRF-publications consti-

tute about 7% of the Danish publications, and they accumulate 10% of all Danish citations (…). Comparing the performance to the benchmark universities, the DNRF is ranked in the middle, below the U.S. universities but well above European universities (…)

An analysis was also carried out with respect to 'high-prestige' journals, which were defined as those journals that have published 30% or more of the top 10% of highly cited publications in their fields in a given year. For the whole period combined, the DNRF-publications have the largest share of publications in 'high-prestige'-journals compared to the European benchmark universities; again U.S. universities are above (…)

There are annual fluctuations and marked variations in performance between fields and subfields and between individual CoEs. But the DNRF-publication set always performs above the international level and for all fields except the social and behavioural sciences well above the national Danish level.

The long funding periods of the CoEs and the large degree of freedom the centre leaders enjoy in setting up their research agenda are supposed to encourage novel ways of thinking in order to achieve scientific breakthroughs and surprising discoveries. The success of this approach shows up in the respective bibliometric data: the analysis shows that the performance in top-end publications like Science and Nature is particularly good; here the CoEs perform at the same level as the highest-ranking universities in the world, equal to MIT and Stanford University, and even slightly above Harvard University.

Evaluating breakthrough research

A supplementary analysis tried to identify potential 'breakthrough' papers coming from a CoE. A breakthrough-paper is defined as a highly cited paper, with an important spread over its own field and also other fields of science which is not a mere follower of other highly cited publications but that has a genuine relevance on its own. The analysis used three distinct 'breakthrough' detection-approaches with different degrees of restriction. In all three approaches, there is an overrepresentation of breakthrough-papers from the set of DNRF-supported publications in relation to the total number of DNRF-supported publications. However, these papers are associated with few CoEs, and for many CoEs, only one or no such paper was detected depending on the restrictedness of the approach. Most of the breakthrough-papers can be categorized as research in bioinformatics and nanoscience and, in the least restrictive approach, also in epidemiological research, catalysis, metal structures and sensory-motor research. The three clearly high-

est ranked CoEs in the impact analysis are also the three most prominent in this breakthrough analysis. In that respect, the breakthrough analysis substantiates the main findings (Schneider; Costas 2013, p. 80-93).

Prizes and awards

Prizes, awards and grants can be seen as another indication of the quality of research. This is particularly true for ERC grants, which are awarded following a highly competitive application, a thorough assessment, and a tough selection process. As to April 2013, Denmark has received a total of 40 starting grants, 10 of which have been awarded to researchers associated with DNRF CoEs. 34 Danish researchers have been awarded prestigious ERC advanced grants. Nineteen (i.e., 56%) of these grant holders received their ERC advanced grant after they became affiliated with a DNRF Centre of Excellence. An additional two ERC advanced grants are held by two DNRF grantees of the Danish-Chinese CoEs.

Winning of Co-financing

Apart from ERC-grants, many CoEs have successfully attracted substantial third-party funding from other sources. This includes funding from the Independent Research Council (mainly for postdocs affiliated with the CoEs) and the Strategic Research Council or the Advanced Technology Foundation. Private foundations also frequently support individual centre members as well as research projects within the CoEs. Many CoEs are successful in obtaining EU and other international grants. Having successfully applied for and run a CoE seems to be a good starting point for acquiring EU grants. The prestige and quality associated with being awarded the status of a Centre of Excellence also seems to be an important factor in attracting additional funding. It should be noted, however, that the ability to attract external funding varies across disciplines. In 2011, the external funding to CoE's within natural sciences, life sciences, and the engineering sciences double the total funding available as compared to the grant received from the DNRF. Within humanities and social sciences external funding equals approximately 50% of the funds they receive from DNRF."

Performance indicators for Denmark as a whole

On a more general level, the 2013 evaluation report lists the indicators and results which show Denmark´s research and innovation performance: "The Danish research system

has recently been subject to a number of examinations. For example, the Royal Swedish Academy of Sciences' report 'Fostering Breakthrough Research' (Öquist; Benner 2012) provides a comparative study between Sweden, Finland, The Netherlands, Switzerland, and Denmark. In terms of high-impact research, Denmark comes out very well in the analysis.

This is consistent with Denmark being placed among a group of four innovation leader countries and ranked as number 3 on the Innovation Union Scoreboard 2013 by the European Union.

The Research Barometer 2012, published by the Danish Ministry of Science, Innovation and Higher Education, presents a broad range of indicators which, together, create an overview of the quality and range of Danish research. With respect to the impact of publications, Denmark ranks third out of 38 countries in terms of citations per publications.

The performance of the Danish universities in international rankings aligns with this picture. In the Shanghai Ranking 2013, two Danish universities are in the top 100: the University of Copenhagen on rank 42 and Aarhus University on rank 81; Technical University of Denmark ranks between 151 and 200. In the THES ranking 2012/13, Aarhus University is on rank 116, the University of Copenhagen on rank 130, and the Technical University of Denmark on rank 149.

In 2010, the total expenditure on research and development in Denmark amounted to 55 billion DKK, corresponding to 3% of GDP of which the public sector accounted for 1% (17 billion DKK). Part of the remaining 2% of GDP includes substantial funding of research at public research institutions provided by private foundations and charities. Denmark displays one of the highest percentage shares in the world of public research funded by private donations" (Danish Agency for Science, Technology and Innovation 2013, p.16).

Sources

Danish Agency for Science, Technology and Innovation (2013): Evaluation of the Danish National Research Foundation. December. Kopenhagen, http://dg.dk/wp-content/uploads/2015/02/Evaluation_of_DNRF.pdf.

Schneider, Jesper W.; Costas, Rodrigo (2013): Bibliometric analyses of publications from Centres of Excellence funded by the Danish National Research Foundation. Report to the Danish Ministry of Science, Innovation and Higher Education, 2013; Appendix 5 the evaluation report mentioned above).

Öquist, Gunnar; Benner, Mats (2012): Fostering breakthrough research: A comparative Study. The Royal Swedish Academy of Sciences, December, www.kva.se/ globalassets/vetenskap_samhallet/forskningspolitik/2012/akademirapport_breakthrough_research_121209.pdf.

2.3 Finland: Centres of Excellence of the Academy of Finland

Short description

Finnish research funding is based on a dual model: First, funding from the Academy of Finland is awarded to 'cutting-edge environments' (spetsforskningsenheter); second, the Finnish Funding Agency for Technology and Innovation (Tekes) provides dedicated support of systemic interaction and cluster-based collaboration in and around various technologies. These measures are intended to reinforce one another and culminate in large-scale integrated science-innovation centres like BioCity in Turku, the Oulu Biocentre and the ICT cluster in Espoo.

In fact, Tekes funding is roughly double that of the Academy, but Academy funding has a broader disciplinary stretch: it supports research in all natural sciences as well as the humanities and social sciences and is geared to scientific merit alone. The Academy has been operating with Centres of Excellence as a key instrument for research funding (Öquist; Benner 2012, p. 41f).

According to its website, the mission of the Academy of Finland is "to fund high-quality scientific research" and to "contribute to the renewal, diversification and increasing internationalisation of Finnish research. The Academy is "keen to emphasise the importance of research impact and breakthrough research. We therefore encourage researchers to submit boundary-crossing applications that involve risks but also offer promise and potential for scientifically significant breakthroughs."[2]

Evaluation reports

In 2007, the Academy issued a report on "Breakthrough Research" in which national strategies to deal with this special kind of research were addressed. Countries analysed

[2] see : http://www.aka.fi/en/about-us/

in the report were the USA, the UK, Sweden and the EU (analysing the ERC). The aim of the report was to find out whether or not Finland would need a special programme for high-risk, breakthrough research (Häyrynen 20017). According to the author of the study, Maunu Häyrynen, who in 2016 is professor of urban design at Turku University in Finland, the Academy decided to integrate breakthrough research funding within existing lines of funding, specially in the Centres of Excellence. This means that the Academy has no specific programme or financing instrument for high-risk / breakthrough research. The adopted policy was mainstreaming, meaning that breakthrough potential is assessed in the proposal evaluation processes among other criteria (see Häyrynen 2007, p. 22).

In the 2012 study of the Royal Swedish Academy of Sciences on breakthrough research (Öquist; Benner 2012), several weak spots in the Finnish research funding system were identified. One of the them was that funding from TEKES and the Academy have in fact not stimulated risk-taking on the researchers ground. Instead, researchers at universities ”have become enmeshed in external resource dependency and criteria fulfilment. This situation has been exacerbated by the widespread use of research assessments in Finnish universities: at an early stage these helped to raise scientific standards, but in the long term they may have led to a culture of risk aversion” (Öquist; Benner 2012, p.45f).

In 2013, the Academy of Finland was evaluated by a team of external researchers (Erik Arnold; Terttu Luukkonen; Patries Boekholt et al. 2013). In the chapter on peer review, high-risk research is being addressed in the following way:

”The Academy is aware of the challenge it faces in recognising high risk/high gain and multi- and interdisciplinary research. There is awareness among the staff and council members of the importance of this type of research. An internal survey in 2011, which aimed to investigate the treatment of interdisciplinarity in the assessment process for different instruments, led to ten recommendations. Some of these are already being implemented. Recently, the Academy has revised its review forms so that they better take into account thematic issues. In addition, each applicant has to include a paragraph on risk management (critical points, alternative ways to implement the project) in her or his research plan. The Academy also has joint panels of research councils specifically to assess multidisciplinary projects. Furthermore, ‘standard’ review panels are explicitly asked by Academy staff to pay attention to inter- and multidisciplinary and high risk/high gain projects in their review of applications (quote Academy staff member): “We advise council members and panellist on this: if there is a good risk assessment, a risk is no

problem. In our opinion this system works." The instructions for peers for evaluating research proposals states on page one that "At all levels of the evaluation process, you are advised to pay attention to potential breakthrough research containing risks".

Like other funders, the Academy thus devotes attention to the need to fund 'high risk' research (on the implicit assumption that research that is risky also has high returns). This concept proves hard to operationalise, and is largely tackled by asking reviewers to bear in mind the need to fund risky research. Conceptually the idea of risky research needs unpacking if it is to affect funding practice. Most often it refers to research that is expected to be path- or groundbreaking, but precisely because of this, entails uncertainties concerning the achievement of the project goals.

Häyrynen (2007) points out that high-risk (or 'transformational' or breakthrough') research has been regarded as a key issue for research councils, especially in the last decade or so. He identified seven types of risk, not all of which are desirable in funded projects.

1. Risk related to the research objectives, such as whether the objectives are realistic and attainable in the first place
2. or whether failure is very likely
3. Risk related to the research methods , such as the use of an untried method, a dataset that is poorly fitted with the method or the wrong kind of research tools
4. Risk related to the field of research, such as the sense that the subject is too marginal or (in Finland) in an orphan situation, and on the other hand that the field is too crowded.
5. Risk related to personnel, such as the lack of scientific merits or the anticipated weakness of the manager's role
6. Ethical risks related to the research, such as data protection issues.
7. The risk connected with interdisciplinarity , i.e. weak links between researchers or participating projects representing different fields of science in interdisciplinary or multidisciplinary programmes
8. Risk related to resources, i.e. the research cannot be completed with the resources projected in the research plan or on timetable.

Häyrynen used a sample of 206 applications to the general research grants scheme in 2005, and classified them in terms of novelty and risk, based on reviewers' comments. He checked his classification against the perceptions of the relevant project officers in the Academy and concluded that while the treatment of high-risk proposals was uneven, highrisk but innovative projects were much more likely than others to be funded. He recommended that project reviews should take greater account of the originality of research

plans, conscious risk-taking and the potential for scientific breakthroughs but that assessment of high-risk proposals should continue to be 'mainstreamed' within the normal review process. Projects identified as high risk should be more closely monitored than more routine ones. One of the council members suggested earmarking some funding for this kind of research. One way or another, it is advisable to develop a more specific approach to ensure that high-risk/high-gain research proposals can succeed at the Academy. There are examples at other funding agencies where risky projects receive funding using a step-by-step approach. First funding is supplied for the proof of concept phase of the project and only after it has proven successful does the rest of the funding follow. The US Department of Defense has a tradition of devoting 10% or so of research programmes to high-risk research (which we have heard described in the Pentagon as 'lunatic fringe' research)" (Arnold, Terttu, Patries et al. 2013, p. 68ff).

Success indicators

According to Häyrynen risks of proposed research are asked to be elaborated in the proposal and in final reporting self-evaluation on whether the project has accomplished a scientific breakthrough is included (Häyrynen, e-mail communication, May 2016). In his e-mail, Häyrynen concludes, "I cannot give you an estimate about how the system has worked so far."

In addition, he mentions the new strategic research funding instrument which the Academy has adopted in 2015, and which has certain elements supporting breakthrough research "but is only targeting pre-defined research themes under specific programmes. There is also a strong emphasis on relevance, so I would not see it as breakthrough research funding either. Here again the Academy officials might differ. All in all, Academy research funding has been substantially downsized.

Outside public research funding agencies a private foundation (Kone) has recently started a breaktrough research funding programme" (Häyrynen, e-mail communication, May 2016).

He suggests to contact Anne Heinänen at the Academy for further information. She is a senior science counsel for the Vice President for Research at the Finnish Academy of Sciences, Prof. Marja Makarow, who is responsible for the Academy's science policy planning and for the development of research funding.

Heinänen confirms that there are no specific schemes to support especially and only breakthrough research in Finland. However, she says that the Centres of Excellence Programme includes this element strongly, citing from their mission statement: "The

Academy of Finland's Centres of Excellence (CoE) are the flagships of Finnish research. They are at the very cutting edge of science in their fields, carving out new avenues for research."[3]

Also, Heinänen mentions the following aspects when asked how bright researchers to propose potentially breakthrough projects are being attracted to the Acadamy programmes:

- Long-term funding: The Centres of Excellence Programme term is in the next programme starting 2018 eight years (previously six years). That is twice the Academy´s normal project funding period four years.
- Funding is substantially larger than normal project-funding.
- The three primary review criteria: scientific quality of the research plan, contribution to science renewal, and scientific impact (Heinänen, e-mail communication, May 2016).

Sources

Erik Arnold; Terttu Luukkonen; Patries Boekholt et al. (2013): Evaluation of the Academy of Finland. Reports of the Ministry of Education and Culture, Finland 2013, www.minedu.fi/export/sites/default/OPM/Julkaisut/2013/liitteet/okm14.pdf?lang=en.

Öquist, Gunnar; Benner, Mats (2012): Fostering breakthrough research: A comparative Study. The Royal Swedish Academy of Sciences, December, www.kva.se/ globalassets/vetenskap_samhallet/forskningspolitik/2012/akademirapport_breakthrough_research_121209.pdf.

Häyrynen, Maunu (2007): Breakthrough Research. funding for high-risk research at the Academy of Finland. Publications of the Academy of Finland 6/07. Helsinki: The Academy of Finland, www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/6_07-breakthrough.pdf.

[3] http://www.aka.fi/en/research-and-science-policy/centres-of-excellence/

2.4 Sweden: The Strategic Research Area (SRA) funding scheme

Short description

Introduced in 2008, the Strategic Research Area (SRA) initiative of the Swedish government complements the national research funding system by encouraging high-risk research in selected areas. The Swedish government has defined 20 strategic research areas in which it finances

- research that, in the long term, has the prerequisites to be of the highest international quality,
- research that can contribute towards fulfilling major needs and solving important problems in society, and
- research in areas that have a connection with the Swedish business sector[4]

The Swedish Research Council (Vetenskapsrådet), the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas), the Swedish Energy Agency (Energimyndigheten) and the Governmental Agency for Innovation Systems (VINNOVA) were commissioned to organise the application process and to review and recommend the allocation of funds to Swedish universities in these strategic research areas.

In total, 43 research environments at 11 host universities were funded with appr. 5270 MSEK during 2010-2014. The funds went directly to the universities, which host the SRA-environments.

According to Maria Thuveson from the Swedish Research Council, the Strategic Research Areas are intended (maybe more indirectly) to promote breakthrough research. These types of calls have a longer funding period and with higher funding levels which would encourage the researcher to be at bit more bold and risk-taking.

In addition to the SRA scheme, the Swedish Research Council is setting up calls directed to attract breakthrough research from time to time. The latest call was issued in 2012 (Project Research Grant - Breakthrough Research[5]). For this call, funds were distributed

4 see www.vr.se/inenglish/shortcuts/strategicresearchareas.4.1f599ea412a30327ccf8000 1572.html.

5 see http://vr.se/inenglish/researchfunding/applyforgrants/callforproposals/closedgrants/ projectresearchgrantbreakthroughresearch.5.13384c8f135aad61b55155.html

directly from the government and the Swedish Research Council was consulted for the review process.

“Grants for Distinguished Professors” of the Swedish Research Council also aim at more risk-taking research in Sweden.[6]

Concerning collaborations and interdisciplinary research, the Swedish Research Council has set up the “Research Environment Grant (NE)”[7]

Evaluation reports

VR (2006): International Evaluation of Swedish Research in Biomedical Engineering. www.vr.se/download/18.176bc5ab10c4b8a9a5080001182/Medicinsk+Teknik+8+2006.pdf.

Öquist, Gunnar; Benner, Mats (2012): Fostering breakthrough research: A comparative Study. The Royal Swedish Academy of Sciences, December, https://www.kva.se/globalassets/vetenskap_samhallet/forskningspolitik/2012/akademirapport_breakthrough_research_121209.pdf.

VR (2013): Evaluation of Swedish research in mechanical engineering. https://publikationer.vr.se/en/product/evaluation-of-swedish-research-in-mechanical-engineering/

The Swedish Research Council (ed.) (2015): EVALUATION OF THE STRATEGIC RESEARCH AREA INITIATIVE 2010–2014. Stockholm, http://stratresearch.se/wp-content/uploads/vr1531evaluation-of-the-strategic-research-area-initiative-2010-20141.pdf

Success indicators

Mainly based on bibliometric data, the evaluation of the Swedish research system by Öquist and Benner (2012) concludes: “In the case of Sweden, what needs explaining is the relative decline in international visibility of our research, especially work that attracts high levels of attention and represents potential breakthroughs. The overarching explanation is the split, patchwork structure of research policy after the economic crisis in the

6 see http://vr.se/inenglish/researchfunding/applyforgrants/callforproposals/closedgrants/grantsfordistinguishedprofessors.5.7c02767a14a5b51525b60507.html.

7 see http://vr.se/inenglish/researchfunding/applyforgrants/callforproposals/closedgrants/ researchenvironmentgrantne.5.26af16d215268a25977578b.html.

1990s, when policy initiatives were added (and removed) with no clear focus on the impact on research quality but, rather, as a result of power configurations and opportunistic decisions." (Öquist; Benner 2012, p. 31).

Concerning the Strategic Research Areas, the report acknowledges that they are a part of the attempt to reduce the flexibility and fragmentation of the Swedish research system. However, the report concludes, that "they often function as funding consortia for several research groups, rather than starting-points for new undertakings (Öquist; Benner 2012, p. 29)

On the other hand, the Evaluation Report of the Strategic Areas of 2015 which uses as broader methodological spectrum including bibliometrics, self-evaluations of the SRA research environments and interviews with university and SRA leadership concludes, that: "the long term nature of the SRA funding appeared to give the research environments a very welcome opportunity to invest in high quality basic research and high risk projects that are often hard to support with short-term external funding." (The Swedish Research Council, 2015, p. 17)

Other hints concerning the issue of funding mainstram research vs. funding high-risk-research scan be found in an older evaluation of research in the biomedical area in Sweden. This evaluation is not related to the SRA funding scheme but may give additional input concerning research impacts.

In the 2006 evaluation report on biomedical research in Sweden, a general lack of high-risk research funding was observed. Although there is some first rate beiomedical research going on in Sweden, the report lists the following shortcomings: "Some investigators had no interaction with industry, while others were too highly leveraged on industry funding for their research support. (…) In many cases the research was incremental in nature, with there not being enough high risk, potentially high reward research. One might argue that, if all funded research achieves the stated objectives, then the "boundaries" of new ideas are not being "pushed" to the extent necessary. Finally, there is clearly too little support for biomedical engineering research in Sweden, especially for basic, high risk research, and the result of this is that many investigators are continually "scrambling" for funds, going from one project to the next to merely survive, much less plan for the future" (VETENSKAPSRÅDET 2006, p. 19).

The report continues criticising the lack of long-term, basic research which is of a more risky nature but might gain more impact in the future: "The research performed is generally solid, but incremental without taking risks, having less international impact than in the past. There are only a few ground breaking areas. The most likely explanation for

this relatively dramatic change is the limited funding on a more long-term basis, hampering the development of real new ideas. Therefore, scientists have to rely on quick developments which are frequently based upon existing technologies. Examples are the developments in the area of Laser Doppler flowmetry and the development of cardiac catheters, an intelligent stethoscope, and sensors to measure blood gases. Also, most of the developments in vascular ultrasound are incremental, both in the assessment of intima-media thickness (IMT) and of artery wall properties. It appears that there is not much opportunity for basic, high-risk research in this area" (VETENSKAPS-RÅDET 2006, p. 25).

Another interesting point is how research proposals to the Swedish Research Council are generally being assessed by reviewers. In the review process to accept or deny research proposals, reviewers are asked to assess the grade of novelty and originality on a seven-grade scale. Together with "scientific quality of the proposed research" and "merits of the applicant(s)", "novelty and originality" is one of the three basic criteria. The scale used for all three these basic criteria runs from "Outstanding" (7) to "Excellent" (6), "Very good to excellent" (5), "Very good" (4), "Good" (3) to "Weak" (2) and "Poor" (1).[8]

Another Swedish research evaluation report focuses on mechanical engineering. In the 2013-evaluation report of the mechanical department of the Swedish Research Council (VR) improvements concerning multi- and interdisciplinary research are being addressed:

"Interdisciplinary or multidisciplinary proposals for cross cutting research are hampered by the clear fixed boundaries of the VR evaluation panels. It is recommended that attention be paid to this aspect in order to ensure that opportunities are not lost, as currently seems to be the case" (VR 2013, p. 12)

Concerning the question, how the Swedish research funding system encourages bright researchers to propose potentially breakthrough projects, Maria Thuveson of the Swedish Research Council explains: "We try to do it by providing longer periods of funding at higher funding levels. Also, we do not monitor the individual project during the funding period, i.e. we do not ask for preliminary results, publications etc. We ask for a scientific report approximately 1,5 years after the funding period has finished. The final report is not evaluated or graded in any way. This leaves the researcher the opportunity to more risk-taking since a potential failure will not influence this calls funding levels or periods. We are very aware of the problems in promoting high-risk, interdisciplinary, collaborative

8 see: http://www.vr.se/inenglish/researchfunding/assessment/assessmentcriteria.4.7257118313b2995b0f27ace.html

and “non-mainstream” research. It is not an easy task and we are continuously discussing these issues.” (E-mail communication of June 29, 2016)

Sources

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VR (2013): Evaluation of Swedish research in mechanical engineering. https://publikationer.vr.se/en/product/evaluation-of-swedish-research-in-mechanical-engineering/

The Swedish Research Council (ed.) (2015): EVALUATION OF THE STRATEGIC RESEARCH AREA INITIATIVE 2010–2014. Stockholm, http://stratresearch.se/wp-content/uploads/vr1531evaluation-of-the-strategic-research-area-initiative-2010-20141.pdf

2.5 UK: IDEAS Factory by the Engineering and Physical Sciences Research Council (EPSRC)

Short description

The IDEAS Factory is a programme aimed at finding new ways to generate highly innovative and more risk-accepting research projects coupled with real-time peer review. The programme is managed by the Engineering and Physical Sciences Research Council (EPSRC), the main UK research funding body in these research fields. The IDEAS Factory program was founded in 2003. According to its self-description, the aim of the IDEAS Factory is to identify and fund potentially transformative research. Topics can be in any area and are often thematic, but a common feature is that they need a new dimension in thinking (see EPSRC 2008, p.2).

A central element of the program is the "sandpit" activity, an intensive 5-day workshop during which 20 to 30 people, selected through an open call for participants, develop research projects to address a grand challenge question. A grand challenge question could be for example "What are the scientific perspectives as well as the ethical and social impacts of synthetic biology?" (see NSF/EPSRC 2008).

Sandpits are led by a director with the support of a group of international experts (known as mentors) as well as stakeholders from industry or society chosen by the director. The director, mentors and stakeholders are the reviewers of the proposals developed by the participants of the workshop. They act as impartial referees in the process.

The sandpit workshop participants come from different disciplines and have different backgrounds. This shall foster interdisciplinary approaches and increase the transformative nature of the outcomes, such as a willingness to take risks, good communication skills, and creativity.

Outcomes of the sandpit are outlines of research projects that vary in scale and scope. A special feature of the sandpit process is that funding is set aside at the outset (pending the availability of funds) to support some or all of the research projects that emerge from the sandpit process, depending on research quality and novelty (see NSF/EPSRC 2008).

Although part of the Engineering and Physical Sciences Research Council, the IDEAS Factory is also open for other disciplines and research areas, including the social and behavioural sciences. The IDEAS Factory is mainly oriented towards UK scientists but there have been several joint sandpit workshops with scientists from the U.S. (see NSF/EPSRC 2008 and EPSRC 2009).

Creativity@home is a new initiative to generate and nurture creative thinking that might lead to potentially transformative research. As Christina Turner, scheme owner for Programme grants writes: “Creativity@Home provides funding for larger teams (like holders of Programme grants) to think creatively about the needs of their research, problem solving, and direction in which the research should go. It usually takes the form of an external facilitator working with the main investigators of the team to teach them various tools and techniques. The investigators then use these with the wider team, including postdoctoral staff, throughout the lifetime of the research grant.

Programme grants themselves are 5-6 years in duration and have flexibility to allow the team to adapt to challenges that arise as a result of their research. Programme grants have an independent steering committee which meets at least annually, and EPSRC has a representative which sits on this committee” (E-Mail communication of 21 March 2016)

Evaluation reports

Concerning the IDEAS Factory is a programme and the new Creativity@home initiative, there are no evaluation reports available.

Regarding impact, this is assessed both formally and informally depending upon the grant and the team within EPSRC which oversees it. As Christina Turner from EPRSC writes: “The formal requirement comes from the fact that the investigators of any grant awarded by EPSRC must record the outputs of that grant in a system called Research-Fish – this captures publications, patents etc. For Programme grants they are required to keep reporting for up to 8 years after the end of the grant. Many Programme grants also have a mid-term review which will include typical impact metrics such as publication, prizes, invited talks and also the destination of staff. On a more informal footing is the fact that these types of metrics often form part of the reporting at the annual steering committee meetings though this depends on what the steering committee has asked the investigators to provide” (E-mail communication of 21 March 2016).

Success indicators

The IDEAS Factory Website cites from an "Independent Sandpit Evaluation Panel" that the IDEAS Factory Sandpit mechanism was considered "unique and has already shown a universally positive impact for those attending. The sandpit has established independent and sustainable research communities; created an observable culture change amongst participants who are embracing creativity and originality; facilitated an increase in the capacity of multidisciplinary researchers and their interactions in the UK" (source: IDEAS Factory Website at www.epsrc.ac.uk/ funding/ howtoapply/routes/network/ideas/whatisasandpit/).

An even more enthusiastic assessment is given by Maladé, the organisational psychologist, who was directly involved in the sandpit exercises: "The IDEAS Factory Sandpit has emerged as a shining EPSRC invention, copied far and wide across continents, funding agencies and multinational corporations. Some imitators have come up with sensible adaptations while others use the label Sandpit or IDEAS Factory as a mere marketing ploy. Its success has even been acknowledged by policy-makers at the highest level" (source: Maldé´s report "Sandpit Psychology" at https://www.epsrc.ac.uk/funding/howtoapply/routes/network/ideas/whatisasandpit/sandpitpsychology/).

Sources

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EPSRC (2009): Synthetic biology sandpit: collaboration between EPSRC and US NSF. Press Release of December 10, 2009, www.epsrc.ac.uk/ newsevents/news/ 2009/Pages/syntheticbiologysandpit.aspx.

NSF/EPSRC (2008): Joint NSF/EPSRC "sandpit" to address grand challenge topics in synthetic biology. November 17, www.nsf.gov/pubs/2009/nsf09012/nsf09012.jsp.

2.6 The Netherlands: Free Competition (Vrije Competitie) by the Dutch Organisation for Scientific Research (NWO)

Short description

An important pillar in the NWO funding is the Free Competition (Vrije Competitie) scheme. In this scheme, researchers can submit original and innovative research proposals without programmatic or thematic restrictions. With the Free Competition, NWO stimulates innovative research, and offers opportunities for researchers to develop pioneering ideas. There are several Free Competition grants, related to the eight NWO divisions. Some of these grants are open for continuous application, others work with calls. In all Free Competition grants, researchers who are working at a Dutch university or at a Dutch research institute can apply for funding for a project. This often includes funding for personnel costs and material cost and in some cases also for travelling and conferences.

The following Free Competition grants are relevant in our context:

- ECHO Project Grants: Free Competition grant of the NWO Division for Chemical Sciences: ECHO-project grants offer the opportunity to carry out a high quality science driven chemical research projects;
- Free Competition of the NWO Division for Physical Sciences;

- Open Programme: Free Competition of the NWO Division for the Earth and Life Sciences;
- TOP Grants: TOP Grants offer top research groups the opportunity to innovate their lines of research in terms of content and collaboration. The goal is to create room for ground-breaking science of high quality. Researchers can apply for a TOP Grant from the NWO Divisions for the Chemical Sciences (CW), Earth and Life Sciences (ALW) and Social Sciences (MaGW) and from the Netherlands Organisation for Health Research and Development (ZonMw).
- An important difference with the Free Competition grants is that TOP grants are intended for established, top research groups with a proven outstanding track record. In collaboration with the NWO Division for Physical Sciences, these organisations (excluding MaGW) have published a joint call in 2009 for the submission of cross-disciplinary TOP Grant applications. With this initiative, the four parties aimed to explore the added value of collaboration across the whole spectrum of science and the potential role of cross-disciplinary initiatives in such a structure. This call was open to researchers from earth sciences, astronomy, biochemistry, chemistry, biology, health sciences, ICT, agricultural and food sciences, medical sciences and mathematics.

Although the different schemes all belong to the Free Competition grants, the specific aims, objectives, assessment criteria and selection processes differ among these schemes.[9]

Evaluation reports

In 2013, the NWO was evaluated by an international committee which was appointed by the Dutch Ministry of Education, Culture and Science. However, in the report, which is only available in Dutch[10], the Free Competition scheme was apparently not addressed explicitly.

Yvett Tuin from NWO writes: “We ask the project leaders to inform us of the results of the project. We do notice it is always very difficult to get the results timely. Some researchers forget to inform us of their results. In some programs we use external assessment for projects, but not within our free competition.

For indicators we ask all and any kind of publication. We do have a form for the final report, unfortunately that is in Dutch, but the following subjects are questioned:

9 see www.nwo.nl/en/research-and-results/programmes/free+competition

10 NWO Evaluation Committee (2013), *Nieuwe dynamiek, passende governance*, May 2013, https://www.rijksoverheid.nl/documenten/rapporten/2013/05/27/rapport-nieuwe-dynamiek-passende-governance

- Research team
- Financial details
- Research plan: goals and changes w.r.t. original plan
- Results: scientific, socio-economic, publications and other output, follow-up, knowledge utilisaton, data management, open access
- Results for a bigger audience" (E-mail communication of June, 13, 2016)

Success indicators

The grants offer the opportunity to carry out high quality science driven research projects. The rationale in the national policy debate is that excellent researchers should have a chance to pursue challenging scientific ideas or open up new research areas, which may provide opportunities for the Netherlands in the long run.

The programme secretariat does not really track very successful projects. This is only done by NWO across all programmes.

The programme secretariat asks the applicants each year to provide an update on the status of the project. This includes information about publications, patents, prizes. In addition, the applicant should prepare a short final report presenting the main results. In case of a PhD project the thesis is accepted as a final report. In addition, a layman summary needs to be prepared. Applicants can report about all the progress and results they consider as relevant; the programme secretariat does not ask them to report on new collaborations, new follow-up research etc. The programme secretariat does not want to increase the burden on project applications and project leaders to provide more and more often information. To get the standard status and final reports, NWO holds back some part of the funding until the final end of the project. Due to lack of time and capacity, evaluations of the programme are not organized (see Annex B (mini-cases) of the 2012 FET-Open-project-report, p. 88f, the minicase was written by Dutch researcher Annelieke van der Giessen)

Sources

NWO Evaluation Committee (2013), Nieuwe dynamiek, passende governance, May 2013, https://www.rijksoverheid.nl/documenten/rapporten/2013/05/27/rapport-nieuwe-dynamiek-passende-governance

www.nwo.nl

2.7 France: “Blanc” and “Blanc International”programmes of the Agence Nationale de la Recherche (ANR)

Short description

The "Programme Blanc" is a funding schemes within the non-thematic department of the ANR. Its aim is to foster the production of knowledge and scientific progress in all disciplines and to support new or pluridisciplinary approaches. The programme tries to support research creativity by giving researchers "total freedom to define research themes through bottom-up non-thematic calls for proposals" (self-description of the non-thematic department of the ANR[11]). As such, the Blanc Programme complements the research projects which are supported in the lines of the thematic priorities set by the government.

In 2011, the Blanc Programme was opened for international cooperations which are grouped under the heading "Blanc International Programme". Under the Blanc International Programme there are two calls running, the Blanc International I Programme which focuses on partnerships with selected foreign research institutions and the Blanc International II Programme which supports jointly written research projects by French and foreign research teams.

According to its Website, the aim of the Blanc International programme is "to provide a significant stimulus to ambitious scientific projects that are competitive on an international level, are highly original and break away from traditional research paths".[12]

From 2009 to 2011, the budget for all Blanc programmes was increased by 25 percent to represent 35 percent of the total agency funding (Rivoire 2010).

Evaluation reports

No systematic report evaluating Blanc or Blanc international could be found.

11 see www.agence-nationale-recherche.fr/en/projects-and-results/2013-and-previous-editions/exploratory-and-emerging-research/

12 see http://www.agence-nationale-recherche.fr/en/projects-and-results/2013-and-previous-editions/aap-en/blanc-programme-2012/

Success indicators

In the 2014 annual report of ANR[13], some interesting research projects which were funded by the Blanc programme are presented. However, no systematic assessment or evaluation of funded projects in this scheme is provided.

Also, in the 2012 annual report of the ANR, the agency presents some highlight cases of the blanc programme, which include the fields of computer science, material science and genetic biology. The cases show that risky, original ideas from top researchers can lead to a number of positive outcomes like the increase in efficiency, the reduction of environmental contamination and production of new knowledge.

Sources

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http://www.agence-nationale-recherche.fr/en/projects-and-results/2013-and-previous-editions/aap-en/blanc-programme-2012/

13 see www.agence-nationale-recherche.fr/fileadin/documents/2015/ANR-annual-report-2014.pdf

2.8 Austria: Austrian Science Fund FWF

Short description

The Austrian Science Fund (FWF) is Austria's central funding organization for basic research. Its purpose is to support science and basic research in Austria at a high international level. It is financed through public funds and contributions of the Austrian Foundation for Research, Technology and Development (Nationalstiftung fuer Forschung, Technologie, Entwicklung; www.stiftung-fte.at). A small part comes from private donations.

With the aim of exploring new frontiers and funding of top-quality research, the FWF combines bottom-up, open research projects as “Stand-alone Projects”. Beside these stand-alone project, the FWF supports international programmes, transnational funding activities as well as priority research programs (Special Research Programmes - SFB). In addition, several awards, prizes, and programmes are introduced for specific groups of researchers.[14]

Stand-Alone Projects provide funding for scientists of all disciplines who are working in Austria in a competitive process. The main goal is the funding of individual research in the area of non-profit oriented scientific research. To get funding the applicants must show high scientific quality of their work measured on an international scale. The projects are funded for up to 48 months and follow-up applications are possible. Maximum funding is € 400,000. Applications are accepted continuously with no application deadlines. They have to be submitted in English and the allocation of funding by the FWF Board is based on an international review process that takes 4 to 6 months in general.[15] Stand-alone projects can be submitted as mono-disciplinary proposals as well as cross-disciplinary proposals.[16]

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14 One example is the START-Programme for outstanding young researchers of any discipline to give them long-term and extensive financial security to plan their research and to build up or consolidate their own research groups. Another example is the Wittgenstein for established and outstanding researchers of any discipline to provide recognition and to guarantee the greatest possible freedom and flexibility in the performance of their research. See: https://www.fwf.ac.at/en/research-funding/fwf-programmes/ (31.07.2016). This program is however the Austrian equivalent to the ERC Starting Grants as applicants are required to apply also for an ERC Grant.

15 https://www.fwf.ac.at/en/research-funding/fwf-programmes/stand-alone-projects/ (31.07.2016)

16 In a study on FWF’s cross-disciplinary research funding, the authors stated that “it cannot be excluded that applicants pursue disciplinary research, because they expect that this kind of research has more success in the approval procedure of a funding organization” (Mutz, Bornmann, & Daniel, 2015, p. 35).

The FWF uses an innovative way of addressing cross-disciplinarity / multidisciplinarity by an innovative way of addressing multidisciplinarity through tructured bottom-up coding. The applicants submit their proposal together with a coding that depict the relevant research disciplines. On the application form, the principal investigator lists up to four disciplines that are relevant to the project.[17] This scheme follows Statistik Austria.[18] The applicants are requested to use the Statistik Austria code where the multitude of disciplines are summed up in fields of science and sub-field. These subdisciplines are in line with the field of science classification in the international Frascati Manual and form the basis of a FWF study to evaluate the cross-discplinary research funded by the FWF (Mutz et al., 2015).

To fund frontier research is high on the agenda of the FWF, however the evaluation is focused on excellence. The annual report 2013 cited Science Europe; “True innovation happens in systems that reward risk and tolerate early failure”, but the evaluation or the proceedings do not assess or evaluate the risk-taking or funding of high-risk research. (FWF, 2013, p. 16). The value section of the annual report highlights some values that are similar to FET: Excellence and competition, independence “Creativity in basic research requires freedom”) and equal treatment of all disciplines (FWF, 2014).

Evaluation reports

The FWF has a double approach to evaluation as the FWF is both the user and the commissioner of evaluation procedures and is itself subject to evaluation. With regard to

- evaluation of projects is the FWF an evaluation user.
- program evaluation is the FWF a commissioner of evaluation.
- the evaluation of the FWF is the FWF the object of evaluation.

Dinges, M. (2005). The Austrian science fund: Ex post evaluation and performance of FWF funded research projects. Vienna: Institute of Technology and Regional Policy. (Dinges, 2005)

17 https://www.fwf.ac.at/fileadmin/files/Dokumente/Antragstellung/antragsformular-a.pdf (19.03.2016)

18 www.statistik.at

Sources

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2.9 Switzerland: Swiss National Science foundation (SNSF)

Short description

For the Swiss National Science Foundation (SNSF) open research including interdisciplinary projects is part of a responsive, researcher-driven funding mode. Since 2008 Sinergia promotes the interdisciplinary collaboration of two to four research groups that propose breakthrough research. Open to all research topics and disciplines the funding has no specific requirements regarding the structure or format of the individual projects. Scientific quality is the only criterion for getting grants. The program Sinergia, established in 2008, enables small consortia to submit joint project proposals and to include a research group from outside Switzerland. 6% of the total funding between 2008 and 2012 was allocated to the Sinergia program (Swiss National Science Foundation - SNSF, 2013, p. 9).

SNSF provides options for research projects at all Swiss research institutions and in all disciplines, research areas and topics. Two funding schemes, SNSF Project funding and Sinergia grants, are especially important instruments for providing support for open research.

The funding of individual projects – called project funding - is the principal funding scheme of SNSF. It is accounting for more than half of all SNSF grants and allowances; it is open to all disciplines and topics, covering fundamental and use-inspired research. The projects funding is typically CHF 50,000 – 300,000 per year and is provided for up

to 3 years with the possibility of one follow-up project so that funding can be extended up to 6 years. The funding covers direct research costs such as staff salaries, materials, travel and other expenses as well as overhead of about 15 per cent to the host institution to cover indirect costs. Applicants and co-applicants are required to be capable of performing independent research, managing their own staff, and having the necessary infrastructure available. They need to have at least two years postdoctoral experience and they are required to have an affiliation at a Swiss research institution. Two application deadlines and review procedures are organized per year. In 2012 SNSF received 2,221 applications for project funding, of which 54 per cent were funded (Langfeldt, Ramberg, & Gunnes, 2014). A major difference to FET is that the salary of the applicant(s) is not part of the funding.

The Sinergia program is more similar to FET as its grants aim to enable researchers to do pioneering research, pursuing new research topics, to enter new fields of research and tackling complex research questions. Sinergia provides funding for networks and collaboration projects, typically involving about 3-4 subprojects or research groups that are based at different universities and/or research institutions. One of the groups can be based outside Switzerland. The terms of grant duration are similar as for Project funding. The main difference is that the grant also covers salary for scientific coordination and meetings. As Sinergia targets established researchers, the eligibility criteria are more demanding than for Project funding: “In the SNSF's understanding, established researchers are qualified scientists who hold a permanent or long-term position at a Swiss research institution, who have one or more research groups of their own, who have already received third-party funding through a competitive procedure, who educate the next generation of scientists and who know how to organise and manage scientific projects.”[19]. Between 2008 and 2013, SNSF has received 458 applications for Sinergia grants, of which 43 per cent have been funded (Langfeldt et al., 2014, p. 12).

Synergia is part of the funding landscape where disciplinary and interdisciplinary research is funded and where some programs focus on the career of young researchers (Ambizione) while others are open for researchers in different stages of their career. Synergia is one of these programs.[20]

The new Synergia program that started in 2016 is characterized by a reorientation towards high risk research, towards Interdisciplinarity and towards collaboration. Interdisciplinarity is the precondition for funding; collaborative projects within a discipline can now be funded within the SNSF Project funding; so that the main specifics of Synergia

19 http://www.snf.ch/en/researchinFocus/faq/Pages/faq-foerderinstrumente-sinergia-fuer-forschende-keine-festanstellung.aspx (01.04.2016)

20 Interview Katrin Milzow, SNF interdisciplinarity,13.05.2016

are interdisciplinarity and high-risk. The SNSF implemented an organizational structure to ensure and support the development/implementation of interdisciplinarity.

The Research Council that is responsible for the evaluation of proposals comprises four divisions:

- Humanities and Social Sciences
- Mathematics, Natural and Engineering Sciences
- Biology and Medicine
- Programmes

These divisions send members to the Specialised Committees (Fachausschüsse), which are responsible for cross-divisional matters. Beside the committees for International Co-operation and careers, Interdisciplinary Research has its own Specialised Committee. The members of this committee are experienced in the area of interdisciplinary research and they are the ones who conceptualize and develop the guidelines for evaluation and criteria of Synergia projects. [21]

Evaluation reports

The self-evaluation report from the SNSF was commissioned by the Swiss State Secretariat for Education, Research and Innovation (SERI) as the basis for a periodic review to be carried out by the Swiss Science and Technology Council (SSTC). It focuses on the SNSF's role in the funding of research infrastructures and research fields (Swiss National Science Foundation - SNSF, 2013).

Swiss National Science Foundation - SNSF. (2013). Evaluation of the Swiss National Science Foundation: Funding of infrastructure and development of research fields. Self-evaluation report of the SNSF.

Success indicators

Success indicators for Synergia are under preparation as the new Synergia starts in 2016. The members of the Specialised Committees (Fachausschüsse), which are responsible for cross-divisional matters will conceptualize and develop the guidelines for evaluation and criteria that Synergia projects have to meet. [22]

[21] Interview Katrin Milzow, SNF interdisciplinarity,13.05.2016

[22] Interview Katrin Milzow, SNF interdisciplinarity,13.05.2016

In the evaluation report (Swiss National Science Foundation - SNSF, 2013) main characteristics of FET-like research are not be taken into account. High-risk research, blue sky research, and breakthrough research is not part of the self-evaluation.

Interdisciplinarity

Only interdisciplinarity gain special attention: Since 2006, projects indicated as interdisciplinary by applicants have been evaluated by a specific committee (Swiss National Science Foundation - SNSF, 2013). After statistical analysis revealed considerably lower success rates of interdisciplinary proposals compared to disciplinary ones in 2006, the SNSF attributed this situation to inadequate evaluation of interdisciplinary proposals by the disciplinarily organised divisions of the Research Council and the SNSF presiding board mandated a multidisciplinary expert group that proposed a specific committee for evaluating proposals declared as interdisciplinary by the applicants. Since 2006, the SNSF created a commission that is now named Specialised Committee Interdisciplinary Research (FA-ID).

The self-evaluation show that the possibility to submit interdisciplinary projects is particularly appreciated by researchers working in institutions other than cantonal universities or Federal institutes of technology. 13% of main PIs submitting an interdisciplinary grant application are working in universities of applied sciences or other institutions. This is twice as many as in the disciplinary divisions (8%). The introduction of this programme enabled a sensitive number of researchers from these institutions to submit proposals to the SNF: 35% of applicants in interdisciplinary research proposals were unknown to disciplinarily organised divisions and were working in institutions other than universities or ETHs (Swiss National Science Foundation - SNSF, 2013, p. 26).

Different demands of different groups of researchers

The SNSF commissioned a survey, where researchers in Switzerland shared their experiences and views concerning research funding. As the SNSF considered fundamental changes to its principal funding scheme, the purpose of the survey was to explore the needs and preferences of researchers in Switzerland, and the potential advantages and disadvantages of the planned changes.

One result is especially interesting with regard to high-risk research. Regarding the evaluation of proposals, there is a divide between the less and more established researchers. Younger applicants and less well established researcher are more in favour of putting *weight on the project idea*, whereas older applicants and established professors are less in favour of this. “Postdocs and scholars outside the universities and ETH domain are concerned that assessments of past performance should not impede the funding of

young researchers or interdisciplinary or applied research" (Langfeldt et al., 2014, p. 67). However, "more established researchers engaged in fundamental sciences may more often question the possibility of predicting the success of projects mainly based on the idea and project description." (Langfeldt et al., 2014, p. 78). These different opinions can represent a tension that researchers with different needs and qualifications compete within one scheme.

Sources:

Langfeldt, L., Ramberg, I., & Gunnes, H. (2014). Swiss research funding. Researcher Survey for the Swiss National Science Foundation (SNSF). Oslo: Nordic Institute for Studies in Innovation, Research and Education (NIF).

Swiss National Science Foundation - SNSF. (2013). Evaluation of the Swiss National Science Foundation: Funding of infrastructure and development of research fields. Self-evaluation report of the SNSF.

2.10 Slovenian Research Agency (ARRS)

Short description

In Slovenia, the major amount of RDI funds are disbursed on a competitive-basis. The institutional funding in Slovenia is provided only for the Public Research Organizations (there are 15 such PROs) founded by the state itself. The largest share of the basic and applied research is funded through so called "Research Group Programme funding", a system established in 1999 to secure stability in funding of the basic and applied research. In 2013, the Slovenian Research Agency funded RGPs in the amount of €52.7 million or more than 36% of total disbursement of research funding (SRA financial report for 2013)."[23]

The Slovenian Research Agency (SRA has a strong system of ex ante and also in some cases ex post evaluations for projects/programmes that are to be co-financed (Boštjan Udovič, Bučar, & Hristov, 2016).

[23] https://rio.jrc.ec.europa.eu/en/library/rio-country-report-slovenia-2014 (25.03.2016).

The Slovenian Research Agency as the largest public funding organization in science funds research in all fields of science. The majority of budget is dedicated to support basic research. The most important funding instrument in this respect is the Programm called *Research programmes*. These *Research programmes* support research groups as long term research funding to ensure financial stability. Research Programmes are evaluated every 3-6 years (depends on previous evaluation) and normally follows long term goals as a crucial element of development of disciplines. *Research programmes* have between 1,5 and 12 Full-time equivalents (FTE). The agency currently finances around 300 research programmes covering all fields of sciences. The Research programme is also a basic research nucleus for supporting education of young researchers as doctoral students. Research programmes are carried out by research groups in public research institutions, universities and other research institutions, which can apply for funding to perform research programmes. It is a mechanism of core funding for research groups, especially those from universities and national research institutes.[24]

Another major scheme for financing is called “Basic and Applied projects”, also operated by the Slovenian Research Agency, distributing funds in 2013 in the amount of €25.5 million or 17.6% of the Agency's whole budget. The Slovenian Research Agency (SRA) is responsible for the execution of public research financing, for the professional and independent selection/evaluation process of projects and programmes and the monitoring of research programmes and projects implementation (Boštjan Udovič et al., 2016).

According to ERAWATCH, the organisational structure for R&D and innovation has changed with the new government in the beginning of the 2012. The technology segment of the previous joint Directorate for Science and Technology at the Ministry of Higher Education, Science and Technology, had moved to the Ministry of Economic Development and Technology (MEDT). Former Ministry of Higher Education, Science and Technology was expanded by entire education sector, culture and sports to become Ministry of Education, Science, Culture and Sports (MESCS).3 Within the ministry, a new Directorate was established, merging higher education and science” (ERAWATCH 2014).

The share of R&D expenditure in GDP has decreased between 2010 and 2012, so that a number of public research organisations have serious financing difficulties, and are calling for revision of funding position in the 2013 budget. The allocation of resources was also decreased for Slovenian Research Agency as the key funding agency in the field of R&D. SRA had to cut several of its regular financing schemes: research programmes received lower financing, most of the support to international activities of the

[24] Pečlin Stojan, ARRS, 23.05.2016

researchers ceased and no new calls for Applied and Basic projects as well as Targeted research programmes had been implemented in 2012 (Boštjan Udovič & Bučar, 2014).

The ARRS is organized around the Scientific Council, which is the agency's professional advisory body that provides expertise in the scientific fields. The minister of science nominates the president and members of the Scientific Council. (cf. ARRS 2011)

The public funding of Slovenian research via SRA research programmes and projects is focused on scientific excellence *per se* and enables open and bottom-up initiative in the selection of specific priorities. The proportions of funding among scientific fields have not changed significantly over the years. In 2011, the SRA funds were spend as follows:

- Engineering and Technology: 30 % of all funds
- Natural Sciences: 27 % of all funds
- Humanities: 11.8 %
- Biotechnology, Social Sciences and Medical Sciences: between 9.6 and 9.8 %
- Multidisciplinary projects and programmes received 1.5 % of all funds

Within a particular scientific field, priorities are mostly determined by the scientific community itself on the basis of peer review of submitted projects (Boštjan Udovič & Bučar, 2014, p. 20).

Evaluation reports

The evaluation reports are in Slovenian language only. Therefore, the following information on evaluation are based on the communication with the Slovenian Research Agency.

Success indicators

The main evaluation criteria of the Research Programmes are scientific quality of research outputs, socioeconomic relevance and quality of a project/ programme proposed. Implementation of the research programme is evaluated through reports, which are prepared by programme research groups. Reports of past work and proposals for continuing are assessed by remote foreign reviewers. The main indicators to be studied are:

- the objectives of the programme,
- success in attaining them,
- scientific excellence,

- most important R&D achievements of the principal investigator,
- most important R&D achievements of other members of programme group,
- social and economic relevance (measured with patents, applicable results, significance for beneficiaries),
- international cooperation.

On the basis of reviews a temporary expert body appointed by the Scientific Council of the Agency, prepare a final assessment. Quantitative measurement of results is done on the basis of bibliometric and other quantitative indicators. This includes the number of publications, number of publications in top journals, number of citations, relative citation index and more broad indicator of social relevance, which indicates amount of money for research that researchers have already received from other sources, sources not from the Agency, like from economy, industry, or from sources outside Slovenia. These data are available to reviewers.[25]

Sources

Udovič, B., & Bučar, M. (2014). ERAWATCH Country Report Slovenia. Luxembourg: European Commission; Joint Research Centre; Institute for Prospective Technological Studies

Udovič, B., Bučar, M., & Hristov, H. (2016). RIO Country Report 2015 Slovenia. Overview of the R&I system

2.11 Scandinavia: Top-level research initiative

Short description

The Scandinavian Top-level Research Initiative (TRI) was “a major Nordic venture for climate, energy and the environment”.[26] TRI is the largest joint Nordic research and innovation initiative. It aims to involve top agencies and institutions in the Nordic region, to promote research and innovation of the highest level with the goal to contribute towards solving the global climate crisis.

[25] Pečlin Stojan, ARRS, 23.05.2016

[26] http://www.toppforskningsinitiativet.org/en/om-toppforskningsinitiativet (01.08.2016)

When TRI was established in 2008 the objectives were to become a central part of the Nordic research effort in the fields of climate, energy and the environment and to be a cross-institutional Nordic research and innovation programme. It was an explicit goal to contribute to the development of good framework conditions in the Nordic countries for cooperation between top research activities, to contribute to an increased coordination and professional leadership of Nordic research and to function as a platform for further international cooperation (DAMVAD for the TRI, 2014).

The TRI organization was established with a Management Board, six Programme Committees (nominated for each of six sub-programmes, see below) and a secretariat for day-to-day activities. The TRI had a portfolio of 40 projects, including six Nordic Centres of Excellence (NCoE), a Nordic Competence Centre, and a number of networks and studies (Riiser, 2015).

The initiative was financially supported by national institutions and agencies of Nordic countries. It was a five year initiative with a total budget of DK 400 million (=€ 53.6 million, source: http://www.toppforskningsinitiativet.org/en).

The management board and observers consist of representatives from the following countries: Denmark, Finland, Iceland, Norway and Sweden.

There is also an emphasis on partnerships with business and industries as well as an interest in the application of research results.

The initiative includes six sub-programmes:

- Effect studies and adaptation to climate change
- Interaction between climate change and the cryosphere
- Energy efficiency with nanotechnology
- Integration of large-scale wind power
- Integration of large-scale wind power
- Sustainable bio-fuels
- Co2 - capture and storage

Additionally, within these six sub-programmes the following areas will be included:

- Advanced climate modelling
- Social sciences and humanities
- A focus on the Arctic area

Evaluation reports

DAMVAD for the TRI. (2014). Final Report from the Ongoing Evaluation of the Top-Level Research Initiative. Copenhagen: DAMVAD.

Success indicators

The TRI evaluation of DAMVAD is based on data from desk research, project case studies and the bibliometric analysis. Indicators for success were the scientific contributions of the TRI, including the volume, interdisciplinarity, quality, popular research dissemination and the training of young researchers.

Number of scientific publications

The first success indicator for evaluation is the number of scientific publications. With regard to this indicator the initiative was successful, as the number of scientific publications increased significantly from 2010 to 2013. The number of scientific publications published by TRI-funded researchers has been increasing from the beginning in the program in 2009 and has been increasing significantly between 2012 and 2013. The evaluators expect this trend to continue as most projects have not yet been finalised and because the scientific output of many projects was still in preparation at the time of the evaluation (DAMVAD for the TRI, 2014, pp. 5, 27f.).

Quality of Publications published by TRI-funded projects

The evaluation used a Norwegian authority list that indexes scientific journals in two levels. Beside a “normal” level 1 for scientific journals it classifies international, leading scientific journals as “high” level 2. This was used to bench-mark TRI publications. According to this classification the number of high-quality TRI publications was comparable high. With a share of 31% of Level 2 publications it was remarkably higher than the expected average (20%) for the list. Within the evaluation, the impact was calculated relative to the average impact for the Nordic countries. The results was that the scientific output of the TRI in the areas of Climate and Nanotechnology is above the average impact obtained for other Nordic research communities in the same research fields (DAMVAD for the TRI, 2014, pp. 5, 31).

Scientific publications with international co-authors

Another success factor was the share of TRI scientific publications with international co-authorship. Cross-country research collaborations were a top priority for the TRI, and results indicates that this has largely been achieved, as 66% of all scientific publications

from TRI projects are co-authored with international authors (DAMVAD for the TRI, 2014, pp. 5, 32).

Interdisciplinarity

Interdisciplinarity was a core objective for the research funded by the TRI. The degree of interdisciplinarity of the scientific results has been measured as a success factor and results show that 70% of all publications are published in journals indexed as interdisciplinary (DAMVAD for the TRI, 2014, pp. 6, 27ff).

Research dissemination to policymakers and authorities

Research dissemination to policymakers and authorities was not a requirement, however some of the TRI projects were involved in disseminating their research for the use policymakers and public authorities, e.g. to be used in a new way to enhance decision-making (DAMVAD for the TRI, 2014, pp. 33).

Sources

DAMVAD for the TRI. (2014). Final Report from the Ongoing Evaluation of the Top-Level Research Initiative. Copenhagen: DAMVAD.

Riiser, A. (Ed.). (2015). Solving the Climate Crisis – A Nordic Contribution. Oslo.

3 Summary

The purpose of the analysis of the national research funding programmes for high-risk, unconventional, interdisciplinary and technology-oriented research was to find out which indicators are used in their impact assessments and check their approaches against our own impact assessment. As such, the analysis in this work package was very valuable as we cross-checked our indicator list with the ones we found in the analysed studies.

The impact studies of the national funders for example reminded us not to forget to ask for spin-off companies from FET-projects in our survey. Or they have adverted to interesting bibliometric methods to determine “breakthrough research results” (in the Danish case).

In addition, the analysis has a value of its own. It shows that:

- Some countries encourage high-risk research, FET-like research within regular funding programmes and some countries have separate programmes for this special kind of research.
- Some countries do regular external expert evaluations which are published and available on the Internet, including bibliometric analysis and some countries only have internal evaluations, if any at all.
- All programme makers are concerned with the question of impact as well as with attracting the right researchers and increasing their footprint.

Concerning the availability of data we find a split picture: For a systematic impact assessment it would be helpful to have all kinds of data in an organised and complete way: project data, participants, affiliations, disciplines, publications, follow-up-activities, self-evaluations, external review reports, contact data, activity reports etc.

On the other hand, reporting obligations are considered by researchers as a burden interfering with the research work to be done in the project. In fact, reporting obligations seem to be especially hindering for high-risk, potentially transformative and highly creative research. Some research programmes analysed in this report thus intentionally refrain from asking impact reports altogether. For example in the Swedish case, the funding organisation does not even monitor the individual project during the funding period which means they do not ask for preliminary results, publications, etc. Instead, they ask for a scientific report approximately 1,5 years after the funding period has finished, a report which is not evaluated or graded in any way.

Another purpose of WP2 was to identify and contact experts at the respective national organisations and ask them if they are willing to share their experiences with this kind of research in a workshop that we will be organising.