

Publications of the Ministry of Economic Affairs and Employment
Enterprises • 2019:13

Securing Finland's competitiveness and economic growth in the 2020s



Ministry of Economic Affairs
and Employment of Finland

Publications of the Ministry of Economic Affairs
and Employment 2019:13

Securing Finland's competitiveness and economic growth in the 2020s

Erkki Ormala

Ministry of Economic Affairs and Employment

ISBN: 978-952-327-401-3

Layout: Government Administration Unit, Publications

Helsinki 2019

Description sheet

Published by	Ministry of Economic Affairs and Employment	2019	
Authors	Erkki Ormala		
Title of publication	Securing Finland's competitiveness and economic growth in the 2020s. Rapporteur's Report		
Series and publication number	Publications of the Ministry of Economic Affairs and Employment 2019:13		
Register number	TEM/1087/00.04.04/2018	Subject	Enterprises
ISBN PDF	978-952-327-401-3	ISSN (PDF)	1797-3562
Website address (URN)	http://urn.fi/URN:ISBN:978-952-327-401-3		
Pages	49	Language	Finnish
Keywords	Research funding, applied research, innovation activities		
Abstract	<p>On 5 June 2018, Minister of Economic Affairs Mika Lintilä commissioned a report and recommendations from Professor Erkki Ormala on the adequacy of resources for applied research and the role of VTT Technical Research Centre of Finland in promoting innovation activities that serve business and industry.</p> <p>The clear message of the report is that by developing applied research and strengthening collaboration between operators, it will be possible to support the growth of the Finnish economy in the 2020s, secure developments in the field of unemployment in Finland and solve the challenges posed by the sustainability gap in the national economy. Finland must return to an operating model that supports the balanced and foreseeable development of research and innovation activities at the national level. The successful implementation of research and innovation activities is largely based on broad, comprehensive national research programmes or key projects aiming to develop and utilise the possibilities of the future. The level of funding for such activities must be increased permanently by a total of EUR 300 million, to be allocated in 2020–2022. The report proposes an increase of EUR 30 million in the level of funding for VTT Technical Research Centre of Finland, to be used for cooperation programmes and in the development of infrastructure and important areas of competence. Universities and universities of applied sciences must be encouraged to participate in cooperation with businesses through results-based management and steering. Future skills needs must be mapped out more effectively, and the necessary changes must be better taken into account when defining the degree targets of higher education institutions and vocational education and training. At the same time, the conditions for further education must be significantly improved. Contact: Pirjo Kutinlahti, tel. 029 504 8260</p>		
Publisher	Ministry of Economic Affairs and Employment		
Distributed by/ publication sales	Electronic version: julkaisut.valtioneuvosto.fi Publication sales: julkaisutilaukset.valtioneuvosto.fi		

Kuvailulehti

Julkaisija	Työ- ja elinkeinoministeriö	2019	
Tekijät	Erkki Ormala		
Julkaisun nimi	Suomen kilpailukyvyyn ja talouskasvun turvaaminen 2020-luvulla. Selvityshenkilön raportti		
Julkaisusarjan nimi ja numero	Työ- ja elinkeinoministeriön julkaisuja 2019:13		
Diaari/hankenumero	TEM/1087/00.04.04/2018	Teema	Yritykset
ISBN PDF	978-952-327-401-3	ISSN PDF	1797-3562
URN-osoite	http://urn.fi/URN:ISBN:978-952-327-401-3		
Sivumäärä	49	Kieli	suomi
Asiasanat	tutkimusrahoitus, soveltava tutkimus, innovaatiotoiminta		
Tiivistelmä	<p>Elinkeinoministeri Mika Lintilä kutsui 5.6.2018 professori Erkki Ormalan selvityshenkilöksi laatimaan arvion ja suositukset soveltavan tutkimuksen voimavarojen riittävydestä sekä Teknologian tutkimuskeskus VTT Oy:n roolista elinkeinoelämää palvelevan innovaatiotoiminnan edistämisessä. Selvityksen keskeinen viesti on, että soveltavaa tutkimusta kehittämällä ja toimijoiden yhteistyötä vahvistamalla voidaan tukea Suomen kansantalouden kasvua 2020-luvulla ja auttaa turvaamaan Suomen työllisyyskehitys sekä ratkaista kansantalouden kestävyysvajeen haasteita. Suomeen on palautettava toimintamalli, joka turvaa kansallisen tutkimus- ja innovaatiotoiminnan tasapainoisen ja ennakoitavan kehittämisen. Tutkimus- ja innovaatiotoiminnan menestyvä toteutus perustuu suurelta osin laajoihin ja kattaviin kansallisiin tutkimusohjelmiin tai kärkihankkeisiin, joissa tavoitteina ovat tulevaisuuden mahdollisuuksien kehittäminen ja hyödyntäminen. Näiden rahoittamiseen tulee ohjata vuosina 2020–2022 yhteensä 300 miljoonan euron pysyvä tasokorotus. VTT:lle esitetään 30 miljoonan euron tasokorotusta, joka tulee käyttää tärkeiden osaamisalueiden kehittämiseen ja yhteistyöohjelmiin sekä infrastruktuurien kehittämiseen. Yliopistoja ja ammattikorkeakouluja tulee kannustaa tulosohjauksen kautta osallistumaan yritysyritysyhteistyöhön. Tulevaisuuden osaajatarpeet tulee kartoittaa nykyistä paremmin ja tarvittavat muutokset on otettava huomioon korkeakoulujen ja ammatillisen koulutuksen tutkintotavoitteita määriteltäessä. Samalla jatkokoulutuksen edellytyksiä on olennaisesti parannettava.</p> <p>Yhteyshenkilö: Pirjo Kutinlahti, puh. 029 504 8260</p>		
Kustantaja	Työ- ja elinkeinoministeriö		
Julkaisun jakaja/myynti	Sähköinen versio: julkaisut.valtioneuvosto.fi Julkaisumyynti: julkaisutilaukset.valtioneuvosto.fi		

Presentationsblad

Utgivare	Arbets- och näringsministeriet	2019	
Författare	Erkki Ormala		
Publikationens titel	Tryggande av Finlands konkurrenskraft och ekonomiska tillväxt på 2020-talet. Rapport av utredare		
Publikationsseriens namn och nummer	Arbets- och näringsministeriets publikationer 2019:13		
Diarie-/ projektnummer	TEM/1087/00.04.04/2018	Tema	Företag
ISBN PDF	978-952-327-401-3	ISSN PDF	1797-3562
URN-adress	http://urn.fi/URN:ISBN:978-952-327-401-3		
Sidantal	49	Språk	finska
Nyckelord	forskningsfinansiering, tillämpad forskning, innovationsverksamhet		
Referat	<p>Den 5 juni 2018 tillsatte näringsminister Mika Lintilä professor Erkki Ormala som utredare för att göra en bedömning och utarbeta rekommendationer om tillräckliga resurser för forskning samt om Teknologiska forskningscentralen VTT Ab:s roll inom främjandet av sådan innovationsverksamhet som betjänar näringslivet.</p> <p>Ett centralt budskap i utredningen är att utvecklande av den tillämpade forskningen och stärkande av samarbetet mellan olika aktörer kan stödja tillväxt inom den finländska samhällsekonomin på 2020-talet och bidra till att trygga sysselsättningsutvecklingen i Finland samt lösa utmaningar i anslutning till det samhällsekonomiska hållbarhetsunderskottet. I Finland bör det åter införas en verksamhetsmodell som tryggar en balanserad och förutsägbar utveckling av den nationella forsknings- och innovationsverksamheten. Ett framgångsrikt genomförande av forsknings- och innovationsverksamheten baserar sig till stor del på omfattande och heltäckande nationella forskningsprogram och spetsprojekt med målet att utveckla och utnyttja framtida möjligheter. För finansieringen av dessa bör det under 2020–2022 anvisas en bestående nivåförhöjning på sammanlagt 300 miljoner euro. Det föreslås att det till Teknologiska forskningscentralen VTT ska anvisas en nivåförhöjning på 30 miljoner euro för att användas för utveckling av viktiga kompetensområden, för samarbetsprogram och för utveckling av infrastruktur. Universitetet och yrkeshögskolorna bör via resultatstyrning spöras att delta i företagssamarbete. De framtida kompetensbehoven bör kartläggas bättre än i nuläget och behövliga ändringar beaktas när högskolornas och yrkesutbildningens examensmål fastställs. Samtidigt bör förutsättningarna för påbyggnadsutbildning väsentligt förbättras.</p> <p>Kontaktperson: Pirjo Kutinlahti, tfn 029 504 8260</p>		
Förläggare	Arbets- och näringsministeriet		
Distribution/ beställningar	Elektronisk version: julkaisut.valtioneuvosto.fi Beställningar: julkaisutilaukset.valtioneuvosto.fi		

Sisältö

FOREWORD	8
1 Introduction	11
2 Basis for a successful research and innovation policy	13
3 Situation in Finland	17
4 VTT Technical Research Centre of Finland Ltd	24
5 Development of innovation activities in Finnish enterprises	26
6 New direction	30
7 Conclusions and recommendations	33
Sources	38
Appendix 1. Company survey on Finland's research and innovation system	39
Appendix 2. Breakdown of the enterprises participating in the company survey	48

FOREWORD

This report examines the securing of Finland's competitiveness from the perspective of innovation activities and it contains concrete proposals on how to put the Finnish innovation policy on a new path.

On 5 June 2018, the Ministry of Economic Affairs and Employment invited Professor Erkki Ormala to examine the development priorities for a business-oriented innovation policy and to submit recommendations for reinvigorating the activities. Professor Ormala has worked for many years in key research and innovation policy tasks in the private and public sector, making him highly qualified to tackle a challenging topic comprising a broad range of different areas.

Finnish industries and innovation activities are in a state of change. An increasingly globalised operating environment is a constant challenge. The days when Finnish enterprises could ensure future growth by simply lowering manufacturing costs and by relying on other similar factors are long gone. The future depends on enterprises being able to supply the global market with high value-added products and services.

Cooperation between research institutes and industries has been a key Finnish strength and this cooperation must be enhanced and kept up to date. The challenges arising from digitalisation and globalisation are so huge that Finland can only remain at the forefront of development if new policy measures are introduced and if there is closer cooperation between the private and public sectors.

This report sends a clear message: Finland can only ensure its competitiveness if there are new sources of growth and business opportunities, as well as successful innovations. Applied research and development projects creating new business

require additional resources. Measures must be introduced to speed up the renewal of Finnish industries, and enterprises must also invest more in research and development. There must be more cooperation between enterprises, universities and research institutes. Close cooperation and interaction between basic and applied research provide a strong basis for scientific advances, while at the same time they also contribute to effective use of new knowledge and expertise.

I would like to extend my warm thanks to Professor Erkki Ormala, the author of the report, for valuable recommendations for renewing Finland's innovation policy and tools for the 2020s. I would also like to thank the enterprises participating in the survey carried out as part of the report, which has helped the Ministry to update the RDI outlook of Finnish enterprises for the next few years.

Helsinki 22 November 2018

Mika Lintilä
Minister of Economic Affairs

1 Introduction

Finland has lost some of its international competitiveness as a result of the developments in recent years. Technology and innovation funding has been substantially reduced and there is now less cooperation between individual actors. A number of international expert evaluations on Finland have been produced in recent years (for example, OECD 2017a and EU 2018) and they all contain similar conclusions and recommendations. Developing applied research and enhancing cooperation between different actors could serve as a basis for stronger economic growth in the 2020s, which would help Finland to maintain high employment levels and to solve the much-discussed sustainability gap in its economy.

In spring 2018, **Mika Lintilä**, Finland's Minister of Economic Affairs, decided to start a project in which the aims were as follows:

1. To prepare an overall assessment of the adequacy of the public-sector measures and whether the measures have been effectively focused on innovation renewing Finnish industries and whether they support enterprises' ability to use knowledge and technologies generated in Finland and elsewhere in the development and commercialisation of new business and solutions.
2. To assess the roles of the reorganised Business Finland and VTT Ltd, the adequacy of their resources, and how these resources are focused from the perspective of the renewal of Finnish industries and the use of new expertise.
3. To assess the impacts of the reforms that have already been introduced and the need to reorganise the funding of the

Strategic Research Council from the perspective of research serving the needs of Finnish industries.

4. To submit proposals for the Government measures creating a basis for putting industrial RDI activities on a growth path.

The purpose of this report is to survey the current situation and the trends in the coming years. The material used for the report comprises international and Finnish literature available on the subject, as well as interviews with innovation actors. An extensive company survey¹ was carried out as part of the report, in which the respondents gave their views on current problems and the outlook for the coming years.

The VTT Technical Research Centre of Finland Ltd is a key supplier of applied research for enterprises and the public sector and its status and role in the future is analysed as part of the report. In addition to covering technology funding, the report also briefly discusses the status and role of other areas of applied research in the Finnish economy.

¹ The survey was carried out in cooperation with the central organisations of Finnish industries, sectoral organisations and Business Finland. Responses were received from a total of 287 enterprises, which provides a representative sample of the sectors with a high R&D input and enterprises of different sizes.

2 Basis for a successful research and innovation policy

International studies have shown that research and innovation play a key role as an engine for economic growth (Romer, 1990, OECD 1996). Improvements in productivity are almost exclusively based on the speedy application of new knowledge and technology. Long-term economic growth requires renewal and diversification of the economy. International studies and experience have shown that providing a stronger basis for innovation activities is the key to facilitating this renewal. Digitalisation and other rapidly developing technologies are changing the operating prerequisites of societies. Countries and regions that are good at creating and using new knowledge will be the top performers of the future. The world's leading economies are enhancing their technological competitiveness on a systematic basis.

It has been known for decades that innovation processes are not 'linear'. The idea adopted in the 1950s that there should first be scientific research and when the findings are available, a changeover should be made to applied research and further on to product and service development, does not correspond to the reality of today's innovation activities. In a well-functioning innovation environment, all these stages are parallel events, taking place in close interaction with each other. In other words, innovation is a systemic process in which all parties work in seamless cooperation. This process is described using the concept of systemic innovation process.

Nowadays, innovation takes place in ecosystems, in which all parties work in close cooperation and in which the ecosystem is headed by a system coordinator (often an international flagship company). Other types of system coordinator models are also used. According to a European-wide innovation survey, about 96% of all innovations are created through ecosystems. Customers and public-sector research

organisations are the most important ecosystem partners for enterprises (IIT 2017). The main purpose of an ecosystem is to share critical expertise among the ecosystem partners. Ecosystems are constantly changing and evolving. New partners join the systems, sometimes partners decide to drop out and an ecosystem may also split into new ecosystems. International studies have shown that the absence of a system coordinator is the main reason for the failure of an ecosystem. (Kania & Kramer 2011).

Many countries have adopted the ecosystem idea and they have adjusted their research and innovation policies accordingly. Long-term cooperation extensively supported with public-sector funding is an essential factor in these solutions. Typically, an innovation ecosystem budget is between EUR 60 and 100 million, which also includes the construction of test environments. The funding is often agreed for a period of between five and ten years and the government usually provides half of the sum. Enterprises with international operations compare the expertise potential and ecosystem funding capacity of different countries and decide on the location of their ecosystems on the basis of the information that they have collected.

In a global economy, countries are increasingly competing as locations of enterprises' research and innovation activities. For example, a country may promise to pay 50% of all costs for the first five years, or make the resources, premises or patents of universities and state-owned research institutes freely available to a company. A number of countries have invested billions of euros in national cooperation projects, which foreign enterprises are welcome to join after they have concluded cooperation agreements with local actors.

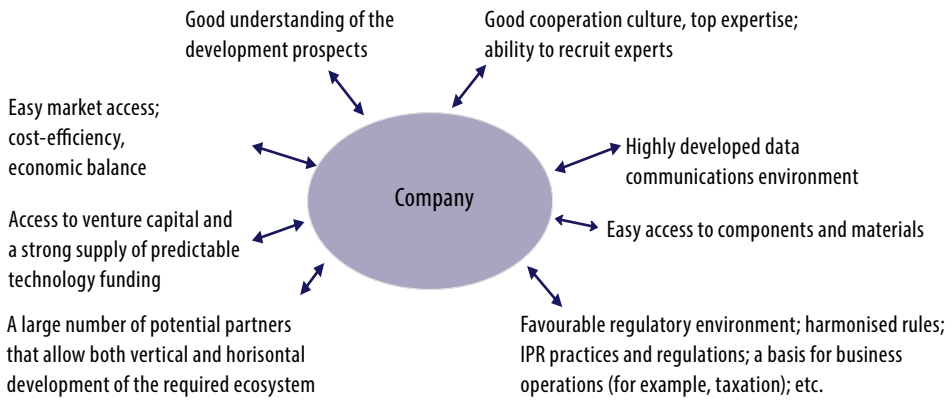
In return for these benefits, enterprises support top research and education. They are extensively involved in educational activities, donate substantial sums to centres of excellence without any requirements concerning the research content, send their own top researchers to academic working environments, provide funding for professorships, locate their own research units on university campuses and provide students and personnel in universities and research institutes with opportunities to work in their own research units. This is how they build strategic partnerships that may last for decades.

Ecosystems are increasingly important as locations of business growth and enterprises' innovation activities (Finnish Government 2017d). Interaction with ecosystem partners substantially strengthens the growth opportunities in the SME sector. For this reason, providing individual SMEs with more innovation funding is not enough to safeguard the growth opportunities of the SME sector. The key aim is to ensure that ecosystems operate in a transparent manner and that consideration is given to the needs of the SME sector.

Digitalisation has provided an additional boost to ecosystem thinking. More and more actors have set up internet-based innovation platforms, which has made it possible to use and manage larger ecosystems. With these platforms, customers, academic institutions and other partners share information, which allows them to expand their own expertise base and to use knowledge developed elsewhere. Artificial intelligence solutions are rapidly becoming popular ecosystem support tools. These applications are already extensively used in a number of different countries.

Nowadays, the most serious obstacles to the innovation activities of European enterprises concern funding, the required expertise, the supply of skilled labour, and the regulatory environment discouraging innovation (IIT 2017, Erixon & Weigel 2016). Unpredictability of the operating environment and the absence of coordination between sectors are also major problems. In such conditions, the key task of the research and innovation policy is to safeguard adequate and balanced funding, develop the required expertise, enhance the cooperation culture and ensure an innovation-friendly regulatory environment. This can only be achieved if there is a clearly structured organisation and clear responsibilities for a balanced development of the innovation system as a whole.

Prerequisites for a good innovation environment are set out in Figure 1. It contains the factors that enterprises use when planning the operating and development environments for their future business.



Kuva 1. An environment for developed innovation activities

3 Situation in Finland

The development of the Finnish innovation environment has gone against the trend. There is a large amount of international background material available on the topic (OECD, 2016; European Commission, 2018; European Commission, 2017; OECD, 2017b; WEF, 2017), which is supplemented by extensive research and report material produced in Finland (Kotiranta & Rouvinen, 2016; Finnish Government 2017b; TTA 2018). The conclusion from these reports is that the Finnish innovation environment and thus also our international competitiveness are rapidly eroding. All reports also make the same recommendations. There must be a substantial increase in applied research funding, while at the same time, closer cooperation between public-sector research and the private sector is needed.

Between 2008 and 2012 (when Finnish R&D expenditure was at its peak), seven billion euros was invested in research and development in Finland every year. In the past few years, about one billion less has been spent on R&D than in the peak period. A fall in corporate R&D investments has been the main factor behind the trend. The corporate sector accounts for about two thirds of all research and development spending in Finland.

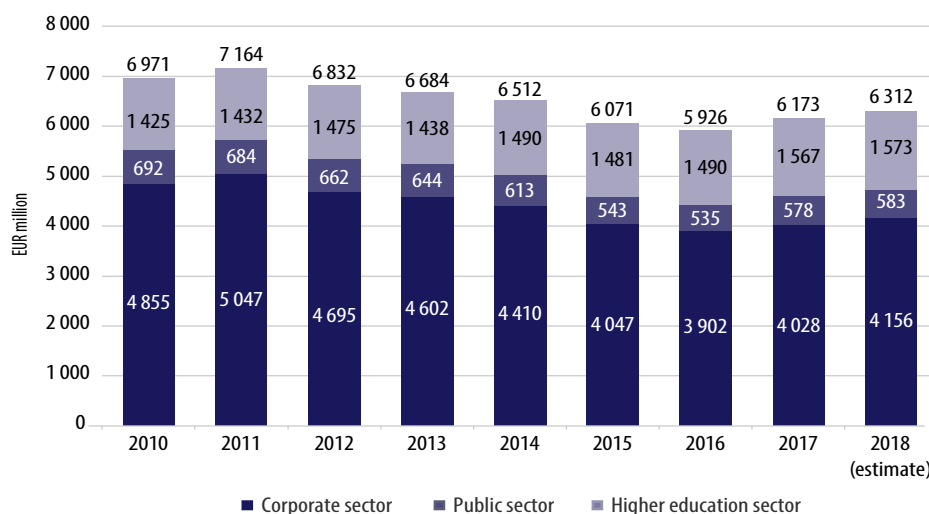


Figure 2. Changes in R&D expenditure by sector, in the period 2010-2018.

There have been substantial cuts in applied research, and the cooperation and coordination of the projects receiving funding have been inadequate. Funding for Business Finland was reduced by more than EUR 250 million between 2010 and 2017. Most of the cuts have been made to business innovation grants and the funding of cooperation projects. They have had a particularly severe impact on the operating prerequisites of large enterprises (=potential ecosystem coordinators) and made it more difficult to strengthen the expertise base in public-sector research supporting the innovation activities of industry. This has significantly slowed down the innovation activities of Finnish enterprises and reduced cooperation opportunities with public-sector research actors. As a result, public-sector funding for corporate R&D has continued to decline and, according to the latest estimates, it now only accounts for 0.08% of the GDP. In this comparison, Finland is placed 28th among the OECD countries (OECD, 2017b). The consequence is that enterprises with international operations are increasingly directing their innovation activities and the resulting new business to locations outside Finland.

Figure 3 shows the funding framework of Business Finland in the period 2008-2022.

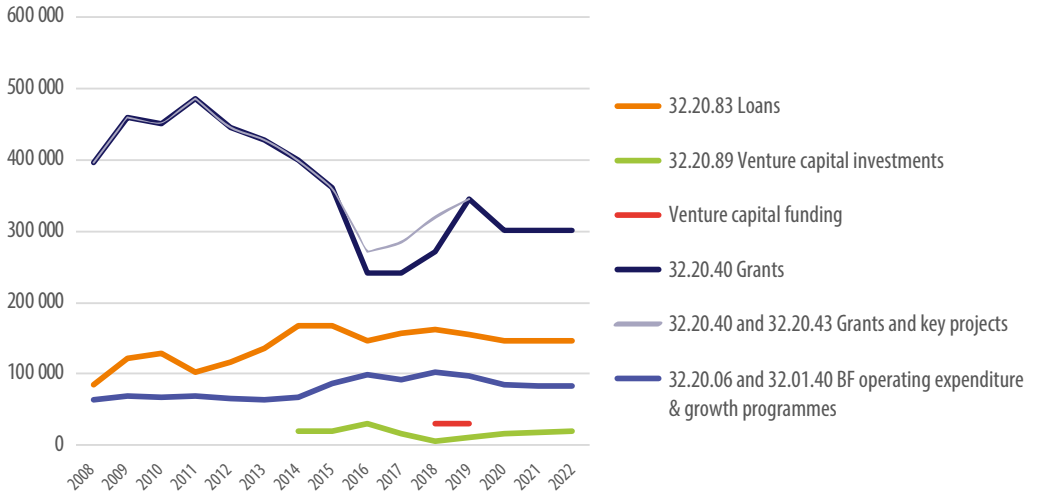


Figure 3. Changes in Business Finland (Tekes) funding in the period 2008-2022 .

In recent years, there has been a substantial reduction in the extensive trust-based cooperation between enterprises and universities, which has been an important contribution to Finland's success. The funding received by universities from the business sector declined by more than 40% between 2010 and 2017 (Statistics Finland 2018).

Since the start of the decade, there has been a steady decline in the R&D funding that universities receive from enterprises. It reached its peak in 2008, when corporate R&D funding accounted for 8.0% of the total. In 2017, the figure had dropped to 3.9%.

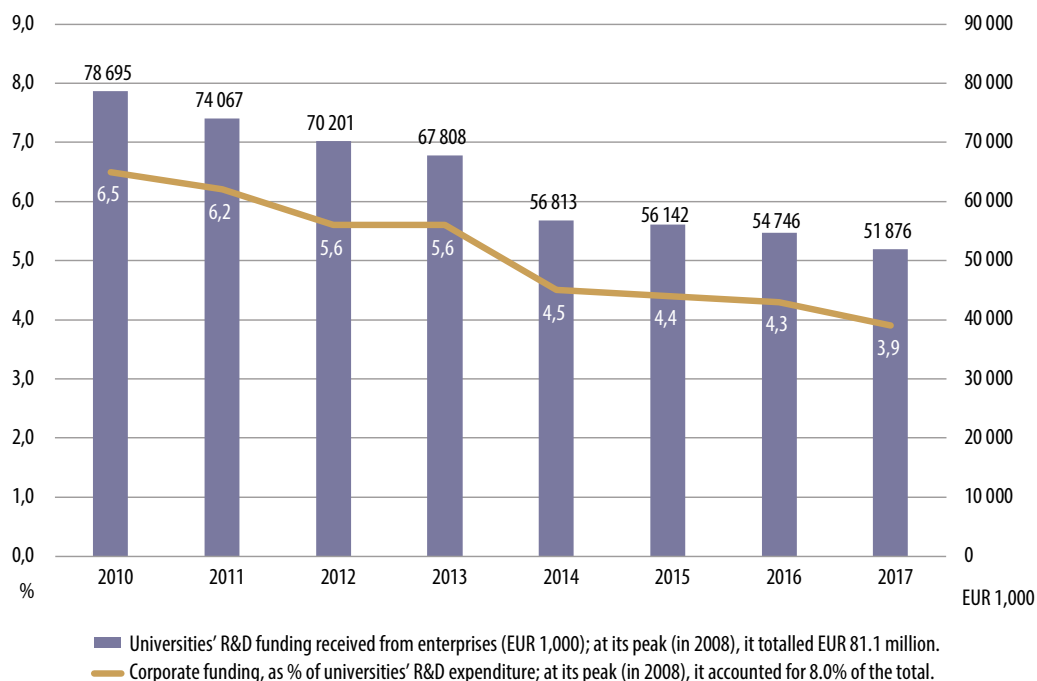


Figure 4. Universities' R&D funding granted by enterprises in the period 2010-2017

Cuts in Business Finland's research funding and the fact that universities are now less interested in supporting innovation activities have contributed to this trend. The waning of interest is the result of universities' performance management practices, in which the emphasis is on scientific publications and degree targets. (Finnish Government 2017b; Ministry of Economic Affairs and Employment 2016). Successfully contributing to the common good is not a criterion when universities are provided with funding. Building connections to working life and developing innovation activities are essential components of this task. Moreover, in the projects funded by the Strategic Research Council, operating under the auspices of the Academy of Finland, no support is provided for cooperation between enterprises and the public sector, which was also noted in the reports produced as part of the OECD country survey.

Weakening of the cooperation culture has led to a fragmented research system. There is no coordination in the funding of research projects. The same subject may

be studied in several universities and research institutes. There is no cooperation between projects; in fact, they compete with each other, and nobody is responsible for coordinating them or for determining whether the projects create any expertise that could be used in innovation.

The dissolution of the financing instrument for strategic centres of excellence (SHOKs) has led to a situation where nobody is responsible for the coordination or use of the research projects funded. Two of the SHOKs (CLIC and DIMECC) have continued their activities in a new form. Both are important research coordinators in their own sectors and they provide extensive support for the sharing of information between research communities and enterprises. It is clear that new tools are needed in Finland to tackle these problems.

Over the past few years, research funding has been substantially channelled to priority areas and Government-initiated key projects. Both the Academy of Finland and Business Finland have focused funding on these areas. Focusing research funding on priority areas is important. This practice becomes, however, a problem if it leads to a situation where funding is no longer available for promising research and expertise needed to support new business when they are outside the thematic areas contained in the priority sectors and key projects. International experience has clearly shown that new successful business is often created in completely unexpected areas and that developing them requires the combined expertise of several sectors. The second problem in the funding based on priority areas is that nobody has examined in advance the applicability of the results or which of the beneficiaries should be invited to join the project planning and implementation. This is the same problem as that concerning the coordination of the projects and the examination of the business opportunities and other potential uses arising from the projects.

In the last few years, Finnish enterprises have focused their innovation activities on developing existing business operations and on making them more efficient. In only a small number of cases, the aim has been to launch new business. (Ormalä et al., 2014). Over the last few years, new organisational models and operating practices have been developed in Europe, such as business units specifically aimed at creating new business, business incubators set up by enterprises and company-operat-

ed risk funds (IIT 2017). New measures are required in Finland so that these activities can be developed and expanded in our country.

Enterprises often complain that it is difficult to use outside expertise in their own innovation activities. The topic has been extensively studied and high-quality material on it is available. Improving this absorptive capacity should be a priority in the development of training and consulting services.

A shortage of experts has also become a major obstacle to innovation activities (IIT 2017). For example, there has been talk of a substantial deficit in the number of software experts and mechanical engineers. This shows clearly that our education system is still too inflexible and is not able to adequately anticipate the skills needs of the future. It is important to ensure that the education system is better able to anticipate future skills needs and respond to changes in them by adjusting its priorities. At the same time, it is important to make Finland a more attractive working environment for foreign experts. In this, active inputs by the Ministry of Education and Culture and the Finnish industry associations are needed. More also needs to be done to strengthen the prerequisites for lifelong learning. More than half of all SMEs cooperating with higher education institutions and research institutes feel that the shortage of skilled labour force constitutes an obstacle to growth. (Ministry of Economic Affairs and Employment 2019)

Over the past few years, Finland's research and innovation policy has been characterised by unpredictability. SHOK organisations were unexpectedly dissolved in 2015. The tax incentives for research activities and venture capital funding were introduced in 2013 and withdrawn in 2015. Funding for Tekes/Business Finland has been cut and increased without any predictability. Under the Government's budget framework for 2018, the increases planned for 2018 and 2019 will be cancelled and the funding will be reduced to 2017 levels between 2020 and 2022. However, last autumn, in the 2019 budget proposal, a total of EUR 94 million was added to research and development grant authorisations and EUR 25 million to R&D appropriations. Both increases will be of permanent nature. The authorisations granted to Business Finland (EUR 69 million) and funding supporting internationalisation and investments (EUR 8 million) accounted for most the increases. Funding was also channelled to VTT (EUR 7 million), universities of applied sciences (EUR 5 mil-

lion) and clinical research in universities (EUR 6 million). There were also increases in the authorisations granted to the Academy of Finland (EUR 25 million).

This practice is in sharp contrast to one of the former key strengths of the Finnish innovation system. All Finnish Governments have pledged to maintain research and technology funding on a long-term basis. This has allowed enterprises and research communities to prepare plans and investments serving the needs of the future. International experience has also shown that such unpredictability makes it more difficult to develop successful innovation activities on a long-term basis. Most of the enterprises participating in the survey carried out as part of this report stated that they are conducting more research outside Finland because the gap in Finnish technology funding will probably not be closed in the foreseeable future.

In autumn 2017, the Research and Innovation Council Finland published a vision and a road map (Finnish Government 2017a), according to which Finland should be the most attractive and competent environment for experimentation and innovation, the number of business-run billion-euro ecosystems should be multiplied, cooperation between enterprises, the third sector and the public sector should be strengthened and Finnish R&D investments should be increased to four per cent of the GDP. All these ambitious goals should be achieved by the year 2030. The resources required for achieving these objectives are not discussed in the road map. In light of the current situation, it is clear that these objectives can only be achieved by allocating more resources for R&D and by taking an entirely new approach to research and innovation funding.

4 VTT Technical Research Centre of Finland Ltd

VTT Technical Research Centre of Finland Ltd is a key player in the Finnish innovation system. It was converted into a limited liability company in 2015. Its task is to provide enterprises and the public sector with research and innovation services enhancing their international competitiveness. VTT extensively supports innovation activities in Finland. Its strategy, which includes a description of the new lighthouse projects, ecosystem processes, support for commercialisation and extensive participation in international cooperation, is a representative sample of the measures required for strengthening the Finnish innovation system.

VTT is the leading implementer of EU research projects in Finland. Its customer enterprises are of the view that VTT's activities have produced results and substantial added value. This opinion is shared by both Finnish and foreign customers. It is important to ensure that VTT does not compete with Finnish enterprises. For example, involving enterprises in EU-funded research projects would make them better placed to use the research results. Even though increases in the revenue generated by foreign customers is a positive development, it may involve problems, for example when Finnish expertise is only used to generate business outside Finland.

The conversion of VTT into a limited liability company in 2015 has not changed its fundamental operating prerequisites. There has, however, been an alarming weakening of VTT's resource base. Both the grants provided by central government and the cooperation funding available through Business Finland were substantially reduced between 2007 and 2017 (by 14% and 42%, respectively). Partially as a result of these cuts, the income received by VTT from the private sector has declined by about 50% since 2007. All this means that it is now considerably more difficult

for VTT to develop excellence for innovation activities, as a result of which enterprises are no longer able to find the necessary expertise in Finland in the same manner as before.

In addition to the adequacy of its funding base, VTT's tasks as a whole and its role as an actor in the national innovation system should also be examined. VTT plays an important role as a body developing and maintaining Finnish and European research infrastructures. More broadly-based use of these infrastructures would be in the interest of all actors. Cooperation with enterprises, other research institutes (including those located outside Finland), universities and universities of applied sciences opens up significant opportunities for developing national test environments. In other areas, too, development of cooperation projects and participation in ecosystem activities would enhance the functioning of the system. The need to enhance cooperation also applies to national research programmes and the Government-initiated key projects, in which VTT plays an important role.

Commercialisation of the research results would also require stronger integration with other organisations supporting commercialisation. Universities, business incubators in the private and public sectors, as well as providers of venture capital in Finland and other countries are valuable partners in these matters. The commercialisation potential can be significantly boosted by combining international and domestic venture capital. For example, the Investment Plan for Europe has already managed to acquire venture capital totalling EUR 334 billion, which is used to support about 800,000 European SMEs.

VTT should also clarify its principles concerning intellectual property rights. It is important to ensure that all partners have adequate opportunities to use jointly developed expertise and that the rules to be observed are clear to everyone. There is plenty of international experience of these practices.

5 Development of innovation activities in Finnish enterprises

An extensive company survey² was carried out to support the report. According to its results, there is little growth in the research and development inputs of Finnish enterprises between 2017 and 2019. At the same time, the proportion of corporate R&D activities taking place outside Finland is growing. In 2015, about 17% of all R&D activities of Finnish enterprises took place in other countries. The figure is expected to reach 28% in 2019. The respondents listed the difficulty getting public-sector funding in Finland, better opportunities for cooperation in other countries and a shortage of experts in Finland as the main reasons for the trend. It is also a natural consequence of the internationalisation of business operations. The main reasons for transferring R&D activities to other countries are given in Figure 5.

The company survey was carried out in cooperation with the Finnish industry associations and Business Finland. The industry associations sent an open link to the survey to their own member companies. The Confederation of Finnish Industries and Business Finland sent the questionnaire to their member companies using random sampling. The questionnaire was sent to about 9,000 enterprises and the responses were collected between 27 June and 10 September 2018. Some of the enterprises received more than one request to take part in the survey. Responses were received from 287 enterprises representing nearly all key sectors of the Finnish economy. The forest industry is under-represented. Enterprises of all sizes were comprehensively represented among

² Gaia Consulting Oy was responsible for the practical aspects of the survey. The survey had three focus areas: changes in the enterprises' R&D investments between 2017 and 2019; the extent of Finnish enterprises' foreign-based R&D activities; and the balance between the development of new business and the strengthening of existing business. The enterprises were also asked to give reasons for their decisions. The survey was based on the innovation survey carried out by Statistics Finland and the aim was that the questions in both surveys would be as identical as possible. The questionnaire can be viewed in Appendix 1.

the respondents. According to the responses, the participating enterprises accounted for about 20% of the total R&D output of Finland's corporate sector in 2017. Based on the results, it is safe to say that the responses are a good sample of the Finnish enterprises engaged in R&D activities. The sectoral and R&D breakdown of the participating enterprises is shown in Appendix 2.



Note: Some of the responses have been placed in more than one category, which means that the total number of responses is higher than n=110

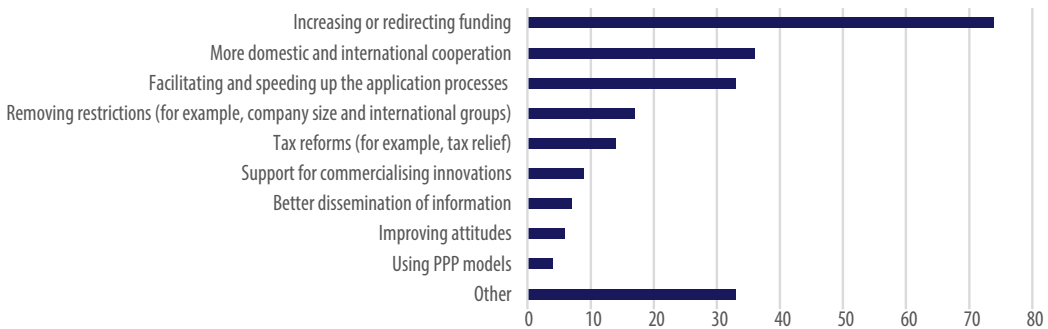
Figure 5. The reasons for increasing R&D activities outside Finland given in the open-ended responses (n=110)

There are substantial differences in the ratio between inputs into new business and into existing operations in different sectors. The pharmaceutical industry, information technology, planning and expert services, and the electronics and electrical industry are the sectors with the highest percentages of inputs aimed at creating new business (>50%). In other sectors, the figures are between 26% and 48%.

Funding provided through Business Finland was considered the most important source of financing. At the same time, however, access to funding, the bureaucracy connected with the applications, lack of information on funding options, wrong thematic and discrimination against large enterprises were considered the most serious problems. The fragmented and short-term nature of the funding and the excessively thematic character of the financing were also emphasised in the open-ended responses. The respondents were particularly worried that the fragmented nature of the existing system will lead to the weakening of the knowledge base crucial to business growth.

Other enterprises in Finland and other countries, as well as Finnish universities, are the most important partners for the enterprises. However, the importance of VTT and foreign universities and research institutes will grow more rapidly than the importance of other partners.

Overall, in the enterprises' view, the following are the most important measures strengthening the basis for innovation activities in Finland: better funding opportunities, redirection of funding, enhancing both domestic and international cooperation, facilitating the application processes, and removing the artificial obstacles to funding (company size and thematic). A summary of the open-ended responses connected with the issue of improving prerequisites for R&D and innovation in Finland can be viewed in Figure 6.



Note: Some of the responses have been placed in more than one category, which means that the number of responses is higher than $n=200$

Figure 6. How should the effectiveness of R&D and innovation be improved so that enterprises would invest more in Finland (categorisation of open-ended responses, $n=145$)

The importance of attracting skilled labour force to Finland was also emphasised in the open-ended responses. This is primarily a question of understanding how Finland can be made into an attractive operating environment for top experts. This requires substantial improvements in the working conditions of foreign experts.

Finally, the enterprises were asked to list Finland's strengths. Broad-based and high-quality expertise, a working culture based on openness and trust, extensive opportunities for cooperation, and a high-quality education system were highlighted in the responses.

To sum up the responses, the challenges facing Finnish enterprises are exactly the same as those highlighted in the international evaluations and comparison material and in the key recommendations presented in the evaluations. In order to safeguard its competitiveness, Finland must enhance the prerequisites for innovation activities by developing applied research and by providing more opportunities for cooperation. These are the measures that will help to ensure growth in innovation by enterprises operating in Finland.

6 New direction

Successful implementation of research and innovation activities is largely based on the opening up of extensive and comprehensive national research programmes and key projects aimed at developing and using future opportunities. Selecting the right themes for the programmes requires broad-based understanding and vision of the new directions of knowledge development and future market trends. At the same time, Finland's strengths and its other potential to use these opportunities must also be assessed. When doing this, we must listen to the research communities and the business world and closely involve both parties in project planning and implementation. This may sometimes require preparatory research and studies for which the necessary resources should be allocated. However, at the same time, it should also be remembered that new opportunities are constantly emerging outside programme themes and that a substantial proportion of the resources should be set aside for a rapid use of these opportunities. Substantial additional resources are needed for technology and innovation funding, which supports strategic research programmes carried out in a long-term and coordinated manner (key projects) and development projects creating new business.

In order to safeguard the effectiveness and long-term nature of the research, programme funding must be ensured for between five and ten years (for example, see the Smart Energy project of Business Finland). However, at the same time, it is important to evaluate the national programmes (for example, every three years) so that their level, overall themes and effectiveness can be verified. Each programme should have a management team, consisting of representatives of the key research communities and the most important beneficiaries. The task of the management teams would be to assess and coordinate the research activities that receive funding through the Academy of Finland and Business Finland and that are carried out within the framework of the programmes. The management teams must ensure

that the beneficiaries (including enterprises) are actively involved in the projects. The task of the management teams would be to find new domestic and foreign partners, determine the actors' roles and responsibilities and appoint coordinators for the project ecosystems if no ecosystem coordinators have been proposed. CLIC and DIMECC are good examples of the organisational models that can be used in the planning and implementation of strategy projects. In order to ensure the effective functioning of the management teams, they should also receive funding if this is required to pay the salaries of full-time secretaries, coordinators and/or other similar officials. These models also help to fill the gap in the Finnish innovation system left by the dissolution of the SHOK organisations.

These national programmes and key projects can only be successfully implemented if there is closer cooperation between the Academy of Finland and Business Finland. The programme management teams would be responsible for the coordination of the projects funded by both organisations and the cooperation between them. In other words, the projects provided with funding would have to report to a single management team. Both organisations make their own funding decisions independently and in accordance with their own objectives. It is important to understand that the introduction of this cooperation and reporting obligation would not in any way affect such issues as the freedom of scientific research or the efforts to strengthen the status of top research in Finland. It would simply create an obligation to report on what is being done and take part in the discussions on possible follow-up projects with the beneficiaries. These measures would significantly improve the knowledge base of all parties on the research and expertise offered by different organisations in the sector concerned. This helps to reduce the fragmentation of the research activities and to improve the chances of finding the best expertise for the needs of the research communities and beneficiaries.

It is clear that the factors connected with the size or sector of the company should not impact the planning or implementation of the research programmes. The key aim is to involve all those parties whose inputs are crucial for ensuring a successful end result. Involving SMEs in the programme implementation also gives them optimal chances of becoming integrated into more extensive ecosystems.

Applied research can only produce results if all parties to the system are involved and the operating environment meets all requirements. The success of the ecosys-

tems can only be ensured if all the necessary resources are available. This applies to the comprehensive development of the innovation system referred to above and coordination responsibilities at the national level. It is also important to ensure that universities, universities of applied sciences and public-sector research institutes are actively involved in the projects as research partners, in the accumulation of the required expertise capital and in the training of experts. When provided with performance guidance, universities and universities of applied sciences should be encouraged to take part in business cooperation projects. It is important so that they can develop their own research and educational activities and use them more effectively.

Private-sector and public-sector services are also developing at an increasingly rapid pace. Digital solutions and new operating models are creating new opportunities for enhancing the quality and cost-efficiency of services. The solutions used for enhancing other innovation activities should also be used in the development of the service sector. Properly managed and coordinated national programmes are the key to success. We have accumulated a great deal of experience of projects in which good operating practices have been created and in which these practices have only been used to develop the service offerings of the organisation in question. In such an approach, substantial resources are wasted and it also slows down the adoption of advanced service solutions at the national level.

7 Conclusions and recommendations

Finland must reintroduce a coordinated research and innovation policy based on the needs of society at large, in which the emphasis is on the predictability, adequacy and balanced focus of public-sector research funding, together with the strengthening of the cooperation culture of organisations operating in different sectors. VTT plays a central role in this process and enhancing this should be a key priority at all times.

National-level planning and coordination of Finland's research and innovation policy require a comprehensive organisational reform. The current practices have weakened Finland's competitiveness, encouraged inefficient use of funding and led to a situation where more and more enterprises are considering whether to move their R&D and innovation activities to other countries.

Finland must reintroduce an operating model that ensures balanced and predictable development of national research and innovation activities.

There are a number of alternatives for building such a system and many of them have also been successfully applied in Finland. In the 1990s, the matters were prepared in the Science and Technology Policy Council and the final decisions were made by the Government or the Ministerial Committee on Economic Policy. The key aim is to ensure that the special interests of individual administrative branches or organisations do not weaken the overall balance and effectiveness of the system. The 'growth and expertise council' proposed in the Strategy for Sustainable Growth published by the Ministry of Economic Affairs and Employment (Ministry of Economic Affairs and Employment 2018) is a good example of the required organisational model. International experience has shown that establishing a separate science and

research ministry would only make research activities even more isolated and create new and higher sectoral barriers.

Successful research and innovation activities are largely based on extensive and comprehensive national research programmes and key projects aimed at developing and using the opportunities opening up in the future. Additional resources are required to implement the programmes and to finance other development projects creating new business.

Funding for applied research should be permanently increased by EUR 300 million between the years 2020 and 2022.

This sum is required in addition to the budget increases for 2019 and should be introduced between 2020 and 2022. In other words, the increase should be EUR 100 million for each year. The proposed funding is based on putting public-sector R&D inputs back on the growth path and on providing enterprises with a credible operating environment for Finnish-based R&D activities.

A total of EUR 240 million of the funding package should be allocated to Business Finland for research programmes based on the above principles. At the same time, part of the funding should be set aside for ad hoc technology projects creating promising business. It is essential to strengthen the funding for R&D activities creating new business, for example by providing a higher support percentage for projects aimed at creating new business. With these funding increases, ecosystem development projects amounting to billions of euros could be launched in Finland each year.

The granting of the funding must be on a centralised basis through the Academy of Finland and Business Finland. Transferring the funding responsibility to regional organisations or other similar bodies would make the research activities even more fragmented, weaken coordination opportunities and completely destroy enterprises' chances to use expertise created in Finland.

The national research programmes to be launched under this scheme should have management teams, consisting of representatives of the research communities and key beneficiaries. The task of the management teams is to ensure that the Academy

of Finland (through strategic research funding), Business Finland (through cooperation funding) and the beneficiaries (through their own R&D inputs) are involved in the implementation of the national programmes. International experience has shown that close cooperation and interaction between high-quality basic and applied research provide a stronger basis for scientific advances, while at the same time, they also support effective use of new knowledge and expertise for new innovations.

About EUR 30 million of the additional funding should be channelled to higher basic funding of VTT and the remaining EUR 30 million to clinical research in university hospitals and the development of health services and other critical themes of applied research (such as research on new foodstuffs, and research advancing sustainable development in agriculture and forestry). With these resource increases, Finland can be made into a competitive operating environment. Management team solutions and clear coordination of research and its use are also needed in these sectors.

VTT plays a key role in the field of applied research.

The additional funding proposed for VTT should be used for the development of key areas of excellence, joint programmes and infrastructure projects.

At the same time, cooperation between VTT and other actors should be enhanced so that the activities can be put on a more efficient and effective basis. VTT should be seen as a partner enhancing Finland's competitiveness that makes its expertise available and actively supports national programmes and enterprises' innovation activities. Shared use of critical research infrastructures should also be enhanced and the right to use intellectual property rights developed.

In certain cases, VTT could also act as an ecosystem coordinator to which other partners would be obliged to report. This arrangement could be an option in situations in which, for one reason or another, other solutions are not available. If the process leads to more active involvement by enterprises, it must be possible to transfer the integration responsibility in a flexible manner to a party best suited for the task.

Active participation of universities and universities of applied sciences in national programmes is crucial for their success.

Universities and universities of applied sciences should be encouraged, through performance indicators, to take active part in business cooperation projects (including strategic research programmes).

Future expertise needs should be surveyed more thoroughly and the changes required should be taken into account when the degree targets in higher education and vocational education and training are determined. At the same time, the prerequisites for continuous learning should be substantially improved.

To ease the shortage of experts, Finland should also make it easier for foreign experts to work in this country. This would require the updating of work permit and visa practices, as well as improvements in working conditions.

Digitalisation has opened up new opportunities for developing cooperation. Many enterprises have established digital cooperation platforms. Introducing similar solutions for public-sector research would make it significantly easier to use information and create new opportunities for cooperation. Finnish public-sector R&D actors should establish research platforms (expertise maps) providing comprehensive information about the strengths of public-sector research and education, the results already achieved, cooperation projects and contact persons that new partners could contact in order to launch new cooperation and research projects. The task of the management teams established for national research programmes would be to ensure that the platforms and information required for implementing the programmes are available.

With these measures, Finland can be made into an attractive research and innovation environment that would significantly improve Finland's ability to compete for corporate R&D investments, foreign top experts and a place in the forefront of science. An effective research and innovation policy would require long-term predictability and commitment, effective coordination and a genuine commitment to jointly agreed objectives by all parties.

These measures would significantly enhance Finland's reputation as a knowledge-based economy, help to diversify our industrial structure and speed up economic growth in the 2020s. At the same time, they would also provide a concrete picture of what is actually needed to achieve the objectives laid out by the Research and Innovation Council.

Sources

- Erixon F. & Weigel B. 2016 'The Innovation Illusion' Yale University Press. 297 s.
- ETLA 2016 (Kotiranta A & Rouvinen P) 'OECD Reviews of Innovation Policy – ETLA Background Report' 2016
- European Commission 2017 'Research and Innovation Observatory Country Analysis: Finland'
- Euroopan Komissio 2018 'Komission yksiköiden valmisteluasiakirja Suomen maaraportti 2018'
- IIT 2017 'Industrial Innovation in Transition' Horizon 2020 project
- Kania J. @ Kramer M. 2011 'Collective Impact' Stanford Social Innovation Review, Winter, 36-41
- OECD 1996 'Technology and Industrial Performance; technology diffusion, productivity, employment and skill, international competitiveness', OECD
- OECD 2016 'OECD Science, Technology and Innovation Outlook 2016'
- OECD 2017a 'OECD Reviews of Innovation Policy: Finland'
- OECD 2017b 'Science, Technology and Industry Scoreboard 2017' OECD Publishing
- Orjala E. & Tukiainen S. & Mattila J. 2014 'Yritysten innovaatiotoiminnan uudet haasteet' Aalto yliopiston julkaisusarja Kauppa + Talous 5/2014
- Pohjola M. 2017 'Suomen talouskasvu ja sen lähteet 1860-2015', Kansantaloudellinen aikakauskirja, vsk. 113, 3/2017; 266-292
- Romer P. 1990 'Endogenous Technical Change', Journal of Political Science, Vol 48
- Tilastokeskus 2018 'Tutkimus- ja kehittämistoiminta 2017'
- TTA 2018 'Suomen Tutkimus- ja Innovaatiopolitiikan haasteet ja toimenpide-ehdotukset, Teknillisten Tieteiden Akatemia'
- Valtioneuvosto 2017a 'Tutkimus- ja Innovaationeuvoston visio ja tiekartta'
- Valtioneuvosto 2017b (Ali-Yrkkö J & Kuusi T & Maliranta M.) 'Miksi yritysten investoinnit ovat vähentyneet' Valtioneuvoston tutkimus- ja selvitystoiminnan julkaisusarja 11/2017
- Valtioneuvosto 2017c (Mikkola E & Nurmisto M & Saarnivaara V-P) 'Korkeakoulujen, tutkimuslaitosten ja elinkeinoelämän yhteistyö – Miten erilainen oikeusasema vaikuttaa' Valtioneuvoston tutkimus- ja selvitystoiminnan julkaisusarja 34/2017
- Valtioneuvosto 2017d (Kaihoavaara A., Haila K., Noro K., Salminen V., Härmälä V., Halme K., Mikkilä K., Saarnivaara V-P, Pekkala H.). Innovaatioekosysteemit elinkeinoelämän ja tutkimuksen yhteistyön vahvistajina. Valtioneuvoston kanslia. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisu 28/2017
- Työ- ja elinkeinoministeriö 2016 (Hautamäki A & Stähle P & Oksanen K & Tukiainen T) 'Vaikuttavaa tutkimusta – Kokeiluehdotuksia tutkimuksen vaikuttavuuden ja kaupallistamisen edistämiseksi'
- Työ- ja elinkeinoministeriö 2018 'Kestävän kasvun agenda' TEM oppaat ja muut julkaisut 14/2018
- Työ- ja elinkeinoministeriö 2019 (Huovinen P. ja Kärpänoja J.) "Pk-yritysten, ammattikorkeakoulujen, yliopistojen ja tutkimuslaitosten yhteistyö". TEM julkaisu, julkaistaan alkuvuodesta 2019.
- WEF 2018 'Global Competitiveness Report 2017-2018' World Economic Forum

Appendix 1. Company survey on Finland's research and innovation system

Company survey on Finland's research and innovation system

A number of studies have concluded that the effectiveness of the Finnish research and innovation system has weakened considerably in recent years. This is a growing problem for enterprises as they are developing their business operations in Finland. Minister of Economic Affairs Mika Lintilä has invited Professor Erkki Ormala to evaluate the adequacy of the research funding and to determine how it should be focused so that the competitiveness of Finnish enterprises can be ensured.

This survey is part of the report produced by Professor Ormala and its purpose is to collect the views of Finnish enterprises. The questionnaire has been sent to the members of Finnish industrial organisations. We would like to apologise if you have received the questionnaire request more than once. Your company only needs to send one completed questionnaire.

The responses sent by the enterprises will be treated confidentially and they will only be used for this particular report. Responses sent by individual enterprises will not be published but the material will be combined with the data collected by Statistics Finland, as applicable.

Answering the questions will take about 30 minutes. The survey will remain open until the end of August but we would like to receive your responses well before that date so that we can compile the interim results.

Inquiries: Professor Erkki Ormala, tel. +358 40 749 2779

Next →

Company survey on Finland's research and innovation system

Background information

Company details *

Name of the company:	<input type="text"/>
Business ID:	<input type="text"/>

Is your company (the unit that the responses concern)*

- an independent company?
- an industrial group/part of an industrial group?

Give the names of the group companies/units that the responses concern:*

Turnover of the company/unit in 2017 (EUR million)*

Main sector of the company:*

- Energy industry
- Oil, gas and petrochemical industry
- Basic chemical industry (production of chemicals, fertilisers...)
- Other chemical products industry (plastic and rubber products, cosmetics, detergents and paints)
- Pharmaceutical industry
- Electronics and electrical industry
- Machinery and metal products industry
- Basic metals
- Information technology
- Planning and expert services
- Chemical forest industry
- Mechanical forest industry
- Transport and logistics
- Maintenance and servicing
- Wholesale and retail trade
- Food industry
- Construction industry
- Other, please specify

Size of your company (number of employees)*

- Less than 10
- 10 – 50
- 50 – 250
- 250 – 500
- 500 – 1,000
- 1,000 – 3,000
- More than 3,000

← Previous

Next →

Company survey on Finland's research and innovation system

Your company's R&D inputs

Estimate your company's total R&D inputs (your own and outsourced R&D activities) in euros in the following years:*

Give the figure in thousands of euros (without spaces). For example: The input is EUR 100,000, enter 100.

2016	<input type="text"/>
2017	<input type="text"/>
Forecast 2018	<input type="text"/>
Forecast 2019	<input type="text"/>

Give the rough breakdown of your company's current R&D inputs (creation of new business/ improvement of existing business).

Give the figures as percentages of the total without the % sign.

Creation of new business (%)	<input type="text"/>
Improvement of existing business (%)	<input type="text"/>

Total: 0

How would you assess the importance of the following partners to you company's current R&D activities?*

	We do not have any cooperation with these partners	Not very important	Important	Very important	Cannot say
Other enterprises in Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other enterprises outside Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Universities in Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Universities outside Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
VTT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other research institutes in Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other research institutes outside Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you assess the importance of the following partners to your company's R&D activities in the coming years?*

	We do not have any cooperation with these partners	Becoming less important	No change in importance	Becoming more important	Cannot say
Other companies in Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other companies outside Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Universities in Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Universities outside Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
VTT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other research institutes in Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other research institutes outside Finland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What are the 2-3 key expertise areas (or themes) in which your company would like to have strategic cooperation with higher education institutions and/or research institutes so that your company can renew itself and achieve long-term success?

This question is intended for the member companies of the Technology Industries of Finland. You do not need to answer if you are not a member.

1. expertise area / theme	<input type="text"/>
2. expertise area / theme	<input type="text"/>
3. expertise area / theme	<input type="text"/>

Has your company carried out R&D outside Finland or with foreign partners after 2015 or are you planning such activities for 2019?*

- Yes
- No

Company survey on Finland's research and innovation system

Current state of R&D in Finland

How would you assess the impact of the following instruments on the development and expansion of R&D cooperation in Finland?*

	Very weak	Weak	Fair	Good	Very good	Cannot say
Public-sector funding (cooperation funding, product development grants)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Acquiring business cooperation partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooperation with Finnish universities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooperation with universities of applied sciences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooperation with VTT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooperation with other Finnish research institutes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In general, does your company have problems with expertise and is it difficult to recruit skilled personnel? Where are the most serious gaps?

How would you assess the usefulness of the following public-sector funding sources (for example, attractiveness of the funding conditions, availability and administration) for your company's R&D and innovation?*

	Very weak	Weak	Fair	Good	Very good	Cannot say
Funding provided by Business Finland (cooperation project funding, product development grants)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funding provided by local-level and regional authorities (for example, ERDF funding)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funding provided by ministries (for example, programmes in key projects)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funding provided by Academy of Finland (funding for strategic research)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
R&D funding by university hospitals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other, please specify	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In your view, what are the most serious problems in public-sector R&D and innovation funding?

In your view, what are the most important measures that should be introduced in Finland to improve the enterprises' R&D and innovation environment?

How should the effectiveness of R&D and innovation activities be developed to ensure that the business R&D investments would be located in Finland more often?

What are the key strengths of Finland's research and innovation system?

Other feedback for the report:

Giving contact details for inquiries:

Your personal data will be stored in accordance with the privacy policy. However, the data will be made available to Erkki Ormala for producing the report.

- I want to give my contact details and allow them to be stored in accordance with privacy policy.
- I do not want to give my contact details

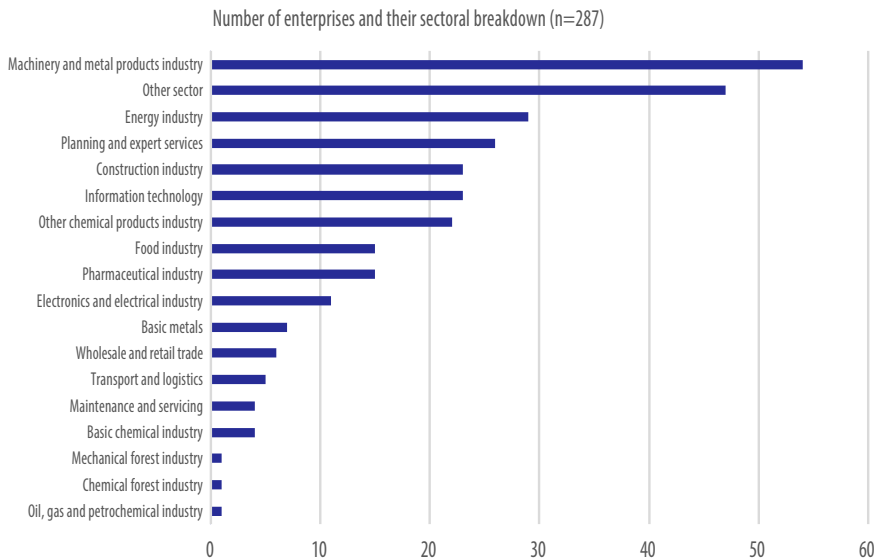
My contact details:*

First name	<input type="text"/>
Last name	<input type="text"/>
Telephone	<input type="text"/>
Email	<input type="text"/>

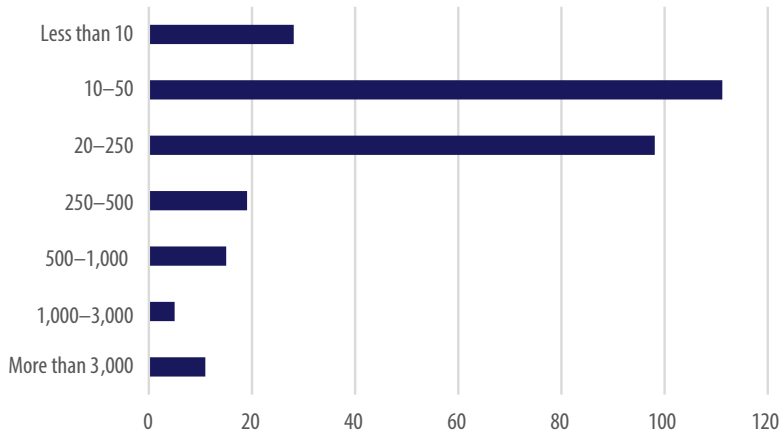
← Previous	Send
----------------------------	----------------------

Appendix 2. Breakdown of the enterprises participating in the company survey

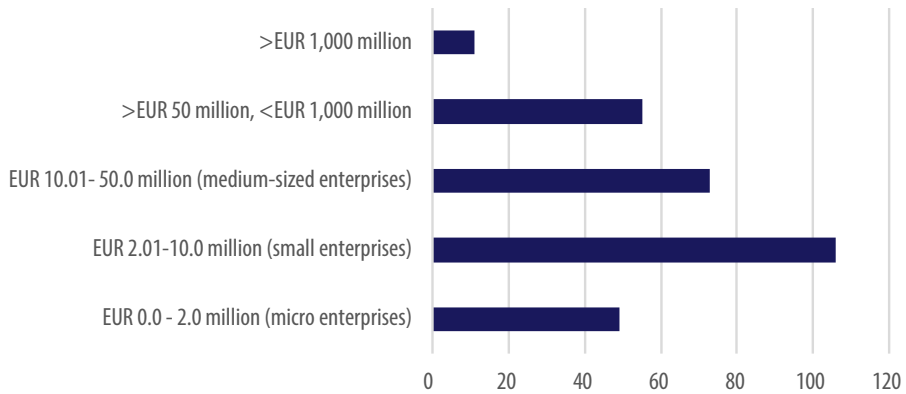
A total of 287 enterprises took part in the survey. Their sectoral breakdown is as follows:



Size of the enterprises participating in the survey, by the number of employees (n=287)



Turnover of the enterprises participating in the survey (n=287)



Securing Finland's competitiveness and economic growth in the 2020s

The report discusses the reforms required in the Finnish innovation policy so that Finland's competitiveness and economic growth can be ensured in the 2020s. Research and innovation play a key role in ensuring long-term economic growth and in the renewal of the economy. Over the past few years, Finland has lost some of its competitive position at the forefront of innovation. Reversing the trend would require a coordinated and comprehensive research and innovation policy that can ensure predictable and balanced development. Substantial increases are needed in applied research funding so that both private-sector and public-sector R&D investments can be put on a growth path. VTT plays an important role in the strengthening of national and international cooperation and in enhancing technological competitiveness. By increasing RDI investments, Finland can also make itself an attractive research and innovation environment for enterprises and top experts.

Electronic publications
ISSN 1797-3562
ISBN 978-952-327-401-3

Electronic version: julkaisut.valtioneuvosto.fi
Publication sales: julkaisutilaukset.valtioneuvosto.fi