Impact evaluation of Finnish Programmes for Centres of Excellence in Research 2000-2005 and 2002-2007 (Finland)

1. Introduction

The evaluation of the societal impact of the programmes for Centres of Excellence (CoE) in Research was commissioned by the Academy of Finland and conducted by Gaia Consulting Ltd from June to December 2008. The evaluation was commissioned in line with the Academy of Finland's statutory obligation to carry out ex-post evaluations of all major expenditure programmes. The budget ceiling for the evaluation was €95k.

The Centres of Excellence Programme was launched by the Academy of Finland in 2000 in order to implement the National Strategy for Centres of Excellence (published in 1997).[1] The evaluation covers the first two CoE programme rounds (2000-2005 and 2002-2007) and examines to what extent they succeeded in promoting the 'societal objectives' laid down in the National CoE Strategy. In the context of the evaluation, *societal impact* is defined broadly as the effect that the CoE Programmes have on the research agendas of the funded units, on cooperation between researcher groups and on society at large. The scientific quality of the CoEs in terms of research outputs produced was explicitly excluded from the evaluation given that units who applied for CoE status were selected on the basis of their research performance, hence it was not deemed necessary to include this element in the evaluation.

The evaluation employs a mix of (primarily qualitative) data gathering tools and analytical methods, including desk research (analysis of programme documentation), case studies on a selection of Centres of Excellence, a survey of host organisations and researchers at Centres of Excellence, an international benchmarking exercise (comparison of the Finnish CoE Programme with similar schemes abroad), and interviews with relevant stakeholders.

This is the first programme level evaluation of the CoE Programme.[2] It was considered timely as it provided an opportunity for policy makers and, in particular, the Academy of Finland (responsible for coordinating the measure) to assess to what extent the first two CoE programmes succeeded in achieving the objectives laid down in the National CoE Strategy and whether significant changes to programme design and operation were required. In addition to the assessment of the programmes' impact at an operational level, the evaluation had an important strategic dimension in that its findings were expected to feed into the review and renewal of the National CoE Strategy, which took place in 2009. Although this was not explicitly mentioned in the study specifications, the evaluation report notes that "this evaluation creates an excellent opportunity for updating the National Strategy for Centres of Excellence in Research". The development of forward-looking recommendations for programme redesign and the review of strategic policy objectives was therefore a central element in this evaluation.

This evaluation will likely be of interest to policy makers looking to commission an evaluation of strategic research funding programmes that have a particular focus on researcher networks and/ or seek to increase the attractiveness of research centres for foreign researchers. The particular strength of the evaluation lies in its integrated

[1] www.aka.fi/Tiedostot/Tiedostot/Julkaisut/Excellence.pdf

[2] An evaluation [organisational review] of the Academy of Finland was carried out by an international expert panel in 2004 (commissioned by the Ministry of Education), however it did not include an assessment of the individual funding programmes coordinated by the Academy, such as the CoE programmes.

analysis of the operational achievements of the first two CoE programme and the broader strategic outlook of the Finnish CoE in Research concept. The evaluation attempts to examine the programmes' impact at the operational and programme levels, while also drawing out relevant conclusions at the systemic level. It looks at the societal impacts generated by the support measure (as opposed to it's impact on the quality of research outputs or on economic impacts), while effectively placing the evaluated measure in the broader context of the national innovation system and assessing its significance for science policy making.

The evaluation provided concrete recommendations for the further development of the Finnish innovation policy, the revision of the National Strategy for CoE, and a review of the operational design and administration of the support measure by the Academy of Finland. With regards to the latter, the evaluation concluded that the two programmes achieved their key objectives, namely to develop stimulating environments for cutting-edge research and researcher training. However, it also found that there are too many CoEs in Finland relative to the size of the country, and as a consequence the available funding is spread out too thinly. CoE funding per unit is found to be inadequate which makes it difficult to create permanent structures. This puts into question the sustainability of the outcomes of the intervention.

2. Description of the evaluated measure

2.1 Background

Finland has had in place a network of Centres of Excellence in Research since the mid-1990s. Between 1995 and 1999, this network was directly funded and operated by the Ministry of Education in cooperation with the Academy of Finland. In 1997, the Academy was charged with drawing up a National Strategy for Centres of Excellence in Research in order to give the CoE network a more coherent and cohesive policy framework and to establish it as one of the key pillars in the overall innovation system.[3]

The National Strategy for Centres of Excellence in Research (1997) envisaged the creation of a newly designed CoE Programme and set out a number of strategic objectives for these Programmes. This led to the launch of the Finnish Programme for Centres of Excellence in Research in 2000 under the auspices of the Academy of Finland. The central policy objective laid down in the National CoE Strategy is

> *"to promote the emergence of high-level, innovative and efficient research and training environments that can generate top international research".*[4]

The Strategy emphasises that the development of *creative research environments* is the key challenge for ensuring a high standard of internationally competitive research. The CoE programmes are designed to address this challenge and fill a gap in the national innovation system.

[3] The Ministry nominated the first 12 centres of excellence for the period 1995–1999, and a further five units for 1997–1999. Under the initial scheme, Centres of Excellence were designed as a tool for performance-based funding (allocated to universities by the Ministry of Education). The Academy of Finland's CoE Programme from 2000 onwards can be seen as a continuation of the Ministry of Education's performance-based funding approach. For example, in 2004 the budget funding for universities included a total of €13.8m of performance-based funding, allocated on the basis of centres of excellence. This money comes on top of universities' core funding and universities may use it at their discretion.

[4] http://www.research.fi/en/resources/centres_of_excellence_in_research

2.2 Policy context and intervention logic

The CoE Programme was conceived as the key funding instrument for the promotion of cutting-edge research and the development of large-scale research teams and creative research environments, and is therefore considered an important pillar in the innovation system.[5] The Programme's original inception was driven by recommendations issued by The Science and Technology Policy Council and supported by the Ministry of Economy and, in particular, the Ministry of Education. The Ministry of Education gave the initial impetus for the CoE Programme by linking its performance-based funding for universities to CoEs in 1997.

Although the CoE Strategy does not spell out a clear intervention logic, it is possible to summarise the "system failure" that the CoE Programme is intended to address as follows:

- lack of internationally competitive research ("There are relatively few research environments in Finland that could be described as creative at the moment." [6])
- lack of adequate structures for long-term funding ("Internationally competitive research can only be created through long-term work and support.")
- low level of interaction between researchers ("The heterogeneity and geographic dispersion of Finland's university system presents challenges for the creation of functional networks that generate active cooperation.")

Therefore, the main rationale for the policy intervention is to support integrated research environments and provide a stable long-term funding framework. According to the original National Strategy for CoE Programmes (1997),

> *"the purpose of the CoE programme is to concentrate resources in places where research of high scientific quality and significant innovative potential already exists or could be created, and where concentrating resources could generate major synergy benefits."*

The creation of the CoE programmes and their interaction with the wider innovation system is expected to lead to a virtuous circle of sorts, which can be summarised as follows:

- The CoE Programme is a policy instrument which aims to support researchers and research groups.
- The generation of new top research can be accelerated by recruiting top foreign experts in the relevant field.
- The rise in the standard of Finnish scientific research and its improved international visibility will, in turn, increase Finland's potential for recruiting top researchers from other countries.
- This will further improve Finland's scientific research and international visibility.
- An excellent research environment will attract ambitious young researchers.

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[5] In terms of the measure's importance and fit in the national policy context, the National Strategy emphasises that the CoE Programme must be integrated as a key component into Finland's research, training and technology policy.

[6] The Strategy specifies that "a research environment should be scientifically inspiring, challenging and interactive, and sufficiently versatile in terms of the research fields represented and the human and material resources available." According to the Strategy, creative research environments are defined by their intellectual capacity, expertise and cooperation. The quality of a research environment depends on the existence of (a) flexible networks formed by researchers or research groups, (b) active international cooperation with other top groups, (c) researcher mobility, (d) slim administrative structures, and (e) good quality physical infrastructure.

- Research units will train new top researchers who may leave the original unit and form creative new research environments and CoE.

2.3 Programme objectives

The CoE Programme is one of the key funding instruments through which the Academy seeks to promote the development of high-level basic research. The primary objectives of the CoE programmes (as set out in the National Strategy) are (1) to create more stimulating research environments, and (2) to improve researcher training. The Academy of Finland uses the CoE Programme as a funding tool to "promote creative research environments where internationally competitive research is combined with top-level researcher training".

It is important to note that, whereas broad high-level objectives for the CoE Programme were outlined as part of the National Strategy in 1997, no targets were set for the programmes in terms of expected outputs and outcomes. The implication is that no benchmark exists against which the relative success or failure of individual programmes could be measured by an evaluation. Consequently, any evaluation can only be concerned with the relative extent to which the individual programmes have attained the high-level goals set out in the National Strategy.

2.4 Programme design, funding and operation

The CoE programmes provide funding for research or researcher training units which are considered to be at the international cutting edge in their respective fields.[7] According to the National Strategy (1997), a Centre of Excellence is

> *"a high-quality research and researcher training unit that has the potential to become an international leader in its field. A CoE consists of one or several research groups of a high international standard that have clear common goals. It can also include individual top researchers who do not belong to any group."*[8]

A Centre of Excellence can be characterised as follows:

- A research or researcher training unit that is at the international cutting edge of research in its field;
- Consists of one or more research teams;
- Shares a common set of research objectives and works under a joint management;
- May be composed of research teams operating both at universities and research institutes, also (but not necessarily) in cooperation with business companies;
- Funding for CoEs comes not only from the Academy of Finland but also from universities and research institutes, as well as other partners;
- CoEs are selected through competition based on an international peer review for a six year period.

The CoE Programme is a nationally funded innovation support measure. Funding is primarily provided by the Academy of Finland[9] and, depending on the programme,

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7 Besides the centres of excellence, this programme also provides funding to seven core facilities organisations.

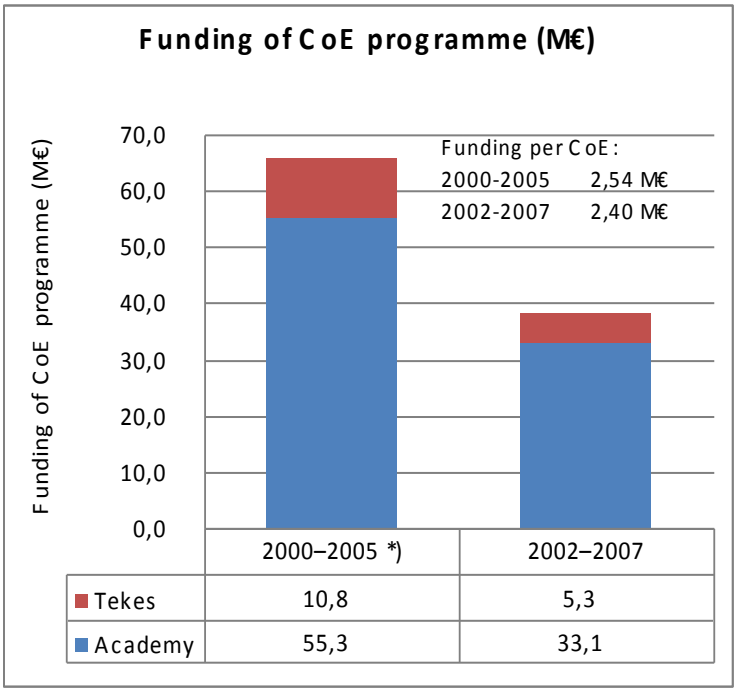
8 This definition was amended in the updated National Strategy in 2009, which again placed an emphasis on researcher networks but importantly added an element of science-industry cooperation to the programmes' mission: "A Centre of Excellence (CoE) is a research and researcher training unit that is at the international cutting edge of research in its field. A CoE may consist of one or more high-level research teams working closely together, based at a university, research institute or spread across several different organisations. A CoE may also have collaboration with private sector companies."

9 €54.9m for the 2000-2005 term and €33.1m for the 2002-2007 term

contractual funding is additionally provided by Tekes (The Finnish Funding Agency for Technology and Innovation)[10]. Taken together, the funding made available by these two organisations amounted to €65.4m for the 2000-2005 term and €38.2m for the 2002-2007 term (which corresponds to an average funding volume per unit of €2.5m and €2.4m respectively). In addition, the host organisations of the CoE – i.e. universities and research institutes – provide a significant share of the funding.

The responsibility for selecting and nominating research units rests with the Academy of Finland. CoEs are funded for a period of six years which is intended to give them the necessary financial stability to pursue new avenues of inquiry and engage in high-risk research, especially in technically oriented fields where funding is not sufficiently long-term.[11]

Figure 1 Funding of the CoE programmes 2000-05 and 2002-07[12]



Source: Academy of Finland (2009)

In the first programming period (2000–2005) and the second programming period (2002-2007), 26 units and 16 research units were given CoE status respectively.[13] The size of the units varied from 20 to almost 200 FTE staff. The CoEs were based at 10 different universities and four research institutes. Research units were selected on the basis of (a) scientific merits and output, (b) the significance and feasibility of the research plan, and (c) the research environment and success of the unit in researcher training.

The individual CoE were subjected to two evaluations during the programmes' lifetime: the first took place after three years (interim project evaluation) and the

[10] €10.8m for the 2000-2005 term and €5.3m for the 2002-2007 term

[11] A CoE can be re-granted CoE status immediately after one successful six-year period if it does well in competition with the new applicants. There is no limitation on the number of times CoE status can be extended.

[12] includes €7.5 million funding for support functions

[13] Since then, two further CoE Programmes have been implemented: in the third term (2006-2011) and fourth term (2008-13), 23 units and 18 units were appointed respectively.

second was a concluding evaluation carried out by an international expert panel. Importantly, one of the five objectives of the concluding evaluation was to assess "the added value generated by CoE funding in the unit's work and in the development of Finland's research and training environments and innovation system."[14] These project-level evaluations provided a useful evidence base for the Impact evaluation of Finnish Programmes for CoE and enabled the evaluator to draw out relevant insights concerning the Programme's overall impact on the innovation system.

3. Designing the evaluation study

3.1 Process

The evaluation study was prepared by the Academy of Finland over the course of one year. The steering group of the evaluation was chaired by the Director of the CoE Programme at the Academy of Finland and, in addition to six other Academy officials, included one representative from the Ministry of Education and from the Finnish Funding Agency for Technology and Innovation (Tekes) respectively.[15] The inclusion of a Tekes official on the steering group is due to the fact that this organisation is co-founding certain research units as part of the CoE programmes (see section 2.4 above).

3.1.1 Preliminary scoping and study design

Prior to the design and finalisation of the study specifications, the steering group organised a scoping meeting with evaluators (in the form of a roundtable discussion) to explore which central issues the evaluation of the CoE programmes should cover and discuss possible approaches with a view to ensuring that the Academy's objectives could be met. Approximately half a dozen consultancy firms were present at this scoping meeting. The company that won the contract is Gaia Consulting Ltd.

In commissioning external evaluations, the Academy usually seeks evaluators' advice in the preparation of the study specifications (i.e. prior to the finalisation of the Terms of Reference) due to the fact that the Academy does not have in-house resources or an evaluation team. It should also be pointed out that the Academy does not use specific guidelines for the commissioning of evaluation studies, thereby relying to a large extent on outside advice in the design of study specifications.

The basic advantage of this "scoping" approach is that it allows the Academy to leverage the skills and evaluation expertise of external consultants prior to finalising the study specifications (which is arguably the crucial phase of any evaluation, given that the quality of the study specifications will to a large extent determine the outcome and usefulness of an evaluation). In addition, this "open roundtable discussion" approach provides an opportunity to reflect on what is feasible and desirable in a

[14] The interim and final evaluations of the individual CoE assessed (a) to what extent objectives were attained and the plans presented at the application stage realised, (b) whether planned research, training and cooperation projects had been successfully concluded, (c) changes to the CoE's capacity for reform and its management capacity, (d) the *added value generated by CoE funding in the unit's work and in the development of Finland's research and training environments and innovation system*, and (e) a unit's strength, weaknesses, opportunities and threats.

[15] The Academy operates under the administration of the Ministry of Education, whereas Tekes funds come from the state budget via the Ministry of Employment and the Economy. is the main government financing and expert organisation for research and technological development in Finland. Tekes finances industrial R&D projects as well as projects in universities and research institutes. Tekes especially promotes innovative, risk-intensive projects. The primary objective of Tekes is to promote the competitiveness of Finnish industry and the service sector by assisting in the creation of world-class technology and technological know-how. Tekes intends to encourage innovation in areas defined on the basis of clear user need. Selective project funding is the basis of Tekes operations. Together with the business community and researchers, Tekes identifies strategically important R&D areas and designs programmes to gather the best players in the field to work with the intention of achieving a common goal.

particular evaluation (i.e. what *can* and what *should be* evaluated, how the study objectives can be aligned with the Academy's goals, etc.) and to explore different possible avenues of inquiry (evaluation issues and questions). By consulting evaluators at an early stage, the Academy is able to narrow the scope of the evaluation and to achieve a more optimal study design.

From the evaluator's perspective, these exploratory discussions can serve to develop a better appreciation of the Academy's main interests and goals in relation to the evaluation study. In addition, practical issues such as timing/ workplan, feasibility of certain methods and approaches, data requirements, etc. can be directly discussed which also means that obstacles for the implementation of the study (in particular related to data gathering) are eliminated from the outset and the requirements in the final specifications are realistic.

Nevertheless, the involvement of evaluators in the design of the study specifications has potential disadvantages. Engaging potential contractors at the preparatory stage on an informal (non-contractual) basis can affect their impartiality and skew the evaluation results later on in the sense that evaluators might be more ready to respond to the Academy's expected findings. Secondly, by giving evaluation consultants a say in the scoping of the study and formulation of specific evaluation questions, the Academy risks that the study design will not necessarily reflect its actual requirements vis-à-vis the evaluation study (in terms of evaluation issues that are relevant and that should be addressed) but rather the capabilities and experience of the particular evaluators involved in the consultation/ brainstorming process (which may or may not be limited to certain methods or a particular set of tools).

In the case of the present evaluation, the persons interviewed for this case study agreed that the process was beneficial in that it helped the steering group to develop a clearer focus on the central issues and refine the evaluation questions so as to achieve a more optimal study design. There is also a sense that the involvement of evaluators at the preparatory stage helps the Academy to develop an adequate framework for the evaluation – in the sense that the proposed budget matches the specified tasks and scope of the evaluation, and that the data required to address evaluation issues can actually be sourced – without compromising on its objectives. Moreover, from the point of view of the evaluator, it was helpful that the Academy indicated a tentative budget for the evaluation already at the planning stage, given that this framed the approach to the methodology (the range of tools and resources that could be employed within the available budget). The maximum budget available for the study was €95,000 which the persons interviewed for this case study deemed appropriate in that it allowed the evaluator to explore all the evaluation questions in detail. More generally, the budget was seen as commensurate with the size of the CoE funding programmes.

3.1.2 Finalisation of study specifications and competitive tender

Following the finalisation of the study specifications the Academy organised a competitive tender. The winning proposal for the tender was selected on the basis of the quality of the proposed methodological approach (50%), while the price (30%) and experience of the team of evaluators (20%) were also factored in. The winning tender's proposed method was considered innovative in that it aimed to capture both the operational and the strategic dimensions of the support measure. Moreover, it included several evaluation questions in addition to the ones that were specified in the ToR. These were questions that the evaluator felt were relevant to the Academy and should be addressed as part of the evaluation.

The proposed approach to the evaluation was further refined during an initial meeting between the evaluator and the steering group which did not, however, result in significant changes to the proposed approach to the study.

3.2 Objectives and thematic scope

The official Terms of Reference for the study are relatively short (at 9 pages) and set out a basic framework for inquiry. The document lists eight main areas that the evaluation is expected to examine, with further specific questions related to each area. Key issues include:

- What has been the added value of the funding provided through the Academy's CoE programmes for the research units?
- What has been the added value of the CoE programmes for the Academy?
- To what extent did the CoE programmes promote basic and applied research, collaboration among researchers and researcher groups, and cooperation between researchers and knowledge users?
- Is there evidence that new research networks have emerged as a result of funding, and how have relationships between existing networks changed during the program? What is the importance of internationalisation in the networks?
- How well have researchers trained at the units been integrated into the labour market?
- To what extent has the CoE programme funding influenced the formulation of strategy at universities/ research institutions? Have they made special investments in research infrastructure as a result of the Academy's funding?
- Have the universities / research institutions developed exit strategies for funding the units after the end of the programme period?

The ToR also note that the above evaluation tasks were drawn up bearing in mind the objectives of the National Strategy for CoE, thereby highlighting the strategic dimension of the evaluation.

Beyond setting out a basic framework for inquiry, the ToR did not prescribe the methods or analytical approaches to be used as part of the evaluation study (nor the data sources or stakeholders to be consulted by the evaluator in order to address the evaluation questions). The original study specifications therefore required evaluators to develop an adequate study design that would allow them to address the evaluation questions.

The reason why the evaluation was expected to focus on the 'societal impacts' of the measure is that the Academy of Finland provides funding for high-level basic research – commercialisation potential is therefore not a criterion for funding.[16] By contrast, Tekes funds projects involving basic research only in so far as they contain elements that can be expected to lead to commercial application in the long run.[17] The Academy is responsible for coordinating the measure and by far the largest financial contributor, hence the focus on the societal dimension of the programme rather than on its economic impact. From a more practical point of view, it is clear that evaluating the economic impact of any programme concerned with funding basic high-risk research would not be appropriate given that generating economic impacts is not part of the purpose of the measure.

[16] The Academy's stated aim is "to ensure that the results of research are put to use in society in the interests of welfare, culture, the economy and the environment". Its priorities include the promotion of internationalisation as well as close collaboration between the research community and funding bodies.

[17] In the context of the CoE programmes this means that in order to qualify for Tekes funding, "CoEs must actively seek out ways of commercially exploiting their research and of making corporate contacts. The aim is to generate fruitful cooperation between basic research, applied research and development, thus eliminating the boundaries between them."

As was noted at the outset, an assessment of scientific quality (outputs produced by the CoE units) and the efficiency of the programme implementation were explicitly excluded from the evaluation. Two observations can be made in this regard:

1. A common element in the evaluation of strategic research programmes is the impact of a given measure on *scientific quality* (most commonly based on bibliometric analysis). However, the Academy decided that scientific quality would not form part of the evaluation given that scientific quality was a criterion for a unit to be designated a CoE in the first place.[18] In spite of this, the evaluation addresses issues related to scientific quality in that it examines the effects that the programme funding has had on the funded research units, i.e. by looking at the kind of changes that take place as a result of the intervention (a) within the CoEs and (b) in the environment of those units (e.g. the university departments where they are located). In short, it was decided that the evaluation would focus on the wider developments that CoE funding set in motion rather than being centred on specific indicators for scientific quality such as the number of scientific publications resulting from enhanced researcher collaboration.
2. In terms of excluding the *efficiency of programme implementation* from the remit of the evaluation, this can be seen as a missed opportunity, given that findings from the evaluation could well have been used for the design of ongoing CoE Programmes, i.e. to identify potential for improvement in programme management and implementation. At the same time, it can be argued that an evaluation of programme efficiency would require a separate study in itself, with an appropriate research design built around a separate set of evaluation questions. On balance, it appears sensible to keep the evaluation focused on a central issue in light of limited resources, and the steering group appears to have made a deliberate choice in this regard.

It must also be noted that there are two important elements missing from the technical specifications for the evaluation:

- First, there is no explicit discussion of the concept of 'societal impact'. This seems surprising given the broad scope and possible differing interpretations of what 'societal impact' of basic research entails and what it *does not* encompass. A clearer delineation would have been useful in order to give better steering to the evaluators and a clearer direction for the evaluation as a whole. Instead, it appears that evaluators were given considerable discretion to develop the concept of 'societal impact' and the way in which it would be addressed in the evaluation. The tools and methodologies used for the evaluation were designed as a function of this interpretation.

  In addition, it is debatable whether the concept of 'societal impacts' as such is appropriate in the context of the Centres of Excellence Programmes. It has become common practice to assess the potential impacts of individual research disciplines on society at large, as for example in the case of nanotechnology, biotechnology, etc. These assessments are often framed as foresight studies, the purpose being to judge the potential benefits and challenges that the introduction of novel technological devices and materials may hold for society and human interaction. (The term is often expanded to also include the health and environmental impacts of a particular field of technology.) The Finnish CoE Programmes provide funding to a variety of research units active in different fields of research. A central question – and arguably a starting point for any evaluation – would then be how exactly 'societal impacts' resulting from this diverse range of research activities could be captured by a programme-level evaluation, given the

[18] In the context of the CoE programmes, 'scientific quality' refers to the record of a research unit in terms of scientific output, the quality of it researcher training, and the quantity and quality of research collaboration.

variety of potential societal impacts resulting from each of the different research activities / CoEs supported by the programmes.

- Secondly, the broad objective of the CoE programmes is defined as the development of "creative research environments, where internationally competitive research is integrated with high-level researcher training." What exactly constitutes a 'creative' research environment – and which evaluation criteria and indicators could be used to measure the degree of 'creativity' – is not specified in the terms of reference.

In sum, a definition of the central concepts related to the CoE Programme's rationale and objectives was missing from the technical specifications for this evaluation. Perhaps more importantly, a description of the 'theory of change' and intervention logic for the CoE Programmes was likewise missing.

In addition to evaluating the impact of the programmes, the steering group expected the evaluation to provide insights for the design and operation of future programmes. Questions that were deemed particularly important for programme management include:

- Is the amount of funding adequate?
- Is the number of units receiving funding adequate, or should the funding be spread more widely?
- What should be emphasised as the main objectives of programme funding vis-à-vis the CoE units? To what extent should societal impacts be emphasised given that the programme is funding basic research? Is it realistic to expect the programme to generate societal impacts? Should the Academy expect basic science research unit to generate societal impact?

3.3 Description of study design: methods, analytical approach, data requirements

The steering group did not have particular expectations concerning the methods that were to be used, giving the evaluator free hand to design an appropriate approach and analytical framework for the evaluation.

In terms of available data, the evaluators were provided with the results of the self-evaluations that CoE units were required to complete (a questionnaire containing units' assessment of their structural development, scientific development, programme implementation, SWOT, and social impact) as well as additional statistical data on the units (number of research staff, breakdown of funding, number of PhD degrees, number of articles published, number of other scientific publications published).

3.4 Challenges associated with the study design

Feedback from interviews conducted for this case study suggests that the published Terms of Reference do not provide a complete picture in terms of the scope of the evaluation. Although this is not made explicit in the study specifications, the evaluation was expected to combine two perspectives that can be distinguished for greater clarity.

From an 'operational' point of view, the main objective of the evaluation was (as the title suggests) to provide the Academy with a better understanding of the success of the CoE programmes in terms of the societal impacts they generated. The evaluation therefore centred on the issue of the Programme's effectiveness, i.e. to what extent did the two programme terms meet the high-level strategic goals spelled out originally in the National CoE Strategy.

There are a number of important challenges associated with the evaluation of the programmes' effectiveness.

- Firstly, the fact that the intervention lacks a clear set of indicators (and corresponding targets) makes it possible to measure its absolute impact, but not its relative impact, thereby leaving considerable room for interpretation regarding the degree of its success.
- Secondly, the fact that the intervention lacks clearly defined objectives (rather than broad high-level goals) makes it necessary for the evaluator to define in what ways impact should be measured in the first place (i.e. which judgement criteria should be applied).
- Finally, at a more systemic level, it is difficult to look at the impacts generated by one policy intervention in isolation due to diffusion effects created by other funding measures and lack of a clear cause-effect relationship. This is a challenge that applies more broadly to the evaluation of innovation support measures regardless of the type of measure. The evaluation therefore had to take into account the fact that the CoE Programme is only one of many support instruments designed to achieve the overall national strategic goals in science in research. Disaggregating the CoE Programme's impacts from the other measures and isolating its net impact therefore poses a significant methodological challenge.

From a 'strategic' point of view, the evaluation was expected to provide insights that would feed into the renewal of the National CoE Strategy. In order to review the role of the CoE Programme, the evaluation would have to take into account the changing policy landscape and shifting priorities in the Finnish innovation system. A particularly important development in this context was the launch of the "Strategic Centres for Science, Technology and Innovation" in 2006, a new support instrument aimed at fulfilling the goals of the national innovation strategy by providing long-term funding for research that is "strategic, pre-commercial, and as a rule not associated with short-term market goals".[19]

The evaluation was therefore expected to help reassess the place of the CoE Programme in relation to other policy instruments and if necessary adjust the objectives of the underlying National CoE Strategy, touching on the issues of relevance and appropriateness of the policy intervention. Surprisingly, however, this important dimension of the evaluation is not explicitly stated in the Terms of Reference of the study and therefore remains obscure to the outside observer.

In sum, it can be said that the study specifications do not adequately reflect the multi-layered expectations vis-à-vis the evaluation and that the objectives of the evaluation could have been differentiated more clearly. Whereas the evaluation questions included in the Terms of Reference cover effectiveness issues, the relevance and appropriateness of the Programme in the wider innovation system (issues that were ultimately central to the evaluation) are not addressed.

4. Implementing evaluation: methodology and process

4.1 Workplan

The overall workplan for the evaluation was accepted by the steering group at an inception meeting and remained mostly unchanged throughout the study. The only exception is the addition of a survey of targeted foreign researchers which was added following the case study programme with the aim to capture more detailed evidence

[19] The decision to set up the Strategic Centres for Science, Technology and Innovation was made by the Science and Technology Policy Council chaired by the Prime Minister in 2006. The intervention aims to support "networks of a new type that engage in intensive and long-term work to achieve shared goals". Public funding is provided by Tekes and the Academy of Finland. Tekes funds the research programmes and projects initiated by companies, and the Academy funds research carried out in the areas of the Strategic Centres.

on the internationalisation effects of the CoE programmes. This survey was intended to assess how CoE units were perceived by foreign researchers and to what extent they succeeded in attracting scientists from abroad.

The workplan for the evaluation comprised 7 stages:

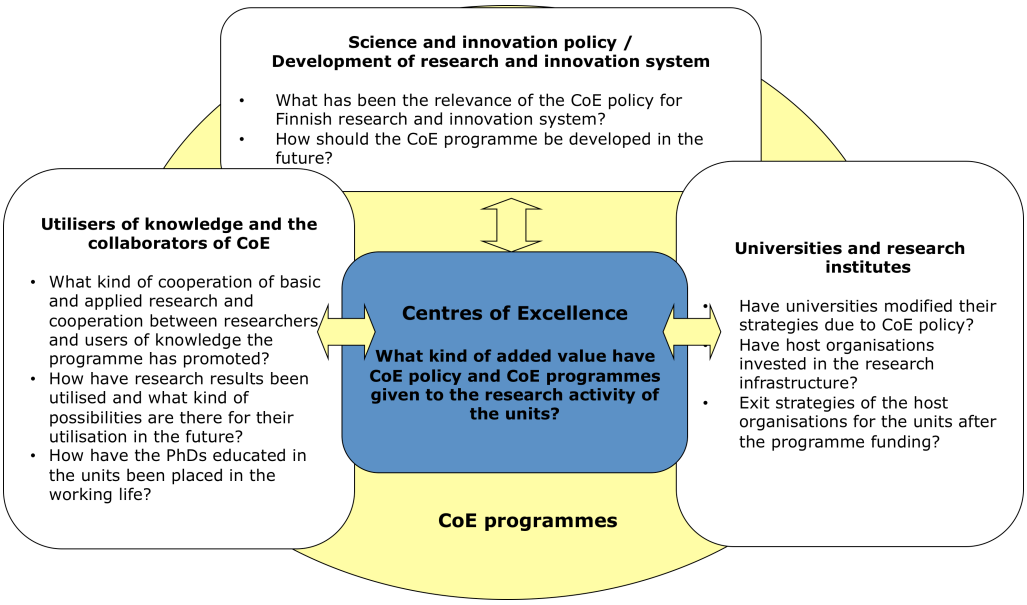
1. Desk research (review of available CoE data and other relevant material)
2. Survey design and implementation
3. Case studies of CoEs
4. International comparison of CoE programmes
5. Supplementary interviews
6. Analysis workshops
7. Reporting

4.2 Approach and methodology

The evaluators chose to structure their overall approach to the evaluation around three main evaluation questions:

- Impact – How has the CoE programme achieved its objectives?
- Added value – What additional value have the CoE programmes produced for the research and innovation system?
- Appropriateness & relevance – How can the CoE programmes and the CoE strategy be developed through the experience gained from the first programmes?

Figure 2 Viewpoints and evaluation questions



Source: Academy of Finland (2009)

The methodological approach put forward by the evaluator combined a number of qualitative data gathering tools (desk research involving the review of CoE units' self-evaluation material; interviews with CoE researchers; case studies; workshops with CoE researchers) and quantitative data gathering tools, including several surveys and the review of statistical data on CoE units.

The initial **desk research** included a review of the written documentation on CoE policy and programmes and analysis of information on the individual CoE units (i.e. self-assessment forms, international evaluations, annual reports). In addition, the evaluators analysed the statistical data related to funding, personnel, and direct research outcomes of individual CoEs that had been compiled by the Academy in the summer of 2006 and 2008. The evaluators used the available material to gain an overview of the programmes and to plan the collection of additional information in the following stages of the study.

The second stage involved the development and implementation of four separate **questionnaires** to canvass the opinions of (potential) host organisations and researchers at CoEs. The individual surveys were targeted at:

- CoE host organisations[20] (target population 95; 35 responses);
- Potential CoE host organisations, targeted at universities that are not CoE host organisations (target population 65; 16 responses);
- Finnish researchers who applied for the post of Academy Research Fellow between 2005 and 2007 (target population 828, 186 responses[21]);
- Foreign senior researchers who had worked at CoEs (target population 235, 44 responses).

The third stage consisted of in-depth **case studies of 13 CoEs** (31% of the total number of CoEs under the two programmes). The purpose of these case studies was to gather detailed information on (a) the mechanisms of knowledge use and operating models employed at different research units, (b) on their forms of cooperation, and (c) on the added value that the CoE programmes brought to the work of the research team. Specifically, the aim was to examine the experiences of CoEs representing different scientific disciplines. The sample of CoEs was broadly balanced in terms of programme periods (the number of cases being proportional to the programme volume), host organisations, research disciplines, and number of researchers. Case studies were based on a detailed review of the available background material and quantitative data as well as additional information obtained through 2-4 personal interviews with relevant individuals (CoE director, researchers, end-users of the knowledge generated by the CoE, partners of the research unit). In all, 34 case study interviews were conducted.

The fourth stage of the evaluation workplan involved **comparative analysis** of the Finnish CoE Programme with the CoE programmes in Switzerland, Denmark and the Netherlands. While the outcome of this international comparison was a separate report, relevant insights were used throughout the main evaluation report.

The fifth and sixth stages of the study involved nine **supplementary interviews** with relevant stakeholders and the organisation of three **analysis workshops** in November 2008 (with 35 participants in total). The interviews and workshops served to fill remaining data gaps and obtain an additional level of qualitative data that could be added to the overall analysis and formulation of conclusions and recommendations.

The evidence gathered through the above methods was used to draw up conclusions during the final stage of the study. The central evaluation questions specified by the steering group are addressed through a combination of data gathered through the relevant tools. The findings of the evaluation are presented in separate chapters corresponding to the main evaluation issues, where each chapter draws on a combination of relevant data sources:

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[20] The survey of CoE host organisations and potential CoE host organisations was targeted at rectors, vice-rectors, heads of administration and deans/ heads of department.

[21] Of which 79 were from researchers who had worked at a CoE in the course of their careers.

- Impacts of the CoE programmes on research – CoE self-assessment reports; survey of CoE host organisations; CoE researcher interviews; workshop discussions.
- Impacts of the CoE programmes on the host organisations – CoE self-assessment reports; survey of CoE host organisations; interviews; workshop discussions.
- Societal impact of the CoE Programme – Review of background material (policy reports etc.); surveys; interviews.
- Centre of Excellence Policy and Development of the Innovation System – Interviews; surveys.

4.3 Organisation of the evaluation process

The evaluation was led by a steering group appointed by the Academy of Finland which met five times over the course of the study. The five meetings were:

1. Kick-off meeting to finalise workplan for the study;
2. Interim meeting with presentation and discussion of survey design; selection of CoE for case studies; people to be interviewed;
3. Presentation of first results from data gathering phase;
4. Discussion on the format of the analysis workshop;
5. Final meeting to discuss draft final report.

The steering group made available relevant background data and material during the inception phase of the evaluation and provided feedback on the selection of interviewees, case studies and workshop participants. The successful execution of the evaluation workplan can be attributed in part to the strong commitment on the part of the steering group to facilitate access to relevant data and ensure a high degree of participation from CoEs in the data gathering stages.

In terms of processes, the evaluation was highly efficient due to the considerable interest on the part of CoE host organisations, CoE administrators and researchers and as a result of the close working relationship between the steering group and the evaluator.

4.4 Evaluation results

The evaluation concludes that the two CoE programmes achieved their central objectives. The overall finding is that the programmes had a significant impact on the *development of cutting edge research environments* and on improving the *quality of researcher training* at the CoE research units. In addition, the evaluation concluded that the two programmes had a positive impact on the *overall research system*, specifically by encouraging more favourable attitudes towards competition for research funding (as evidence by findings from interviews with CoE managers and surveys with host institutions and researchers). In view of these findings, the evaluators recommend that the CoE programmes be continued on the basis of the existing programme design, with scientific quality constituting the primary selection criterion for research units.

At the same time the evaluation notes that there are too many CoEs for a country the size of Finland and that money is spread out too thinly. The evaluators note that CoE funding for each unit has remained too low to allow the creation of permanent research structures, which means that impacts from the CoE programmes may remain only temporary. Therefore, the study's central recommendation is to concentrate the available funding on fewer CoE in future programme rounds.

From an operational point of view, the evaluation highlights the need for host organisations (predominantly universities) to assume a more prominent and active role in supporting CoE in the future. In addition, it notes that research management,

strategic planning and administrative procedures within the CoE programmes could be further improved. Finally, the evaluators concede that no definite recommendation can be made concerning the maximum number of CoE terms for one and the same unit.

Based on the evidence gathered, a central conclusion of the evaluation is that the CoE programmes have helped CoEs to raise their profile and thereby enabled them to attract more (and longer-term) funding. This has in turn increased financial stability and enabled research units to take a long-term view on their research projects and improve researcher training. The evaluation outlines additional positive impacts in relation to three main areas:

- Greater attractiveness of CoE research units (for senior researchers, graduate school students, and international partners).
- Ability to take greater 'risks' (in terms of research agenda) through greater funding stability, as well as greater flexibility in development of new themes and research methods.
- Better research administration and improved strategic planning abilities.

Looking forward, the evaluators make the following recommendations:

- CoE programmes should be continued and future appointments should continue to be made first and foremost on grounds of scientific quality.
- However, future CoE programmes should aim to incorporate a smaller number of units while increasing the amount of public funding per unit.
- Furthermore, CoE host organisations, i.e. universities and research institutes, should take a stronger and more active role in supporting CoEs in the future.
- CoEs themselves should invest greater effort in maximising the added value gained from international engagement and other aspects of the programme.

5. Effectiveness and efficiency of evaluation

Overall, the evaluators were able to address the key evaluation issues by drawing on the available programme data and evidence gathered through a combination of tools and analytical methods. The effectiveness of the study can be assessed in terms of its ability to address the main evaluation issues that were raised initially. The ability of the evaluator to arrive at cohesive findings and put forward a number of concrete recommendations for the future design of the CoE Programme and the strategic review of the policy instrument can be seen as evidence of the success of the chosen approach.

The methods employed for this evaluation can be considered appropriate given the particular focus on the 'societal impact' generated by the intervention. As explained previously, the rationale for the CoE policy is to create creative research environments that would have lasting benefits for the national innovation system and positive societal impacts. It is important to acknowledge the methodological difficulties related to the evaluation of societal impacts of basic research funding. The range of data gathering tools and methods that can be used to compile reliable evidence on societal impacts are limited in the sense that they will necessarily focus on the effects reported by researchers and stakeholders involved in CoEs.

The basis for assessment (i.e. data sources and criteria applied for assessing the impact in each of those five areas) has been a combination of data obtained through the aforementioned research tools (i.e. surveys, case studies, interviews, comparison with other CoE programmes, and the final analysis workshop). No hard indicators were used for this assessment and instead a balanced judgement was formed on the basis of the available qualitative evidence obtained.

An important factor in this evaluation is the experience that the evaluator was able to bring to this study, given their involvement in numerous evaluations of other innovation support instruments funded by Tekes and the Academy of Finland. Moreover, the evaluator's understanding of the Finnish innovation system allowed it to contextualise the evaluation and to provide an additional strategic perspective on the Programme's future design.

The analysis workshops during the final stage of the study were important in ensuring that the conclusions of the evaluation are sufficiently robust and that the quantitative data is fully utilised. The workshops can serve to strengthen the outcome of the evaluation by allowing the evaluator to present their findings and interpretation of the evidence and to gather feedback / criticism before reaching a final conclusions.

Among the methods employed by the evaluator, the in-depth case studies of CoEs have arguably the greatest added value as they can serve to explain the system of basic science and the nature of the impact generated by CoE programme funding. Given the resource intensiveness of this method, a greater focus of case studies is bound to have implications for the evaluation budget.

One possibility of enhancing the study design in similar evaluations would be to attempt a more detailed comparison of the measure with similar interventions in other countries. The advantage of such an approach would be the identification of transferable lessons and relevant benchmarks, making it possible to assess the intervention's success in relative rather than merely absolute terms. In practical terms, however, any attempt at an international benchmarking/ comparison with other programmes is likely to be hindered by the varying policy contexts and differences in programme design and set-up, and will require considerable additional resources.

Another method that would seem of interest in the context of this evaluation – and is relevant to evaluations of measures providing support to strategic research and researcher networks (intra-science collaboration) more generally – is social network analysis. By mapping the relationship between participants in a research network and the nature of their collaboration, this method has the potential to provide valuable insights into the effects of the CoE programmes on the science community and their effect on research environments. This would ideally involve an analysis of the research networks in which CoEs were engaged before and after programme funding, making it possible to estimate the "brand value" of the CoE programme, i.e. whether it has been even easier for research units to build/ expand their networks because of their status. While social network analysis is a technique that is still rarely used in the context of evaluations, it can add an important additional layer of evidence when assessing the impact of measures aimed at fostering researcher collaboration.

6. Conclusions and lessons learned

The main strength of the evaluation is its successful triangulation of a wide range of data obtained through qualitative research tools. At the same time, the absence of hard indicators and quantifiable benchmarks limits the transferability of the evaluation design. Different contexts may provide better opportunities to employ quantitative approaches depending on the available budget.

In sum, the evaluation successfully addresses a number of key issues related to the CoE programme's objectives:

- Impact on the national research system – At a strategic level, the evaluation examined the added value of the CoE programmes in the context of the national innovation system. It found that CoE programmes have had a positive impact on the formation of high quality research and training environments and contributed to the goals of the national innovation strategy.

- Impact on research cooperation and training environments – At the programme level, the evaluation examined the effect that CoE programmes have on research cooperation and the development of stimulating research and training environments.
- Effectiveness of programme design – At an operational level, the evaluation reviewed the effectiveness of the programme design/ funding mechanism in terms of selection criteria for CoE research units, the role of host organisations in supporting CoEs and the distribution of available funding.

The Impact evaluation of Finnish Programmes for Centres of Excellence in Research provides a good example of the way in which operational, programme and strategic aspects can be integrated in order to provide an overall assessment of a funding programme for strategic research. At the same time, this kind of broad based approach poses significant challenges given the need to gather substantial data through a range of tools in order to reach reliable conclusions. The strategic assessment of the intervention's role in the overall national innovation system and relevant lessons for the further development of innovation policy in particular require substantial experience on the part of the evaluator in the evaluation of R&D funding programmes.

Finally, it must be noted that the evaluation of strategic research programmes can take a variety of foci and 'societal impacts' is only one of them. The methods and analytical approaches must be tailored to the underlying rationale of the intervention. In different countries and contexts, CoE policy can be guided by a variety of objectives, such as developing national know-how and competitiveness in fields that can involve basic and/or applied research, supporting top-rank researchers, supporting multi-disciplinary cross-sector research programmes, marshalling scientific resources at universities and promoting results exchange and exploitation. CoE programmes can also have close links with trade and industry in order to promote information provision and commercial utilisation of innovative ideas and technologies, and thereby optimise scientific and technological resources. A focus on any of the above issues will likely benefit from a greater emphasis on quantitative analytical techniques involving, for example, econometric analysis to assess the net added value of the particular scheme on its beneficiaries.

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