

Innovation Fund Denmark – Report of the International Evaluation Panel 2019



March, 2019



Published by	Ministry of Higher Education and Science Danish Agency for Institutions and Educational Grants Bredgade 43 DK-1215 Copenhagen www.ufm.dk
Photo	Ministry of Higher Education and Science Danish Agency for Institutions and Educational Grants Nana Reimers Nikolaj Rentzmann iStockphoto LP
Layout	Christine Meike Jensen
Print	Rosendahls
1st print run	500 pcs. Printed March 2019

This publication can be downloaded at ufm.dk/publikationer

ISBN: 978-87-92962-82-9

ISBN (elektronisk publikation): 978-87-92962-83-6

Content

Sammendrag	6
Executive Summary	8
1. Introduction and background	11
1.1 Terms of reference	13
1.2 Political agreement and legal basis	15
1.3 The Danish knowledge-based innovation system and role of IFD	16
1.3.1 The knowledge-based innovation system concept	16
1.3.2 Structure of the Danish knowledge-based innovation system	18
1.3.3 IFD's history and place in the knowledge- based innovation system	21
1.4 Current role and function of IFD	22
1.4.1 Funding	22
1.4.2 Strategy	23
1.4.3 Organisation and governance	23
1.4.4 Instruments	25
1.4.5 Future changes	25

2. What Innovation Fund Denmark does well **29**

2.1 A cultural shift	29
2.2 Fast, simple and unbureaucratic	30
2.3 Peer review and evaluation	31
2.4 Absence of systemic bias	31
2.5 Appropriate programmes	31
2.5.1 InnoFounder, Industrial Researcher and Innovation Pilot in Rural Districts	32
2.5.2 InnoBooster	32
2.5.3 Grand Solutions	33

3. Recommendations for improvement of IFD **35**

3.1 Purpose	36
3.2 Strategy	37
3.3 Governance	42
3.4 Operation	44
3.5 Communication	47
3.6 Funding	48
3.7 Internationalisation	50
3.8 KPIs and benchmarking	52

4. Evidence to support recommendations	55
4.1 Evidence in support of what IFD does well (chapter 2)	57
4.1.1 Absence of systemic bias (chapter 2.3)	57
4.1.2 Appropriate programmes (chapter 2.4)	58
4.2 Evidence in support of issues and recommendations (chapter 3)	59
 5. Appendix	 67
Appendix 1: Members of the Evaluation Panel	67
Appendix 2: Documentation Available to the Panel	68
Appendix 3: Written contributions and Interview Partners of the Evaluation Panel	70
Appendix 4: Data "wish list"	76

Sammendrag

Danmarks Innovationsfond (IFD) er en nøglespiller inden for det danske vidensbaserede innovationssystem, og fonden er godt på vej til at imødekomme de store forventninger fra beslutningstagere og interessenter, som fulgte i kølvandet på fondens oprettelse.

IFD har haft succes med at gennemføre en transformation og et kulturelt skifte til en proaktiv dialogbaseret fond med færre programmer, simplere ansøgningsprocesser og et fokus på resultater. Fondens ansatte er tilgængelige og hjælpsomme. Med de nye programmer og evalueringsprocedurer er IFD blevet hurtig og omstillingsparat. Generelt er IFD lykket med at skabe passende programmer, som rammer de rigtige målgrupper. Alt i alt finder evalueringspanelet, at IFD repræsenterer et velfungerende og agilt bidrag til det danske innovationssystem. Fokus i denne evalueringsrapport er derfor på den fortsatte udvikling af IFD.

De centrale anbefalinger fra panelet kan opsummeres i tre overordnede temaer:

Formål og strategi

IFD bør udvikle en ny strategi for fondens videre udvikling. Der skal være bedre koordination, samarbejde og samfinansiering med de andre aktører i det danske forsknings- og innovationssystem. IFD bør udvikle et nyt program til at stimulere strategisk forskning og udvikling, som kan løfte hele områder eller teknologiske platforme for at komplementere den nuværende én-til-en-tilgang. Både interdisciplinær forskning og innovation og strategisk forskning bør tilskyndes, f.eks. ved at prioritere samfundsvidenskab og humaniora højere og støtte forskning i nye generiske teknologier og metoder. Det er nødvendigt at finde på nye måder at støtte forskning og innovation i regionerne. Man bør også overveje en koordineret national Grand Challenge-tilgang.

Data, KPI'er og referencepunkter

IFD bør udvikle sit datagrundlag, så fonden ligger inde med kvalitets-sikrede data omkring resultater og effekter af de programmer, som IFD har finansieret. Derudover bør IFD gøre data offentlig tilgængelig og tilgængelig for uafhængig forskningsanalyse og international sammenligning. Der skal udvikles nye KPI'er til at vurdere udviklingen med implementeringen af fondens nye strategi og til at evaluere IFD. IFD skal internationalises på flere måder: IFD bør benchmarke sig selv med de bedste sammenlignelige internationale organisationer, rekruttere internationale bestyrelsesmedlemmer, gøre hele deres hjemmeside og oversigt over finansierede projekter tilgængeligt på engelsk, samt koordinere og prioritere fælles internationale programmer.

Ledelse og drift

Organiseringen af IFD bør understøtte en klar ansvarsopdeling imellem bestyrelse og ledelse: Bestyrelsen bør være ansvarlig for det overordnede tilsyn med ledelsen og for implementeringen af de bestyrelses-godkendte strategier, politikker, procedurer og budgetter, mens ledelsen skal have en mere udøvende funktion. Kommunikation og koordination mellem IFD og Uddannelses- og Forskningsministeriet bør forbedres.

Panelet har derudover en række anbefalinger til driftsmæssige forbedringer. Det anbefales at øge finansieringen til IFD, f.eks. ved at øge effektiviteten i administrationen af finansiering fra andre ministerier, ved samarbejde og samfinansiering med private fonde og ved at ændre måden, hvorpå regeringen opgør EU-bidragene i udregningen af det danske budget for forskning og udvikling.

Executive Summary

Innovation Fund Denmark (IFD) is a key component of the Danish knowledge-based innovation system and is well on its way to meet the great expectations from policymakers and stakeholders that were set out when the fund was created.

IFD has been successful in executing a transformation and a cultural shift to a proactive dialogue-based fund, with fewer programmes, simpler application and a focus on outcomes. Employees are accessible and helpful. With the new programmes and evaluation procedures, IFD has managed to become fast and agile. Generally, IFD has managed to create appropriate programmes that target the correct groups of applicants. All in all, the evaluation panel finds that IFD represents a well-functioning and agile addition to the Danish innovation system. Thus, the focus of this evaluation report is on the continuous improvement of IFD.

The key recommendations from the panel can be summarised in three overall themes:

Purpose and Strategy

IFD needs to develop a new strategy for this new phase of its development. There needs to be better coordination, collaboration and co-funding with the other actors in the Danish research and innovation system. IFD needs to develop a new programme to stimulate strategic research and development by lifting entire fields or technology platforms, to complement the current one-to-one approach. Both inter-disciplinary research and innovation and basic strategic research should be encouraged, e.g. by better accommodating the social sciences and humanities and supporting research into new generic technologies and methods. New approaches to support research and innovation in the regions are required. A coordinated national Grand Challenge approach should be considered.

Data, KPIs and Benchmarking

IFD should become rich in quality curated data about the outputs, outcomes and impacts of the programmes it has funded, share this data widely and open them to independent research analysis and international comparison. New KPIs should be developed to assess progress with implementing the new strategy and to evaluate IFD itself. IFD should internationalise in a variety of ways: It should benchmark itself against the best comparable international organisations, recruit international board members, publish website and funded projects in English, coordinate and prioritise international collaborative programmes.

Governance and Operations

The governance structure of IFD should support a clear division of responsibilities between board and management: The board should be in charge of oversight and monitoring compliance with implementing the board approved strategy, policies, procedures and budgets, whilst the management should have an executive function. Communication and coordination between IFD and the Ministry of Higher Education and Science should be improved.

A number of operational improvements are suggested. Recommendations are made to increase funding to IFD, e.g. by increasing efficiencies in the administration of funds from other Ministries, by collaboration and co-funding with private foundations and by altering the way in which the government calculates the EU contribution to the overall Danish research and development budget.

1. Introduction and background



1. Introduction and background

Innovation Fund Denmark (IFD) constitutes a central part of the Danish knowledge-based innovation system. Since its establishment in 2014, IFD has awarded around DKK 6.9 billion (app. EUR 924 Million)¹ to Danish innovation and research, to the benefit of the project participants and society at large.

IFD functions as a central point of entry for companies and researchers across the whole country, covering a wide range of the value chain. IFD offers a selection of funding programmes that cater to different types of projects – from small-scale, fast support for young companies in the InnoBooster programme to larger-scale collaborative projects in the Grand Solutions programme.

There have been great expectations of the new fund. The political agreement² behind the establishment of IFD underlined that its purpose is to contribute to solving societal challenges and to create growth and jobs in the Danish society. The parties behind the reform wanted a more simple and powerful innovation system and IFD was a central element in this endeavour. To a very large extent these expectations have been met, and we commend the Board and Management of IFD for its efforts. The focus of this report is on the continuous improvement of IFD. While the establishment and initial operationalisation of IFD has been successful, it is now appropriate to adapt its strategy, building on these initial successes, recognising the future challenges and capitalising on future opportunities.

This report presents a range of recommendations to further improve the work of IFD and its impact. These recommendations are directed to The

¹ The financial acts of 2014–2018

² Aftale om Danmarks Innovationsfond – Fonden for strategisk forskning, højteknologi og innovation, October 3rd, 2013.



Ministry of Higher Education and Science, IFD and other stakeholders in the knowledge-based innovation system. The recommendations should not be read as a criticism of the practices that the fund has had in the first years of its existence. As with start-up companies and company mergers, IFD has had a strong organisational setup and mission which has got it off to a good start. Going into the next phase of IFD's development, some changes in strategy, governance and operations will be necessary. However, it is still too early to comprehensively assess the impact of IFD's activities on the Danish research and innovation landscape, mainly due to lack of appropriate data. Therefore, there are limits to the extent that this report can thoroughly evaluate the success of IFD in fulfilling its mission (see chapter 4).

This report presents the results of an evaluation of IFD, conducted by an international peer review panel at the request of the Ministry of Higher Education and Science. Chapter 1, the introduction, summarises the Terms of Reference, the political agreement and legal basis for IFD and places the fund within the Danish knowledge-based innovation system. Chapter 2 assesses what IFD does well, while chapter 3 presents recommendations for the improvement of IFD. Chapter 4 describes methods and data and presents the evidence that supports the conclusions in the report.

1.1 Terms of reference

With reference to the political agreement behind the establishment of IFD, the Ministry of Higher Education and Science launched an evaluation of IFD. According to the Terms of Reference (ToR) of this evaluation, the purpose is "to get an in-depth and critical view of the structure, functioning and the results of IFD"³. Furthermore, the evaluation "shall focus on how IFD fulfils its tasks, and whether this is in compliance with the purpose laid out in the law and political agreement."⁴.

More concretely, the panel is expected to look into the following:

1. Whether IFD bases its allocation of grants on societal challenges and needs as well as the needs of enterprises.
2. Whether IFD meets the criteria in their stated purpose in regards to the distribution of funding
3. Whether the instruments of IFD are coherent and coordinated with relevant funding instruments in the Danish research and innovation system (e.g. The Danish Growth Fund, UDPs)
4. Whether IFD contributes to international collaboration, international co-publications or in other ways supports the internationalisation of Danish research.

Based on its assessment, the panel is expected to give recommendations on how to optimise the work done by IFD. The target groups of the evaluation are the political system and the public, IFD and research institutions.

The basis of the evaluation is data gathered by the ministry, in cooperation with the panel, a self-assessment by IFD and interviews with a range of stakeholders (see chapter 4 for further elaboration on data and methods).

³ Terms of Reference, The ministry of Higher Education and Science, August 30th, 2018, p. 1

⁴ Ibid., p. 1

The panel is composed of members with the same qualifications as are required for the Board of Directors of IFD. Thus, as stated in the ToR, *"the members of the panel shall have a broad professional background and international experience in management and strategic planning, including funding, at research institutions. Furthermore, the panel as a whole shall have experience with technology development and innovation in the private sector."*

The panel must consist of a majority with experience from the private sector as well as a majority of internationally acknowledged researchers from different fields of research. Furthermore, the combined experience of the panel shall cover technology development and innovation, strategic and challenge-driven research, use and commercialisation of research results and financing of innovation and research."

The members of the evaluation panel are:

- Mark Ferguson (panel chair), Director General, Science Foundation Ireland & Chief Scientific Advisor to the Government of Ireland.
- Sylvia Schwaag Serger, Deputy Vice-Chancellor, Lund University, Sweden.
- Harri Kulmala, CEO DIMECC Ltd, Finland.
- Christoph Kratky, Professor Emeritus Karl-Franzens Universität, Graz & Former President of the Austrian Science Fund (FWF), Austria.
- Jackie Hunter, CEO BenevolentBIO Ltd & Director Benevolent AI Ltd, UK.

Academic secretary: Rapporteur – Jonas Krog Lind, PhD fellow, Department of Political Science, University of Copenhagen, Denmark.



1.2 Political agreement and legal basis

Following the launch of the first Danish national innovation strategy, Denmark – the land of solutions⁵, a broad coalition of parties entered into a political agreement on October 3rd 2013 that, among other changes to the Danish research and innovation system, established IFD. IFD was an amalgamation of three former independent councils and foundations, The Danish Council for Strategic Research, The Danish Council for Technology and Innovation and The Danish National Advanced Technology Foundation. Establishing the new fund was part of an effort to create a simpler and more flexible system with fewer funding bodies.

The political agreement defined three overall goals of IFD:

1. Increasing the proportion of innovative companies
2. Increasing the proportion of private companies' investment in research and development
3. Increasing the proportion of highly educated employees in companies

⁵ Denmark – løsningernes land, The Ministry of Higher Education and Science, December 20th, 2012. <https://ufm.dk/publikationer/2012/danmark-losningernes-land/danmark-losningernes-land>

IFD was established with the Act on Innovation Fund Denmark no. 306 of March 29, 2014 as an independent body, under supervision by the Ministry of Higher Education and Science, delegated to the Danish Agency for Institutions and Educational Grants (SIU).

In the Act, the purpose of IFD is stated as supporting, through grants, "...the development of knowledge and technology, including advanced technology, which leads to enhancement of research and innovative solutions for the benefit of growth and employment in Denmark"⁶. The purpose is elaborated to focus especially on supporting solutions to grand societal challenges and to increase the research and innovation efforts in private companies.

1.3 The Danish knowledge-based innovation system and role of IFD

In the following, we develop our understanding of the concept 'knowledge-based innovation system' and describe the Danish knowledge-based innovation system and the role of IFD within this system.

1.3.1 The knowledge-based innovation system concept

During the 1980s, the Innovation System concept emerged as a reaction to the linear-model thinking of innovation. The 'science-push'⁷ model was questioned, stressing the interplay between supply and demand dynamics in fostering innovation⁸. As a part of this development, the concept of National Innovation Systems was proposed as a framework to understand how different arrangements across countries were important for explaining differences in economic growth⁹.

⁶ Act on Innovation Fund Denmark no. 306 of March 29, 2014, §2. See English translation of the Act here: <https://ufm.dk/en/legislation/prevaling-laws-and-regulations/research-and-innovation/final-lov-om-danmarks-innovationsfond-eng.pdf>

⁷ Bush V. (1945), Science, the Endless Frontier. A Report to the President, Washington, DC, US Government Printing Office.

⁸ K. Matthias Weber and Bernhard Truffer (2017). 'Moving innovation systems research to the next level: towards an integrative agenda', Oxford Review of Economic Policy, Volume 33, Issue 1, 1 January 2017, Pages 101–121

⁹ Lundvall B.-Å. (ed.) (1992). National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning, London and New York, Pinter.

At the core of the concept of innovation systems is the understanding that innovation success "...depends on the balanced interplay between heterogeneous elements (actors, networks, institutions, technologies)"¹⁰. Instead of innovation being seen as the outcome of independent decision-making from individual actors, the system level approach sees innovation as arising from interactions between a company and its environment.¹¹

While there are arguments for the idea that innovation systems increasingly can be identified on local, regional and sector levels (with globalisation as a central explanation), the idea that national innovation systems still matter remains persuasive. National economic performance varies greatly across the world, reflecting underlying structural differences. Despite globalisation theorists routinely rendering the state obsolete, states, especially in a European context, still play a crucial role in supporting and coordinating the national systems of innovation.¹²

Attempts to determine the overall constellations and specific dynamic interactions for a well-functioning national innovation system invariably suffer from the problem that "a myriad of constellations of system elements could lead to similar levels of innovation success, while similar constellations could lead to widely varying outcomes depending on the context conditions."¹³ As has been pointed out in the literature, innovation policy "...is about making decisions based on adapting and learning, rather than decisions that are following a single one-size-fits-all optimal model for all systems."¹⁴ Hence, contextual knowledge of the national innovation system in question, as well as attention to the observed effects of changes to the system, are important to assess its function.

¹⁰ K. Matthias Weber and Bernhard Truffer (2017). 'Moving innovation systems research to the next level: towards an integrative agenda', *Oxford Review of Economic Policy*, Volume 33, Issue 1, 1 January 2017, p. 112.

¹¹ Smith K. (2000), 'Innovation as a Systemic Phenomenon: Rethinking the Role of Policy, Enterprise & Innovation', *Management Studies*, 1, 73–102.
Ibid.

¹² Ibid.

¹³ K. Matthias Weber and Bernhard Truffer (2017). 'Moving innovation systems research to the next level: towards an integrative agenda', *Oxford Review of Economic Policy*, Volume 33, Issue 1, 1 January 2017, p. 113

¹⁴ Borrás, S. and Edquist, C. (forthcoming). *Holistic Innovation Policy: Theoretical Foundations, Policy Problems and Instrument Choices*, Oxford University Press, p. 61

A peer review evaluation of IFD, and its function within the national innovation system, will never be able to apply a rigorous scientific approach. However, an evaluation panel with international experience supported by a range of specifically collected qualitative and quantitative data will hopefully enable some useful feedback on how to improve the function of IFD and its integration into the wider knowledge-based innovation system.

When we use the term ‘knowledge-based innovation system’ we emphasize that the system encompasses both elements of research and innovation. The focus is on innovation that is based upon scientific knowledge. Hence, we view the term ‘research and innovation system’ as synonymous with ‘knowledge-based innovation system’. This means that basic and applied research, which both serve as a knowledge base for innovation and create broader societal value through research-based education and/or build-up of socially important knowledge, are within the boundaries of the concept. Furthermore, when we use the concept in this report, we implicitly refer to the national (Danish) knowledge-based innovation system.

1.3.2 Structure of the Danish knowledge-based innovation system

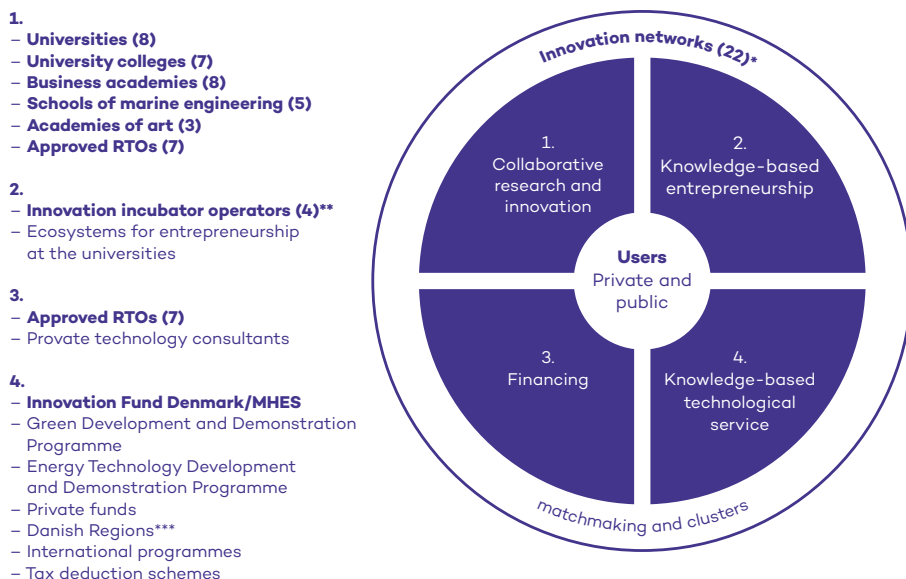
There are many ways to conceptualise and present the Danish knowledge-based innovation system. For the purpose of this evaluation, we have chosen the model developed in the *Literature review and assessment of the Danish knowledge-based innovation support system*, developed by Iris Group for the Danish Ministry of Higher Education and Science (2018). The report was developed to support another international evaluation panel which is tasked with reviewing the overall Danish knowledge-based innovation system. The review document provides a summary of the Danish knowledge-based innovation system to which the reader is referred for further information. Since IFD is a part of this overall system, and because it is a part of the mandate of the evaluation to consider how IFD activities relate to that of the other funding bodies and actors in the system, we present a short introduction to the system and IFD’s position within it.

In the centre of the model, we find the users of the system.¹⁵ Surrounding the users, the circle quadrants show the focal areas of activities in the

¹⁵ Obviously, the role as ‘user’ will vary. Sometimes users are universities and other higher education institutions, sometimes it is companies (and often both). Furthermore, companies are also producers of knowledge (not just users of a system). The focus in this model is on the public support system for research and innovation. As of January 1, 2019, the number of Innovation Networks have been reduced from 22 to 17.

Figure 1.1

Model of the knowledge-based innovation support system in Denmark.



* The number of Innovation Networks will be reduced from 22 to 17 in 2019.

** The innovation incubator operators will be phased out from 2019. Tasks will be transferred to the Innovation Fund Denmark and the Growth Fund.

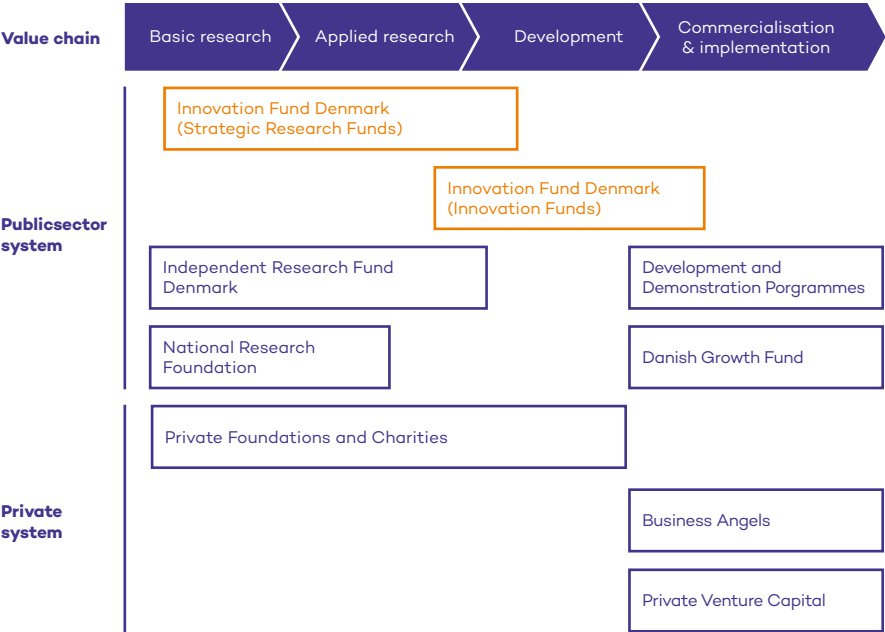
*** The role of the Danish Regions will be modified as a consequence of the political agreement to reform the public business promotion system (see section 1.1.).

Source: Figure made on background of the literature review.

system, while the white boxes list the main operators relating to each area. Because Innovation Networks and clusters are crucial in connecting and facilitating access to all parts of the system, these are illustrated with a ring around the inner circle. The operators in bold are the ones under the Ministry of Higher Education and Science (the number of organisations in brackets). It should be noted that because some operators overlap in functions, the model is a simplification of the system.

The funding activities of IFD (lower-left corner of the circle) are contextualised in the following figure.

Figure 1.2
Overview of funds



Innovation Fund Denmark's primary purpose in regards of research funding is to award grants to strategic research areas of importance to Denmark. IFD also has funds support innovation in both private companies and the public sector.

Independent Research Fund Denmark funds specific research activities within all scientific areas that are based on the researchers' own initiatives and that improve the quality and internationalisation of Danish research.

National Research Foundation primary funding instrument awards funds to "Centers of Excellence" - A center grant is large and flexible and has a lifetime of up to 10 years. The Danish National Research Foundation expects a center to deliver groundbreaking results.

Danish Growth Fund operates through co-financing to contribute to the growth of economically viable yet uncertain small and medium-sized enterprises.

Development and demonstration Programmes provides funding to the realisation of good ideas that can strengthen an ambitious business-oriented innovation.

Figure 1.2 shows how the current research and innovation funding actors in Denmark can be placed on the value chain from basic research to commercialisation and implementation. As opposed to figure 1.1, we include funding actors supporting research in addition to those focused on innovation, since IFD's mission also includes supporting strategic research. In the public sector support for research and innovation (upper part of figure 1.2), we find the Danish National Research Foundation and the Independent Research Fund Denmark. These bodies are the main funders of project-based basic/fundamental research, with no thematic restrictions on calls. Innovation Fund Denmark covers the largest part of the value chain from basic research to commercialisation and implementation. In the commercialisation and implementation end of the value chain, we also find the Development and demonstration programmes (EUDP, MUDP, GUDP), the Market Development Fund (soon to be closed down) and The Danish Growth Fund. The Development and demonstration programmes fund the development of technologies in fields of strategic importance and are administered by the sector ministries associated with the different themes. The Market Development Fund has focused on creating growth in companies by supporting the early development phases, for example through industry partnerships. The Danish Growth Fund invests in and provides loans to companies in early stages where the market is still hesitant. In the private sector funding of research and innovation we find the private funds, non-financial enterprises and financial institutions. Private non-profit funds have gained importance in recent years due to increased investments.

1.3.3 IFD's history and place in the knowledge-based innovation system

In the years after the turn of the millennium, the Danish knowledge-based innovation system saw growth in the number of funding bodies and their areas of responsibility. From a system with mainly discipline centred research councils, new funding bodies like The Danish Council for Technology and Innovation (2002), The Danish Council for Strategic Research (2003), The Danish Council for Independent Research (2003) and The Danish National Advanced Technology Foundation (2005) were founded. Hence, instead of replacing or reorganising existing organisations,

a strategy of layering was chosen.¹⁶ This created a system of many overlapping funding operators.

In the 2012 European Research Area and Innovation Committee (ERAC) peer review, the Danish research and innovation system was assessed as overly complex.¹⁷ The report expressed concern that activities were not effectively coordinated and that instruments overlapped. It recommended that the number of funding bodies should be reduced, suggesting as a possible solution "...one funding council for basic/strategic research and another for applied/innovation-oriented research as in several other countries, such as Finland, the Netherlands, Norway, Sweden, etc."¹⁸

Following the ERAC review report, the government developed the aforementioned strategy for strengthening innovation in Denmark: Denmark – the land of solutions. Drawing on the recommendations in the report, the strategy pointed to the necessity of simplifying the research and innovation funding system. However, instead of choosing the model suggested by the ERAC review report, the government chose to combine all the three areas of strategic research, innovation and high technology into one new comprehensive fund. One of the reasons was the aim for better synergy between research and innovation, for a simpler system with better coordination between fewer instruments. Through the political agreement referred to earlier, the government realised the strategy by merging the three former independent councils and funds into one new organisation: Innovation Fund Denmark.

1.4 Current role and function of IFD

1.4.1 Funding

In addition to the Act on Innovation Fund Denmark, the function of IFD is governed by the annual Financial Act, which provides funding for its

¹⁶ Aagaard, K. (2017). 'The Evolution of a National Research Funding System: Transformative Change Through Layering and Displacement', *Minerva*, Issue 55/3, p. 279-297.

¹⁷ ERAC peer review of the Danish research and innovation system, Expert Group Report prepared for the European Research Area Committee, 2012: <https://ufm.dk/publikationer/2012/peer-review-of-the-danish-research-and-innovation-system-strengthening-innovation-performance>

¹⁸ ERAC peer review of the Danish research and innovation system, Expert Group Report prepared for the European Research Area Committee, 2012, p. 3

programmes and operations. Yearly political negotiations on the distribution of the 'research reserve' is a part of the process of establishing the following year's budget for IFD. The financial act, to some degree, earmarks funding to specific thematic areas or otherwise introduces limits to the spending of funds. The earmarking of funding to strategic research themes is primarily done with reference to the Research20XX (Research 2015, 2020, 2025, etc.) catalogues.

When spending its funding, IFD must follow the rules set by the Danish Public Administration Act, which, among other things, sets out rules for guiding applicants, informing applicants of decisions in writing, providing appeal instructions, observe rules of conflicts of interests, etc.

IFD is allowed to award funding for societal partnerships, co-funding projects with other public or private funds, grant funding through international forums (up to 20% of the budget) and to require co-funding from applicants.

Finally, because IFD programmes involve funding private companies, the fund must comply with EU state aid rules.

1.4.2 Strategy

The overall objective, as defined by IFD's strategy, is to bridge research and society. The mission is defined as follows: "IFD invests in the cultivation and translation of ideas, knowledge and technology of benefit to the Danish society"¹⁹. The objectives of IFD, defined as growth, improving the competences of the work force and solutions to grand challenges, will be pursued by means of innovation and technological advances, interdisciplinary alliances, thriving entrepreneurship, research excellence and a dynamic international outlook.

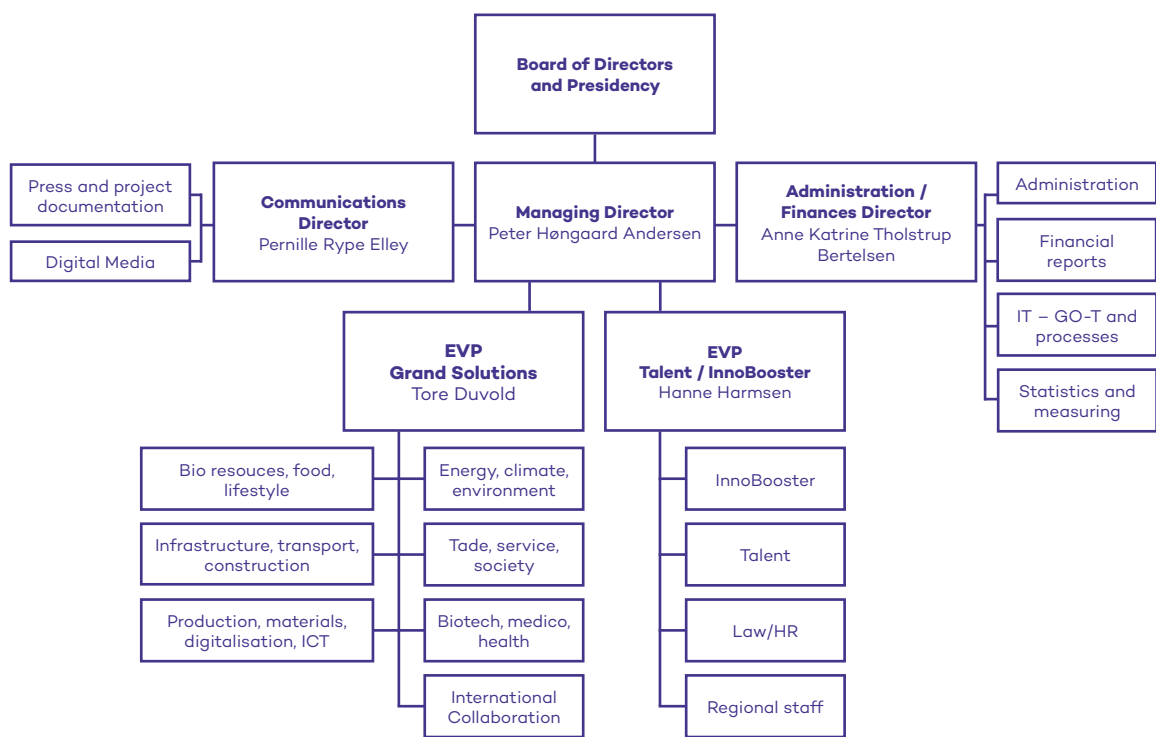
1.4.3 Organisation and governance

IFD has a board of directors, who have the overall responsibility for IFD. While the board of directors has the overall strategic and supervisory role, they are also currently involved in executive functions, such as evaluating and deciding Grand Solutions projects.

¹⁹ Innovation Fund Denmark – Self-evaluation of the role, tasks and organisation of IFD and its position in the Danish Research and Innovation system, Innovation Fund Denmark, 2018, p. 10

The organisation is led by a Managing Director, two Executive Vice Presidents and two Vice Directors. IFD has a total of 47 employees, organised into two departments, Grand Solutions and Talent/InnoBooster, with the remaining employees being in either communications or administration/finances. In the pursuit of a fast, flexible, efficient and effective system, a new – compared to the old councils and funds – category of employees was developed: Scientific Officers. They are hired for their scientific and business competencies and are responsible for parts of the evaluation procedures in the fund.

Figure 1.3
Organization of IFD





1.4.4 Instruments

IFD has created three entries into the various programmes: Talent, Inno-Booster and Grand Solutions. Through the Talent entry into IFD, applicants gain access to the programmes InnoFounder, Industrial Researcher and Innovation Pilot in Rural Districts, all targeted at early career researchers and entrepreneurs. InnoBooster is the second entry into IFD funding, offering support to knowledge-based innovation in small and medium sized enterprises. The third entry into IFD is the Grand Solutions (GS) programme, which cater to both companies and researchers. The GS Programme supports collaborative projects and partnerships and covers both strategic research and research-based innovation. In addition to these core programmes in the fund, IFD supports research and innovation through participation in different international calls, selected by IFD on the basis of its international strategy. For a more detailed description of programmes, see the IFD self-assessment report in Appendix D.

1.4.5. Future changes

In 2018 a political agreement was reached in the Danish Parliament to reduce the number operators and public schemes for business development. Consequently, support measures will be concentrated at municipal and national level with no regional operators. At national level, risk capital instruments will be concentrated at The Danish Growth Fund, whereas IFD will be the major supplier of soft funding.

As part of this transformation, The Market Development Fund has been closed down and their tasks transferred to IFD. It will be the IFD's task to ensure that the activities of the Market Development Fund will be integrated into the existing portfolio of programmes and general function of IFD. Also, the innovation incubator scheme will be discontinued. It will be replaced partly by a scheme at IFD providing proof of concept-funding for development and commercial exploitation of early stage inventions from public research, and partly by new credit facilities at the Danish Growth Fund.

Furthermore, according to the same political agreement, IFD and the three Development and Demonstration Programmes will develop a joint, single point of entry for enterprises and investigate to what extent information and application procedures could be harmonized.

As a part of the government's plan for moving state jobs out of the capital and spreading them around the country, IFD will be relocated to Aarhus. While the main office will be in Aarhus, satellite offices will be set up in Copenhagen, Aalborg and Odense.

Finally, both the director of IFD and the chair of the IFD board will retire in 2019.



2. What Innovation Fund Denmark does well



2. What Innovation Fund Denmark does well

IFD is well on its way to fulfilling the expectations that parliament, the Ministry of Higher Education and Science, stakeholders and society at large had for the new fund that was established in 2014.

As a testimony to how well IFD has handled the transition, neither stakeholders nor users wish for a return to the system of three independent councils and funds. On the contrary, most find that the best elements have been preserved and that a positive transition in strategy, operation and the culture of the new fund has taken place. All in all, IFD represents a well-functioning and agile addition to the Danish innovation system. IFD has been successful in establishing a central point of entry to innovation funding in Denmark. Users generally find IFD well-functioning, meeting their needs for appropriate funding programmes, low administrative burdens, fast application processing and engaged employees who are helpful in all phases from pre-award to post-award.

The board, management and the rest of the staff, are to be commended for showing courage and perseverance in their efforts to make IFD a success in a short time.

2.1 A cultural shift

One of the challenges, and one in which IFD has been largely successful, was to foster a strong identity as a "science and innovation based, committed and dialogue-based fund" (IFD, 2018: 13). IFD has managed to develop a culture where employees are accessible and eager to help applicants to improve their applications. IFD staff take ownership over projects: Not just when helping applicants in the pre-award phase, but also when an application is granted and IFD follows the project as it develops. As one of the users phrased it "you become a part of the family". Most users find that the employees of IFD are well qualified to give advice,



and that they have a positive attitude when contacted. The feedback they give is helpful for improving applications. IFD also go beyond giving advice to applicants on the proposals. A broadly appreciated training programme is offered to project leaders which has helped professionalise the management of the funded projects.

All in all, IFD has been successful in fostering an organisational culture that is proactive, both in terms of a direct involvement in helping shape projects that applicants propose and in terms of suggesting new collaborations and merging of similar projects.

2.2 Fast, simple and unbureaucratic

One of the aims of establishing IFD was to create a central point of entry to innovation funding, with simplified pre- and post-award phases. IFD generally seems to have been successful in doing so.

Users appreciate that IFD allows for speedy application processing, allowing for little time from idea creation to execution. This also allows for quick improvement and resubmission after an application has been rejected.

Most users find applying for funding simple and straightforward. The application system as well as the reporting system are found to be intuitive and well-built by most users.

2.3 Peer review and evaluation

IFD are to be congratulated on introducing a novel peer review and evaluation process, involving face to face presentations and interviews as well as expert review. Although we recommend some improvements to this process, we commend and support the decision of the management and board to institute this process.

Furthermore, the practice of evaluating the progress in funded projects seems to work well. The practice gives extra value, apart from securing the success of the individual project under evaluation, in that it makes cross-pollination between similar projects possible and that it serves as a learning experience for the Scientific Officers who get updated on current trends in their fields.

2.4 Absence of systemic bias

Generally, it seems that the programmes in IFD target the appropriate groups of potential applicants and that no groups have been disenfranchised when the current user group is compared with the one served by the former councils and funds. There is a fairly good correspondence between the groups of potential RDI-active companies and the groups of companies that receive funding from IFD with regard to business sectors. With minor changes, the individual Danish universities get similar proportions of the total funding from IFD and have similar success rates as they did under the previous councils and funds.

2.5 Appropriate programmes

Most companies and researchers find IFD a relevant place to pursue funding for their projects. The available programmes cater to different target groups or to different kinds of projects. There appear to be few gaps in the portfolio of programmes, although we make some recommendations for improvement.

The overall success rates in IFD are at an appropriate level of approx. 20%. The success rates vary between programmes. However, the panel does not find this problematic as the high success rates are found within programmes where the grants are relatively small, and the lower success rates in programmes where the potential grants are large. In the future, it is important to maintain success rates around 20% since lower rates than this tend to act as a disincentive to apply, especially for companies. To simplify access to funding, IFD has created three entries into the various programmes: Talent, InnoBooster and Grand Solutions.

2.5.1 InnoFounder, Industrial Researcher and Innovation Pilot in Rural Districts

Through the Talent entry into IFD, applicants gain access to the programmes InnoFounder, Industrial Researcher and Innovation Pilot in Rural Districts, all targeted at early career researchers and entrepreneurs. Users find the InnoFounder programme useful and well-organised. It is one of the few programmes for innovation support in Denmark where young people can pursue a new idea for a start-up. The mentor setup works well with engaged and talented mentors, and the workshops are helpful for the founders in developing their ideas further.

The industrial researcher programme is valuable for both the researcher employed through the programme and for the companies and universities involved. For the researcher, the programme offers a great starting point for a career in industry. For companies and universities, the programme offers an opportunity for better integration between academia and business. The industrial researchers are valuable knowledge brokers in this interaction. The need for such an approach is evident: When the Academy of Finland cancelled such a funding instrument after 2010, private foundations and private sector leaders started a new one in 2015 with a unique private-funding-only set up called PoDoCo™ (Post Docs in Companies, www.podoco.fi).

The Innovation Pilot in Rural Districts is less successful and we make recommendations regarding this issue in the next chapter.

2.5.2 InnoBooster

The second entry into IFD is through InnoBooster. The InnoBooster programme supports knowledge-based innovation in small and medium

sized enterprises and is widely appreciated by both users and stakeholders. Users find Innobooster fast and simple to apply for. The flexibility of the programme, given the broad range of available grant sizes and the lack of thematic restrictions, makes it very attractive to most new start-ups. Thus, the InnoBooster programme effectively addresses the demand side (pull) in the Danish innovation system. Furthermore, venture capital funds spoke positively about the programme.

2.5.3 Grand Solutions

The third entry into IFD funding is through Grand Solutions. The Grand Solution (GS) Programme supports collaborative projects and partnerships. Generally, participants and interviewed stakeholders find the GS programme relevant and useful. Especially appreciated are the instances when IFD, through the GS programme, has been successful in supporting and developing broad technology platforms, like the Manufacturing Academy of Denmark (MADE) project, which involves the wide dissemination of knowledge to a range of different project participants. With the GS programme, there is also a focus on the supply-side (push) in the Danish research and innovation system. Furthermore, while the InnoBooster programme mostly serves the smaller companies, the GS programme provides balance in the programme portfolio by serving the larger companies and universities. However, see recommendation 11 about a possible gap concerning middle-sized companies.

3. Recommendations for improvement of IFD



3. Recommendations for improvement of IFD

As described in chapter 2, the evaluation panel generally finds that IFD is on the right track. This chapter presents the recommendations from the evaluation panel. The recommendations are based on identified issues, which the evaluation panel believes should be addressed.

The issues and recommendations have been identified through extensive consultations with IFD, the Ministry, IFD users and other stakeholders. Furthermore, a range of documents and data, specifically collected to aid the evaluation, support the recommendations made by the panel (see chapter 4). The panel also draws on its extensive international experience and comparative statistical analysis which it requested, when comparing and benchmarking the function of IFD to similar international bodies and programmes. However, a number of quantitative data requests that the panel asked for, which for a variety of reasons, could not be delivered (see chapter 4 for an elaboration). Such data should be collected to assist future evaluations.

Most recommendations are addressed to IFD, but some are addressed to the Ministry of Higher Education and Science and other actors who influence the function of IFD in the Danish research and innovation landscape. Under each recommendation, the report points to whom it is directed.

The panel emphasises that it has purposely left some of the recommendations at a high level and less detailed. In these cases, the panel has identified issues which it finds are important to address, but it did not have enough data or detailed knowledge to recommend specific actions. Recommendations which are too narrow would restrict the political process, as well as the IFD internal process, following their consideration of this report, where the knowledge and priorities of the involved parties are crucial in deciding how to act.

The issues and recommendations are organised according to eight themes: Purpose, Strategy, Governance, Operation, Communication, Funding, Internationalisation and KPIs & Benchmarking.

3.1 Purpose

1. Issue: The panel believes that both the Ministry and the IFD should clarify the mandate and role of IFD within the Danish innovation and research system. If necessary, this may require a revision of the relevant legislation. The panel believes that currently IFD interprets its mandate too broadly, in that it appears to produce its own policy analysis (e.g. 'Manufacturing 4.0', 'Cybersecurity' and 'Gender Diversity in Denmark') and develops its strategy somewhat separately from the Ministry, other stakeholders and national prioritisation, e.g. FORSK20XX catalogue. It is not the mandate of IFD to act as an independent policy actor, but as a strategic actor, within the framework set by the political system. There needs to be better coordination, collaboration and co-funding with the other actors (government funding agencies, private foundations and industry) in the Danish research and innovation system. The current indicators for success of IFD specified in the legislation are at a macro (country performance) level and therefore, almost impossible to use to assess the performance of IFD. Conversely, the current legislative basis of IFD appears to overly specify how it should execute its tasks, e.g. on peer review panels, which restricts the scope for future innovative procedures of the type successfully pioneered by IFD.

Recommendation: The Ministry and IFD should agree on the mandate and role of IFD within the Danish research and innovation system. This may be assisted by the ongoing international review of the Danish innovation system. There should be better coordination, cooperation and co-funding across the Danish innovation system and some of the following recommendations indicate how this could be achieved. The Ministry, in consultation with IFD, should agree on new key performance indicators for the success of IFD, that are measurable and attributable (e.g. impact of IFD funding on company growth, new innovative products, patents, collaborations, funding of public research and development, etc.). IFD should not be legally constrained or micro-managed in how it executes its function, but rather the legislation should specify important principles, e.g. that it must use international peer review, but not the minutiae of how that is executed.

Directed to: The Ministry of Higher Education and Science and IFD

3.2 Strategy

2. Issue: Both to support the recommendations in this report and to recognise the additional responsibilities, geographical relocation and new Chair and CEO of IFD as it progresses to the next phase of development, it is essential that IFD develops a new strategy and implementation plan. Some of the following issues and recommendations provide suggestions for topics to be incorporated in that new strategy.

Recommendation: IFD needs to develop a new strategy, taking into account the recommendations in this report. The strategy should be more data-driven, including measures of success (see recommendation 9).

Directed to: IFD

3. Issue: The strategy of IFD is not sufficiently coordinated and nested within the strategies of other important actors in the Danish innovation system.

Recommendation: IFD should develop its strategy in closer collaboration with stakeholders and ensure that it is integrated with overarching strategies and documents (e.g. the 'FORSK20XX' catalogue from The Ministry of Higher Education and Science) and is complementary to other stakeholder strategies. IFD could also consider involving stakeholders in the more concrete development and operationalisation of its strategy, e.g. by organising formal consultation workshops or by publishing drafts of new proposed topics and calls for consultation (as in Horizon 2020).

Directed to: IFD

4. Issue: It is a concern among most stakeholders and users that the task of supporting long term strategic research has not been sufficiently undertaken by IFD. This issue has more to do with the funding strategy rather than the level of funding for strategic research. Currently IFD promotes strategic research and innovation through its Grand Solutions programme, which results in a series of predominantly one-to-one projects across a particular field. There are few programmes to lift entire fields or technology platforms, by reaching and connecting a large number of



companies, research institutions and Research and Technology Organizations²⁰. There are few interdisciplinary research programmes involving, for example, social sciences and humanities. There are no programmes to catalyse or develop important areas of national importance, where there is little existing expertise in the academic system. Many of the stakeholders, particularly from industry, were concerned that strategic basic research was underrepresented in the Grand Solutions programme and advocated for a prioritisation of new generic technologies and methods.

Recommendation: In the first phase of IFD there appears to have been an appropriate (and successful) focus on reducing the number of programmes and making them simpler to use. However, IFD now needs to consider strategically what new programmes it needs to execute its mandate successfully. Taking inspiration from MADE, it should consider what programmes it could develop in collaboration with the Ministry, other government research funders, industry and foundations, to lift entire fields of strategic research and innovation of national importance,

²⁰ Research and Technology Organizations is the English term for the organisations in Denmark known as 'Godkendte Teknologiske Serviceinstitutter' (GTS).

including prioritising strategic research into new generic technologies and methods. IFD should consider better mapping of technology readiness levels of the projects they support (see recommendation 28). IFD should also consider the necessity of developing recruitment programmes, to catalyse the development of strategic fields of national importance, which are currently underrepresented in the academic research ecosystem. Aspects of this new strategic research and innovation programme could be nested within a new national Grand Challenges programme, which would promote interdisciplinary approaches and agency co-funding, e.g. joint calls, coordinated action – see recommendation 5.

Directed to: IFD

5. Issue: While Grand Solutions is an excellent public/private partnership scheme, which addresses important industry questions and which should be maintained, it does not live up to its name by addressing Grand Challenges. With a low proportion of interdisciplinary projects, low social science and humanities (SSH) participation, a more one-to-one approach, no cross-agency collaboration/co-funding and no commitment to maintain priorities for several years, the Grand Solutions programme is not geared towards driving transformative change on a grand scale.

Recommendation: IFD should consider if Grand Solutions is the correct name for this excellent partnership programme. If the Ministry and IFD really want to find solutions to important challenges for Denmark, they should consider a new, bolder and better integrated programme. For example, nationally, a small number of strategic priority areas could be agreed for the next five years, ensuring continuity of funding priorities. Different funding agencies, including IFD, could address these priority areas, including joint calls and co-funding. For example, if the grand challenge was ‘actions to reduce climate change’ then IFD might address, for example, carbon sequestration, battery technology and lifestyle changes in collaboration with the Independent Research Fund Denmark, industry and foundations.

Directed to: The Ministry and IFD

6. Issue: A large number of stakeholders and users feel that it is difficult to get support for SSH projects in IFD, which is also reflected in the quantitative data which shows low participation from these fields. Including SSH is important for supporting inter-disciplinary projects.

The issue seems related to a range of strategic, cultural and operational factors and addressing it will require some broad strategic thinking.

Recommendation: Working with the new strategy, IFD should try to ensure that researchers and companies working with SSH projects or inter-disciplinary projects with an SSH aspect, find IFD a suitable place to apply for funding. The board, management and employees, especially Scientific Officers, should have the appropriate expertise and mindsets to accommodate SSH project proposals. Evaluation criteria, and their operationalisation in guidelines and application forms, should be open to a definition of value that is compatible with SSH. Furthermore, given that the Independent Research Fund Denmark has undertaken the responsibility for strategic research within SSH, close coordination and cooperation between IFD and the Independent Research Fund Denmark on the division of labour is necessary and the efficient sharing of expertise and personnel is encouraged. Finally, IFD should consider if the strategy of having a dedicated SSH programme is appropriate. SSH could be an important element in many grand challenges and partnership programmes, and a source of inter-disciplinary collaboration, but would need to be accommodated better, e.g. in terms of encouraging proper integration within a coherent research proposal which undergoes appropriate holistic review.

Directed to: IFD

7. Issue: Data suggests that there is an issue with innovation performance in regions outside of the capital areas in Denmark and that companies in some regions, Region Zealand and Region of Southern Denmark, are underrepresented in successful IFD awards compared to the proportion of RDI-active companies in these regions. Furthermore, the existing programme for targeting companies in these regions, the Innovation Pilot in Rural Districts programme, does not seem to work well. There are a large number of abandoned projects, often due to companies having problems with finding or retaining candidates.

Recommendation: IFD should investigate what characterises the companies in these regions and consider whether they are catered for by existing IFD programmes, whether new programmes or themes are warranted, e.g. taking into account the principal fields of business of these companies, their size and capacity to absorb/execute research and development or whether better promotion of existing IFD programmes is required, e.g. the flexibility of the InnoBooster programme.

Directed to: IFD

8. Issue: The available data suggests that there could be a gap in the company profile of supported IFD applicants with mid-sized companies being underrepresented. IFD supports small companies through the InnoBooster programme, and large companies through the Grand Solutions programme. When compared against the potential RDI-active companies in Denmark, middle-sized companies appear to be under-represented in IFD supported programmes.

Recommendation: IFD should investigate whether the distribution of grants across the company landscape is consistent with expectations based on IFDs strategic objectives. Such analysis might also suggest that other actors in the Danish research and development system, e.g. the Danish Growth Fund, could target such companies to scale up and develop innovative capacity.

Directed to: IFD and other actors in the research and innovation system

9. Issue: To implement some of the recommendations in this report, IFD will need to hire staff with the correct skills and mindsets. Scientific Officers need to understand interdisciplinary projects, including how to integrate SSH with other disciplines. In general, there needs to be diversity in the Scientific Officers' scientific and employment background.

Recommendation: IFD should use the opportunity that lies in the relocation of IFD and the resulting vacancies, to ensure that the staff hiring strategy is fully integrated with its new strategy. IFD could experiment with more flexible models for Scientific Officers, e.g. hiring people on a fixed-term basis in order to enhance turnover and make possible necessary future shifts in the skill sets and background of Scientific Officers.

Directed to: IFD

10. Issue: IFD does not seem to have prioritised a coherent strategy for data collection, curation and processing. The panel asked IFD (as well as the Ministry) for a range of data to support the work on the evaluation. While some of these were impossible to obtain because IFD has been in operation for a relatively short time (making impact assessment difficult), other data should have been possible for IFD to deliver. Furthermore, when comparing different data sources, there were large discrepancies,

suggesting a data curation issue that has negative consequences for the reliability and utility of the data. The panel believes this stems from a failure of IFD to invest in sufficient data cleansing, checking, curation, archiving and making the data publicly available for independent analysis, e.g. by academic researchers. In the view of the panel, data collection and curation are paramount for assessing the performance of various IFD programmes, to facilitate their improvement and the launch of new programmes and to assess the overall performance of IFD in realising the objectives, goals and KPIs set out in its new strategy.

Recommendation: IFD should develop a strategy for data collection, curation and processing and ensure the implementation of the strategy. The development of the data strategy should relate directly to the overall IFD strategy, the KPIs the Board agrees for IFD and the agreed international benchmarking. IFD should develop a comprehensive funding database. IFD should have employees with analytical skills but also, where possible, automate data collection, e.g. from central repositories of publications, patents and individual data, e.g. ORCHID, to reduce the administrative burden on researchers and IFD staff. Data should be shared with the Ministry, quality checked and validated against other sources, e.g. patent, publication and citation databases, enterprise databases etc. IFD should become rich in quality curated data about the outputs, outcomes and impacts of the programmes it has funded, publish this data and open them to independent research analysis and international comparison.

Directed to: IFD

3.3 Governance

11. Issue: The governance structure of IFD does not support a clear, or desirable, division of responsibilities between board and management. The current practice of the board being heavily involved in the executive work of IFD, mainly through application processing and evaluation, is neither sustainable nor scalable. Furthermore, the management of IFD takes on responsibilities of a strategic nature, which are more appropriately the responsibility of the board.

Recommendation: The board should have the overall responsibility for strategy, oversight and monitoring compliance with board approved



policies, procedures and budgets, while the management should have an executive function. This change will require substantial reorganisation, especially in the procedures for application processing and evaluation. It may also require a revision of IFD's legal basis to remove the overly specified process of peer review and evaluation and replace it with a broader description that encompasses the current and future procedures. However, the panel believes that these changes are necessary in order to strengthen the strategic capability of the board and to create a more efficient, transparent, scalable and accountable application processing system.

Directed to: The Ministry and IFD

12. Issue: Currently all IFD board members are Danish. With no international members on the board, IFD lacks the outsider perspective on the Danish research and innovation system. At least one international member could help generate new ideas, provide international benchmarking and secure the internationalisation of IFD.

Recommendation: The procedure for appointing members of the board should include searching for relevant international candidates and should ideally result in the appointment of at least one international board member. Alternatively, if the lack of proficiency in the Danish language is seen as an issue, Nordic colleagues, Danish expatriates with considerable international experience or international professionals currently working in Denmark might be considered as alternatives.

Directed to: The Ministry

13. Issue: The panel finds that communication and coordination between IFD and the Ministry of Higher Education and Science could be improved.

Recommendation: Two models for better communication and coordination with the IFD board should be considered: 1) The ministry could have a high-level ministry official as an observer, without voting rights, on the board of IFD (observer status would not compromise the independence of the IFD), 2) The board of IFD invites a high-level official from the ministry, and possibly other external stakeholders, to attend meetings for specific items when discussing matters of strategic importance where coordination with the ministry and stakeholders is crucial. The regular meetings between the CEO and the Ministry could be extended to lower levels of the organisation to facilitate specific dialogue and updates.

Directed to: The Ministry and IFD

14. Issue: When the Market Development Fund closes, and IFD takes over its responsibilities, it will be challenging to transfer the knowledge and skills from the old organisation.

Recommendation: The Ministry of Higher Education and Science and IFD should ensure that the knowledge and skills of the Market Development Fund is transferred to IFD by appointing former Market Development Fund board members or senior staff to the IFD board, or to a time limited transition advisory committee.

Directed to: The Ministry and IFD

3.4 Operation

15. Issue: Users find that there is a lack of transparency in evaluation criteria and that feedback is insufficient and inconsistent. Users often find that it is unclear whether rejections are given on scientific grounds or because of lack of commercial potential (scientific vs. business evaluation), or because of lack of budget. Some users find feedback insufficient, partly because the written feedback is generic. Furthermore, some applicants with very positive peer review evaluations find it hard to

understand why the application was not successful. Technology transfer offices apparently are not informed when a project application has been successfully funded.

Recommendations: The panel recommends a number of initiatives to solve these issues:

- a) In depth workshops, webinars and certified trainers (based at the regional Business Houses) could give applicants hands on feedback regarding how to interpret and address evaluation criteria when applying.
- b) Feedback on applications should be given in writing, rather than orally (which is less systematic, too open to interpretation and selective memory recall), and should be more comprehensive and less generic. This could be useful for the individual applicant, and comprehensive and written feedback will also give managers in research organisations and businesses a better and more systematic foundation for evaluating why their employees are less or more successful in IFD. This will assist in raising the standard of the innovation ecosystem.
- c) IFD should consider having a prioritised reserve list and inform applicants if and where they are on such a list. Applicants would therefore be able to clearly distinguish if their application was flawed in some respect (and therefore rejected), or if it was deemed worthy of funding but of a lower priority. Learning that their application was fundable, but received lower priority than other, even better applications, would help them to understand why they, in spite of positive peer review results, were unsuccessful. Appropriate publishing of such reserve lists (respecting data protection and confidentiality issues e.g. with academic applicant's name, institution and a general, non-commercially sensitive title) will also assist in demonstrating the potential in the Danish Innovation system that is being lost due to an inadequate budget allocation to IFD or specific IFD programmes.
- d) If IFD chooses to follow recommendation 11, removing the executive functions from the board, the business evaluation of proposals should be done by external business experts (national and international), who may form part of a panel/panels.
- e) Inform the central university authorities, or the relevant technology transfer office, of successful applications by copying them on the award letter so that contract negotiations can begin promptly.

Directed to: IFD

16. Issue: Negotiating contracts in the post-award phase is apparently complicated and time consuming for grant recipients, having to coordinate with all project participants with little guidance from IFD.

Recommendation: IFD should provide clear guidance to both grant receivers and project participants on expectations, deadlines and duties of all parties involved in the contract negotiation phase.

Directed to: IFD

17. Issue: The contract templates are long, complicated, and must be signed even by companies participating who will not be receiving funding from the grant.

Recommendation: IFD should simplify contracts and consider having much less extensive contracts for project participants not receiving funding from IFD.



Directed to: IFD

18. Issue: The budget template for Grand Solution applications is too complicated and time consuming and some users feel that not all information is used by IFD.

Recommendation: IFD should consider reducing the complexity of the full budget, considering which parts are needed for the application process and, if necessary, asking for more details during the post-award phase.

Directed to: IFD

19. Issue: Many users and stakeholders find it problematic that Ph.D.'s in Grand Solution projects are not fully funded. This creates an incentive to include only postdocs in the applications to avoid the necessity of finding co-funding. This disincentive to hire PhD students in Grand Solutions projects decreases the number of personnel in training by the Universities and the possibility of the companies participating in the Grand Solution programmes hiring such students once they qualify to continue the innovation within the company post award, thus not maximising the potential of the Danish Innovation ecosystem.

Recommendation: IFD should fund Ph.D.'s fully in the Grand Solution programme.

Directed to: IFD

3.5 Communication

20. Issue: While there are descriptions of selected funded projects on IFD's website, there are no complete lists of funded projects. This information would be helpful for users and the practice would have the additional benefit of increasing accountability. For example, all Science Foundation Ireland applicants (academic and commercial) agree, on application, a title and a short abstract which can be published publicly.

Recommendation: IFD should publish a complete list of funded projects every year, including abstracts, allowing potential applicants and stakeholders to see what kinds of projects are being funded and to facilitate a

national analysis of the broad areas and themes being funded. Through these lists, it should be made clear how the strategic allocations from the Ministry, e.g. through the 'research reserve', have been translated into project funding. IFD should, over time, develop a fully searchable, comprehensive and public database of funded projects.

Directed to: IFD

21. Issue: Some users find that the website is not user friendly and sections are not translated into English. As funded projects are not published in English, international researchers, e.g. searching for a Horizon 2020 partner, could overlook a potential Danish partner.

Recommendation: IFD should work continuously to make the website more user friendly and ensure that all information on the website is available in English.

Directed to: IFD

3.6 Funding

22. Issue: If IFD is to broaden and expand its role and importance within the Danish research and innovation system (as planned and recommended), it is essential that success rates are maintained around the 20% level. This is particularly important for programmes involving companies, who, if faced with lower success rates, are unlikely to devote the time and resources to submit future applications, which in turn will lead to suboptimal development, both of the Danish innovation ecosystem and the economy. Any expansion in IFD's role within the Danish innovation system means that IFD will need to find additional budget.

Recommendation: The government should increase the funding level of IFD. The panel recognises that there are constraints on how this could be achieved within the current system. However, one possibility is for the more efficient use of existing resources. IFD currently evaluates large numbers of applications for programmes located in other Ministries. IFD could seek to align these programmes with the IFD strategy and national priorities, e.g. for Grand Challenges and to negotiate with the involved ministries to act as the lead agency in allocating these funds. IFD should also collaborate with other funders to jointly fund appropri-

ate programmes, e.g. with the Independent Research Fund Denmark to jointly fund strategic interdisciplinary research projects involving SSH. Recommendations 23 and 24 also indicate how additional budget could be found for IFD.

Directed to: The Ministry and IFD

23. Issue: There are untapped resources in collaborating with private foundations for funding innovation. Denmark has many private foundations who in recent years have dramatically increased their funding of research.

Recommendation: IFD should explore the possibilities of working more closely with private foundations on common calls, and other co-funding possibilities, in areas of strategic importance to IFD.

Directed to: IFD

24. Issue: The practice of calculating the Danish spending on research by also adding EU funding creates the unfortunate incentive, on an aggregate level, not to pursue funding from the EU since any increase in EU funding will be matched by an equal deduction from the national Danish research budget when the total spending would otherwise exceed 1%.

Recommendation: While funding from the EU is contributed by the member states, individual countries might win more funds than they contribute. The Danish calculation of the 1% goal should include the funding that Denmark contributes to the EU research budget. However, any amount that Danish researchers win in excess of this amount should not be calculated as part of the 1% goal. This would provide a major incentive for Danish researchers to be successful in EU programmes – to everyone's benefit – and would follow the practice of other countries.

Directed to: The Ministry



3.7 Internationalisation

25. Issue: Research and innovation are global activities embedded in an international field. However, IFD is very nationally oriented and lacks an international outlook. While IFD does participate in some international funding schemes, bilaterally and through the EU framework, their own calls, especially in the Grand Solutions programme, could benefit from more international collaboration. A limited international outlook can perhaps be expected of a young organisation, but now is the time for stepping up the international outlook of IFD.

Recommendation: IFD should improve its efforts to internationalise in a number of ways. It should encourage more international collaboration across all programmes, use more international benchmarking (benchmarking both the organisation as well as its programmes and research and innovation outputs with the aim of utilising best practices), consider having more international staff (including international board members – see recommendation 12) and having structured international relations with similar organisations.

Directed to: IFD

26. Issue: IFD has developed an international strategy with a number of general, broad criteria for its international priorities. The strategy does not, however, provide a clear overview of the processes through

which IFD selects its specific priorities, including the role of stakeholders. Furthermore, the strategy does not include specific, thematic areas or certain countries or regions of strategic importance.

Recommendation: IFD should expand and operationalise the international strategy in cooperation with stakeholders and the Strategic Advisory Board (see issue and recommendation 27). The strategy should specify the processes and criteria through which the IFD prioritises its resources for international initiatives (e.g. EU-partnerships and bilateral calls) and reflect consultations with the Research 20XX catalogues, the action plan for participation in the EUs framework programme for research and innovation²¹ and other relevant national strategies and documents in a given time period.

Directed to: IFD

27. Issue: There seems to have been little involvement of stakeholders in deciding between different possible partnerships to participate in (JPI's, ERA-NET's, etc.) and some stakeholders find that partnerships which are important for universities, e.g. to build networks for future Horizon 2020 success, are no longer supported. In 2018, IFD set up a Strategic Advisory Board to help provide input on international prioritisation. While this initiative is to be commended, there are no procedures for interaction and coordination between Strategic Advisory Board and the Strategic Reference Group for Horizon 2020 (SRGH).

Recommendation: IFD should cooperate more closely with the Ministry, universities and other stakeholders in prioritising international partnerships, including the EU's funding schemes. Better cooperation between Strategic Advisory Board and the Strategic Reference Group for Horizon 2020 is necessary to meet this end. Building on the input and discussions in Strategic Advisory Board, IFD should operationalise criteria for engaging in international funding schemes. Universities Denmark could be asked to develop its own list of priorities, based on input from all universities, which could go into the work in Strategic Advisory Board to determine priorities.

Directed to: The Ministry and IFD

²¹ <https://ufm.dk/publikationer/2018/handlingsplan-for-dansk-deltagelse-i-eus-rammeprogram-for-forskning-og-innovation>

3.8 KPIs and benchmarking

28. Issue: IFD appears not to have developed and published a set of key performance indicators which could be used to monitor the progress of IFD in achieving its strategic objectives.

Recommendation: IFD should agree and publish a set of stretching KPIs by which its performance can be monitored. The KPIs should be linked to the IFD's strategy and a brief evaluation update should be undertaken and published annually, e.g. as done by Science Foundation Ireland for the KPIs related to its strategy 'Agenda 2020'. IFD should expand and strengthen data gathering and analysis, e.g. it should ask applicants to state the technology readiness level for their project so that the IFD can analyse the technology readiness level distribution across all its programmes. Metrics should include innovative, alternative metrics in addition to more traditional metrics.

Directed to: IFD

29. Issue: Currently IFD does not use international benchmarking to assess its progress or to garner ideas about new programmes. The panel believes that a lot can be learned from benchmarking its strategic efforts, governance structure, operation, programmes, results, etc. with other successful innovation funding bodies abroad.

Recommendation: IFD should benchmark its activities and results with a number of named overseas successful innovation funding bodies selected by the board.

Directed to: IFD

30. Issue: Not all applicants in IFD funded projects have ORCID ID's²². This makes it difficult to link IFD level data to data on the researchers involved in funded projects.

Recommendation: IFD should make having an ORCID ID mandatory for all applicants taking part in IFD funded projects.

Directed to: IFD

²² <https://orcid.org/>



4. Evidence to support recommendations



4. Evidence to support recommendations

In this chapter, we summarise the evidence that supports the recommendations made by the panel in chapter 3. All of the data and evidence made available to the panel is listed in the appendices in the back of the report.

The evidence used in this report comes mainly in three forms: 1) reports and data analysis made for the panel by the Ministry of Higher Education or IFD, 2) interviews with IFD users and stakeholders conducted by the panel and 3) written statements from users and stakeholders evaluating IFD. Reports to support the evaluation include; a self-evaluation made by IFD (Report D), a register-based analysis made for the Ministry of Science and Higher Education (Report A) and two supplementary data reports, one made for the Ministry of Higher Education and Science (Report B), and another for IFD (Report C). The two supplementary reports were made after the panel asked for more data to supplement the already commissioned data in the register-based analysis (Report A). Other reports and material made available to the panel are listed in Appendix 2. Furthermore, the panel conducted a number of interviews with a wide range of stakeholders, including companies and researchers (successful and unsuccessful with their applications). The Chairman of the IFD board, the Managing Director of IFD and a number of IFD employees were interviewed by the panel. The panel also met with key officials from the Danish Ministry for Higher Education and Science and agencies as well as the Minister. Finally, a call was issued to all potential stakeholders and all those invited for interviews, to give brief written evaluations of IFD by answering two questions; what IFD does well and what could be improved? This resulted in 21 written statements (see appendix 3).

The panel wishes to draw attention to some issues regarding the data available for the evaluation. Firstly, data on the effects and broader impact of IFD are not available. IFD has only been in operation since 2014, and the latest year for data availability from Statistics Denmark is 2016.



This means that it has not been possible to do an impact study of either IFD in its entirety or for individual programmes. IFD is currently in the process of designing such studies for selected programmes. These will be valuable for the continuous evaluation and improvement of IFD. Secondly, not all data that the panel requested from IFD has been delivered (see list of data requested in Appendix 4). While some non-deliveries are understandable, some are also within the realm of what should be possible for IFD to deliver (e.g. numbers on gender distribution among applicants and turnover of employees at IFD). Thirdly, the panel found discrepancies in the data available on success rates for applied and awarded amounts in IFD programmes when comparing Report A²³ with *Tal om forskning og innovation 2017* ("Numbers on research and innovation 2017")²⁴. For example, the numbers on awarded amounts for 2017 deviate by more than 200 million DKK between the two sources. These data issues point to the importance of the panel's recommendation 9, namely the importance of IFD developing and implementing a strategy for data collection, curation and processing.

²³ See figure 3.3 in Report A

²⁴ See p. 44 in *Tal om forskning og innovation 2017 – pengestrømme i Danmarks forsknings- og innovationssystem*, The Ministry of Higher Education and Science, 2018.

4.1 Evidence in support of what IFD does well (chapter 2)

4.1.1 Absence of systemic bias (chapter 2.3)

From the interviews we found no evidence that any user groups felt disenfranchised as a consequence of changes following the establishment of IFD. This view was reinforced by the quantitative data available to the panel.

Companies applying for funding from IFD are found within a range of sectors in the Danish economy. Most companies are within the categories *Manufacturing, mining and quarrying, and utility, Business service, Information and communication* and *Trade and transport etc.* These are also the business sectors which have the most Research, Development and Innovation (RDI)-active companies²⁵. Support for the individual sectors has only changed slightly, compared to what was funded by the former councils and funds, except for a large increase in the field of *Information and communication*, which has almost doubled.²⁶ However, this increase is to be expected, considering the rapid development and increasing importance of this area²⁷, indicated by the high proportion of new start-up companies in this area, and reflects a general shift to more knowledge-intensive sectors.²⁸ Furthermore, there is a fairly good correspondence between the percentage of accepted applicants within each sector and the percentage of potential RDI active companies within the sectors.²⁹

The average number of employees, age and revenue of companies participating in IFD has not changed much compared with the former councils and foundations (however, see recommendation 11 and data in chapter 4.2).³⁰

While some universities receive substantially more funding from IFD than others, especially The Danish Technical University and University of

²⁵ See table 4.6 in Report A

²⁶ See table 7.1 in Report A

²⁷ See table 8.2 in Report B

²⁸ See chapter 7.1 p. 55 in Report A

²⁹ See table 4.6 in Report A (see also definition of potential RDI active companies in box 4.1 in Report A)

³⁰ See table 1.1 in Report C

Copenhagen, the distribution between universities has stayed roughly the same compared with the former councils and funds.³¹ Furthermore, the success rates across universities are fairly similar, ranging between 25 % and 41 %.³² However, there appears to be an issue in terms of which of the main scientific areas are funded by IFD (see recommendation 6 and data in chapter 4.2).

4.1.2 Appropriate programmes (chapter 2.4)

Stakeholders and users generally found the programmes in IFD appropriate. Most users found that there was at least one programme that catered to their needs. The different funding instruments support different types of companies. This view is confirmed by the quantitative data.

Firstly, the success rates seem appropriate and matched with the different instruments. The programmes with small grants, InnoBooster and Industrial researcher, have fairly high success rates (25% and 41% respectively in 2017), while the Grand Solutions programme, with large grants to a consortium of participants, has a lower success rate (17% in 2017). The overall success rate was 24% in 2017 (based on applied vs. granted number of projects).³³

The Innobooster programme is clearly targeted to SMEs with growth potential and start-ups with promising ideas. Therefore, the user base for InnoBooster is mostly found among the group of smaller companies in Denmark. The majority of funding (60%) is given to companies with 1-9 employees. While the Grand Solutions and Industrial researcher programmes also fund smaller companies, the majority of funds (40%) go to big companies with 100 or more employees.³⁴ The InnoBooster programme mainly funds relatively young companies (65% of grants are given to companies that are between 0 and 10 years old), while the Grand Solutions and Industrial researcher programmes mainly serve the older companies (66% of grants are given to companies that are 10 years or older).³⁵

³¹ See table 7.5 in Report A

³² See figure 5.2 in Report A

³³ See figure 3.2 in Report A

³⁴ See figure 4.3 in Report A

³⁵ See figure 4.4 in Report A

4.2 Evidence in support of issues and recommendations (chapter 3)

In the second part of this chapter, we focus on the data that supports the issues and recommendations made in chapter 3. The data are organised according to the individual recommendations.

Recommendation 1

The recommendation is based on the interviews carried out by the panel, the written contributions and the general understanding that the panel has developed of the role of IFD. Furthermore, the recommendation is based on the reading and interpretation of the Act on Innovation Fund Denmark. The main goals stated in the Act are to increase the proportion of innovative companies in Denmark³⁶, the proportion of private investments in research and development³⁷ and the proportion of highly educated people in the private sector³⁸. Across the three goals set out for IFD, there has been only modest or no increase. However, it is not possible to attribute the overall performance of these national indicators solely to the function of IFD. Firstly, IFD has only been in operation since 2014, and some effects will probably not have materialised yet. Secondly, other factors than IFD, and even the national research and innovation system as a whole, contribute to these outcomes. Therefore, such overall national goals, as stated in the law behind IFD, are not the best measures of the success of IFD.

IFD has produced its own policy analysis documents.³⁹

The current procedure of the Board participating in some project evaluations directly is apparently the result of their interpretation of the peer review procedures laid out in the Act.⁴⁰

³⁶ See figure 1.1 in Report B

³⁷ See table 2.1 in Report B

³⁸ See figure 4.3 in Report B

³⁹ E.g. 'Gender Diversity in Denmark' (IFD, 2018), 'The future market for cybersecurity in Denmark', (IFD, 2018) and 'Winning the Industry 4.0 Race' (IFD, 2018).

⁴⁰ Act on Innovation Fund Denmark: <https://www.retsinformation.dk/forms/r0710.aspx?id=162389#Kap5>

Recommendation 2

The recommendation is based on the interviews carried out by the panel, the written contributions, and on a reading of the strategy documents provided by IFD.

Recommendation 3

The recommendation is based on the interviews carried out by the panel, especially drawing on the experiences of both stakeholders and officials of the Ministry of Higher Education and Science, and the written contributions.

Recommendation 4

The recommendation is based on the interviews carried out by the panel and the written contributions, stressing that IFD programmes predominantly award grants on a one-to-one basis. Projects with broad dissemination, involving a range of participants, like the MADE project, are rare. Interdisciplinarity is relatively low in Grand Solutions projects. 17% of the projects, based on the participation of universities, can be classified as interdisciplinary.⁴¹

Recommendation 5

The same evidence base as for recommendations 4 and 6.

Recommendation 6

The recommendation is based on the interviews carried out by the panel, the written contributions as well as quantitative data.

If we look at the main scientific areas in the universities and higher education institutions it is clear that IFD grants are heavily skewed towards the technical/natural science areas.⁴² Applicants from these areas are more likely to get funding. Furthermore, humanities, social sciences and health win substantially fewer funds than one would expect when comparing with the overall research and development expenditures in universities within these areas. The humanities are especially underrepresented with only 0,3% of the funding in IFD compared to research and development expenditures in universities of 9%. Social science and health are

⁴¹ See p. 49 in Report A. The number is based on university involvement. The proportion of interdisciplinary projects would likely be higher if other projects partners were included.

⁴² See figure 5.5 in Report A

also underrepresented. Social science attracts 7% of IFD funding while spending 12% of the overall research and development expenditures in universities, and health attracts 15% of IFD funding while spending 24% of the overall research and development expenditures in universities.

While most innovations, at least with an economic potential, could be expected to be founded on research in the technical/natural science fields, there seems to be an untapped potential in engaging researchers from humanities and social sciences, especially since the adoption and acceptance of such technologies relies heavily on research from these fields. This is also reflected in the interview data, where some interviewees felt that it is difficult to get support for social science and humanities projects (SSH) in IFD. In these cases, they find that it is difficult to match their research outcomes and impact with the evaluation criteria in IFD which focuses on financial impact rather than societal impact. While health also underperforms, compared to the general research and development expenditures in universities, this area has other possibilities of funding of both research and innovation by some of the major private funds in Denmark (which is also a part of the reason why the proportion of total research and development expenditures in universities is so high within health).

Recommendation 7

The recommendation is based on the interviews carried out by the panel, the written contributions, the IFD self-evaluation report (Report D) as well as quantitative data.

When broken down by region, the innovation rates seem to diverge between the capital region of Denmark and the central Denmark region, and the north Denmark region, region Zealand and the region of southern Denmark. Where the former experienced a slight increase, the latter experienced a decrease in innovation rates.⁴³ When comparing the levels of funding across regions, Region Zealand and Region of Southern Denmark have lower levels than the proportion of potential RDI-active companies in these regions would suggest.⁴⁴ The proportion of funding going to these two regions is on the level of their respective proportion of potential RDI-active companies when the former councils and funds

⁴³ See figure 1.3 in Report B

⁴⁴ See table 4.9 in Report A

were in charge of allocating the funding.⁴⁵ The practice of IFD funding may have worked to disenfranchise these regions. The reason for this is probably not any bias in how IFD processes applications from companies in these areas, but likely stems from the selection of themes to support (e.g. Information and Communication technology (ICT) is a sector which has companies concentrated in the larger cities in Denmark). However, IFD should investigate further why these regions both fall behind on innovation performance and get less funding from IFD than before. Perhaps they need a focused theme, e.g. agritech.

The self-assessment report from IFD, as well as the evidence from interviews, clearly indicates that the Innovation Pilot in Rural Areas programme is not satisfactory.

Recommendation 8

The recommendation is based on the quantitative data made available to the panel. When looking at the size distribution of companies receiving funding from IFD, it appears that the very small companies (0-9 employees) and the big companies (100 or more employees) apply for and receive more funding than companies in the middle-sized category, when comparing with the group of potential RDI-active companies in each size category. The group of middle-sized companies with employee numbers between 10 and 49 received about a quarter of the funds from IFD but constitute about half of the potential RDI-active companies.⁴⁶

Recommendation 9

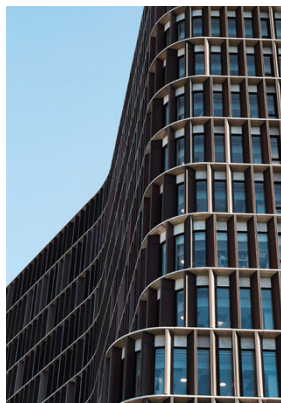
The recommendation is based on the interviews carried out by the panel.

Recommendation 10

This recommendation is based primarily on the difficulties the panel had in getting the data it requested – see the introduction to this chapter for a fuller discussion and references. The recommendation is also based on the interviews carried out by the panel and the written contributions.

⁴⁵ See table 7.4 in Report A

⁴⁶ See table 4.7 in Report A



Recommendation 11

The recommendation is based on the interviews carried out by the panel, the written contributions, and on the knowledge of the panel on best practices.

Recommendation 12

The recommendation is based on the interviews carried out by the panel, the written contributions, and on the knowledge of the panel on best practices.

Recommendation 13

The recommendation is based primarily on the interviews carried out by the panel, especially the interviews with senior officials in the Ministry of Higher Education and Science as well as in IFD.

Recommendation 14

The recommendation is based on the interviews carried out by the panel and the written contributions.

Recommendation 15

The recommendation is based on the interviews carried out by the panel, especially the interviews with users of IFD, as well as the written contributions.

Recommendation 16

The recommendation is based on the interviews carried out by the panel, especially the interviews with users of IFD, as well as the written contributions.

Recommendation 17

The recommendation is based on the interviews carried out by the panel, especially the interviews with users of IFD, as well as the written contributions.

Recommendation 18

The recommendation is based on the interviews carried out by the panel, especially the interviews with users of IFD, as well as the written contributions.

Recommendation 19

The recommendation is based on the interviews carried out by the panel, especially the interviews with users of IFD, as well as the written contributions.

Recommendation 20

The recommendation is based on an examination of IFD's website, the interviews carried out by the panel (especially the interviews with users of IFD), the written contributions, as well as on the knowledge on best practices among the panel members.

Recommendation 21

The recommendation is based on an examination of IFD's website, the interviews carried out by the panel, especially the interviews with users of IFD, as well as the written contributions.

Recommendation 22

The recommendation is based on the interviews carried out by the panel (especially the interviews with users of IFD), the written contributions, as well as on the knowledge on best practices among the panel members. Furthermore, the recommendation is based on an assessment of the success rates for IFD programmes (see section 4.1.2 in this chapter).

Recommendation 23

The recommendation is based on the interviews carried out by the panel and the written contributions. Furthermore, the recommendation is

based on the fact that the contribution from private funds to research and innovation has been increasing in recent years.⁴⁷ It is expected that these private funds will contribute even more in future years⁴⁸ so the opportunities and gains from collaboration will increase.

Recommendation 24

The recommendation is based on the interviews carried out by the panel and its own assessment of the practice of calculating the 1% goal for public funding of research.

Recommendation 25

The recommendation is based on the interviews carried out by the panel and the written contributions.

Recommendation 26

The recommendation is based on the interviews carried out by the panel, the written contributions, and on reading the international strategy of IFD.

Recommendation 27

The recommendation is based on the interviews carried out by the panel and the written contributions.

Recommendation 28

The recommendation is based on the interviews carried out by the panel, the written contributions, and a reading of the self-assessment report from IFD (Report D).

Recommendation 29

The recommendation is based on the interviews carried out by the panel, the written contributions and a reading of the self-assessment report from IFD.

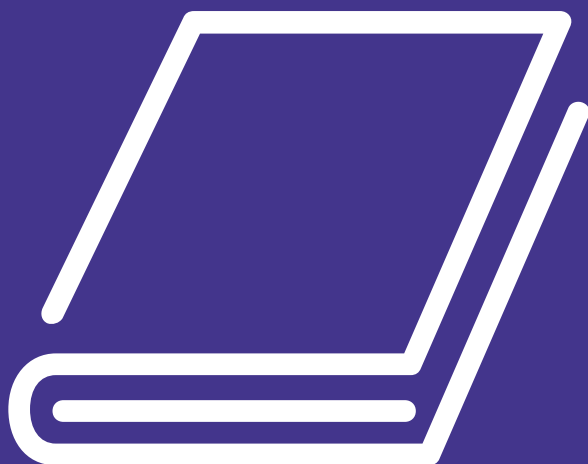
Recommendation 30

The recommendation is based on the interviews carried out by the panel.

⁴⁷ P. 27 in Private fonde. En kortlægning af bidraget til dansk forskning, innovation og videregående uddannelse ("Private Foundations. A mapping of the contribution to Danish research, innovation and higher education"), The ministry of Higher Education and Science, 2016.

⁴⁸ See e.g. the Novo Nordisk Foundation strategy for 2019–2023, in which the foundation forecast a four-fold increase in payouts towards 2023.

5. Appendix



Appendix 1: Members of the Evaluation Panel



Dr. Mark Ferguson
Director General of Science Foundation Ireland
and Chief Scientific Adviser to the Government
of Ireland, Ireland (Chair)



Dr. Harri Kulmala
CEO of DIMECC Ltd., Finnish Digital Industry
Innovation Ecosystem,
Finland



Dr. Jackie Hunter
CEO at BenevolentBio Ltd. and Professor
at St George's Hospital Medical School,
United Kingdom



Dr. Sylvia Schwagg Serger
Deputy Vice-Chancellor at Lund University,
Former Director of Vinnova,
Sweden



Dr. Christoph Kratky
Professor Emeritus at the Institute of Molecular
Biosciences at University of Graz, Former President
of the Austrian Science Fund, Austria



Academic secretary:
Rapporteur – Jonas Krog Lind, PhD fellow,
Department of Political Science, University
of Copenhagen, Denmark

Appendix 2:

Documentation

Available to the Panel

Documentation from the Danish Ministry of Higher Education and Science

- Innovation Strategy 2012: Denmark – a nation of solutions
Enhanced cooperation and improved frameworks for innovation
in enterprises, 2012
- Vision for the Innovation Strategy, 2012
- RESEARCH2020 – Strategic Research Horizons, 2012
- Summary of RESEARCH2020 – Strategic Research Horizons, 2012
- Inno+ The Innovative Denmark, 2013
- RESEARCH2025 – promising future research areas, 2018
- Summary of RESEARCH2025 – promising future research, 2018
- Denmark – Ready to seize future opportunities. The Government's
objectives for Danish research and innovation, 2018
- Note, Allocation of politically prioritised research funds – funding
of “strategic research”, 2018
- Note, Interfaces between the Agency for Higher Education and
Science and the Innovation Fund Denmark regarding international
cooperation, 2018
- Note, Reform of the public business promotion system, 2018
- Note, Basic funding for the Danish universities, 2018
- Translation of the Agreements of Allocation of Research Reserve
2014-18
- Parts of Target Group Analysis 2014 – former councils and funds
- Analysis of Innovation Fund Denmark's users and potential target
groups (Report A), 2019
- Supplementary material for the Analysis of Innovation Fund
Denmark's users and potential target groups (Report B), 2019

Documentation from IFD

- Self-Assessment of the Danish Research and Innovation System, 2012
- Strategy of the Innovation Fund Denmark, 2015
- The User's Experience of Innovation Fund Denmark, 2018
- Impacts of Grand Solutions Projects on research and innovation, 2018
- Selected pages from Industrial Researcher report, company perspective
- Selected pages from Industrial Researcher report, PhD perspective
- Selected pages from MADE report (Danish)
- Supplementary material for the evaluation of Innovation Fund Denmark (Report C), 2019

Documentation from the European Commission

- Peer-Review of the Danish Research and Innovation System: Strengthening innovation performance, 2012

Documentation from MADE

- MADE brochure: How do we create world class manufacturing in Denmark?
- MADE one pager, 2018

Statistics

- European Innovation Scoreboard, 2018
- Analysis of the Industrial PhD Programme

Appendix 3: Written contributions and Interview Partners of the Evaluation Panel

Interview partners

Innovation Institutions (RTO's, Networks and Cluster Excellence):

- Betina Simonsen, Managing Director of Lifestyle & Design Cluster, UMT
- Christian Graversen, CEO of Welfare Tech
- Christina E. Wanscher, Network Manager of RoboCluster
- Juan Farré, CEO of FORCE Technology and member of GTS Board of Directors
- Kim Guldstrand Larsen, professor at Aalborg University and Director of CISS, IDEA4CPS, InfinIT and DiCyPS
- Liselotte Hohwy Stokholm, Director at Erhvervshus Hovedstaden
- Merete Daniel Nielsen, Co-founder and director of Cluster Excellence Denmark
- Mette Sandgaard, Business Developer at Erhvervshus Hovedstaden
- Per Spindler, Director of Biopeople (Innovation Network)
- Ragnar Heldt Nielsen, Director of GTS Secretariat
- Søren Stjernqvist, CEO of Danish Technological Institute and Chairman of GTS Board of Directors

Private Foundations:

- Birgitte Nauntofte, Director of the Novo Nordisk Foundation
- Christian Elling, Managing Partner at The Lundbeck Foundation
- Hans Kann Rasmussen, Chairman of The Velux Foundation
- Jens Kann-Rasmussen, Chairman of The Villum Foundation
- Jesper Nygård, CEO of Realdania
- Jørgen Huno Rasmussen, Director of The Lundbeck Foundation

Public Foundations and Councils:

- Ann Dorthea Larsen, Chairman of EUDP
- Christian Motzfeldt, Director of Vækstfonden
- Jens Oddershede, member of the board of directors of the Velux Foundation and Chairman of the Danish Council for Research and Innovation Policy
- Liselotte Højgaard, Chair of the Danish National Research Foundation
- Malou Aamund, Country Director of Google in Denmark
- Mikael Thinghuus, CEO of Royal Greenland
- Peter Munk Christiansen, Chairman of the Board of directors, The Independent Research Fund Denmark
- Søren-Peter Olesen, CEO of the Danish National Research Foundation (DNRF)
- Thomas Bech Hansen, Council member of the Danish Council for Research and Innovation Policy

Representatives from the Danish Universities:

- Annette Fløkke Lorenzen, Industrial Relations Manager at Copenhagen University
- Benjamin Miguel Olivares Bøgeskov, Senior Associate Professor at University College Copenhagen
- Charlotte Gisselmann Jessen, Consultant at the Copenhagen Business School
- Gitte Gramstrup, representative from the IT University of Copenhagen
- Henrik C. Wegener, Rector of the University of Copenhagen
- Jens Christian Godskesen
- Lars Bo Nielsen, Chairman of The Research and Innovation Policy Committee at Aarhus University
- Lauge Sørensen, Assistant Professor at The University of Copenhagen
- Line Slemming, Team Manager at the department of Research Support and Collaboration, Aarhus University
- Luisa Nygaard, Special Consultant at the department of Research & Innovation, The University of Copenhagen
- Mads Tofte, Vice Chancellor of the IT University of Copenhagen
- Majbritt Milter Dyhr Vestergaard, Senior Executive Legal Advisor at the Office for Innovation and Sector Services, Technical University of Denmark
- Maria Harbo Thomsen, representative from Aalborg University

- Niels Christian Nielsen, Dean at Aarhus University
- Peter Berensdorff Poulsen, Senior Scientific Officer at The Technical University of Denmark
- Tina Skoubo Elcer, Member of the Faculty Administration at the Faculty of Engineering at the University of Southern Denmark
- Ulla Kær Olesen, Special Consultant at the department of Innovation, Aalborg University

**Members from the Research and Innovation Policy Committee
(Danish Universities):**

- Henrik Bindslev, Dean at the University of Southern Denmark
- Jacob Graff Nielsen, Dean at the University of Copenhagen
- Katrine Krogh Andersen, Dean of Research, Technical University of Denmark
- Mogens Rysholdt Poulsen, Dean at Aalborg University
- Peter Kjær, Prorector at Roskilde University
- Søren Hvidkjær, Dean of Research at Copenhagen Business School

Companies:

- Alicia Johansson, representative from NIL Technology
- Jens Christiansen, Team Manager at Teknologisk Institut
- Lars Frederiksen, CTO and Co-founder of LED iBond
- Lars Moltzen, Chief Science Officer at 2operate A/S
- Malte Kristian Skovby Ahm, Aarhus Vand
- Martin Huus Bjerger, CFO of Rope Robotics ApS
- Nigel Edmondson, Managing Director of MADE (Manufacturing Academy of Denmark)

Interest groups:

- Allan Skårup Kristensen, Chief Consultant for Research and Innovation, The Danish Association of the Pharmaceutical Industry (Lif)
- Anders Klöcker, representative from the Danish Agriculture and Food Council
- Ane Buch, Managing Director of SMVdanmark
- Bente Sorgenfrey, Director of FTF
- Dorte Kulle, Chief Consultant, SMEdenmark
- Ida Sofie Jensen, Group CEO of Lif
- Jonas Orebo Pyndt, Consultant for Research and Innovation at Danish Industry
- Karen Hækkerup, former Director of the Danish Agriculture & Food Council

- Lars Qvistgaard, President of AC
- Magnus Balslev Jensen, Consultant for Innovation and Growth Policy, FTF – Confederation of Professionals in Denmark
- Mette Fjord Sørensen, Head of Research and Higher Education, Confederation of Danish Industry
- Morten Andersen Linnet, Head of Research Policy, Danish Agriculture & Food Council
- Peter Szabo, Representative of IDA – The Danish Society of Engineers
- René Flege Højmark, Consultant for Business and Insurance, IDA – The Danish Society of Engineers
- Thomas Damkjær Petersen, President of IDA

Representatives from Danish Ministries:

- Agnete Gersing, Department head within The Ministry of Higher Education and Science
- Hans Müller Pedersen, Director General of the Danish Agency for Science and Higher Education
- Karin Kjær Madsen, Chief Consultant for DFIR
- Lene Brøndum, representative from The Ministry of Health
- Mogens Udh Nielsen, representative from The Danish Energy Agency
- Niels Henrik Mortensen, representative from the Ministry of Environment and Food of Denmark
- Nikolaj Veje, Director of the Danish Agency for Institutions and Educational Grants
- Nils Agerhus, Director of the Permanent Secretary's Department
- Sigmund Lubanski, Department Head within Business Development and International Relations in the Danish Business Authority
- Søren Bukh Svenningsen, Department Head of the Danish Environmental Protection Agency

Researchers:

- Brigitte Maria Städler, Associate professor at the Interdisciplinary Nanoscience Center, Aarhus University
- Johan Hjelm, Associate professor at the Department of Energy Conversion and Storage, Technical University of Denmark
- Mads Koustrup Jørgensen, Lecture at the Department of Chemistry and Bioscience, Aalborg University
- Stephen Alstrup, Vice Head of the Department of Innovation and Business Cooperation at the Department of Computer Science,

University of Copenhagen

- Sune Thorsteinsson, Project Manager at Department of Photonics Engineering, Technical University of Denmark
- Susanne Ekman, Associate professor at the Department of People and Technology, Roskilde University

Venture Capital foundations and Business Angels:

- Amer Ramzan, Managing Partner at Promentum Equity Partners
- Jesper Nørregaard, Private Business Angel
- Ulrik Jørring, Managing Partner at Nordic Alpha Partners

Additional contributions:

- Conni Simonsen, Former chair of the Danish Council for Technology and Innovation
- Jørgen Mads Clausen, Chairman of the Board of Directors at Danfoss
- Karin Kindt-Larsen, Senior Executive Adviser at the Centre for Innovation and Research, The Capital Region of Denmark
- Mette Sandgaard, employee at Vaeksthus Copenhagen
- Peter Olesen, ActiFoods ApS. Chairman, Danish Council for Strategic Research

Written contributions

- Anders H. Lund, professor at BRIC (bio-tech, research and innovation centre), Institut of Copenhagen University
- Anders Hede, representative from TrygFonden
- Brian Bech Nielsen, Rector of Aarhus University
- Christian Vintergaard, representative from The Foundation of Entrepreneurship
- Erik Østergaard, researcher from Aarhus University
- Henrik Skou Pedersen, representative from Business Development Centre Central Denmark
- Jørgen Mads Clausen, former chairman of the Danish National Advanced Technology Foundation
- Lars Bo Nielsen, chair at research and innovation policy committee, Danish Universities
- Lars Kvistgaard, chairman at the Danish Confederation of Professional Associations.
- Lars Stigel, representative from FOIN
- Lia Leffland, representative from The Danish Academy of Technical Sciences
- Lone Vingtoft, representative from Danish Regions

- Louise Riisgaard and Mads Eriksen, representative from The Danish Chamber of Commerce
- Mads Lebech, representative from The Danish Industry Foundation
- Mads Nielsen, representative from Biomediq
- Mette Skovbjerg, representative from Local Government Denmark
- Rasmus Stoklund Holm-Nielsen, representative from The Danish Metalworkers Union
- Steen Enemark Kildesgaard, Rector of KEA: Copenhagen School of Design and Technology
- Stefan Hermann, Rector of University College Copenhagen
- Torben Holm, Chief Secretary at The College of Rectors from the Higher Education Institutions within the Fine Arts
- Torben Tranæs, representative from The Danish Center for Social Science Research, VIVE

Appendix 4: Data "wish list"

This is a raw wish list of data, based on ideas that came up on the first panel meeting. UFM and IFD is expected to 1) Check if these data are available or possible to acquire and 2) assess if there are existing data in either IFD or UFM that could be useful to the panel. The ideas for data could also be ideas for what to include in the evaluation regime of the foundation in the future.

1. National level data – for the past 5 years

- The proportion of innovative companies
- The proportion of companies' investment in research and development
- The proportion of highly educated employees in private companies
- Private funding of public research (separated into private companies and private, non-profit foundations)
- Numbers on SME's according to number of employees (1 employee, 1-3, 4-10, etc.)
- Industry-academic co-authorship of publications
- Who are the major patent filers in Denmark – Companies, HEI researchers, others (by field) – including top 20 names in each category

2. Before (i.e. the three funds merger) and after (IFD) analysis

- Companies funded – names, size, field, value chain
- Companies started – names, size, field, value chain
- Companies grown (scaling) – names, size, field, value chain
- Researcher funded – institutions, PI-names, fields
- Sizes, types and number of grants
- Application process + Time from submission to decision
- Review process (detailed description)
- Board, sub-committee + management (composition + management chart)

3. IFD level data

- Do companies funded by IFD grow? (data on how they grow in comparison with similar companies?)
- FD grants distributed on field of research (incl. interdisciplinary and cross disciplinary research)
- How much change in collaboration partners are there? (between projects, over time). And changes in projects themes, etc.
- Numbers (percentages) of project participants hired in collaborative partner companies
- Repeat business of escalating financial value (e.g. from looking at press releases)
- Failed projects that even so lead to positive outcomes
- Ratio of potential applicants and number of actual applications
 - by field in HEI + companies
- Geographical distribution of the companies
- Possible to do threshold analysis (those who had similar evaluations in peer review, but either got or did not get funding). What is the bias in these two groups?
- Different data on staff: Turnover, workload (manpower vs. distributed funds). Benchmark staffing with other organizations (see earlier benchmarking section)
- Data on gender (pool of applicants, grantees, composition in projects)
- Examples of the three “packages” of applications, reviews, etc. that board members get
- Detailed descriptions from IFD of the application process for each instrument + flow chart
- Any indicators in European Innovation Scoreboard that we can get IFD level data on?
- Any indicators from the Small-advanced economies impact initiative we can get IFD level data on?
- Copies of board agendas
- Generally: A before and now count on a number of parameters (what data is available?)
- What % of the top 20 + top 100 in each of these fields has A/applied for or B/been granted IFD funding (broken down, if possible, by sectors):
 - Fastest growing companies (by employee numbers and value)
 - Most innovative companies (e.g. highest patent filers)
 - Top patent filers in universities + research/innovation institutions

- Top patent filers in companies
- Most highly cited researchers (by bibliometric analysis)
- Entrepreneurs (business founders)
- Researchers in HEI who co-author publications with industry researchers
- Companies founded in past 2 years
- Top + bottom company analysis for the following parameters:
 - Fastest growing by value
 - Fastest growing by employee numbers
 - Most innovative
 - Most R&D intensive. Take the top 20 % and the bottom 20 % and determine what % of each had IFD funding. Any differences between companies in those groups with or without IFD funding?
- Number + value of spin-out companies from IFD projects – investment raised by those companies (private + government sponsored), sales (if appropriate)
- Sentiment analysis (positive or negative) of the media coverage (In table on pg 18 in the self-evaluation report).
- New collaborations and reaching new actors (e.g. social network analysis)
- Documentation on how IFD works with a portfolio approach

4. Grand Solutions

- Provide details of societal readiness level
- Table 1 pg. 27:
 - Number of projects as well as value
 - Numbers of organizations who applied, were successful and are eligible to apply, by fields
- Amount co-invested, in cash + in kind
- Number of jobs created
- Numbers (percentages) of project participants hired in collaborative partner companies
- Co-authorship on publications
- Number + value + growth of any spin out companies
- Geographical location of collaborating companies
- Which universities/research institutions are involved
- Are top academics/innovators/patent filers using this program

5. Innobooster/innofounder

- How many of these companies get VC funding + amount
- What is growth rate (value + number of employees) of these companies compared to peers with no IFD funding
- What is survival rate of these companies compared to peers
- Top + bottom 20 % analysis for companies

6. Industrial researcher

- Where are people employed, 1,5 + 10 years after program
- Do participating companies spend more on public R&D, have more academic collaborations, have more spin-outs, etc.
- Do participating companies grow more (value/number of employees), have greater sales of innovative products
- Quantify the company co-financing

7. Innovation pilot in rural districts

- What potentially good program would you propose for regional development?

