POLICY INITIATIVES TO ENHANCE THE IMPACT OF PUBLIC RESEARCH

PROMOTING EXCELLENCE, TRANSFER AND CO-CREATION

Case studies
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### 1. Austria – Christian Doppler Research Association (CDG)

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<th>Objective</th>
<th>The objective of the Christian Doppler Research Association (CDG) is to support long-term cooperation between industry and science in the area of “application-oriented basic research”. CDG provides grants for the establishment of research laboratories within Austrian universities based on an industry challenge (industry relevant questions in basic research), which are co-financed by industry.</th>
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</thead>
<tbody>
<tr>
<td>Target audience</td>
<td>Firms and research groups from universities</td>
</tr>
<tr>
<td>Timetable</td>
<td>Launched in 1988, and reorganised in 1995 as an association. Still active today, with no established end date.</td>
</tr>
<tr>
<td>Priority industries and technologies</td>
<td>Focus on “application-orientated basic research”. Initial focus was de facto on material sciences, later broadened towards a wide range of research fields, mostly related to natural sciences and engineering. This specialisation pattern was not the result of any kind of priority setting but simply a reflection of the structure of Austria’s nationalised industries, where the CD Labs originated. Currently there are no thematic restrictions, CDG strictly applies a bottom-up approach.</td>
</tr>
<tr>
<td>Specific approach to breakthrough innovation</td>
<td>N.A.</td>
</tr>
<tr>
<td>Instruments used</td>
<td>Grants for public collaborative research</td>
</tr>
<tr>
<td>Budget</td>
<td>Yearly budget range: EUR 20-50 million. Annual grant up to EUR 700,000 (EUR 110,000 minimum) per CD Lab. Funding in cash: 50% by company partners, 50% public partner/ministry. Maximum amount of grant awarded per Lab (within a 7 year funding period): EUR 4.9 million.</td>
</tr>
<tr>
<td>Responsible policy making body</td>
<td>Federal Ministry of Digital and Economic Affairs</td>
</tr>
<tr>
<td>Responsible implementation body</td>
<td>The CDG is funded by the Federal Ministry of Digital and Economic Affairs. At the same time, the CDG is an independent association. CDG activities are determined by the General Assembly, the CDG Executive Board, the CDG Scientific Board (all of them are jointly formed by CDG members from industry, academia and government) and supported by the CDG Secretariat. The academia-dominated CDG Scientific Board decides, based on scientific criteria, about the quality of a research proposal and the researchers and its eligibility to be funded. The industry-dominated CDG Executive Board decides about the concept of the funding structure, its development and its implementation. In any case, representatives of the Federal Ministry of Digital and Economic Affairs have the right to veto decisions.</td>
</tr>
<tr>
<td>Implementation of the initiative</td>
<td>CD laboratories must receive 50% of industry co-funding, and public support lasts up to 7 years. CD Labs consist of research groups (5-15 people on average) and are led by a laboratory head. They are directly embedded within a hosting university or research institution.</td>
</tr>
</tbody>
</table>
Applications to set up a CD Lab can be submitted at any time. The application to set up a CD Laboratory is drafted by the lead scientist in coordination with the commercial partner and submitted to the CDG Secretariat. In this capacity, the scientist represents the respective university or research institution. There is the possibility to carry out sub-areas of the scientific activity (or “modules”) of a CD Lab at another university or non-university research institution.

The assessment of an application for establishing a CD Lab follows a clear procedure that considers the following criteria: Track record of applicant, scientific impact anticipated, commercial impact anticipated. In advance of the formal application, the CDG Secretariat offers information and advice to prospective applicants. The evaluation process includes internal evaluation by the CDG Scientific Board and external peer-review.

In 2012, the CDG started an additional programme for Josef Ressel (JR) Centres to be established at universities of applied sciences. They basically correspond to the structure and objectives of the CD Labs, with the difference to focus on application-oriented research. Their maximum duration is 5 years and their budget is also lower (up to EUR 400,000 annually, minimum 80,000).

As of June 2018, 90 active CDG-funded research units (80 CD Labs and 10 JR Centres) were supported by public funding and 162 industrial partners. Over the years, more than 200 research units have been supported via the CDG (Ecker et al., 2019).

CD Labs and JR centres are not established as separate legal entities, but remain fully integrated in the host institution, which helps to avoid the disadvantages of parallel structures (OECD, 2018). They use the host institution’s infrastructure for their administrative and research activities. The centres remain open to include additional business partners as they evolve.

| Regional aspects | CD labs are concentrated at the main university locations. The JR Centres programme contributed to strengthened the regional dimension as these are established in (more decentralised) Universities of Applied Sciences, which are deeply embedded in the regions where they are located. |
| International aspects | CD Labs can be set up at non-Austrian universities and research institutions, subject to the following additional requirements at the time of application: 1) Information on the necessity for the scientific expertise (justifying that the scientific expertise required to work on the industrial partner’s chosen topic is not available in Austria, or its quality is insufficient). 2) Information on the benefit for Austria (the topic must be of general interest for Austria and the application must show that the project in question has particular benefit for Austria by acquiring new knowledge for business and/or creating new international collaborations for Austrian research institutions). A module (or sub-activity) of a CD Lab can also be placed in a university outside Austria, subject to similar requirements. In addition, foreign companies may participate as partners of CD Labs located at an Austrian university/research institution, provided that the application presents the benefits of the project to Austria as a business location or to the Austrian science system. Research undertaken at a non-Austrian university/research institution with companies outside Austria cannot be supported. |

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OECD SCIENCE, TECHNOLOGY AND INNOVATION POLICY PAPERS
Monitoring and evaluation strategies

CD Labs are established for a maximum of 7 years. This period is subdivided into periods of 2, 3 and 2 years. Entering the subsequent period is possible only after passing a scientific evaluation. For JR Centres the maximum duration is 5 years (2 plus 3-year phase).

In addition to regular monitoring and interim evaluation of individual laboratories, the CDG programme as a whole has passed three independent evaluations, most recently in 2016 (see Ecker et al., 2019 for a review). The latest review was based on an analysis of bibliometric and patenting indicators, as well as questionnaires and interviews with the centres’ managers, researchers, and partner companies. Each of the centres was evaluated, based on quantitative and qualitative evaluations, against the following criteria: i) achievement of the program objectives; ii) quality and singularity (uniqueness) of research; iii) suitability of the funding models; iv) adjustment or changes needed; v) current and future role of the program in the Austrian research and innovation landscape (competition, synergies); vi) current and future international positioning of the program; and vii) promotion of young scientists. There were no efforts, however, to measure the overall socio-economic impact of the programme.

Critical dimensions

Recent evaluations indicate that the CDG can be regarded as best practice instrument for promoting industry-science co-creation and knowledge transfer in Austria (Ecker et al., 2019). The funding model of the CDG is perceived as flexible and adaptable with regard to market demand and the practical needs of the participating partners. Long-term funding and intense cooperation in “applied-oriented basic research” has proven to build up strong research units and highly qualified researchers.

According to a recent OECD review, the key to success is the “CDG model of funding industry-university co-operation which combines – in a straightforward and highly flexible manner – basic research with industrial application, providing all partners with powerful incentives to co-operate, and assuring the quality of research performed in the CD Laboratories and JR Centres” (OECD, 2018, p. 35).

Other reasons of success of the CDG model include the following (see also Ecker et al., 2019):

- Sufficient time and critical mass to enable strategic co-operations.
- Scientists and industrial partners develop together and agree on the research programme. It is for the commercial partners to transfer the research results into new products or processes. Scientists and companies work closely together, creating a mutual benefit.
- Specified problems and precise questions of the industry to be answered by basic research are in themselves “specific knowledge” usually not available to academia. Especially at the beginning of a project, the knowledge transfer often needs to flow from the industrial to the academic partner: the trust to disclose commercially relevant often secret knowledge is a precondition for a successful Lab.
- The model enhances the strengths of existing research structures. No new research institution (legal entity) is created. Therefore, no creation of parallel institutions and costly build-up of new overhead. Also, no unclear IPR-situations, no commercial conflicts of the industrial partners with a newly created “PPP research company”.
- Selection and funding of CD-Labs is based on rigorous peer review evaluation.
New methods developed, new equipment invested stay with the host institute after the 7 years expire. The competences developed by the research team are often valued by the industrial partners, so that collaboration tends to extend beyond the 7 years.

The CD-Labs proved to serve as a career-platform for the scientists involved. Often PhDs, trained at the CD Labs get positions with industrial partners.

CDG is highly industry-driven (considerably more so than other programmes for industry-science collaboration in Austria and elsewhere), as reflected in its governance structure and operational procedures. Indeed, CDG has a unique governance structure where beneficiaries become members of the association and of its decision-making bodies. While this governance structure facilitates industry participation and contributes to increasing the relevance of public research, it may be difficult to apply in other countries since the risk of capture may be considered too large in other institutional contexts.

The programme’s thematic openness and bottom-up approach has advantages but also limitations. The CDG model seems to work well to support excellent research of current interest to industry. However, it is a relatively small programme which would need to be complemented by other more targeted or “mission-oriented” programmes based on industry-science cooperation to address societal challenge or to foster structural change and economic diversification.

**Sources**


https://www.cdg.ac.at/en/
## 2. Canada – Technology Access Centres (TAC)

| Objective | The programme supports the operations of technology access centres (TAC) established by colleges or polytechnics across Canada’s regions with the main objective of enhancing the ability of SMEs to become more innovative and productive. TACs help firms get their products market-ready and enhance their processes by:
| | • offering objective advice and specialized technical services, applied research support and advice;
| | • providing training related to new types of equipment and processes; and
| | • conducting applied R&D projects focused on company problems. |
| Target audience | Colleges/Polytechnics |
| Timetable | 2010-current |
| Priority industries and technologies | Each TAC focuses on an industrial sector or technology of significance to the region where it is located. TACs focus on demand-driven, applied R&D activities. |
| Specific approach to breakthrough innovation | N.A. |
| Instruments used | Direct financial support: TACs receive a 5-year renewable grant to finance their operations. However, TACs themselves do not offer any financing to SMEs. As an innovation service provider, they work with firms on a fee-for-service basis to solve their innovation challenges via flexible engagements related to the provision of business and technical services, applied research projects, and customized training. |
| Budget of the initiative | Yearly budget for each centre is currently around 230,000 euro. Up to 2018, annual budget for the TAC Grants was around 4.8 million euro. The investment announced in Federal Budget 2018 will bring the programme’s annual budget to 8.9 million euro per year and increase the number of TACs to 58 by 2020-21. |
| Responsible policy making body | Natural Sciences and Engineering Research Council of Canada (NSERC). |
| Responsible implementation body | The programme is part of the NSERC-managed College and Community Innovation (CCI) Program, which aims to increase innovation at the community and/or regional level by enabling Canadian colleges to increase their capacity to work with local companies, particularly SMEs. The NSERC collaborates in managing the TAC grants with the Canadian Institutes of Health Research (CIHR) and the Social Sciences and Humanities Research Council of Canada (SSHRC), which are federal agencies of the Government of Canada that provide research funding. |
| Implementation of the initiative | The programme currently supports 30 TACs throughout the country, which are small specialized applied R&D centres affiliated with a Canadian college that receive a five-year renewable grant. These grants support activities related to a TACs’ operations, including administrative personnel, purchase or rental of equipment or a facility, travel |
Many of these centres existed with a different name before the launch of the TAC programme. The TAC programme bestowed an official designation and additional resources on what was a pre-existing (but unofficial) research centre/group/team with a track record of collaborative applied research projects with local/regional firms.

TAC Grant competitions have a two-stage application process; i.e., letters of intent followed by applications from invited applicants. Both stages are reviewed by a panel made up of representatives from industry and academia against the TAC Grant selection criteria. The competition process takes about 14 months from the launch of the competition to the award decision.

The first 9 TAC grants were awarded on May 2012. The 5 competitions to date have created 30 TACs at 27 colleges. As mentioned above, the 2018 Federal Budget provided additional annual funding, allowing at least 2 new TAC Grant competitions that will award 16 new centres with the TAC designation in 2019-20, and an additional 12 in 2020-21.

In 2015, with funding from NSERC, the centres supported by TAC Grants established a formal, member-led network with a dedicated secretariat, which aimed to leverage lessons learned as a basis for supporting excellence in applied research at Canadian colleges. Since 2016, this network has been known as Tech-Access Canada. In February 2018, the network was made permanent with ongoing funding from NSERC.

### Regional aspects

Each TAC focuses on strengthening an industrial sector of significance to that region. The individual TACs are afforded the flexibility to respond to local needs as they see fit (e.g. realities of rural and remote areas, different sized companies, different industrial sectors, etc.). The TACs are networked with one another, and may refer a company seeking assistance to another TAC if the local TAC’s specialization and the company’s need do not align.

Regional governments sometimes complement federal funding with additional funds for the TACs in their region. In particular, the government of Quebec has provided substantial co-funding and support to the 13 TACs located in the region.

### International aspects

While TACs help Canadian SMEs get products and processes to market and gain exposure to business opportunities around the world, TACs also provide a soft-landing for international firms wishing to enter the Canadian market with their own innovation. For example, Canada’s Smartest Kitchen, a TAC dedicated to food product development, is collaborating with European food packaging and design experts Food Atelier & DeDutch in order to pilot a new packaging innovation project. The TACs expect this type of service offering to grow, as attracting high-quality, innovative foreign investment into Canada is important to the government.

### Monitoring and evaluation strategies

Tech-Access Canada collects annual performance indicators and applied research metrics from the individual TACs. Metrics used by Tech-Access Canada are divided into three categories—capacity, activity, and results—as follows:

1. **Capacity:**
   - Number of TACs operating across Canada.
   - Number of business innovation and applied R&D experts available at TACs.
POLICY INITIATIVES TO ENHANCE THE IMPACT OF PUBLIC RESEARCH

- Amount of dedicated innovation and applied research space (square feet) available at TACs.
- Dollar value of the highly-specialized equipment and facilities at TACs.

2. Activity:
- Number of unique areas of innovation expertise at the TACs.
- Number of unique business and technical services, applied research, training, and technology diffusion offerings at the TACs.
- Number of companies served (annually) by the TACs.
- Percentage of companies served annually who were Small-and-Medium-Sized Enterprises (SMEs).
- Number of other clients assisted (annually) by the TACs, such as universities, colleges, and government and private labs.
- Amount of cash revenue from companies served by the TACs for business innovation and applied research activity.
- Amount of cash revenue to the TACs from other sources for business innovation and applied research activity.

3. Results:
- Number of specialized technical service engagements provided to clients by the TACs.
- Number of collaborative applied research projects between TACs and external partners.
- Number of new products, processes, or services moved to market faster with the assistance of the TACs.
- Number of improved products, processes, or services moved to market faster with the assistance of the TACs.
- Number of training contracts provided to clients by the TACs.
- Count of person-hours of training received by clients.
- Number of students involved in TAC-delivered services.
- Count of hours of innovation skills acquisition by students.

Data collected by Tech-Access Canada from 2016-17 show that Canada’s TACs provided 5,661 specialized technical service engagements to clients and partnered on 1,197 collaborative applied research projects, solving a company-identified problem. The engagements resulted in 793 new or improved products and processes.

In addition, in the same year, Canada’s TACs leveraged around 24 million euro worth of business innovation investment from external collaborators, 55% of which came from companies served. This represents a multiplier effect of almost five times the Government of Canada’s 2016-17 investment of 4.8 million euro to support the core operation of the TACs.

Although a fully-fledged evaluation has not been undertaken on the TAC Grants specifically, in 2018, NSERC undertook an evaluation of the CCI Program. The evaluation found that SMEs are increasingly engaging Canadian colleges to undertake
applied R&D. Between 2010-11 and 2016-17, 958 partners were involved in one or more applied R&D activity funded by a CCI grant (including the TAC and other two grant programmes). Ninety percent of these were companies and other industry partners.

In particular, with respect to the centres funded by TAC Grants, almost a third (29 percent) of their surveyed clients (who had completed an applied R&D or technical and business service project) indicated that their revenue increased.

The evaluation also found that the increased participation in R&D by Canadian colleges is enriching the curriculum of colleges and the learning experiences of students. As faculty members are increasingly participating in R&D projects, the new knowledge and experience is shared with students through course materials. Students also benefit by being directly involved in projects funded through the CCI Program, which provide them the opportunity to apply their classroom learning to a “real world” environment. This improves their potential for employment once they graduate from college. Some projects supported by the CCI Program have led to increased revenues and a larger workforce for participating companies.

Critical dimensions

According to Hampel and Doyle (2019) the TAC Grant has succeeded to a significant degree because:

- It builds on the applied R&D capacity of Canada’s colleges, which has been developed over the past decade through the support of other grants.
- It supports centres located across Canada that focus on the local/regional innovation system.
- It aims to enhance the ability of companies, particularly SMEs, to become more productive and innovative by addressing industry-defined opportunities and challenges.
- It enables teachers and students to participate in applied R&D projects to address specific industry challenges, thereby enhancing the educational experience and developing the next generation of talent in demand by companies.
- It is designed to complement other players in the Canadian research and innovation system such as incubators, accelerators, private research and testing laboratories, universities, and government research laboratories.

Sources


https://tech-access.ca/en/home/
### Germany – Excellence Strategy

<table>
<thead>
<tr>
<th>Objective</th>
<th>The Excellence Strategy was launched in 2016 to continue the development of German universities that successfully began with the Excellence Initiative (2005-2016) by supporting research of the highest standard, enhancing research profiles, and facilitating cooperation in the research system. The programme consists of two funding lines: i) Clusters of Excellence for project-based funding in internationally competitive research fields at universities or university consortia; ii) Universities of Excellence to strengthen universities as individual institutions or as university consortia in the long term and further develop their leading international role in research on the basis of successful Clusters of Excellence.</th>
</tr>
</thead>
</table>
| Target audience | Research groups (for Clusters of Excellence)  
HEIs (for Universities of Excellence) |
| Timetable | Funding starts in 2019 |
| Priority industries and technologies | All |
| Specific approach to breakthrough innovation | N.A. |
| Instruments used | Centres of excellence grants  
Project grants for public research |
| Budget | Annual budget of over €500 million (€385 million for Clusters of Excellence and €148 million for Universities of Excellence). Each Cluster of Excellence can receive between €3 million and €10 million annually. |
| Responsible policy making body | Federal Ministry of Education and Research |
| Responsible implementation body | German Research Foundation (DFG) (for Clusters of Excellence)  
German Council of Science and Humanities (for Universities of Excellence) |

Implementation of the initiative:

1. **Clusters of Excellence** (EXC) to support project-based funding in internationally competitive research fields at a university or university consortium; to hone research profiles and promote prioritisation at universities; and to create excellent training and career opportunities for early career researchers. The DFG is responsible for developing and implementing this funding line.

Proposals may be submitted by universities and consortia of two, or in exceptional cases three applicant universities. Additional cooperation partners, such as researchers from other universities, non-university research institutions, the private sector and other areas of society, may also participate.
The main selection criteria are: excellence of research; track record of participating researchers; high quality of the university’s supporting structures in the Cluster of Excellence; supportive and high-performance environment for the Cluster of Excellence.

Proposals are reviewed and decided upon in an academically driven, two-stage competitive process (draft proposals and full proposals). The draft proposals were reviewed by 255 reviewers, of which more than 90 percent came from abroad. During the proposal phase for the Excellence Strategy in 2018, a total of 88 proposals were reviewed in 32 meetings by 385 reviewers from 31 countries. On the basis of these reviews, the Excellence Commission decided in September 2018 to award funding to 57 Clusters of Excellence at 34 universities. Funding commenced on 1 January 2019.

Clusters of Excellence are funded for seven years (2019-2025) with 3-10 million euro annually. A second funding period of seven years is possible. Funding covers personnel, direct project costs and instrumentation. The funding amount for a Cluster of Excellence includes a programme allowance for indirect project costs of €1 million for the first cluster at a university, €750,000 for the second cluster and €500,000 for each additional cluster.

2. Universities of Excellence (EXU) to strengthen either a university as a single institution or a consortium of universities (University Excellence Consortium) in the long term on the basis of sustained, joint strategic objectives in a long-lasting collaboration and to develop its international leading position in research based on successful Clusters of Excellence (i.e. only those universities that have been granted funding for at least two Clusters of Excellence as an individual institution or three Clusters of Excellence as a university consortium can apply). Funding can be used for a broad variety of actions to implement new strategies including the reorganisation of departments, investments in new research infrastructure, recruitment of leading professors and the development of a stimulating framework for early-stage researchers.

The German Council of Science and Humanities is responsible for developing and implementing this funding line. Following a call for proposals, final decisions will be made in July 2019, with funding to commence on 1 November 2019. A total of approximately €148 million will be available annually for this funding line.

The Excellence Strategy builds upon the results of the Excellence Initiative (2005-2017), which had three funding lines: 1) Graduate Schools; 2) Clusters of Excellence and 3) Institutional Strategies. A detailed case study of the Excellence Initiative is available at OECD (2014). In 2016, the evaluation of the Excellence Initiative by the "Imboden Commission" produced a positive assessment and recommended to continue with the programme. The new Excellence Strategy was launched on the basis of that input, whereby funding line 1 disappeared, funding line 2 continues mostly unchanged and funding line 3 has been renamed as “Universities of Excellence” but maintains similar logic.
The infas Institute for Applied Social Sciences conducted an online survey of the reviewers on behalf of the DGF to evaluate the programme’s review process. Two-thirds of reviewers responded to the survey. The results can be found [here](https://www.dfg.de/en/research_funding/programmes/excellence_strategy/), including the following:

- The majority of reviewers regard the process as very suitable (63%) or suitable (32%) as a means of identifying the best projects.
- The quality of the proposals presented to the review panels was judged to be very high (75%) or high (22%).

### Critical dimensions

- The large budget of the initiative and concentration of resources in selected universities allows building critical mass in research.
- The programme promotes a process of prioritisation and strategic planning at universities
- The programme promotes cooperation between different universities and research teams.
- The programme aims to create excellent training and career opportunities for early career researchers

### Sources

[https://www.dfg.de/en/research_funding/programmes/excellence_strategy/](https://www.dfg.de/en/research_funding/programmes/excellence_strategy/)
### 4. Germany – Fraunhofer Venture

| Objective | The Fraunhofer Society (Fraunhofer-Gesellschaft) -founded in 1942 by representatives of academia, industry and government- is the main institution fostering technology transfer in Germany and the largest organization for applied research in Europe. Fraunhofer Society is composed of 72 institutes and research units at different locations throughout Germany and employs a staff of more than 26,000 who work with an annual research budget totalling 2.3 billion euros, of which almost 2 billion euros is generated through contract research (Lambertus et al., 2019). The so-called "Fraunhofer model", in existence since 1973, implies that the Fraunhofer Society earns about 70% of its income through contracts with industry or from publicly financed research projects. The other 30% of the budget is sourced in the proportion 9:1 from federal and state (Land) government grants and is used to support preparatory research. This funding model applies also to the individual institutes. This contributes to the strong market focus and entrepreneurial approach to the research institutes' activity. With the large variety of technology transfer channels and programmes used by Fraunhofer across the different research areas and institutes, this case study will focus on its approach to promote spin-offs, which has become increasingly important in recent years. The objective of Fraunhofer’s programmes to support spin-offs is to commercialize its research results, thus increasing its own revenue and also enhancing its contribution to the country’s socio-economic development. In 2001, Fraunhofer Venture was created as a dedicated department with the purpose of providing comprehensive support for Fraunhofer spin-off projects. |
| Target audience | Researchers affiliated to Fraunhofer institutes. |
| Timetable | 2001-present |
| Priority industries and technologies | All |
| Specific approach to breakthrough innovation | N.A. |
| Instruments used | Grants for business R&D and innovation  
Equity financing  
Technology transfer and business advisory services |
| Budget | - FDays provide € 25,000 per selected team (180 teams selected in the last 5 years).  
- Those that participate in the next phase (FFE) receive an additional € 150,000.  
- Those that also participate in the final FFM stage receive up to €100,000 to enhance their management.  
- Besides those grants, Fraunhofer Venture invests in the equity of some of the start-ups (in 2017, one million euros in 8 new start-ups). To further support such equity investments, Fraunhofer Tech Transfer Fund was created in 2019 as a dedicated fund for spin-offs with an initial volume of €60 million. |
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<th>Responsible policy making body</th>
<th>Fraunhofer-Gesellschaft</th>
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<tr>
<td>Responsible implementation body</td>
<td>Fraunhofer Venture</td>
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</table>

Implementation of the initiative

Over the years, Fraunhofer has increased the support it offers to its researchers who intend to create a new business (or spin-off) based on their research results. 25 new spin-offs created in 2017 and around 26 in 2018. At the start of 2018, Fraunhofer was involved in a total of 85 companies from a wide variety of industries.

In 2001, Fraunhofer Venture was created as a dedicated department to promote spin-offs, by connecting IP and technologies, entrepreneurs, investors and industry partners. It has a team of 25 people comprising venture managers, lawyers and company building experts.

The spin-off support system consists of 4 sequential phases:

- Business Ideation: pre-qualification programme, including short workshops where employees develop business ideas and test their market potential. In this stage, there is no funding involved, but no fee is charged to participants.

- Fraunhofer Days (FDays): 12-week acceleration programme that acts as a stress test for market, team, and technology. Three times a year between 10-15 teams are picked from different Fraunhofer institutes and selected partners. With 180+ project in 17 batches within the last 5 years, it has become the flagship program of Fraunhofer Venture and one of the most prominent high-tech accelerators in Germany. Each selected team receives a funding of 25,000 € which mainly covers labour and travel costs for the 10 on-site days, plus some additional yet minor budgets for hiring business students. The program itself is provided free of charge. Besides the grant, some of the spin-offs sometimes receive and additional equity investment by Fraunhofer.

- Fraunhofer Fosters Entrepreneurs (FFE): business plan development and specific support in the preparations for founding the spin-off. Offered mainly to FDays alumni, but also open to other projects that have a validated business model. For every spin-off project there is a tandem of an investment manager and a lawyer for coaching and guiding the team (2-on-1 coaching). Each project may receive a grant of up to 150,000 €.

- Fraunhofer Fosters Management (FFM): financial support for completing management competences, including coaching to existing team of founders and sometimes also financial support to hire an experienced manager. Each spin-off may receive up to €100,000.

An additional step has been the creation of the Fraunhofer Tech Transfer Fund in 2019 with an initial volume of €60 million, which acts as a dedicated investment fund for Fraunhofer spin-offs. It is a critical means to overcome the “valley of death” for many spin-off projects.

Regional aspects

Fraunhofer holds 72 institutes and research units spread throughout Germany, so it supports a balanced geographic development of the national innovation system. There is no specific participation of regional governments in Fraunhofer Venture.
Fraunhofer Venture also aims to connect with the international start up ecosystem, including foreign venture capital funds. In 2019, the Fraunhofer Tech Transfer Fund was created under the European Commission’s InnovFin programme and in cooperation with the European Investment Fund (EIF).

### Monitoring and evaluation strategies

Fraunhofer Venture regularly monitors and evaluates its activities based on different metrics. Recent signs of success include the following:

- 97% of Fraunhofer spin-offs still exist after three years, which is far above the 72% reported in the “Deutsche Start-up Monitor” when looking at Germany-wide data in 2006-2015. In addition, 47% of the spin-offs achieved revenues 500,000+ € per year as compared to 30% for other, Germany-based start-ups. When it comes to raising capital beyond 1 million €, it is 40% against 26%.

- In 2017-18 an annual ratio of 1.4 new spin-offs per 1,000 researchers was achieved, which is high by international standards for comparable research and technology institutes (e.g. Max-Planck: 0.36; TNO: 0.72; VTT: 0.81). Since 2019, a new target was established to reach a ratio of 2 spin-offs per 1,000 researchers and year.

- The conversion rate from FDays to FFE was 80% for 2017, which suggests a successful interplay between the two programmes.

In 2018, a thorough assessment of the activities of Fraunhofer Venture was conducted. This was based upon a global best practice analysis (e.g. The Engine, MIT, USA; Start-up Runway Program, Cornell Tech, USA; Cyclotron Road, Berkeley, USA; T3 accelerator, Technion, Israel; Yes!Delft, Netherlands) and by incorporating the major learnings from a 17 years track record of spin-off activities at Fraunhofer Venture. As a result, starting in 2019 the approach to support spin-offs will be transformed within the context of a new programme called AHEAD ([http://www.ahead.fraunhofer.de/en.html](http://www.ahead.fraunhofer.de/en.html)). These changes are further discussed in Lambertus et al. (2019).

### Critical dimensions

Of course, a key factor of success for this spin-off support programme is the fact that Fraunhofer is the largest applied research centre in Europe. Scale is important because this critical mass in research allows selecting the most promising projects to develop into spin-offs. In addition, Fraunhofer has been an extremely successful organization in terms of conducting applied research of high relevance to industry, which increases the likelihood of successful spin-offs.

Another obvious reason for success is related to the strong commitment of financial and human resources to the promotion of spin-offs. This institutional support is also reflected in the fact that a specific department tasked to promote spin-offs was created in 2001.

The spin-off support process combines financial support with targeted training, networking and support services, and coaching. It provides specific lines of support for entrepreneurial researchers and spin-offs at different stages of their life cycle. It has a clear focus on fostering market interactions, including testing product viability and conducting interviews with potential customers. These are some of the main reasons behind the success of the Fraunhofer model to promote spin-offs.

The new AHEAD programme that started in 2019 includes some changes to address weaknesses of the previous model. In particular, the new model aims to streamline and simplify the spin-off support programme, creating one single brand and program instead of the previous 4 sub-programmes. This enables a more effective marketing and outreach, and more importantly, removes many artificial barriers that existed in the past when
transitioning from one program to the other (new application, new program managers, new rules, new structure and expectations).

In addition, AHEAD aims to provide a more flexible, need-based programme structure, recognizing that a one-size-fits-all program is not able to address the very specific challenges that each single spin-off faces. Consequently, the program structure itself will react according to the needs of its project with on-demand workshops, coaching, network, etc. The coaches will define a tailored roadmap with every project and put the needed program elements into it.

Sources


https://www.fraunhoferventure.de/en/Landingpage.html
5. Germany – Research Campus

<table>
<thead>
<tr>
<th>Objective</th>
<th>The general objective of the “Research Campus: Public Private Partnership to Foster Innovation” is to support large-scale and long-term cooperation between science and industry. A Research Campus comprises three criteria: it merges private and public research competences at a single location, it has a medium to long-term perspective and builds on a reliable public-private partnership.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target audience</td>
<td>Universities, public research institutes and firms develop joint proposals to receive funding as a consortium.</td>
</tr>
<tr>
<td>Timetable</td>
<td>2011-present</td>
</tr>
<tr>
<td>Priority industries and technologies</td>
<td>Complex and multi-faceted research areas with the potential to generate large socioeconomic impacts. The topics range from new methods of infectious disease diagnosis and the transformation of the energy system to materials development and innovative production technologies.</td>
</tr>
<tr>
<td>Specific approach to breakthrough innovation</td>
<td>Focus on research areas that involve high risks and hold particular potential for quantum leap innovations.</td>
</tr>
<tr>
<td>Instruments used</td>
<td>Competitive funding scheme based on the development of a public-private partnership</td>
</tr>
<tr>
<td>Budget</td>
<td>Yearly budget of around €10-20 million. Each research campus receives up to €2 million of public funding per year for a period of up to 15 years. In addition, the activities of a research campus not funded by the programme must always account for a larger percentage of the total budget. This funding can be provided by the academic or industry partners and may include in-kind contributions in the form of infrastructure or personnel.</td>
</tr>
<tr>
<td>Responsible policy making body</td>
<td>Federal Ministry of Education and Research (BMBF) The programme forms part of the German “High-Tech Strategy”</td>
</tr>
<tr>
<td>Responsible implementation body</td>
<td>BMBF</td>
</tr>
<tr>
<td>Implementation of the initiative</td>
<td>The Research Campus competition was launched in 2011. Following the selection in September 2012, 9 Research Campuses are currently being funded for a period of up to 15 years (up to 2027). The application process involved two-stages, with a “pre-phase” to develop the proposals and a “main phase” where full proposals were presented. The Research Campuses currently being funded specialize in different research areas:</td>
</tr>
<tr>
<td></td>
<td>• Active Research Environment for the Next Generation of Automobiles (ARENA2036)</td>
</tr>
<tr>
<td></td>
<td>• Digital Photonic Production (DPP)</td>
</tr>
<tr>
<td></td>
<td>• Flexible Electrical Networks (FEN)</td>
</tr>
</tbody>
</table>
- Infection Diagnostics (InfectoGnostics)
- Innovative cancer therapies (M2OLIE)
- Renewable energy and e-mobility (Mobility2Grid)
- Mathematical Optimization and Data Analysis Laboratory (Modal)
- Materials and Production Technologies for Cost-Effective and Multifunctional Lightweight Construction (Open Hybrid Lab Factory)
- Minimally Invasive Treatment of Widespread Diseases (STIMULATE)

The Research Campuses represent a new type of research structure where researchers from universities, research institutes and companies work “under one roof”. Several companies should be part of a Research Campus, including SMEs; but large (multinational) companies are drivers in most cases. Each of the 9 Research Campuses currently in place has between 13 and 23 industry partners. Various forms of organisation and contracts are established suiting the specific demand of each Research Campus. One very important aspect is the regulation of IPR issues.

Their organisational status differs (association, limited liability company, non-profit company) and thus their coordination is regulated and organised differently as well (campus offices, board of directors, campus coordinators). Resources are pooled through the ‘under one roof’ concept and complementarity exists regarding the partners’ specific competencies in pursuing a jointly formulated research agenda. The partnerships are strategic networks with a high degree of central powers shared between mainly large firms and academic organisations.

A “Supporting Programme” has been set in place to promote collaboration and exchange of best practices between the different Research Campuses. This programme consists in one- or two-day strategy workshops once or twice a year to encourage regular exchanges of experiences and information between the research campuses. The focus is on involving all the research campuses in drafting strategy processes, criteria for success and best practice examples.

Regional aspects

While local or regional governments (Lander) do not participate in the initiative, the programme has a strong regional/local component because it is based on the physical interaction (“under one roof”) of various strategic actors. Selected Research Campuses span across 7 different cities in East and West Germany, but they do not cover all regions. Indeed, they are confined to certain locations which offer the required research capabilities and already well-developed linkages between research organisations and industry.

International aspects

Various subsidiaries of foreign multinational companies participate as industrial partners in some of the Research Campuses, such as Hewlett Packard and DXC Technology in ARENA2036; Philips in DPP; GE, Fuji Electronics, Hitachi and Hyosung in FEN; Cisco in Mobility2Grid; Visage Imaging in MODAL; Magna International in Open Hybrid Lab Factory; CAScination and Metria Innovation in STIMULATE.

Some of the Research Campuses have also forged partnerships with foreign universities or research institutes. For example, Open Hybrid Lab Factory has established partnership agreements with various research centres in Asia such as the Singapore Institute for Manufacturing Technology (SimTech), the Institute for Frontier Materials and the Carbon Nexus research facility at Deakin University, the University of New South Wales in Australia, and Tongji University in Shanghai.
| Monitoring and evaluation strategies | The policy initiative provides for the research campuses to receive funding during several phases of up to five years each. An independent jury selected the centres and conducts an evaluation after each phase. Existing Research Campuses will be due for a renewed evaluation by the jury from 2018-2021 (depending on the Research Campus) to consider transition into the second main phase. The 2012-2016 evaluation was undertaken by Fraunhofer ISI as an accompanying research project and funded as an R&D project, following the same competitive selection project as that of the research campuses. This comprised continuous contact and exchange with the BMBF, the project executing organisation, and the research campuses as part of the scientific analysis and processing of the topic, a continuous learning process and the exchange of experiences. The methodological mix of scientific analyses and monitoring the developments in the research campuses was used to acquire scientific knowledge, support the individual research campuses and foster public relations. Some of the conclusions of this project are that the programme has been “assessed positively by companies and the campus management, because it enables an interdisciplinary collaboration that would not be possible otherwise” (…) “allows work on highly complex issues” (…) “has a long-term nature which is a decisive “advantage and a key differentiator to other support measures” (…) “another important advantage is the ability to initiate further bilateral partnerships that would not be possible without the presence in a Research Campus” (Koschatzky and Stahlecker, 2016). In 2018, after 5-years of operation, a large expert conference was hosted by the Federal Ministry of Education and Research to take stock of achievements, best practices and challenges, with representatives of the 9 research campuses, industry, politics, and society. An evaluation of the programme’s impact is currently being undertaken. This evaluation exercise, which started in February 2019, is expected to last for 3 years. A Europe-wide tendering procedure was carried out and Ramboll Management GmbH was selected as contracting partner. The main objectives of the evaluation will be to examine the Research Campus funding instrument, in particular with regard to its implications for supporting long-term strategic partnerships between science and industry. In addition, the influence of a Research Campus on the strengthening of Germany as a centre of innovation and business, with particular emphasis on strengthening SMEs, will be analysed. |
| Critical dimensions | Projects to be funded are selected through a competitive selection process involving an independent jury. Binding agreements govern the cooperation among partners and intellectual property in particular. These agreements are the basis on which the research campuses are founded. They allow the research campuses to develop long-term research agendas and work on sustainable solutions to problems. The physical proximity of the individual partners on a research campus helps to strike a balance between their different interests and to unite them in a joint research and transfer approach. In this way future applications can be already taken into account when research projects are being planned. This facilitates the future translation of research results into new products, processes and services. In addition, research campuses are also involved in university teaching or the education of young scientists, thereby ensuring the supply of skilled professionals. The Research Campus model has been successful in bringing together diverse parties including different universities, large and small firms, entrepreneurs and young talents. The programme has been successful in fostering an open innovation culture, offering |
advantages to academic researchers, established firms and start-ups alike. The Ministry of Education and Research played a critical steering role to bring in the necessary partners and participants in order to succeed in the public-private partnership model.

According to Koschatzky and Stahlecker (2016) a lesson that can be learnt from the Research Campus is the need for an already well developed culture of cooperation between scientific organisations and industry, which favours the pooling of different interests and competences in long-term oriented strategic research fields. Previously existing contacts and trust between the major actors in a Research Campus were the main foundations for success of this kind of partnership.

Sources

https://www.forschungscampus.bmbf.de/homepage
6. Israel – Centres of Research Excellence

<table>
<thead>
<tr>
<th>Objective</th>
<th>The Centres of Research Excellence (I-CORE) are collaborative research infrastructure whose objectives are to reinforce Israel’s intellectual capacities, promote synergy among Israel’s leading research centres and boost research infrastructure in the chosen fields. It is anticipated that I-COREs will become catalysts for new academic publications and creative scholarly ventures, intellectual property, technologies and start-ups that will have a profound scientific and economic impact. The initiative is part of the Higher Education Multi-year Reform Plan, which gradually establishes leading research centres specializing in a range of disciplines. The Centres of Excellence and the programme’s vision are aimed at strengthening the long term positioning of Israel's academic research and its stature among leading researchers in Israel and abroad. The Program's objectives are:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Strengthening scientific research in Israel and establishing Israel's standing as a world leader in scientific research;</td>
<td></td>
</tr>
<tr>
<td>• “Brain Gain”: Bringing excellent researchers back to Israel, as a central means of fortifying the research capabilities and the academic faculty of the institutions of higher education;</td>
<td></td>
</tr>
<tr>
<td>• Creating a critical mass and intensifying the relative advantages in select fields in the different institutions;</td>
<td></td>
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<tr>
<td>• Improving and upgrading the research infrastructure in the universities;</td>
<td></td>
</tr>
<tr>
<td>• Encouraging academic innovation, including integration between different fields of knowledge (multi-disciplinarity);</td>
<td></td>
</tr>
<tr>
<td>• Maintaining and promoting advanced programs of instruction and training in select fields;</td>
<td></td>
</tr>
<tr>
<td>• Encouraging research collaboration between institutions of higher education, both universities and colleges;</td>
<td></td>
</tr>
<tr>
<td>• Strengthening the scientific research in Israel in disciplines of system-wide and national importance</td>
<td></td>
</tr>
<tr>
<td>• Promoting collaboration with leading researchers and research institutions worldwide.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target audience</th>
<th>Research groups from HEIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timetable</td>
<td>2010-present</td>
</tr>
<tr>
<td>Priority industries and technologies</td>
<td>All</td>
</tr>
<tr>
<td>Specific approach to breakthrough innovation</td>
<td>The programme aims to focus on breakthrough innovation and this is part of the selection criteria.</td>
</tr>
<tr>
<td>Instruments used</td>
<td>Centres of excellence grants</td>
</tr>
</tbody>
</table>
## Budget

The programme’s annual budget was around 303 million euro in 2018, up from 173 in 2013. In addition to this public funding received from the Planning and Budgeting Committee, the Centres of Excellence also receive funding from their partner institutions (i.e., universities or public research institutes) and strategic partners (occasionally other public agencies or ministries such as health ministry, or also firms).

## Responsible policy making body

Planning and Budgeting Committee of the Israeli Council for Higher Education.

The Council for Higher Education (CHE) is the official authority for higher education in Israel and determines policy for the higher education system. The Planning and Budgeting Committee (PBC) is responsible for funding the Israeli system of higher education.

## Responsible implementation body

Planning and Budgeting Committee of the Israeli Council for Higher Education and Israeli Science Foundation.

The Israel Science Foundation is the main research funding agency of the Government of Israel, providing monetary grants for scientific research. It is administered by the Israel Academy of Sciences and Humanities.

## Implementation of the initiative

So far, 16 I-COREs have been established in a wide array of topics. The first wave of 4 centres started operating on October 2011, and the second wave of 12 started operating on May 2013.

The evaluation and selection of the proposals is carried out by the Israeli Science Foundation via international evaluation committees, which examined the proposals on a competitive basis. The evaluation and assessment processes were carried out in two stages - preliminary proposals and full proposals. Selection criteria: Alignment to national research priorities; Novelty of research or its application; Existing research capacity; Track record; Scientific impact anticipated.

The I-CORE Steering Committee is in charge of designing and approving the programme's principles and modus operandi, the selection of research topics, the reviewing of the evaluation committees’ reports, and declaration of the groups selected to establish the I-COREs. The International Scientific Advisory Committee of the programme advises the Steering Committee on various issues, particularly the evaluation process, supplying it with an external professional perspective.

Selected centres receive funding for a 6-year period. A “Centre of excellence” is an association of outstanding researchers in a specific research field, who are current faculty members of different higher education institutions, for the purpose of promoting ground-breaking and innovative research. The centre serves as an anchor for shared research infrastructure and research groups in this field, and allows optimal utilization of the scientific potential of Israel. The members of the centre benefit from a significant budget for the centre’s activities, including international activities, scholarships for research students and postdoctoral fellows, usage of equipment and materials, technical HR etc.

In addition to the members of the I-CORE who are current faculty members of Israeli institutions of higher education, new outstanding researchers also join the centre during the first three years of activity. The new researchers join the various higher education institutions where they get a regular tenure-track academic appointment, and also receive annual research grants for a period of five years and equipment grants.

## Regional aspects

N.A.
## International aspects
Grants can be used for international activities and for hiring foreign researchers. One of the declared objectives of the programme is “bringing excellent researchers back to Israel, as a central means of fortifying the research capabilities and the academic faculty of the institutions of higher education”.

## Monitoring and evaluation strategies
In 2010, a monitoring team was appointed to the I-CORE program. The Monitoring team is headed by the chairman of the Planning and Budgeting Committee, and the members are the President of the Israel Academy of Sciences and Humanities, head of the Budget Department in the Ministry of Finance, National Economic Council in the Prime Minister office, Chief Scientist at the Ministry of Science and Technology, and Head of Economics Department in the Ministry of Immigrant Absorption, or personal representative, and a representative of the chairman of the Council for Higher Education.

The monitoring team follows the programme and monitors its implementation from its inception. The chairman of the Planning and Budgeting Committee will report to the monitoring team on the progress in implementing the program every six months.

## Critical dimensions
The establishment of Centres of Excellence allows creating a critical mass in research and intensifying the relative advantages in select fields in the different institutions. It also encourages research collaboration between institutions of higher education and integration between different fields of knowledge (multi-disciplinarity).

The programme is also an efficient way for strengthening the scientific research in Israel in disciplines of national priority. The research topics for the centres were selected in a wide bottom-up process of consultation with the Israeli academic community, such that they reflect the genuine priorities and scientific interest of researchers in Israel. Out of the large number of suggestions received by researchers, specific topics were chosen by designated committees. Once the topics were announced, a call for proposal was issued inviting groups of researchers to submit proposals for the establishment of I-COREs in these topics.

### Source
http://www.i-core.org.il/
### 7. Netherlands – Valorisation programme

| **Objective** | Aims to encourage HEIs to set up high-quality facilities for entrepreneurship education and for starting and supporting knowledge-intensive firms. The programme emerged in 2010 building upon the former subsidy scheme ‘Knowledge Exploitation’, which led to the creation of innovation incubators at universities and science parks. The Valorisation programme has led to the creation of 12 regional consortia to foster entrepreneurship education and knowledge valorisation. Entrepreneurs and start-ups can approach these consortia for advice, training, networking and funding. |
| **Target audience** | Regional consortia (consisting of universities, firms, municipalities, provinces and other societal actors) receive the funding, which is later used to provide advice and funding to entrepreneurs and start-ups, including those initiated by university students and researchers. |
| **Timetable** | 2010-2018 |
| **Priority industries and technologies** | N.A. |
| **Specific approach to breakthrough innovation** | N.A. |
| **Instruments used** | The programme provides non-reimbursable subsidies to newly established valorisation centres formed as consortia of regional actors, with co-funding requirement of at least 50%. With these funds, valorisation centres provide advisory services and grants to foster entrepreneurship and knowledge transfer. |
| **Budget** | A total of €62.7 million of subsidies has been granted to the 12 centres up to 2018 (i.e. around €7 million per year for the whole programme and €580,000 annually per centre). Institutions participating in each consortium should contribute with at least 50% of the centres overall budget. |
| **Responsible policy making body** | Joint initiative of Ministry of Economic Affairs & Climate Policy and Ministry of Education, Culture & Science. |
| **Responsible implementation body** | Netherlands Enterprise Agency |
| **Implementation of the initiative** | The programme offered financial support to 12 consortia, consisting of universities, firms, municipalities, provinces and other societal actors. These consortia implemented valorisation plans with a runtime of 6 years, the last ones of them ending in 2018. The goal of the plans was to improve and embed the use of knowledge in regional ecosystems. The subsidies could be used for the following seven facilities: |
|  | • Entrepreneurship education |
Valorisation centres provide support to researchers and students with promising ideas, as well as to other starting and established firms in a region. Each valorisation centre acts as a hinge, connecting the domains of research and education with application domains of socio-economic relevance.

The regional valorisation centres are still active and perceived as useful by their stakeholders. However, with the end of the programme in 2018, valorisation centres no longer receive direct funding from the programme and must finance their activities based on contributions from their member institutions, revenue generated from their services, and other different streams of competitive public funding. Nevertheless, in 2019 a new programme to support thematic cooperation in knowledge transfer was launched with an initial budget of €24 million. Following a call for applications, which ran from March to June 2019, a final decision to support three consortia is still to be taken. There are no pre-defined thematic priorities, but the aim is to support cooperation for knowledge transfer with a focus on strategic industries or technologies. Existing valorisation centres are expected to participate actively in this new programme.

### Regional aspects

The programme has a regional approach since its aim is to develop valorisation centres in each of country’s regions. The programme is designed flexibly so that each centre can define its own mix of activities in view of regional needs.

### International aspects

N.A.

### Monitoring and evaluation strategies

Besides regular monitoring, a mid-term assessment was conducted in 2014 and final evaluation was commissioned in 2018 to Dialogic, an external consulting firm (Janssen, 2018). This evaluation comprised a combination of research methods, including desk research, microdata analysis, a CATI survey (>300 respondents), 12 site visits, about 15 interviews, and two validation workshops. The evaluation budget is not public, but we were told it was below 125,000 EUR.

Some key conclusions from the final evaluation include the following (Janssen, 2018):

- “The overall impression is that participating consortia have been able to give a positive impulse to their valorisation infrastructures”
- “With its emphasis on screening & scouting, IP and funding, the Valorisation Program mostly focused on ‘pushing’ knowledge into society. Some consortia also managed to bring the user perspective more into the universities, as an alternative approach to ensuring that research and students eventually will be of use for society. This is a promising development”.
- “The Valorisation Program was also used to boost the entrepreneurial skills and attitude amongst researchers and students, as well as to get regional
stakeholders (like SMEs) in touch with the universities. Remarkable is that most of the ±2000 supported firms consist of start-ups from outside the universities, rather than of academic start-ups.”

<table>
<thead>
<tr>
<th>Critical dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible, bottom-up design and region-specific implementation allows to better address the specific needs of each region. It is important to stimulate knowledge transfer at regional level, since regional knowledge hubs are often keen to organise such efforts and most of the benefits are reaped at this level.</td>
</tr>
<tr>
<td>A national initiative such as this one is a useful vehicle to mobilise regional stakeholders. The advantage of a “freedom to experiment” approach is that there is more variety in outcomes across the 12 consortia. There is now much opportunity to learn from each other and also to be inspired by success and failures of other consortia. A disadvantage might be that results are less comparable than in a uniform approach.</td>
</tr>
<tr>
<td>The positive impact of the Valorisation Program is also related to other ongoing policy developments in the fields of science, innovation and entrepreneurship. During the past few years, a large number of parallel initiatives helped to put knowledge use higher on the agenda. The Valorisation programme can be regarded as fundamental structures within this policy mix, targeted at supporting actors that might also benefit from the complementary policies.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sources</th>
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</table>
8. Norway – FORNY

Objective

FORNY facilitates the commercialisation of results from projects conducted at publicly funded research institutions and helps to bring the products and services to the market. It is the main support mechanism for commercialisation of public funded research in Norway.

The FORNY programme aims to compensate for the lack of private capital in the early phases of project development. In this phase, the potential utility and profitability of a project are not always adequately documented, and the level of technological and financial risk may be too high for private or public actors to be willing to assume responsibility for further development.

Main objectives:

- Increased value creation by bringing research results and ideas from publicly-funded research institutions to the market.
- Generate growth in new and existing companies by providing funding to projects based on research results.
- Enhance the professionalism and efficacy of the TTOs affiliated with universities, university colleges, hospitals and independent research institutes in their respective fields.

Target audience

HEIs
PRIs

Timetable

1995-present

Priority industries and technologies

All

Specific approach to breakthrough innovation

N.A.

Instruments used

Funding provided to Technology Transfer Offices (TTOs) for them to provide grants and support services to academic spin-offs.

Budget

Yearly budget range: € 20-50 million

Responsible policy making body

Research Council of Norway (RCN)

Responsible implementation body

Research Council of Norway (RCN)

Implementation of the initiative

The programme contributes to the development of TTOs and provides specific funding for spin-offs and patent applications at HEIs, including proof-of-concept and commercialization activities. Rather than creating new TTOs at the regional level or off-
campus structures pooling resources, the programme supports directly the pre-existing TTOs of individual universities or public research institutes.

The FORNY programme was established in 1995 and has experienced a strong expansion in budget and number of grants provided over the years. In 2011, a new FORNY-programme was launched following the 2010 evaluation. The main changes in the so-called FORNY-2020 were more emphasis on proof-of-concept funding and cultivating the best business concepts generated at publicly funded research institutions. In addition to funding proof-of-concept projects and funding for local projects in the TTOs, the programme also aims to improve the competence level and networks of TTOs.

In 2016, the STUD-ENT initiative for student entrepreneurship was started as part of the FORNY 2020 programme, targeting master students at HEIs. The students need the support of their HEIs and may get max 100 000 € a year based on a national competition. In 2018, 25 per cent of the applicants got funds.

Currently, the four main instruments employed by the programme are:

- Proof-of-concept funding: a national competitive arena for verification of the most promising R&D results showing significant commercial potential, including in international markets;
- STUD-ENT funding: a national competitive arena for verification of top student-driven projects that show significant commercial potential, including international markets;
- Local project funding: a national competitive arena to fund early-phase proof-of-concept activities at the regional level via the Technology Transfer Offices (TTOs), the programme’s primary partners.
- Measures to enhance structure and promote network-building and competence-building at TTOs: a national competitive arena to further develop the TTOs.

The FORNY programme has no thematic, scientific, sectoral or industrial priorities, and provides funding to commercialisation projects that are based partially or entirely on R&D results from publicly-funded research institutions in Norway. The programme funds projects from all industries, at various levels of maturity and with different paths to market. There are no unilateral requirements relating to technology readiness levels (TRL), but the programme stipulates clear criteria relating to types of proof-of-concept activity, performance indicators for measuring results, implementation capacity and the ability to trigger commercialisation activity.

The FORNY programme gives priority to projects that are expected to lead to substantial commercial returns and/or other major societal benefits, and that have an excellent implementation capacity. The programme supports the development of concepts and R&D results generated by both researchers and students in institutions of higher education.

| Regional aspects | One of the 4 main instruments of the programme, as mentioned above, is the “Local project funding”, which is a national competition to fund early-phase proof-of-concept activities at the regional level via TTOs. |

| International aspects | Among the strategic tasks of the FORNY 2020 is “linking projects with other national and international funding instruments and stakeholders” and “Promoting cooperation with the other relevant public agencies, both nationally and internationally”. |
The FORNY programme aims to play an important role in connecting projects to relevant incubators, start-ups, industry and the capital market in key international markets such as Scandinavia, Europe, North America and Asia. In particular, the programme aims to improve connections with international capital markets that may contribute to financing Norwegian spin-offs.

### Monitoring and evaluation strategies

The programme and its results have been evaluated several times (see Borlaug et al. 2019 for a review). In general, the evaluations have been rather critical towards the results of the programme, arguing that a large amount of money has been used to support the development of projects, but resulting in few success histories. For instance, Rasmussen et al. (2013) found that approximately 20 percent of the 474 spin-off companies in the portfolio from 1995 until 2013 had a positive result in terms of growth or being bought by other companies. The majority of these spin-offs were established between 1995 and 2005, which illustrates that the way to the market is long. Furthermore, 26 percent were closed down and 29 percent were just registered or sleeping without any activity. The remaining 25 percent of the spin-offs were active and had significant activity in terms of operating costs, but mostly negative in terms of profits - often common for these types of companies. However, while the evaluations are relatively critical, they are also optimistic about future developments and revenues as they acknowledge that the support system for technology transfer has improved, but the system still lacks capital to invest in university spin-offs.

### Critical dimensions

The programme’s implementation approach, focused on TTOs as primary programme partners who then provide research commercialization support to researchers and students, has proved to be an efficient delivery method.

The programme organizes various meetings where representatives of TTOs (which are the primary programme’s partners) meet to exchange experiences and coordinate the programme’s activities. This includes a major annual meeting of TTOs and their project managers, as well as meetings with the heads of TTOs roughly three times a year as a means of further developing the programme and fostering a sense of ownership of, and strategic support for, the various programme instruments.

The FORNY programme has often been criticized for its low flexibility (Borlaug et al., 2019). Calls for proof-of-concept funding was previously only once a year – now twice, but still this is considered by TTOs as too little as many projects demand funding that may be devoted rather fast in order to keep the enthusiasm and engagement of the researcher. However, measures have been taken by both the RCN and individual HEIs. Based on competition between the TTOs, RCN allocates so-called local project funding dedicated to early proof-of-concept to the TTOs, and some HEIs have established their own preliminary proof-of-concept funding for which both researchers and students may apply.

### Sources


https://www.forskningsradet.no/om-forskningsradet/programmer/forny2020/
9. Sweden – Strategic Innovation Programmes (SIP)

| **Objective** | The aim of this programme is to improve international competitiveness and find sustainable solutions to global challenges by enhancing interactions between universities, companies, and other civil society organizations and government agencies. This involves supporting the formulation of Strategic research agendas (SIAs) and launching a number of strategic innovation programmes (SIPs). The programme emerged to address a perceived imbalance in Swedish research and innovation policies, which were focusing too heavily on research excellence without giving sufficient attention to science-industry collaboration for innovation. |
| **Target audience** | Universities, public research institutes, firms and other stakeholders develop joint proposals to receive funding as a consortium. |
| **Timetable** | 2013-present |
| **Priority industries and technologies** | Strategic research agendas, aligned with global societal challenges. |
| **Specific approach to breakthrough innovation** | Projects include work in “breakthrough” technology areas of interest to research institutions and private firms. |
| **Instruments used** | Grants for collaborative research projects Networking and collaborative platforms |
| **Budget** | N.A. |
| **Responsible policy making body** | Vinnova (Swedish Innovation Agency). Other Swedish government agencies such as the Swedish Energy Agency and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) also contribute funding to areas within their remit. |
| **Responsible implementation body** | Vinnova |
| **Implementation of the initiative** | The first step of the programme consisted in a bottom-up process whereby key actors of the innovation system worked together to formulate “strategic research agendas” (SIAs) through widespread consultative processes involving large numbers of relevant actors. Once completed, the second stage consisted in inviting proposals for “strategic innovation programmes” (SIPs) within the areas defined by those SIAs. Different configurations of research and innovation actors generated SIAs in areas of their own choosing and then submitted proposals for SIPs within them, generating proposals for activities to be conducted within these programmes. Proposals were evaluated by independent experts nominated by Vinnova, which was ultimately responsible for the formal funding decisions. In some cases,
applicants of rejected proposals were asked to consider resubmitting them after taking into account the existence of overlapping proposals. For example, communities submitting ten separate agendas related to the forestry sector eventually submitted a combined proposal. This process of “consolidation” occurred at several stages, including the SIA development stage.

Funding for each SIP is provided initially on a three-year basis, with the possibility of renewal for a maximum of nine further years based on review processes every three years.

To date, there have been three waves of calls asking for SIAs to be formulated and submitted as part of the process of designating SIPs. A total of 16 SIPs have been established so far. Beneficiaries in the first wave of 5 SIPs tended to be communities in areas of traditional Swedish strengths (mining and metal mining, metallic materials, lightweight materials, process industries and automation, and production technology) that had prior experience in formulating roadmaps and innovation agendas of this nature. The second and third waves of SIPs had a greater focus on some areas more obviously related to societal challenges, in line with the call for SIAs to focus on challenge-oriented areas, including aerospace, bio-based innovation, life sciences, the Internet of Things, smart electronics and graphene, resource and waste management, automated transport systems, medical and health-related technologies, smart built environments, transport infrastructure, and viable cities.

All the SIPs involve a broad range of actors, including universities, research institutes, large companies and SMEs. Other distinguishing features include the actor-led procedures determining the nature and strategic direction of the SIPs, and the strong role played by these actors in SIP governance.

HEIs receive the bulk of public funds, followed by research institutes. It should also be noted that in terms of overall funding levels, the funds available to universities are approximately matched in both waves by the total collective funds associated with industrial participation (including SMEs, larger Swedish-owned companies, foreign-owned companies and companies owned by municipal/county councils), with the bulk provided by industry itself rather than by the public purse.

Each SIP is managed by an external project co-ordinator and overseen by a board of directors, which is responsible for designing the SIP activities (often assisted by an appointed “agenda council” comprising select members of the community) and implementing them after they have been approved by VINNOVA.

Once initiated, the SIPs are responsible for devising and implementing activities in line with the overall aims of the SIA. These primarily involve launching calls for project proposals (perhaps one or two calls every year for each SIP) and overseeing the implementation of the resulting projects. These calls (which can be for pre-studies or full projects) are designed by the SIPs themselves, with various inputs from programme co-ordinators, board members and consultation exercises, sometimes involving the appointment of agenda councils. Once launched, responsibility for the selection of projects to be funded once again lies with the panels of independent experts constituted by VINNOVA.

The orientation and selection criteria of the calls and distribution of funding among different calls are mostly decided by the programme leadership. The programmes also carry out a small number of “strategic projects” that are usually
larger and organised in a more direct process without issuing an open call if the SIP and VINNOVA both agree with this course of action.

The nature of projects funded by the SIPs varies enormously the project portfolio contains much that is of interest to academics and industry alike, including examples of work in “breakthrough” technology areas, the production of demonstrators as outputs and plans to include product vendors.

Although calls for proposals dominate the activity profiles of the SIPs, they are also responsible for carrying out a range of other activities. These include:

- holding regular (e.g. monthly) meetings of core participants to review progress and take management decisions
- organising regular (e.g. annual) consultations with the SIP communities to continuously assess needs and priorities
- appointing agenda councils comprising not only board members, but also other members of the community, to update roadmaps and refresh strategies
- organising industry fairs and workshops on specific topics of interest to the community
- attending “sharing” meetings set up by VINNOVA for SIPs to share lessons among themselves

### Regional aspects

| N.A. |

### International aspects

SIP activities include international outreach such as:

- producing roadmaps and commissioning analytical studies (e.g. screening similar initiatives in other parts of the world)
- organising visits of core members to relevant centres of expertise and policy initiatives in other countries
- using SIPs as a platform to examine relevant EU activities and initiatives, with a view to both shaping these developments and taking advantage of funding opportunities

### Monitoring and evaluation strategies

Each SIP is subject to a review processes every three years, and this will determine whether it will continue receiving funding (up to max 12 years). While the main purpose of the reviews is to provide learning support for strategy development within each SIP, they should also focus on impact assessment.

Correspondingly, in order to assess the long-term impacts of the programme, these reviews should be designed as integral components of a longer-term monitoring and evaluation framework capable of defining, collecting and assessing the data needed to determine whether higher-level objectives have been met.

OECD review of innovation policy in Sweden (OECD, 2016) performed a review of the overall programme, concluding that although it is too early to determine the long-term impacts, “the SIP has achieved its initial objective of stimulating innovative activities by enhancing collaboration between an extensive range of innovation stakeholders in areas deemed strategically important by both VINNOVA and a significant proportion of Swedish innovation stakeholders”.

OECD SCIENCE, TECHNOLOGY AND INNOVATION POLICY PAPERS
Critical dimensions

The SIP programme has been very successful in stimulating collective research and innovation agenda-setting among a broad community of actors. It has also been successful in promoting closer collaboration in innovation projects between universities, public research institutes, firms of different sizes, and other civil society actors.

However, a risk with the bottom-up strategy formulation processes that led to the constitution of 16 SIPs is that it may end up reflecting the short-term needs of particular industrial communities at particular points in the innovation spectrum and fail to reflect the longer-term needs of society as a whole. Broadening the consultative base for each SIP proposal acted as a counterbalance to selected communities’ dominance over proposals, but a broader view of how all the different proposals fitted together and matched with broader societal aspirations and technical drivers was missing (OECD, 2016).

Moreover, Grillitsch et al. (2019) argue that “the attempt to achieve shared visions among many stakeholders led to broad, catch-all agendas (…) SIPs were designed as an umbrella of several agendas representing different actor interests rather than as a collectively deliberated, well-aligned and integrated programme. This is problematic because it weakens the power of the SIPs to provide clear objectives and concrete direction for the participating actors”.

Other key challenges that appeared in the programme’s implementation were related to the lack of governance capabilities of the SIPs and the uncertainty regarding the forms of governance that would work best, which calls for a more active role of Vinnova in providing guidance and sharing good practices for an effective governance of the established consortia (Grillitsch et al., 2019).

Finally, critics have argued that creating 17 SIPs might be too much, since it dilutes the funding available to each SIP, and makes the term “strategic” become meaningless in the face of so many different research areas. On the other hand, nominating too few strategic areas is also risky if the chosen areas are too generic. In the longer term, it is quite probable that the number of SIPs supported will decline as the need for them fades or mergers and realignments occur, but this number could also increase as new needs arise and new priorities assert themselves.

Sources


https://www.vinnova.se/en/m/strategic-innovation-programmes/
### 10. UK – Knowledge Transfer Partnerships

<table>
<thead>
<tr>
<th><strong>Objective</strong></th>
<th>The programme’s aim is to facilitate the transfer of knowledge and the spread of technical and business skills through projects undertaken by highly skilled, recently qualified, graduates under the joint supervision of personnel from business and the knowledge base. The overall goal is to improve business competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK Knowledge Base.</th>
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<tbody>
<tr>
<td><strong>Target audience</strong></td>
<td>Three-lateral partnerships between a university, a firm and a graduate student.</td>
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<tr>
<td><strong>Timetable</strong></td>
<td>In 2003 the Teaching Company Scheme (which had been operating since 1975) was reformed and renamed to become Knowledge Transfer Partnerships programme, which remains active today.</td>
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<tr>
<td><strong>Priority industries and technologies</strong></td>
<td>All</td>
</tr>
<tr>
<td><strong>Specific approach to breakthrough innovation</strong></td>
<td>N.A.</td>
</tr>
<tr>
<td><strong>Instruments used</strong></td>
<td>Grants co-financed by government grant and business.</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>The programme’s total annual budget (2018-19) was £54.1 million (€60.45 million) of which £32.4 million (60%) from government budget (£24.9 million from Innovate UK plus £6.5m co-funding from devolved administrations, research councils &amp; other government departments) and £22.5 million (40%) from business contributions. Annual budget per project was around £70,000 (€78,200) in 2018-19.</td>
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<tr>
<td><strong>Responsible policy making body</strong></td>
<td>Innovate UK</td>
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<td><strong>Responsible implementation body</strong></td>
<td>Innovate UK</td>
</tr>
<tr>
<td><strong>Implementation of the initiative</strong></td>
<td>Each KTP is a 3-way partnership between a UK-based business of any of any size or a not-for-profit organisation; an academic or research organisation, which can be a university, college or research and technology organisation in the UK; and a suitably-qualified graduate with the capability to lead a strategic business project. The academic or research organisation partner will help to recruit a suitable graduate, known as an Associate. They will act as the employer of the graduate, who then works at the company between 12 and 36 months, depending on what the project is and the needs of the business. Average project length has increased from 24 months in 2017-18 to 28 months in 2018-19.</td>
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A KTP is part-funded by a grant. The company contributes to the salary of the Associate who will implement the project, plus the cost of a supervisor who will oversee the scheme. The amount to be invested by the company depends on the scale and length of the project. It also depends on the size of the company. Typically:

- SMEs contribute around £35,000 per year, about one-third of the project costs
- Large businesses contribute around £55,000 per year, or half of the project costs

As of March 2019 there were over 800 live partnerships and around 80% involved SMEs. From April 2007 to March 2015, the KTP programme has supported around 3,400 projects, which committed a total grant value of over £255M.

In 2019, a typical project had an annual cost of £60,000-£80,000, including the Associate’s gross salary (£27,000 - £45,000), travel and equipment costs (around £6,000) and access to university expertise and facilities (around £30,000)

Most academic and research organisations have a dedicated KTP office. These offices work with the business and academic partners who intend to collaborate together to scope out the project. They can also help with the application to Innovate UK. As for the graduates, KTP is one of the UK’s largest graduate recruitment programmes. There are over 300 job opportunities each year. It supports career development and often leads to a permanent job. In 2018-19, 69% of associates were offered employment and 72% accepted the offer.

A KTP application must be completed jointly by the prospective business and the academic or research organisation partner, with the agreement of a KT Adviser. It should include information about each of the participants, their objectives, the proposed tasks and deliverables for the Associate. The completed application should be submitted by the academic or research organisation.

Applications are assessed by an independent panel and results are delivered within 3 months of application. Recruitment of the selected Associates is done jointly by the academic organisation and business partner. The Associate’s contract of employment is established with the academic organisation.

Each proposal for a KTP is assessed against the following three criteria:

1) General

- All projects must be fully in accord with the agreed aims and objectives for Knowledge Transfer Partnerships.
- There must be a clear need for input from the UK knowledge base to the project and a clearly demonstrated need for knowledge transfer.
- The potential outcomes/benefits for all three partners will not, or will be most unlikely to, occur to the same extent without a Knowledge Transfer Partnerships project (i.e. there is clear additionality).
- The project must not replace what could be achieved by using independent consultants (i.e. it must require the ongoing involvement of an academic partner in project delivery and needs the active embedding of outcomes by an Associate), and must not replace solutions that are available ‘off the shelf’ (e.g. commercial software packages).
- The project must be stimulating and challenging for all three partners.
• The stated potential benefits for all three partners will be likely to accrue.

2) Business:

• The business partner must be capable of making significant use of the knowledge, skills and/or capability to be transferred.

• The proposed project must be innovative and of clear strategic relevance to the business.

• The proposed project must be underpinned by a clear business case, including commercial, societal, cultural and environmental outputs and outcomes as appropriate.

• The business partner must be regarded as being financially viable following consideration of their latest Report and Accounts, or other financial information where appropriate.

• There must be evidence of commitment to the project by the business and this shall be reflected in the proposed membership of the Local Management Committee.

• The business partner must indicate how the proposed project is likely to result in the spread of best practice (e.g. within that firm or to suppliers or to customers).

3) Associate:

• The project must provide the Associate(s) with a challenging learning experience appropriate to his/her background and aspirations.

• There must be a clear training and development plan for the Associate(s) which is appropriate to the requirements of the KTP project.

• There must be an appropriate level of academic and company support available to the Associate(s) throughout the project.

4) Knowledge Base:

• There must be clear benefits to the knowledge base partner, including target outcomes.

• The proposed involvement of the knowledge base partner must provide the appropriate expertise, having regard to the knowledge, skills and expertise to be transferred during the course of the project.

• There must be evidence of commitment to the project by the knowledge base partner and this shall be reflected in the proposed membership of the Local Management Committee.

Regional aspects

Under the leadership of Innovate UK, the innovation agencies of Scotland, Wales and Northern Ireland financially support the programme.

International aspects

N.A.

Monitoring and evaluation strategies

The programme is regularly monitored by Innovate UK. In particular, at the conclusion of every project, it is independently reviewed by 2 external assessors and receives a final grading. This provides a baseline dataset for broader evaluation. The cost of this is relatively small, at less than £10,000 per year.
In addition, the programme as a whole is subject to broader impact evaluations, approximately every 5 years. The next major review is scheduled for 2020/21. The latest review, conducted in 2015, was commissioned by Innovate UK to Warwick Economics and Development (Siora et al., 2015) with a cost of around £30,000. The study findings are based on both qualitative and quantitative methods including interviews with stakeholders, review of the information held in Innovate UK’s KTP databases, and ad hoc surveys. The approach to quantifying the impact of KTP Associates’ participation on the UK economy was to estimate the impact of their participation on productivity, as reflected in their salary and related Gross Value Added (GVA). The economic contribution of new businesses started by KTP Associates was also taken into account. Some conclusions from this report are as follows:

- Every £1 of KTP grant invested results in up to £8 of net extra GVA
- With regard to the Associates, 94% said KTP had had a positive impact on their personal/career development and 95% would recommend it to other graduates / post graduates.
- With regard to the Research Institutions, 82% of respondents cited closer partnerships with industry enabling the development of better understanding of industry as a result of participation in the KTP programme. KTPs were noted as a particularly effective method of engaging with SMEs. Research related benefits such as research publications, enhanced teaching materials and new research projects and staff skills development all exceeded expectations.

The previous review, conducted by Regeneris Consulting Ltd. (2010), found that the KTP programme generated between £4.2 and £4.6 billion of new sales, between £1.6 and £1.8 billion of GVA and 5,530 – 6,090 jobs between 2001/2 and 2007/8. This review emphasized that the programme benefited academic partners by providing insights for academic teaching and research as the academic partners were able to gain insights to industry practices through the KTP associates embedded in the participating companies.

Critical dimensions

The programme focusses on the mobility of human capital, which represents one of the key channels of knowledge transfer but is sometimes overlooked by policymakers. It provides a simple yet effective platform for facilitating collaborations between universities and firms whereby highly-skilled graduates engage in business relevant innovative projects inside firms.

As discussed in Cunningham and Gök (2016), one of the success factors is that KTP represents an intensive intervention with a highly structured management, which ensures that it is suitable for businesses with low absorptive capacity. In fact, in the latest review of the programme (Siora et al., 2015), KTPs were noted by research institutions as a particularly effective method to engage with SMEs.

A review of the programme conducted in 2003 had found that it suffered from an overly bureaucratic application process, but following this review improvements were put in place to reduce the time from application to project start from 52 to 22 weeks. Lengthy negotiations over intellectual property were also found to be a weakness, which was later mitigated by the introduction of a model contract for all partners. Other recent changes include alignment of policy with employer flexible working policy, and an even shorter time scale for project approval, which in 2019 stood at about 8 weeks from competition close to funding decision. Thus, the programme’s responsiveness to identified barriers represents another relevant success factor.
<table>
<thead>
<tr>
<th>Sources</th>
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<tr>
<td>Regeneris Consulting Ltd. (2010), Knowledge Transfer Partnerships Strategic Review. Technology Strategy Board.</td>
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<tr>
<td><a href="http://ktp.innovateuk.org/">http://ktp.innovateuk.org/</a></td>
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### 11. UK – Research Excellence Framework

<table>
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<tr>
<th>Objective</th>
<th>The Research Excellence Framework (REF) is an assessment of the research agenda of UK higher education, conducted by the country’s main funding bodies with the following aims:</th>
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<tr>
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<td>- To provide accountability for public investment in research and produce evidence of the benefits of this investment.</td>
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<td></td>
<td>- To provide benchmarking information and establish reputational yardsticks, for use within the HE sector and for public information.</td>
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<td>- To inform the selective allocation of funding for research.</td>
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For the first time in the UK, since 2014 REF includes an impact element as part of the assessment of university research, with the aim of encourages universities to undertake more relevant research activities, transfer the results of their research to industry and interact to a larger extent with non-academic actors, thus leading to a stronger economic and social impact.

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<tr>
<th>Target audience</th>
<th>HEIs</th>
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<th>Timetable</th>
<th>2014-ongoing</th>
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<th>Priority industries and technologies</th>
<th>All</th>
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<th>Specific approach to breakthrough innovation</th>
<th>N.A.</th>
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<tr>
<th>Instruments used</th>
<th>Assessment method to determine the allocation of institutional funding for public research (performance-based funding system)</th>
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<th>Budget</th>
<th>REF is the new method used to allocate around £2 billion (€2.23 billion) per year of public funding for universities’ research.</th>
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<td>The total cost of the REF itself was estimated at £246 million (€274 million) for the last year it was conducted (2014), of which £232 million were costs incurred by the higher education community (including £212 million for the submission process and £19 million for panellists’ time) and around £14 million in terms of costs for the four UK higher education funding bodies (Source: Technopolis, 2015). Considering that the results of REF 2014 were used over a period of 6 years, a cost per year of €45.7 million can be attributed to the system.</td>
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<th>Responsible policy making body</th>
<th>REF is undertaken by the four UK higher education funding bodies:</th>
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<td>- Research England</td>
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<td></td>
<td>- Scottish Funding Council (SFC)</td>
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<td></td>
<td>- Higher Education Funding Council for Wales (HEFCW)</td>
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<td></td>
<td>- Department for the Economy, Northern Ireland (DfE)</td>
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The Higher Education Funding bodies collectively conduct a UK-wide exercise every 5-6 years to assess the quality of research from UK universities and other higher education institutions (HEIs) – previously called the “Research Assessment Exercise” (RAE) and now the Research Excellence Framework (REF). In fact, the UK was one of the first countries to introduce this kind of performance-based funding of universities, dating back to 1986.

The REF outcomes are used to inform the allocation of public funding for universities’ research. The first review under the REF system started in 2014. The next REF is scheduled for 2021. REF is based on rigorous peer review by expert evaluation panels of: (i) selected research outputs, (ii) the research environment in which it is produced, (iii) selected examples of impact arising from the university’s excellent research. This third element is a novelty of REF with respect to RAE, and represents 20% in the total score (which will be raise to 25% in the 2021). The remainder of the score for REF 2014 comprised 65% for ‘Outputs’ which assessed the ‘originality, significance and rigour’ of research outputs, primarily in the form of publications, and 15% for ‘Environment’ which assessed the ‘vitality and sustainability’ of the research environment.

Submissions are assessed by 36 expert panels covering all academic disciplines. Expert panels are made up of senior academics, international members, and research users, which are appointed by the four UK funding bodies. These 34 panels work under the guidance of four main panels, which oversee the assessment, ensuring the assessment criteria and standards are consistently applied. They are responsible for signing-off the results recommended by the sub-panels. The main panels include international members to provide assurance about the international benchmarking of standards.

In addition, “research users” play a key role on the REF’s expert panels, sitting alongside senior academics, with a particular focus on assessing the wider impact of research beyond academia. “Research users” are people outside of academia in the private, public or third sectors, who make use of university research in their organisation or professional activity (by commissioning research or collaborating with academic researchers, for example). Over 250 research users participated in the expert panels in REF 2014.

REF 2014 defined ‘Impact’ as: “any effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia”. Considering that impact cannot be measured properly based on quantitative methods alone, a method to evaluate impact was introduced, consisting on impact case studies submitted by research centres or Departments. An Impact case study is a short four-page document which has five sections:

1. Summary of the Impact
2. A description of the underpinning research
3. References to the research
4. Details of the Impact, and
5. Sources to corroborate the Impact

Each case study is assessed by using two criteria:

1. Reach- ‘the spread or breadth of influence of effect on the relevant constituencies’ and
2. Significance — ‘the intensity of the influence or effect’.

Not all academics within an institution are required to produce an impact case study for the REF, but one case study is required per 10 academics in any department.

In REF 2014, a total of 154 UK HEIs submitted 6,975 impact case studies for assessment. These were reviewed by 36 expert panels, consisting of 898 academic members and 259 research users. 44% of Impacts were awarded the top outstanding (4*) rating, with a further 40% considered to be ‘very considerable’ (3*). The evaluation results and a database of all case studies is available here: https://www.ref.ac.uk/2014/

Regional aspects

The research funding bodies of England, Scotland, Wales and Northern Ireland participate in REF.

International aspects

The main expert panels that conduct the assessments comprise international experts to enable an international benchmarking of standards.

Monitoring and evaluation strategies

The Dowling review of business-university research collaborations (Dowling, 2015) concludes that “the evidence so far is that the inclusion of Impact in the REF has helped to stimulate a more positive attitude amongst academics towards collaboration with business”. This review recommended that the REF should:

- Maintain or increase the weighting given to Impact;
- Provide more explicit recognition for staff who have moved between industry and academia in either direction, or ‘discipline-hopped’; and
- Consider universities’ industrial collaborations, including the exchange of people and the success of their translation activities, as an important part of the ‘Environment’ component.

Following the REF 2014, RAND Europe was commissioned to evaluate the assessment process of the impact element of REF submissions (Manville et al., 2015). The report concluded that in general the process was successful, but also identified a number of challenges such as the difficulty of assessing the impact templates, the large variation in the way the process was conducted, and the difficulty of involving users in the evaluation process.

Critical dimensions

REF has introduced new incentives for universities to collaborate with business and commercialize their research. It encourages universities and individual researchers to undertake more relevant research activities, transfer the results of their research to industry, and interact to a larger extent with non-academic actors.

A new method for assessing the impact of research using “impact case studies” was introduced. This method considers not only quantitative indicators, but also qualitative evidence and narratives, thus capturing all the different dimensions of impact beyond traditional measures such as income from patent licensing or from contract research with industry. This, however, makes the assessment process inevitably more subjective and more costly, which may explain why other countries have not adopted this model (Sivertsen, 2017).

The participation of “research users” in expert panels is useful to assess the impact of public research conducted at HEIs. It also brings other benefits to the system, such as giving users new networking opportunities with research leaders; Insight into current developments in research; and an enhanced appreciation of the connections that can be
made between researchers and stakeholders; and increased understanding of the potential barriers to engagement with researchers and how to overcome them.

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<th>Sources</th>
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<td><a href="https://www.ref.ac.uk/">https://www.ref.ac.uk/</a></td>
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## 12. USA – Industry-University Cooperative Research Centres

<table>
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<tr>
<th>Objective</th>
<th>The general objective of the Industry-University Cooperative Research Centres (IUCRC) programme is to develop long-term partnerships among industry, academe, and government. Each centre is established to conduct research that is of interest to both the industry members and the centre faculty. An IUCRC aims to contribute to the nation's research infrastructure base and enhances the intellectual capacity of the engineering and science workforce through the integration of research and education. More precisely, the programme’s sub-objectives are defined as follows:</th>
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<td>* Contributing to the nation's research enterprise by developing long-term partnerships among industry, academe, and government;</td>
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<td></td>
<td>* Leveraging NSF funds with industry to support graduate students performing industrially relevant pre-competitive research;</td>
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<tr>
<td></td>
<td>* Expanding the innovation capacity of the nation's competitive workforce through partnerships between industries and universities; and</td>
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<tr>
<td></td>
<td>* Encouraging the nation’s research enterprise to remain competitive through active engagement with academic and industrial leaders throughout the world. As appropriate, NSF encourages international collaborations that advance these goals within the global context.</td>
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</table>

| Target audience | Only US academic institutions with graduate research programmes may apply. The principal investigator of the proposal must be a tenured faculty member unless NSF provides a waiver. The Centers can be formed by a single university or through a multi-university partnership. Industry has significant participation through fee bearing memberships that contribute directly in supporting collaborative research activity. The program also includes a supplemental funding opportunity to facilitate development of international partner sites. |

| Timetable | 1973-present |

| Priority industries and technologies | Focus on precompetitive research areas identified among the science and technology priorities for the nation. Research foci for Centres are driven by current industrial and academic interest and are evaluated using NSF’s merit review process. In addition, the NSF Program may periodically highlight specific areas of interest via a Dear Colleague Letter (DCL) published on www.nsf.gov. Centres generally fall into the following broad categories: advanced electronics and photonics; advanced manufacturing; biotechnology; civil infrastructure systems; energy and environment; information, communication, and computing; and system design and simulation. These categories are not predetermined but represent the current portfolio of Centres. The composition of the Centre portfolio will evolve over time in response to technologically driven research needs. |

| Specific approach to breakthrough innovation | The generation of new research knowledge through industry-driven funding in IUCRCs is anticipated to drive downstream development of new technological innovations. Examples of IUCRC emerging breakthroughs are captured here: [http://iucrc.org/breakthroughs](http://iucrc.org/breakthroughs) |
Instruments used

Grants for public research. The current funding announcement is available here: 

Budget

The annual budget allocated by NSF to programme was USD 19.5 million in 2018, up from USD 7.5 million in 2005.

Each centre (currently 77) receives public funding from the programme over 15 years, divided in three 5-year phases: Up to USD 150,000 annually in Phase I, up to 100,000 in Phase II, and up to 50,000 in Phase III.

In Phase I, for every dollar from NSF, a Centre must raise at least $1 of cash from industry – a 1:1 ratio of NSF funds to industry funds. In Phase II, the industry cash funding needs to meet or exceed a 2:1 ratio to NSF funds. In Phase III, industry cash funding needs to meet or exceed a 5:1 ratio to NSF funds.

In any case, Centres’ in-kind contributions are possible but should be limited and need to be approved by the Center’s industry members.

NSF funds pay for Centre operations and industry funds pay for Centre research. Per NSF requirements, no more than 10% of industry funds must be spend on the indirect costs of research.

Responsible policy making body

National Science Foundation (NSF)

Responsible implementation body

IUCRCs are supported by the National Science Foundation’s Directorate for Engineering, Directorate for Computer and Information Science and Engineering, Directorate for Geosciences, and Directorate for Social, Behavioural and Economic Sciences. The IUCRC program is run by the Division of Industrial Innovation and Partnerships in the Directorate for Engineering.

Implementation of the initiative

The programme has been operating for over 4 decades and has been very stable and robust. Proposals for new IUCRC can be submitted to NSF twice a year and are evaluated by NSF programme officers and peer reviewed by an invited external panel of experts. The NSF invests in nationwide Centres that do not overlap in research foci with existing IUCRCs. To meet national needs, multi-university IUCRCs are preferred to single-university IUCRCs because multi-university Centres contribute to an increased research base as well as to increased interaction among Centre participants.

The IUCRC program provides selected centres with public grants over three competitively awarded 5-year phases, making for 15 years. The first stage in seeking to form an IUCRC Centre applying for a Planning Grant. Each university seeking to form a site in the proposed IUCRC can compete to receive $15,000 for planning purposes to secure industry financial commitment. Post planning, the sites (universities) apply as a team for Phase I funding if industry financial commitment is secured and a strong collaborative research agenda is identified. The initial Phase I stage offers five-year grants of up to USD 150,000 paid annually for each site (university) in a multi-site IUCRC. Phase I IUCRC sites can seek NSF funding to continue to Phase II and receive $100,000 annually, respectively, for an additional five-year period. Phase II IUCRC sites can seek NSF funding for the third phase, to receive $50,000 annually over an additional five-year period. Single site IUCRCs are required to bring forth eight members and at least $400,000 of industry funding annually across all phases. At the end of each Phase a centre seeking the next five year phase of funding is required to undergo NSF merit review.
Selected centres receive funding for their operating costs from the NSF and the research funding for projects comes from industry members. The NSF takes a supporting role in the development and evolution of the IUCRC, providing a framework for membership and operations as well as requirements derived from extensive centre experience and evaluation.

Industry members can join the IUCRC at any time. All IUCRC members sign a standard membership agreement that spells out the university and industry rights and responsibilities, financial commitments to the Centre, publication rights, and how IP is handled.

The current published membership agreement template is available here: https://www.nsf.gov/eng/iip/iucrc/sample_agreement_form.jsp

U.S. government agencies have additional options to join an IUCRC. Details are here: https://www.nsf.gov/eng/iip/iucrc/government.jsp

The internal governance of each IUCRC is composed of: i) a centre director at the lead university site who is responsible for the overall operations; ii) co-directors that manage their university team’s researchers and collaborate with the lead site; iii) Industrial Advisory Board comprising the centre’s industrial members, with an elected chair, that guides, selects and oversees research activities funded by membership fees; iv) a university policy committee that that facilitates the operation of the Center while ensuring compliance with the university’s policies; and v) an external evaluator appointed by NSF to provide improvement-oriented real-time, data-based evaluation feedback to the centres and to NSF.

The centres conduct pre-competitive research on topics of mutual benefit for university partners and industry members. The research conducted at each centre is vetted by an Industry Advisory Board that ensures through the voting process, that it aligns with the emerging needs of the IUCRC rather than the particular interests of one individual company.

The programme has initiated more than 170 Centers and more than 70 remain actively funded under IUCRC grants today. Following a period with around 50 centres constantly in operation during the 1990s, the number of active centres decreased to around 35 in the mid to late 2000s and more recently rose to around 77, following increased investment by the NSF. More than 700 organizations were members in IUCRCs, holding more than 1,000 memberships in IUCRCs. Around 50% of IUCRC members were large corporations, 25% smaller enterprises and 25% were other federal/state agencies as well as NGOs.

| Regional aspects | The programme has initiated IUCRCs in virtually every State in the country. States participate in a variety of ways. Some state agencies with a specific mission related to a centre’s research may participate as member organizations, paying a fee to participate. In other cases, state’s may be interested in supporting the centre through a targeted grant to pursue a research question that is of particular importance to the region, either from an economic development or environmental perspective. |
| International aspects | As appropriate, NSF encourages international collaborations (with a foreign university partner) that advance the goals of an IUCRC within the global context. As of 2018, 5 IUCRCs have 8 integrated international partner sites. According to the programme application process, international site supplemental funding requests must include: a detailed plan to interact with the international research site; a description of the proposed joint research projects; a description of the infrastructure that is in place to enable |
collaboration; evidence that the international research entity has adequate partner funding in place; a formal agreement between the foreign and U.S.-based sites that replicates the provisions for IPR, publication delays, etc. identified in the IUCRC membership agreement; a letter from the IUCRC Industrial Advisory Board that endorses the international collaboration.

In addition, foreign and global firms often participate in IUCRCs as members, contributing membership fees and sometimes providing venues to hold IUCRC conferences in their home countries. Some of them act as members through their U.S. subsidiaries while others provide funding and fees directly from their home countries. Industry members pay membership fees and do not receive public funding, but they benefit from the centre’s activities.

### Monitoring and evaluation strategies

The individual IUCRCs are evaluated annually and the results of such evaluations are available [here](https://www.iucrc.org/evaluation). IUCRCs have to present annual project reports, as well as final project report at the expiration of each of the 5-year phases of the project. The annual report includes three main parts: i) the director’s report; ii) the evaluator’s report; and iii) the formal certification of membership funds. All centres must have an independent evaluator from the beginning of their activities. Thus, the process combines self-evaluation with independent evaluation.

Annual programme level evaluation involves collection of centres’ structural data, such as total funding, membership support, student training, and other centre outcomes, as well as analysis of trends in these data over time. Each centre’s evaluator also conducts annual surveys with centre faculty, students, and industry members to assess their participation in the centre and how they have benefited from their involvement. These data are used by individual centres for performance benchmarking, strategic decision making, and recruitment of new industry members. They are also valuable for NSF programmatic decision making and evaluation of overall programme performance.

Besides the evaluations of individual IUCRCs, the programme as a whole has also been subject to several evaluations, which are catalogued here: [https://projects.ncsu.edu/iucrc/NatReports.htm](https://projects.ncsu.edu/iucrc/NatReports.htm)

Evaluation is a critical component of the IUCRC programme. The goal of the IUCRC Evaluation Project are 1) To help NSF and local centers objectively evaluate their impact by documenting IUCRC outcomes and accomplishments; 2) To promote continuous improvement by giving actionable, timely, data-based (formally collected and observational) feedback, analysis and advice to NSF and local centres; 3) To identify and communicate information about IUCRC best practices to NSF and local centres; and 4) To help promote a better understanding of industry-university-government research cooperation. At the programme level, evaluation results are primarily used to benchmark performance and document programme outcomes. Annual data collection also facilitates targeted analysis and research on topics of particular importance to NSF and US administrations. At the centre level, evaluation results are used to identify what is working or not working within a given centre, and to help them identify areas for improvement and best practices to address those areas. This approach to evaluation has been consistent throughout the life of the program, but the tools and metrics used to evaluate the programme have evolved over time. Currently, the evaluation collects data related to centre structural characteristics, centre operations, surveys of industry member satisfaction and benefits of participation, with a focus on economic impacts, faculty participation, and student participation and career outcomes. Recent additions to the evaluation include more detailed and precise metrics of research relevance, R&D efficiency metrics for industry, student career outcomes, and start-up formation. There
Critical dimensions

IUCRCs adopt a long-term perspective for university-industry collaborations, and many industrial partners continue funding the IUCRC beyond the 15-year funding period offered by NSF. Recent evaluations show that one year after end of NSF funding, more than 80% of all centres remain active.

The programme is based on effective administrative processes. Researchers presenting proposals receive real time feedback from their industry members about their interest in the proposal and how it can be modified to optimize industrial relevance and potential impact. Centre Directors receive clear instructions and facilitating resources such as manuals on how to set up a centres, guidelines, and standardized processes. Throughout the years, the system of project selection and support has been refined and improved.

The programme follows a “formative” evaluation approach whereby lessons learnt from evaluations are taken up in close collaboration with the individual centres. Thus, the program has been highly successful in training qualified researchers to become leaders of research projects. Over 6300 students (Bachelors, Masters and Doctoral combined) have been trained at IUCRC centres over the 2008-2017 timeframe and 25% of these students have been hired by centre members (mostly industry).

IUCRCs are typically established and set up after having been prepared during a planning grant stage. In this stage, NSF provides a grant of USD 15,000 per academic institution for one year, intended to cover planning expenses including travel to the mandatory “boot camp” for aspiring Centre Directors. This boot camp informs potential awardees about the planning process, the IUCRC model in general, member recruitment processes, and best practices in centre operations. NSF also provides funding for an evaluator, who shares best practices and acts as a resource for the aspiring centre directors in launching a successful centre.

The model of internal governance that the centres must comply with, enables their agile set up, avoiding long negotiations between prospective partners.

The NSF invests in nationwide centres that do not overlap in research foci with existing IUCRCs. Applicants are asked to review the IUCRC Center Directory found on the programme webpage (https://www.nsf.gov/eng/iip/iucrc/) for potential overlaps prior to proposing a new centre. In the event of a potential overlap, applicants should consider joining the already existing IUCRCs.

Multi-university IUCRCs are preferred to single-university IUCRCs because multi-university centres contribute to an increased research base as well as to increased interaction among centre participants.

IPR generated by the IUCRCs is shared with all centre members under a non-exclusive royalty free licencing agreement. Centres typically conduct pre-competitive research that leads to new fundamental use-inspired knowledge; and occasionally to patented intellectual property. In sum, the shared-IP based model simplifies the setup of the centres by avoiding cumbersome negotiations between the members.

IUCRCs do not constitute separate legal entities, so that all equipment transferred to them in the context of projects will automatically become the property of the respective university.

The programme went through a period of discovery in its initial stages of development, after which it was quite stable for several decades. The NSF would often experiment...
with different supplemental funding programmes to increase opportunities to do specific types of research, training, or collaboration (CORBI, SBIR supplement, State-IUCRCs, FRP, IMD, Grand Challenges etc.). For instance, in response to increasing demand from centres for a longer period of funding as well as targeted studies of the impact and survival of graduated centers, NSF launched a Phase 3 to allow centers up to 15 years of NSF IUCRC funding. Evaluation feedback was also instrumental in arguing the case that universities should waive the overhead on member funds. The programme significantly increased the funding amount for all centres around 2016. That funding increase was accompanied by increased operational requirements intended to improve programme performance and streamline program management.

Additional info
IUCRC webpage: https://www.nsf.gov/eng/iip/iucrc/
IUCRC Contact email: iucrc@nsf.gov