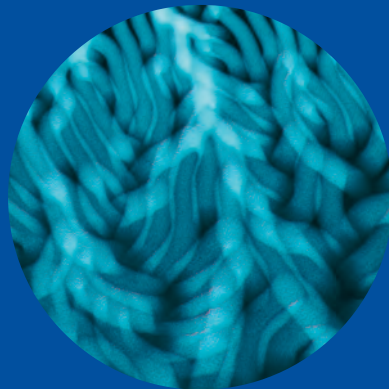
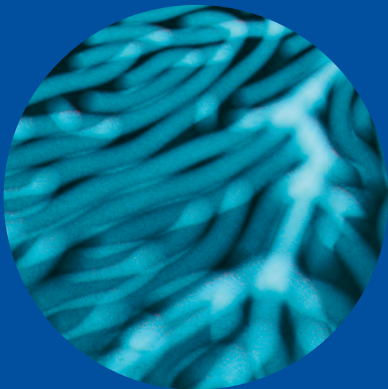
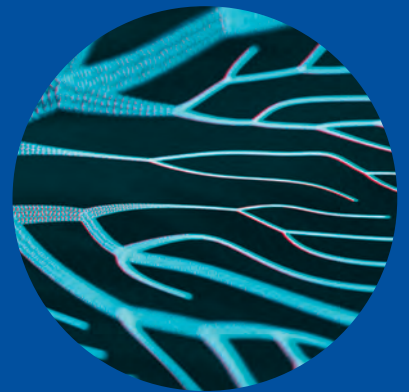
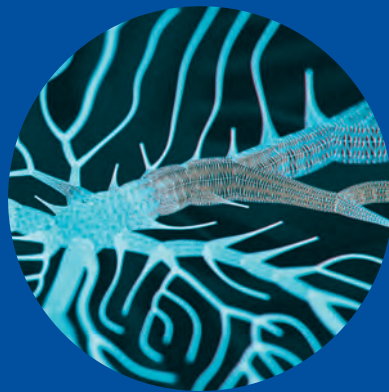
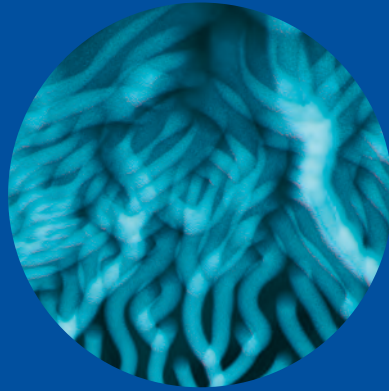
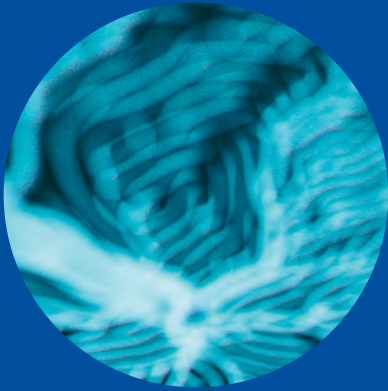






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foreword

Austria's research, technology and innovation have experienced a remarkable catch-up process in the past two decades. This is a special example of an objective and dedicated policy, which is not merely oriented on what is necessary, but rather in particular also pursues long-term goals. Important successes were achieved as a result of this policy, especially the fact that with a current research quota of 3.2 percent (as at February 2020) of gross domestic product, Austria is now ranked number two in the European Union. This is an essential reason for our country's economic strength, which in turn is the basis for our prosperity and social security, even though it is undisputed that further steps and measures are required to drive Austria's dynamic further on in the RTI area. This foreword emerges in the shadow of the corona virus, currently affecting our country and practically the entire world. To combat the effects of COVID-19 the Austrian Government has both implemented extensive measures in

the healthcare and social welfare system and introduced immediate aid and assistance in the research area. The pandemic can only be stopped by an effective vaccine, on which the efforts in both basic research and applied research are now concentrated.

During its soon to be twenty-year existence, in its active role as an advisory body for the Austrian Government the Austrian Council has always proven itself as an important stimulus provider and critical companion of the Austrian RTI policy and therefore also contributed significantly to the successes of the past two decades. Faced in particular with the massive challenges the corona crisis will leave in its wake and continue to pose, the Austrian Government will continue to expect stimuli from the Research Council to further develop the RTI system. Our sincere thanks are therefore very much owed to the Council's members for constantly supporting the Austrian Government's RTI policy with their sound and indispensable advisory activity.



Univ.-Prof. Dr. Heinz Faßmann
Federal Minister of
Education, Science and Research



Leonore Gewessler, BA
Federal Minister for
Climate Protection, Environment, Energy, Mobility,
Innovation and Technology



Mag. Gernot Blümel, MBA
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Finances



Dr. Margarete Schramböck
Federal Minister for
Digital and Economic Affairs

The current Council Board's term of office ends in autumn 2020. It is therefore time for a first recapitulation, and all the more so because recent years have seen such turbulent events.

The first two decades since the turn of the millennium were lost years in many respects. They began on 11 September 2001 with the attacks on the World Trade Center, which lead to the "War on Terror" in Iraq and Afghanistan. In 2008 the Lehman collapse took us by surprise and developed into a global financial and economic crisis, from which not all countries have entirely recovered yet. And today it is the undeniable climate change, the burgeoning populism around the globe and the advent of a new multi-polar world order that occupy us on such a massive scale. The days of the USA's global hegemony appear numbered, due to the competition delivered by other powers, the People's Republic of China in particular, and an erratically behaving US president. To steer clear of responsibility he has even put America's leadership role in resolving global challenges in question, by withdrawing from the Paris Agreement, for example.

In view of this and other geopolitical upheavals (keyword, "Middle East"), Europe is called upon to emancipate itself from its dependence to date on the USA. This applies of course to security, but especially so to digitisation, where Europe's dependence on Google, Amazon, Facebook, Apple and Microsoft, the "Big Five" technology giants, has an immense danger potential. Faced with the threat of "specific engineering of behaviour" and a new "surveillance capitalism" (Shoshana Zuboff), Europe must represent its citizens' interests against the market dominance of just a few companies better than it has done to date. And it must endeavour to attain digital sovereignty, and in critical areas, such as with high-power computers (quantum computers), cloud computing, the Internet of Things and with artificial intelligence, for example, it must go its own, European way. In addition to appropriate legal, economic, social, taxation and eco-

logical framework conditions, this in particular also requires strategic concentration on the key future areas of education, science, research and innovation.

In view of the challenges briefly outlined above in particular, the importance of education is undisputed. It is not only the basis of a successful business location at the beginning of a knowledge society, but rather is also a basic requirement for successfully overcoming the grand challenges – from climate change to digitisation and what is now referred to as the "fourth industrial revolution", through to migration and integration. And the dawning of the digital age increases the importance of education quite a good deal more. Digitisation is a radical change which must be utilised, even if its effects in their entirety are not yet foreseeable, but it must also be kept under control. From today's standpoint this in particular requires measures in three areas – education, social cushioning and the formulation of national and international regulations.

The lessons of the first industrial revolution must also be observed here. Luddites, who strictly reject the new technologies, are never successful, but those that actively shape technological development and in doing so consider and attenuate its social consequences, before massive social inequalities appear and perhaps result in political unrest or even revolt, are indeed successful.

This of course also requires new rules of engagement, and especially in light of the possible dangers connected with the digital transformation. Digitisation and artificial intelligence create new types of threats and vulnerabilities, ranging from data theft to total surveillance, from smaller hacker attacks to the threat to our democracy (keyword, "election interference") or paralysation of our countries by attacks on critical infrastructures, such as power supply, for example.

editorial



Hannes Androsch
Chairman
of the Austrian Council



Markus Hengstschläger
Deputy Chairman
of the Austrian Council

editorial

The overriding goal must therefore be to ensure a beneficial relationship between humankind and the machines, to always have control of the processes and developments and in particular to always leave the final decision and therefore the ultimate responsibility to the human.

Education, science, research and innovation are the key issues of the future to be able to do all this. A country like Austria, which has no significant raw material sources, must focus on its citizens' creativity. The goal formulated a decade ago of taking Austria into Europe's top research and innovation league is therefore not simply *l'art pour l'art*, but rather a necessity for our country to be able to secure economic prosperity and therefore the well-being of its inhabitants.

In this context it is time to both take stock of the situation and to present recommendations to overcome existing challenges. The Austrian Council has always accompanied Austrian Governments over the past decade as a dedicated adviser. It did not consider itself here as merely a driving force for the areas of science, research, technology and innovation, but rather it also addressed itself to topics and issues that increase our understanding of historic developments, current processes and, building on this, future challenges. On an evidence-based foundation, mostly medium-term goal positions were defined and consequently paths to achieve them were discussed together with the stakeholders. Much was achieved here, but there is still much to be done to successfully shape our country's future.



The Austrian Council,
from left to right standing:

Hermann Hauser

Markus Hengstschläger

Klara Sekanina

Hannes Androsch

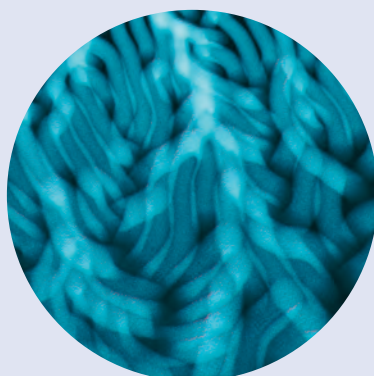
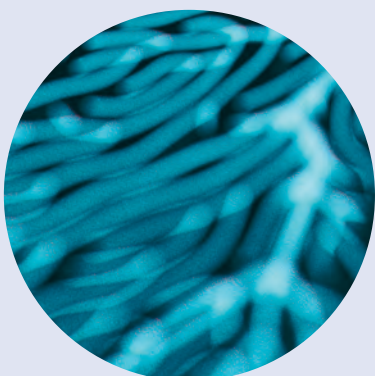
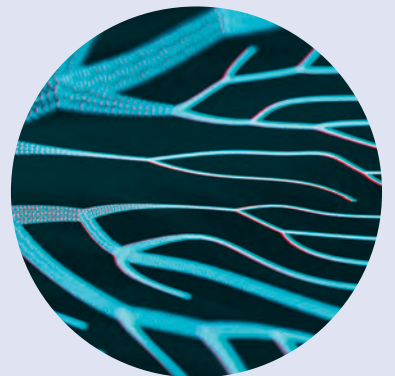
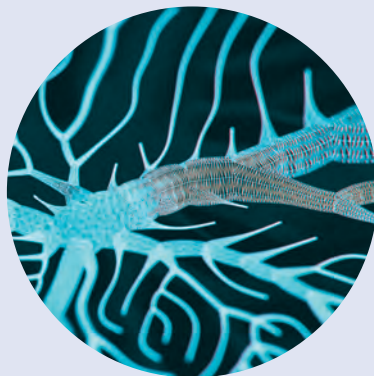
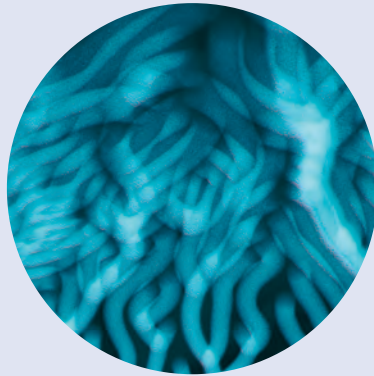
Jakob Edler

Left to right sitting:

Sabine Herlitschka

Helga Nowotny

Sylvia Schwaag-Serger



Austria's RTI system: solid performance with significant improvement potential

Education, science, research, technology and innovation are essential requirements in achieving scientific, economic, technical, social, ecological and cultural progress in the future, and to consequently create top quality jobs and therefore secure social prosperity. The goal of the Austrian Government to join the group of innovation leaders thus also serves the achievement of a series of higher-level social objectives.

Austria has developed rather well in the last two decades with regard to research, technology and innovation (RTI).^{1*} Austria generally occupies a position in the forward midfield in the majority of international rankings on innovation performance, competitiveness etc. Proof then that innovation activities have certainly triggered a development dynamic that releases positive effects and could contribute to an improvement in economic development, prosperity and quality of life and the environment.

In contrast, however, it must be stressed that this dynamic on the whole is insufficient to achieve the level of the top countries. Compared with the European innovation leaders, Denmark, Germany, Finland, the UK, Luxembourg, the Netherlands, Sweden and Switzerland in particular, Austrian performance is stagnating in future areas, despite existing improvements in individual sectors. In the relevant international rankings Austria therefore continues to deliver average performance among the comparison countries, with the distance to the top group remaining constant over the past ten years.

With the Research, Technology and Innovation Strategy (RTI Strategy) adopted in 2011 the Austrian Government set itself the goal of making Austria an innovation leader by 2020. The 2020 time horizon specified therein is now upon us. In recent years the Austrian Council has systematically analysed the advances made with the implementation of the RTI Strategy within the scope of its annual Report on Austria's Scientific and Technological Capability.^{2*}

Approximately ten years after the starting signal to work out the current strategy document and parallel with the start of drafting a new strategy, the Austrian Council believes it is now time to make a final, summarising assessment of Austria's innovation performance. In its last report on Austria's scientific and technological capability the Austrian Council analysed the developments of the domestic RTI system and its performance compared with the innovation leaders from 2010 until today and evaluated the level of achieving the goal of joining the leading innovation nations by 2020.^{3*}

Austria's distance to the top group remains unchanged since 2010

The Austrian Council's innovation monitoring shows that the performance of the Austrian RTI system has definitely improved since 2010. The extent of these improvements is not sufficient, however, to move in any significant way towards the level of the innovation leaders. Despite above-average R&D investments and successful developments in some areas, Austria's goal dis-

1* OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris, p. 3.

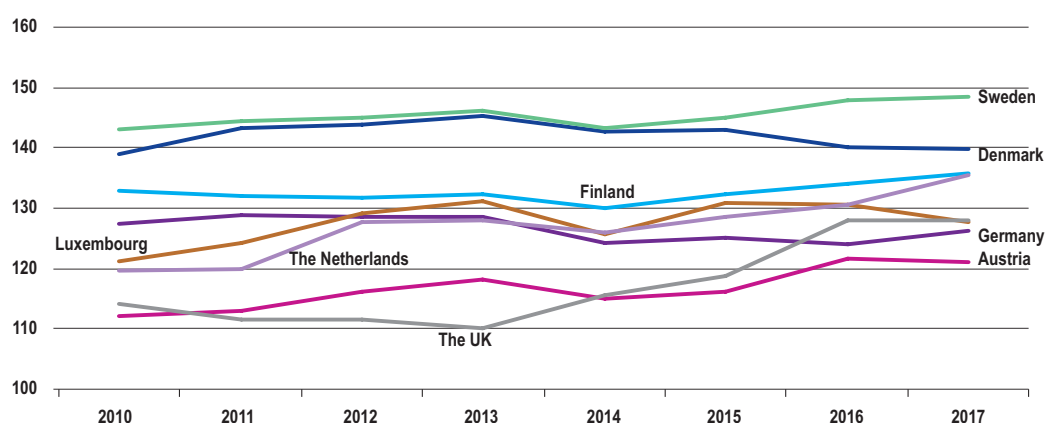
2* For this, see the reports on Austria's scientific and technological capability by the Austrian Council, online at <https://www.rat-fte.at/leistungsberichte.html>.

3* It should be noted that quite a lot of data exhibit a considerable time-lag, and an effective evaluation will therefore only be possible in 2022/23.

tance to the leading nations measured with the Austrian Council's innovation monitoring could not be reduced across the board. These findings essentially also apply with the results of the European Innovation Scoreboard (EIS), which the overarching objective of the Austrian Government and the RTI Strategy, to join the group of leading innovation nations, is oriented on. Austria's distance to the group of innovation lead-

ers since 2010 has remained unchanged in the EIS as well. Austria's total points in the EIS in 2010 were 112, while the average value of the leading countries was 128. More recently the Austrian value was approximately 120 points, while the average for the leaders' group rose to 135. This means that the distance between Austria and the group of innovation leaders has not changed significantly since 2010 (see figure 1*).

Figure 1*: Performance comparison in the European Innovation Scoreboard from 2010 to 2017



Source: European Innovation Scoreboard 2011–2018.

The EIS is only one prominent example among many here. A look at the most important international RTI rankings over the last ten years reveals a generally negative trend. And even if upward trends are seen time and again in individual rankings, the overall development is indeed clearly downward. These findings are confirmed in the annual Monitoring Report of the Austrian Economic Chamber, which summarizes Austria's performance in more than 150 international rankings. Across and beyond all analyses

and indicators it shows a clear downward trend in recent years. Regardless of the respective survey methods and the indicators used, on the whole these rankings only show, "... average, for a high-income country with low rankings and deterioration in many places."^{4*} The lead places on the other hand are mostly occupied by the innovation leaders, which are also chosen as reference countries for the Austrian Council's innovation monitoring

^{4*} Tichy, G. (2017): Mangelnde Effizienz als Erfolgsbremse. In: WIFO-Monatsberichte, 2017, 90(9), pp. 677–699, p. 690.

Innovation efficiency – higher input dynamic than output dynamic

Especially responsible here is the fact that the Austrian RTI system has clearly not been able to convert its high research inputs into corresponding innovation outputs. With an R&D rate estimated by Statistik Austria at 3.19 percent for 2018, in the international comparison Austria invests an above-average high amount in its RTI system. At the same time, however, this only generates comparatively moderate innovation output. The high R&D expenditure therefore does not result in performance that is appropriate for Austria's advanced scientific and innovation level. At best we could say that, despite Austria's high inputs, performance in the areas of science, research, technology and innovation is stagnating compared with the leading countries in Europe. If we compare the high (particularly financial) inputs with the outputs or outcomes generated from them, it becomes evident that the Austrian RTI system suffers from considerable inefficiencies compared with the leading countries.

These findings apply to all areas of the RTI system^{5*} and are also confirmed by the OECD.^{6*} The imbalance between innovation input and output is an indication of perhaps the greatest challenge Austria must overcome in the decade ahead – to make the move from innovation follower to innovation leader, or from a country in a catch-up process to a country at the technological frontier, and therefore a frontrunner. This development step is overdue, as the returns of a strategy that correspond with an innovation

follower and a country in a catch-up phase, have long since already been largely exhausted. Developments of recent years in this respect and the successes in achieving the 3.76 percent goal have not changed the structures in Austria sufficiently, so the task of a fundamental change in the orientation of the education, science, research, technology and innovation policy will also remain the same in the near future. The step towards innovation leader, the reforms (structural) in the RTI system required for this, which the Austrian Council has recommended for some years now, and corresponding policy measures and implementation activities would significantly extend Austrian options, both with regard to increased competitiveness and with the achievement of social and ecological goals.

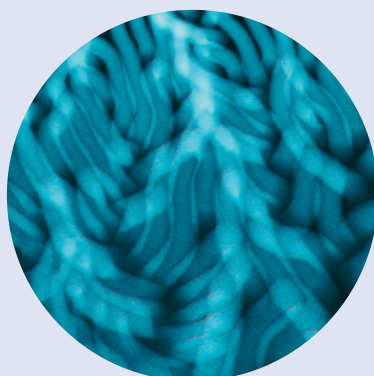
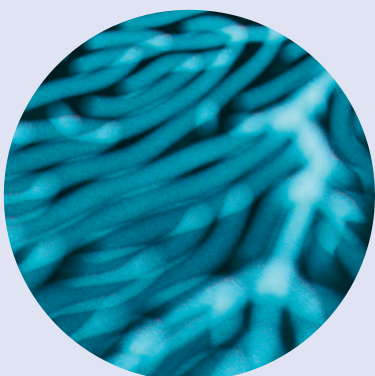
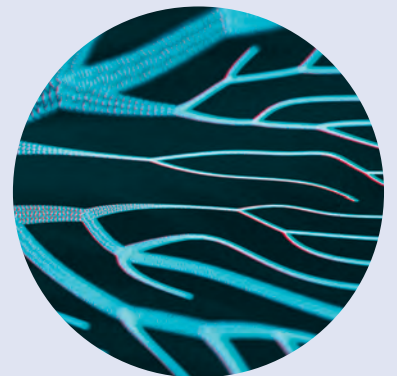
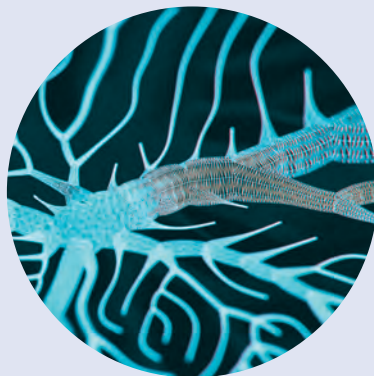
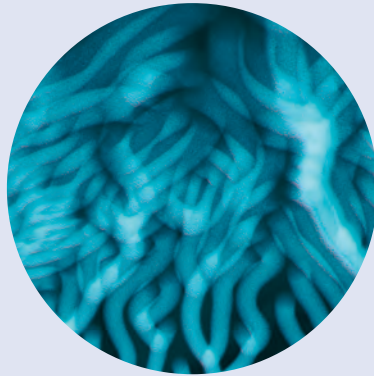
Greater attention must therefore be paid in the future to how the Austrian RTI system can better convert the high inputs into corresponding outputs than was previously the case, and therefore increase its system efficiency. The Austrian Council has worked out specific proposals several times in the past for this^{7*}, and in its Review of Innovation Policy the OECD also points to existing potential to increase efficiency.^{8*} The challenge for the RTI policy in the years ahead will therefore be to massively increase its implementation activity in this respect and to conclusively address the difficulties of the past. The Austrian Council recapitulated the priority areas of action that must be addressed in a corresponding recommendation for the RTI policy in the 27th legislative period, which you'll find again in the "Recommendations" chapter.

5* For this in detail, see Austrian Council (2018): Report on Austria's Scientific and Technological Capability 2018. Vienna, pp. 18 ff.

6* OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris, p. 13 and pp. 52 ff.

7* Austrian Council (2017): Recommendation on the way to the forefront of innovation of 30/11/2017.; Austrian Council (2018): Report on Austria's Scientific and Technological Capability 2018. Vienna, pp. 32 ff.

8* OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris, pp. 17 ff.



Recommendations 2019

Priorities for awarding National Foundation funds RTD 2020 –

Recommendation of 15 March 2019

The Nationalstiftung FTE plays a very important role in the Austrian RTI system as an additional financing source for long-term strategic measures.

The Austrian Council therefore welcomes the Foundation's allocation of EUR 100 million per annum for the three years from 2018 to 2020 provided for in the RTD National Foundation Act. In the long term, however, the required

planning security for the National Foundation is not a given, as the financing beyond 2020 is currently still completely open.

We therefore wish to make clear once again that a sufficient and sustainable allocation of funds is necessary for the National Foundation to perform its functions. The Austrian Council believes it is absolutely key that the targeted level of EUR 100 million per annum be maintained.

Following detailed discussion and on the basis of the priority areas of action identified in the Report on Austria's Scientific and Technological Capability, the Council Board recommends the following content-relevant orientation for awarding funds in 2018 in descending priority:

- Reinforcing the research infrastructure with initiatives with appropriate critical variables and risk potential
- Coordination and harmonisation of regional and federal RTI activities
- Activities that have a broader innovation focus (open innovation, social innovations)
- Reinforcing of the national human potential basis
- Reinforcing competitive funding in basic and applied research
- Risk capital strengthening

The orientation here follows the principle of the National Foundation's long-term planning ability and continuity.

The Austrian Council would also point out that

the simultaneous addressing of several key points is positively reflected in the evaluation of an application made to the National Foundation.

Austrian Council recommendation for Austria's efficient integration into Europe's industrial policy – Recommendation of 22 March 2019

Recommendation

Against the backdrop of geopolitical upheavals and the ongoing digital transformation, the Austrian Council recommends stronger Austrian commitment within the framework of European industrial policy. The European discussion on the importance of strategic value cre-

ation chains is extremely relevant for Austria. A holistic approach must be established here to pursue a long-term industrial policy strategy and implement specific measures to increase innovation performance in strategically important key technologies. Sufficient incentives must

be created in Austria to secure its long-term opportunities and to strengthen the integration of domestic RTI activities into European projects and processes.

To increase research and innovation activities the Austrian Council therefore recommends an acceleration of the key technologies (Key Enabling Technologies, KETs) defined by the EU Commission in close coordination with other policy areas as key elements of the strategic value creation chains for Europe and a basic participation in projects that are of common European interest (Important Projects of Common European Interest, IPCEI). The Austrian Council believes Austria's cooperation in IPCEI in the KETs area is a location and technology policy necessity.

Based on the IPCEI and KETs, the Austrian Council is of the opinion that national research and innovation priorities should therefore be defined. These will be addressed via national funding programmes and also earmark investment supports and qualification measures. Bespoke research and innovation activities, which contribute to Austria's efficient integration into the strategic European industrial policy, can consequently be initiated.

Background

Together with the USA and China, the EU is one of the world's three most important economic players. European industry, which secures growth, jobs and prosperity and strengthens innovation in Europe, makes an essential contribution in this respect. This is impressive-

ly confirmed by the following figures from the manufacturing in Europe area¹:

- Industry's share in overall value creation (plus six percent since 2009)
- Employment – with more than 1.5 million new jobs in industry since 2013
- Labour productivity – 2.7 percent annual growth on average since 2009, higher than the USA (0.7 percent) and South Korea (2.3 percent)

Compared with the USA and China, however, the European industrial, technology and innovation policy still appears to be under-focused on joint strategic competences and interests.² Disruptive technologies and China and the USA's economic arms race show clearly that the EU must intensify its efforts with industrial policy issues now, so it does not fall behind in global competition. This means strengthening and expanding key competences and strategic value creation chains in Europe.

As a country with a high industry ratio, the Austrian Council believes Austria is predestined to push the European industrial policy as a suitable strategic mechanism more intensively into the core of its EU policy. Despite the financial and economic crisis, in the past ten years more than eleven million new jobs have been created in Europe, and are directly and indirectly linked to industrial growth.³ The acceleration of Austria's efficient integration into the European industrial policy therefore becomes all the more important. The EU has provided the option of implementing Important Projects of

recommendations

¹ Eurostat taken over from COM (2017) 479, 13/9/2017.

² Austrian Council, Annual Report 2017, <https://www.rat-fte.at/taetigkeitsberichte.html>

³ Statista, European Union & Euro Zone: Employed people figures from 2007 to 2017, <https://de.statista.com/statistik/daten/studie/249097/umfrage/erwerbstaeftige-in-der-europaeischen-union-eu/>



recommendations

Common European Interest⁴ (IPCEI) as a suitable industrial policy mechanism, to finance important projects with a common interest across Europe with state aids. The member states should be encouraged here to promote cross-border projects that make a clear contribution to strengthening European competitiveness.

Within the framework of IPCEI, knowledge, know-how, financial resources and economic operators from the entire European Union can be consolidated to address economic and social challenges that cannot be otherwise resolved. They are arranged so the public and private sectors cooperate on large-scale projects that produce important benefits for the EU and its citizens.⁵ It should be noted here that a project can be described as an IPCEI (as set out in Article 107, Paragraph 3, Item b) when it is part of a transnational European programme that is supported jointly by a number of governments of the member states or is the result of a concerted action by a number of member states in combating a common threat.⁶

Due to their positive spill-over effects, IPCEI can be relevant for all policy areas and measures that pursue common European goals and address industrial policy activities at national level. This, however, in particular affects key areas that make an absolutely crucial contribution to securing competition, prosperity and growth,

such as the key technologies (Key Enabling Technologies, KETs) defined by the EU Commission, which are a fundamental component of the European industrial policy.⁷

According to the official definition, “KETs are knowledge intensive and associated with high R&D intensity, rapid innovation cycles, high capital expenditure and highly-skilled employment. They enable process, goods and service innovation throughout the economy and are of systemic relevance. They are multidisciplinary, cutting across many technology areas with a trend towards convergence and integration. KETs can assist technology leaders in other fields to capitalise on their research efforts.”⁸

On the basis of diverse research work and economic analyses of market trends and their contribution to meeting social challenges, in 2009 the European Commission defined the following six topics as recognised overriding EU Key Enabling Technologies:⁹

- Microelectronics/nanoelectronics
- Nanotechnology
- Photonics
- Materials sciences
- Industrial biotechnology
- Advanced production technologies

This technology policy focus has since demonstrated its effect: A total of fifteen member states have since defined six KETs as “intelligent specification”.¹⁰ In preparing the forthcoming 9th

⁴ Communication from the Commission: Criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest (2014/C 188/02), [https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52014XC0620\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52014XC0620(01)&from=EN)

⁵ Ibid.

⁶ Ibid.

⁷ Council of the European Union, NOTE 14217/18, November 2018.

⁸ EU-Commission (2009): Current situation of key enabling technologies in Europe. SEC(2009) 1257 final. Brussels, 30/9/2009.

⁹ Commission's Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A European Strategy for Key Enabling Technologies – A bridge to growth and jobs, (KOM [2012] 341 final of 26/6/2012).

¹⁰ Wiener Zeitung, EU-Schlüsseltechnologien: “Europa muss Stärke zeigen”, Interview with Sabine Herlitschka, 13/8/2018.

EU research framework programme, “Horizon Europe”, in its report the EU High Level Strategy Group on Industrial Technologies defined three big clusters (production, digital and cyber technologies) as a bracketing element across these key technologies and consolidated the existing KETs, materials, nanotechnology and microelectronics/nanoelectronics, photonics, and the biotechnology focus was then also extended to life science technologies.¹¹

Based on the current developments in research and innovation, digital security, connectivity and artificial intelligence were also added as new KETs. Within these KETs there are also cross-over effects – microelectronics and nanoelectronics, for example, play an especially important role in the area of artificial intelligence. Microchips are also a key enabler for digitisation. KETs are therefore the basis for innovations that are key for Austria’s industrial policy development.

With the creation of innovation-stimulating synergies between IPCEI and KETs, in the future more importance could be afforded to a higher output and impact orientation in Austria to push forward into the group of leading innovation nations. These synergies could of course also play a role in companies’ location decisions. An example of introducing cross-sector growth stimuli: On 30 November 2018, France, Germany, Italy and the UK jointly notified the Commission about an IPCEI to promote research and innovation in the microelectronics KETs area.¹² The microelectronics key technology is about tiny electronic components that generally con-

sist of semiconductor materials such as silicon, and are connected with each other and with other components via complex structure and connection technologies (resistors and capacitors, for example). The basic microelectronic components, generally known as microchips, are now used in almost all electronic devices. The funding for this joint project is EUR 1.75 billion, and a further EUR 6 billion is to be mobilised in private investments. The existing microelectronic cluster in Dresden (German state of Saxony) will be further expanded as the project progresses. The entire microelectronics value creation chain is therefore on-site in Dresden – from chip design to high-volume wafer production and processing, through to a broadly-based supplier, service provider and user industry. In Austria the Silicon Alps Cluster¹³ was successfully set up with more than 100 members, and together they now cover the entire value creation chain.

A study¹⁴ using the example of the KETs from the semiconductor industry demonstrates the importance of robust funding of common interest projects as understood by IPCEI for global competition. According to the study, of the fifteen biggest semiconductor manufacturers around the globe, eight companies are based in the USA, four in Asia and only three in Europe – Infineon, NXP and ST Microelectronics (see table 1). Added to this is AT&S as the only packaging manufacturer in this very small European environment. So there is very little expertise remaining in Europe.

recommendations

11 RE-FINDING INDUSTRY Report from the High-Level Strategy Group on Industrial Technologies. Conference Document published on February 23rd, 2018, <https://era.gv.at/object/document/3992>

12 European Commission: EU approves cross-border funding in the billions for microelectronics, press release of 18 12 2018, https://ec.europa.eu/germany/news/20181218-genehmigung-foerderung-mikroelektronik-sachsen_de

13 Silicon Alps, <https://www.silicon-alps.at/>

14 IC Insights (2018): Thirteen Top-15 1Q18 Semi Suppliers Register Double-Digit Gains, 15. 5 2018; online under <http://www.icinsights.com/data/articles/documents/1066.pdf>

recommendations

The study also shows how the world's ten biggest semiconductor manufacturers have a market share of 57 percent.¹⁵ This share is growing continually; ten years ago it was only 46 percent. We can see that in this context it is not about individual companies, but rather about the existing strategic competence in Europe. Not just for Europe, but rather for Austria in particular as well, it will therefore be crucial that the right industrial policy strategies be used

for the future, with the member states actively interacting with the respective European institutions. For if Austria is to pursue its goal of claiming a place in 21st century global competition, the right pointers must also be set in the area of industrial research and technology development. Appropriate steps towards Austria's more efficient integration into European processes and structures are therefore extremely relevant in strategic matters.

Table 1: Top fifteen of the global leading semiconductor companies

1Q18 Rank	1Q17 Rank	Company	Headquarters	1Q17 Tot IC	1Q17 Tot O-S-D	1Q17 Tot Semi	1Q18 Tot IC	1Q18 Tot O-S-D	1Q18 Tot Semi	1Q18/1Q17 %Change
1	2	Samsung	South Korea	12,811	770	13,581	18,581	820	19,401	43 %
2	1	Intel	U.S.	14,220	0	14,220	15,832	0	15,832	11 %
3	3	TSMC (1)	Taiwan	7,524	0	7,524	8,473	0	8,473	13 %
4	4	SK Hynix	South Korea	5,346	109	5,455	8,016	125	8,141	49 %
5	5	Micron	U.S.	4,931	0	4,931	7,360	0	7,360	49 %
6	6	Broadcom Ltd. (2)	U.S.	3,740	368	4,108	4,160	430	4,590	12 %
7	7	Qualcomm (2)	U.S.	3,676	0	3,676	3,897	0	3,897	6 %
8	9	Toshiba	Japan	2,747	265	3,012	3,517	310	3,827	27 %
9	8	TI	U.S.	2,960	204	3,164	3,339	227	3,566	13 %
10	11	Nvidia (2)	U.S.	1,965	0	1,965	3,110	0	3,110	58 %
11	15	WD/SanDisk	U.S.	1,795	0	1,795	2,350	0	2,350	31 %
12	10	NXP	Europe	1,965	246	2,211	2,017	252	2,269	3 %
13	12	Infineon	Europe	1,130	754	1,884	1,360	907	2,267	20 %
14	13	ST	Europe	1,378	440	1,818	1,696	518	2,214	22 %
15	17	Apple* (2)	U.S.	1,600	0	1,600	1,830	0	1,830	14 %
–	–	Top 10 Total		59,920	1,716	61,636	76,285	1,912	78,197	26,9 %
–	–	Top 15 Total		67,788	3,156	70,944	85,538	3,589	89,127	25,6 %

(1) Foundry (2) Fabless * Custom Devices for internal use.

Quelle: IC Insights (2018): Thirteen Top-15 1Q18 Semi Suppliers Register Double-Digit Gains, 15/5/2018; online unter <http://www.icinsights.com/data/articles/documents/1066.pdf>

¹⁵ IC Insights (2018): Thirteen Top-15 1Q18 Semi Suppliers Register Double-Digit Gains, 15/5/2018; online unter <http://www.icinsights.com/data/articles/documents/1066.pdf>

Austrian Council recommendation for the establishment of a holistic industry and technology policy strategy for platform economy in Austria — Recommendation of 06 June 2019

recommendations

Recommendation

The innovation factor is crucial in the competition of the global regions. According to the current OECD report¹⁶, digitisation with data as an important raw material has a direct influence on innovation. Similar to refining crude oil, data must also be mined, processed and enriched so it can be used to create value. This also requires a suitable digital infrastructure, which is provided by platforms. Digital platforms offer the option for companies to exploit the potential of digitisation to return revenue, so platform ecosystems therefore play an increasingly key role in the digitisation strategy.¹⁷

To participate in the value creation of the platform economy and therefore to accelerate digital innovation growth in Austria, the Austrian Council recommends appropriate framework conditions for strategic alliances be created, to then also accelerate the implementation of a joint European platform economy. Linked data technologies, which have been accepted by an increasing number of data providers, have pushed to the fore in recent years. This requires the promotion of cross-border and cross-sector interoperability, with participation in the International Data Spaces Association¹⁸ (IDSA), for example. This non-profit initiative is therefore engaged in ensuring that only openly funded data ecosystems and marketplaces that guarantee the data sovereignty of the data's creator emerge and that the International Data Space (IDS) is

recognised as the standard for data and data sovereignty in the digital economy in Europe.¹⁹ Participation in the IDSA is therefore of key importance for Austria's economy in securing digital innovation capacity and a cooperative and business-oriented location policy.

Topics such as scalable networking, platforms, digital services, IoT basic technologies, analysis of data flows from sensors, digital processes and usage-centred innovative business models in the future will make a decisive contribution to a country's international competitiveness.

In the interests of a holistic economic and industrial policy the Austrian Council recommends the Austrian innovation ecosystem be rethought as the digital transformation progresses. Cooperation between leading companies, universities, start-ups and SMEs and the people operating within them is of key importance in the innovation ecosystem. Leading companies already enable a few hundred start-ups and SMEs to deal with future issues cooperatively. An ecosystem is, however, only as successful as the people working in it. It is therefore important that these people acquire experiences in various institutional structures, to continuously and sustainably further develop the ecosystem on this basis. Appropriate framework conditions within the institutional structure are required here to be able to respond swiftly and flexibly to the forthcoming challenges.

16 OECD (2019), Digital Innovation: Seizing Policy Opportunities, OECD Publishing, Paris.
<https://doi.org/10.1787/a298dc87-en>

17 Wirtschaftskammer Österreich (WKO): WKO innovation strategy for Austria, April 2019.

18 International Data Association: <https://www.internationaldataspaces.org/>

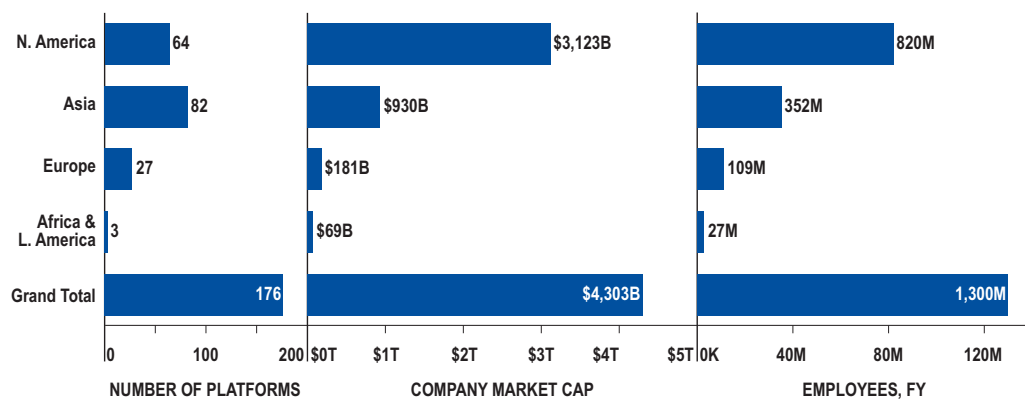
19 International Data Spaces Association: Jointly Paving the Way for a Data Driven Digitisation of European Industry, Strategic Paper for Europe IDSA, 2018, <https://www.internationaldataspaces.org/ressource-hub/publications-ids/>

Background

The platform economy has heavily influenced the digital economy and society in the past two decades. It plays a key role in the digital value creation that will significantly influence future economic growth in the EU, and will also have an important impact on the functioning of the digital single market.²⁰ On the whole, however, only four percent of the total global market capitalisation of the biggest online platforms is attributed to the EU.²¹ The rapid development of the digital economy and the diversity and fast pace of the platforms pose great challenges in the political arena.

The systematic networking of hardware, software, data and services and the modularisation of services constantly increase the importance of digital platforms as the central connector of different stakeholder groups on the market. Technological developments, which already began in the Business-to-Consumer (B2C) area for e-commerce about fifteen years ago, are also increasingly used in the Business-to-Business (B2B) area and the Internet of Things (IoT).²² As technical and economic key enablers, IoT platforms (General Electric's Predix, for example) are the pivotal point of innovative

Figure 1: Global distribution of platform companies according to number, market capitalisation and number of employees



Source : Evans and Gawer, The Rise of the Platform Enterprise. A Global Survey, 2016, <https://www.thecge.net/archived-papers/the-rise-of-the-platform-enterprise-a-global-survey/>

²⁰ European Commission: Communication on Online Platforms and the Digital Single Market Opportunities and Challenges for Europe (COM(2016)288), May 2016, <https://ec.europa.eu/digital-single-market/en/news/communication-online-platforms-and-digital-single-market-opportunities-and-challenges-europe>

²¹ Ibid.

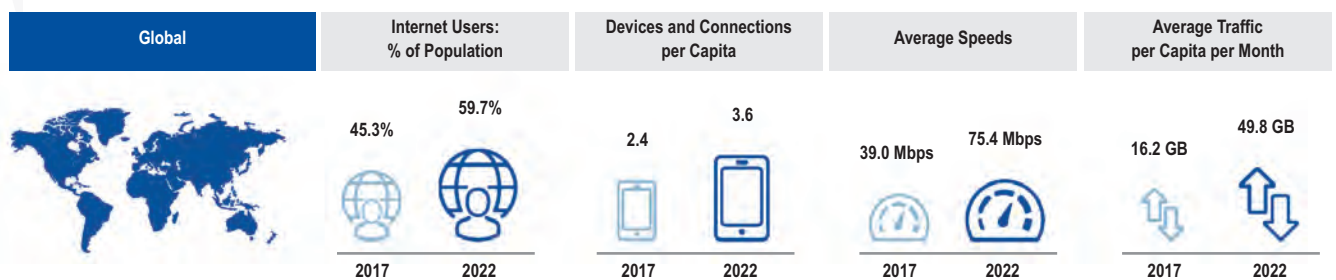
²² AUTONOMIK for Industry 4.0 accompanying research: Study as part of accompanying research for the AUTONOMIK technology programme for Industry 4.0 of the Federal Ministry for Economic Affairs and Energy, https://www.digitale-technologien.de/DT/Redaktion/DE/Downloads/Publikation/autonomik-studie-digitale-plattformen.pdf?__blob=publicationFile&v=9

data-driven business models and therefore definitively drive forward industry's digitisation.²³ The platform economy creates disruptive technological and industrial upheavals. This puts the international market in a process of more extensive and further-reaching changes at a radically accelerated speed. As an attractive industrial location and hub between east and west Austria must endeavour to actively co-shape these developments. Globally successful companies of the platform economy currently still emerge almost exclusively in the USA and increasingly in China,

but not, however, in the EU²⁴ (see figure 1). The merging of the physical world with the virtual world into cyber-physical systems (CPS) is constantly increasing. Based on this rapidly progressing digital networking, more and more companies develop business models using new technologies and data that provide the key to many innovations. In its report published annually, Cisco forecasts the development of the "Internet of Everything", in which people, things, components and processes are all networked (see figure 2).²⁵

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Figure 2: Cisco Visual Networking Index Forecasts Global Internet



Source: Cisco VNI Complete Forecast Highlights, Global 2022; online at https://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html

Cisco forecasts that by 2022 around the world there will be,

- (i) 28.5 billion networked devices, compared with 18 billion in 2017
- (ii) 3.6 networked devices per capita, compared with 2.4 per capita in 2017
- (iii) 43 percent of all networked devices will be connected as mobile

- (iv) 81 percent of global IP traffic caused by non-PC devices, compared with 59 percent in 2017, and
- (v) 6.4 percent of M2M modules making up the entire IP traffic, compared with 3.7 percent in 2017, to name just a few examples.

²³ BITKOM: IoT-Plattformen – current trends and challenges, recommendations for action based on Bitkom survey 2018, <https://www.bitkom.org/Bitkom/Publikationen/IoT-Plattformen-aktuelle-Trends-und-Herausforderungen.html>

²⁴ National Industrial Strategy 2030: Strategic guidelines for a German and European industrial policy, Federal Ministry for Economic Affairs and Energy, February 2019, <https://www.bmwi.de/Redaktion/DE/Publikationen/Industrie/nationale-industriestrategie-2030.html>

²⁵ Cisco: VNI Complete Forecast Highlights, Global – 2022, https://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html

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The networking of the physical world by the IoT and IIoT for Germany alone enables a forecast value creation potential of approximately EUR 700 billion.²⁶

According to a study²⁷ on the features and success factors of digital platforms, in 2017 just under fifteen percent of all German companies surveyed used digital platform technologies. Another study²⁸, funded by the Federal Ministry for Economic Affairs and Energy reveals that the German economy underestimates the relevance and potential of platform ecosystems and the effects on companies and at the same time massively overestimates its own organisation possibilities. The objective must therefore be to actively co-shape the platform economy with the specific use of digital technologies in Austria. The starting position for platforms in Austria is good, as Austria is among the European leaders in using them.²⁹ The market shifts towards platform economy are impressively confirmed by the platform index³⁰, according to which the stock exchange value of the sixty biggest platforms in the world

increased in the first half of 2018 by a total of one billion US dollars.³¹

Along with the shift towards smart machines and products, digitisation in the manufacturing industry in particular represents a change in the market structures. A large number of companies offer their products and services on digital platforms. Customers and providers come together in the virtual market. Now that the race in the B2C area by dominating players from the North American and Asian regions appears to be lost (Alphabet, Amazon and Alibaba, for example), Europe still scores relatively well in the B2B areas.³²

Two examples: Evonik Industries AG³³ based in Essen in Germany is one of the globally leading companies in the area of specialty chemicals and high-performance materials. The second largest German chemicals company is active in more than 100 countries around the globe with approximately 36,000 employees and benefits in particular from its integrated technology platforms. In fiscal 2018³⁴ the company generated turnover of

26 BITKOM: Digital sovereignty, positioning and first recommendations for action for Germany and Europe, 2015, <https://www.bitkom.org/Bitkom/Publikationen/Digitale-Souveraenitaet-Positionsbestimmung-und-erste-Handlungsrecommendationen-fuer-Deutschland-und-Europa.html>

27 AUTONOMIK for Industry 4.0: Study as part of accompanying research for the AUTONOMIK technology programme for Industry 4.0 of the Federal Ministry for Economic Affairs and Energy, https://www.digitale-technologien.de/DT/Redaktion/DE/Downloads/Publikation/autonomik-studie-digitale-plattformen.pdf?__blob=publicationFile&v=9

28 Final report of the "IKT-Wandel" joint project funded by the Federal Ministry for Economic Affairs and Technology, fortiss GmbH 2017, https://download.fortiss.org/public/digitale_transformation/studie_digitale_transformation_komplett.pdf

29 BMVIT: "Ökonomie im digitalen Wandel", 18/9/2018, https://eventmaker.at/vertikom/oekonomie_des_digitalen_wandels/downloads.html

30 Plattform-Index: <https://www.plattform-index.com/>

31 <https://www.netzoeconom.de/2018/06/24/wert-der-plattform-oekonomie-steigt-im-ersten-halb-jahr-um-1-billion-dollar/>

32 AUTONOMIK for Industry 4.0: Study as part of accompanying research for the AUTONOMIK technology programme for Industry 4.0 of the Federal Ministry for Economic Affairs and Energy, https://www.digitale-technologien.de/DT/Redaktion/DE/Downloads/Publikation/autonomik-studie-digitale-plattformen.pdf?__blob=publicationFile&v=9

33 <https://corporate.evonik.de/de/>

34 <https://de.statista.com/statistik/daten/studie/192347/umfrage/umsatz-der-evonik-industries-ag-seit-2006/>

just under EUR 15 billion. JeNaCell³⁵ is another example of the successful use of innovative platform technologies. Based in Jena, Germany, the company specialises in biotechnologically produced nanocellulose and has a unique production process in this area. The company uses platform technologies to produce a high-tech biomaterial. Complex B2B2C structures, such as the platform provider Alibaba, for example, are now emerging in the USA and Asia. This means the boundaries of B2C and B2B business relations are increasingly blurring. In Germany usage-centred business models based on platforms are developing in almost every industrial sector, in engineering, car making, logistics, electro-technology and chemicals, for example.

Other technologies, such as Blockchain or Edge Computing, for example, and their effects are also discussed within the scope of platform economy. The potential of Blockchain technology, for example, is in the reduction of transaction costs or the secure and fast checking of platform users' authenticity. Along with the potential, specific obstacles in Blockchain technology, the high computing capacity with the verification of transactions, for example, should also be examined and appropriate solutions worked out. The potential of Edge or Swarm Computing is found in

conjunction with the exponentially increasing number of smart devices and their use. In the future data will be processed directly here and saved where it is collected, that is, on the "edges" close to the devices. While today approximately 80 percent of all data is processed centrally in data centres and in the Cloud and 20 percent locally where it is collected, according to forecasts³⁶ this ratio will already turn around by 2025.

Information and Communication Technology (ICT) is an intricate part of the transformation, and therefore the competitiveness gap must be closed, data sovereignty³⁷ must be produced as a sub-area of digital sovereignty, to fully exploit the potential of key technologies and to swiftly recognise and assess global innovation lines and proactively react to them. To ensure Austria does not lose ground, in the future intensive European and internationally strategic networks will be crucial to recognise technological agenda settings and socio-economic changes early on and position oneself successfully in the resulting value creation networks. Only when Austrian industry succeeds in transferring to the digital world and developing an appropriate platform strategy, can industrial value creation also be secured in the future for location Austria.

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Recommendation for the continuation of priority projects in the areas of science, research and innovation – Recommendation of 06 June 2019

Background

The last Austrian Government set itself ambitious goals with its 2017-2022 government programme and specified them in its Cabinet presentation on 16 August 2018.³⁸ It outlines priority projects for achieving Austrian innovation

leadership. The development of a new Research, Technology and Innovation Strategy (RTI Strategy 2030), which should present the strategic guidelines for Austria's path to becoming an innovation leader, was a key starting point here.

³⁵ <http://www.jenacell.com/de/>

³⁶ <https://www.networkworld.com/article/3325397/idc-expect-175-zettabytes-of-data-worldwide-by-2025.html>

³⁷ Challenges, trends and recommendations for action of this priority derived from them should be considered in a separate Austrian Council recommendation.

³⁸ Austrian Government (2018): Future initiative for research, technology and innovation Presentation to the Cabinet on 16/8/2018.

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The relevant cornerstones for developing the RTI Strategy 2030, the introduction of an excellence initiative or the implementation of a research funding act should have been presented as part of an RTI summit in May of this year. The premature end of the coalition means that these priority projects, which were also welcomed by the Austrian Council in its current 2019³⁹ report on Austria's scientific and technological capability, became unclear in their process and the content of their implementation.

Recommendation

The Austrian Council recommends the transitional government continue to pursue the priority projects for the Austrian RTI system. While fully understanding that the transitional government is not setting any new priorities and will not implement all measures planned for the RTI area, the Austrian Council believes at least some of these projects are extremely important and should therefore be realised. This applies in particular to the following four points, where there has already been intensive preparatory work:

● 1 RTI Strategy 2030

The current RTI Strategy, which was adopted in 2011 and which the RTI policy of recent years has been oriented on, reached its time horizon in 2020, without the strategic objectives being achieved.⁴⁰ The development of a new RTI Strategy is therefore required for the period up to 2030. The last Austrian Government already made arrangements for the strategy development process. The strategy should be worked out on the basis of the "OECD Reviews of Innovation Policy: Austria", which

was presented in December 2018, and within the framework of thematically organised work groups. The work groups have already assembled and begun in places with the first content-related meetings. A public web-based consultation process was to be launched at the cancelled RTI summit in May 2019 to integrate the RTI community and relevant stakeholders into the process.

The Austrian Council recommends the transitional government continue the work on the strategy development process to provide a successor government in autumn this year the appropriate bases for the quickest possible delivery of an RTI policy strategy document.

● 2 The Austrian Research Funding Act

The RTI Strategy from 2011 already includes the objective of establishing a research funding act, in which the principles of the Austrian RTI policy would have been defined, output goals anchored and a long-term budgetary planning security would have been guaranteed.⁴¹ The last Austrian Government addressed and formalized this issue in its government programme. According to the Council of Ministers decision in August 2018 a draft for an appropriate research funding act was finally worked out. In line with the original plans this was to be presented at the cancelled RTI summit in May 2019, subsequently sent for parliamentary appraisal and adopted by the summer. Before the cancelled summit, agreement could not be reached with regard to the act's content orientation, especially towards the stronger agentification recommended by the Austrian Council or a more efficient controlling of the RTI system via appropriate governance structures⁴².

39 Austrian Council (2019): Report on Austria's Scientific and Technological Capability 2019. Vienna, pp. 61 f.

40 See Austrian Council (2019): Report on Austria's Scientific and Technological Capability 2019. Vienna, pp. 56 ff.

41 Austrian Government (2011): The Path to Becoming an Innovation Leader. Federal Government strategy for research, technology and innovation. Vienna, p. 47.

The Austrian Council recommends the transitional government extend the existing draft of the research funding act with relevant governance elements and that it prepare the fastest possible parliamentary appraisal.

● **3 Excellence initiative**

In the past the Austrian Council has repeatedly referred to the need to strengthen basic research in Austria with special focus on stronger excellence orientation.⁴³ This was addressed by the last Austrian Government. The establishment of an excellence initiative for basic research was anchored accordingly in the coalition agreement. On the basis of the Council of Ministers decision in August 2018 a team of experts was consequently deployed to create a concept to introduce an “excellence initiative for increasing competitively financed basic research”. Framework, goals and scope of this initiative were defined herein, and had already undergone a consultation and received broad support. The presentation of the excellence initiative was planned as part of the cancelled RTI summit.

The Austrian Council recommends the transitional government immediately implement the excellence initiative on the basis of the already agreed expert paper.

● **4 Research funding database**

As part of its examination of research funding in Austria, in 2016 the Court of Auditors referred to the intransparency of the financing flows in the RTI system and the setting up of

a standardised database to ensure recording of research funding across Austria.⁴⁴ At the Federal Ministry of Education, Science and Research and the Federal Ministry of Traffic, Innovation and Technology’s request the Austrian Council performed an extensive feasibility study⁴⁵, on the basis of which the setting up of a research funding database for Austria was recommended.⁴⁶ This recommendation was also included in the coalition agreement of the last Austrian Government. In autumn 2018 a work group was set up with the task of developing an implementation concept for setting up an Austria-wide research funding database. It was supposed to be presented at the cancelled RTI summit.

The Austrian Council recommends the transitional government continue to specify the interministerially worked out implementation concept and that it also introduce the swift implementation of the research funding database. Along with these priority projects and preparatory activities for the next Austrian Government, some of which must be implemented for the long term, the Austrian Council recommends the transitional government also introduce the following, short-term effective measures as quickly as possible:

- Secure sufficient allocation of funds of the National Foundation for Research, Technology and Development, as well as the Austria Fund at the volume of previous years.⁴⁷

recommendations

⁴² Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation. Vienna, pp. 18 ff.

⁴³ See, inter alia, Austrian Council (2017): Recommendation on the way to the forefront of innovation of 30/11/2017, pp. 24 f.; Austrian Council (2018): Recommendation for an excellence programme to promote science as key for increased cooperation and competition in basic and top-quality research of 22/3/2018.

⁴⁴ Rechnungshof (2016): Forschungsfinanzierung in Österreich. Reihe Bund 2016/4.

⁴⁵ Rütter Sococo, Senarclens, Leu & Partner und Quantum Analytics (2017): Feasibility study on setting up a nationwide research funding database. Study commissioned by the Austrian Council. Zurich.

⁴⁶ Austrian Council (2018): Recommendation to set up a nationwide database to illustrate research inputs and outputs of 22/3/2018.

⁴⁷ See Austrian Council (2016): Recommendation for funding education, research and innovation in Austria of 5/9/2016, pp. 2 f.



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- Accelerate efforts to participate in projects of common European interest (Important Projects of Common European Interest, IPCEI)⁴⁸
- Set priorities on RTI activities in the area of artificial intelligence and digitisation, as well as an accelerated expansion of the digital infrastructures required for this⁴⁹

Austrian Council recommendation for the establishment of a future fund for science, research and innovation — Recommendation of 20 August 2019

Recommendations

Austria is far behind comparable countries such as Switzerland, the Netherlands and Sweden with regard to innovation dynamic. This is due to outdated structures in the education system and above all to the insufficient dynamic of change in science, research and innovation. Concepts and strategies have been available for many years now, but implementation has made no headway. In the Global Innovation Index⁵⁰ Austria fell one place compared to last year and is now placed at 21. It is clear that it is not sufficient to just stimulate research, but rather that a broader innovation basis and more flexible accesses are also required, as also planned by the European Innovation Council's (EIC) European initiative, which must be supported intensively from the Austrian side.⁵¹ For this reason the Austrian Council recommends a **future fund** for science, research and innovation, which provides a **total volume of EUR 30 billion for ten years**, to establish Austria sustainably in the

group of innovation leaders. It must be stressed here that this additional financing is an input factor in the research system, which must be accompanied by measures to increase efficiency in the system, to accelerate innovativeness and therefore the implementation of the research results accordingly on the market.

Background

In August last year the previous Austrian Government passed a resolution on a number of important implementation points for the areas of education, research and innovation. This was, however, absent with the financial resources for implementation. Specific implementation resolutions were to be made at the research summit planned for May 2019, however this was cancelled. Even a special funding by the National Foundation, which was adopted at EUR 100 million per year for the years 2018-2020, is no longer secured after 2020.

⁴⁸ See Austrian Council (2019): Austrian Council recommendation for Austria's efficient integration into the European industrial policy of 22/3/2019.

⁴⁹ See Austrian Council (2019): Report on Austria's Scientific and Technological Capability 2019. Vienna, p. 22.

⁵⁰ APA Science, Politik und Wirtschaft,

https://science.apa.at/rubrik/politik_und_wirtschaft/Oesterreich_stagniert_in_weltweitem_Innovationsindex_auf_Rang_21/SCI_20190725_SCI40111351049734012, (25.7.2019)

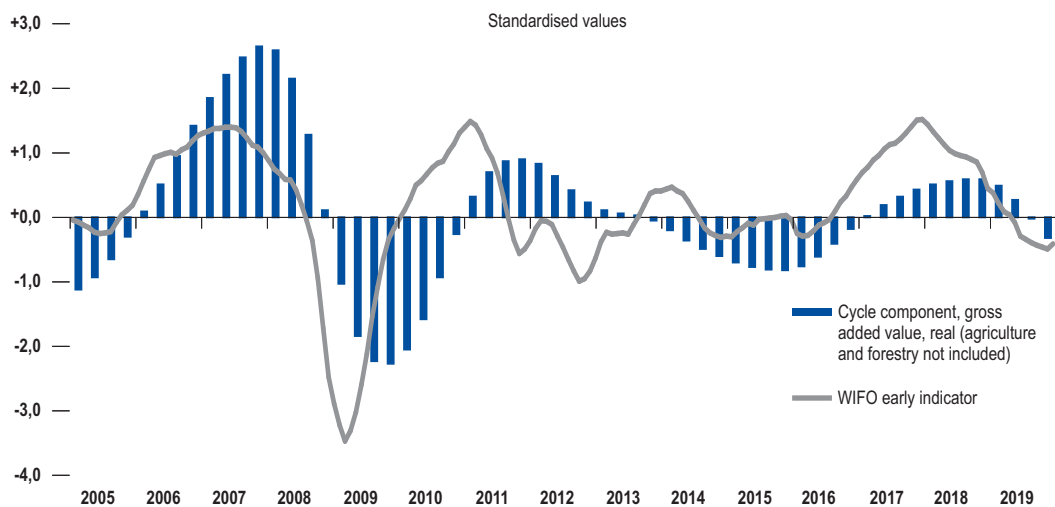
⁵¹ European Innovation Council, Empowering European Innovators, https://ec.europa.eu/commission/news/european-innovation-council-2019-mar-18_de

Some institutions in Austria, such as the AIT, IST Austria or the ÖAW prove that top scientific quality is possible with the right framework conditions. According to Nature Index, IST Austria currently occupies place 3 in the global research ranking.⁵² These successes are based on medium-term secured financing and partially autonomous activity by these institutions. These framework conditions are also necessary for many other institutions in Austria.

The weakening international competition also slows economic growth in Austria. The current level of the WIFO early indicator is significantly below its long-standing average level and also continues to indicate a dampened economic dynamic, as shown in figure 3.⁵³ Economic growth in Austria in 2019 slowed to an average 1.7 percent and the forecast for 2020 is that it will even out at 1.5 percent.⁵⁴

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Figure 3: WIFO early indicator



Source: WIFO. The cycle component of the seasonally-adjusted gross added value (= reference sequence) is calculated using two-sided HP filters (smoothing parameters, 1,600 and 10, respectively).

⁵² Nature Index, 2018, <https://www.nature.com/articles/d41586-019-01924-x>

⁵³ WIFO economy portal, current early indicator, <https://konjunktur.wifo.ac.at/index.php?id=488>

⁵⁴ WIFO, Christian Glocker: Forecasts for 2019 and 2020: Slowdown in the global economy dampens growth in Austria, June 2019, https://www.wifo.ac.at/jart/prj3/wifo/main.jart?content-id=1454619331110&publikation_id=61857&detail-view=yes



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Future investments must be politically prioritised vis-à-vis consumption expenditure to reactivate this dynamic. This means the investment quota that is too low in both the private and the public area must be increased in order to sustainably strengthen innovation growth in Austria.

In addition to the imbalance between investment and consumption the austerity policy also plays an important role here. In contrast to Switzerland, Sweden and the Netherlands, with a record taxation burden and resulting high revenues, and also as a result of the taxation increase with cold tax progression, the Austrian budget policy has achieved a surplus. A study⁵⁵ in 2012 commissioned by the IMF already highlighted the negative effects of this policy. During the study period an increase in fiscal consolidation of one percentage point of GDP resulted in an average cumulative decline in GDP growth by about 1.9 percentage points. It was clear that the rigid budget consolidation with expenditure cuts and tax increases did not produce the desired success.

The result of this financial policy is that Austria, with a sustained current account surplus, high savings activity but investment that is too low, exhibits a continuous and dangerous investment gap, especially in the infrastructure area, so for shaping the future. This is also especially true for science, research and innovation. A future fund for science, research and innovation will have to be created to close this gap and enable a future-viable innovation dynamic. This will incorporate a volume of 30 billion for the next ten years and

be available regardless of the resources committed annually by the budget policy for longer-term planning capability. The successes of this on average three billion in annual investments will in turn condense into increased taxation income, but at the same time also contribute to Austria being able to join the innovation leaders and therefore strengthen its international competitiveness. On the whole such a step would be a contribution to overcoming the standstill and finally making a contribution to shaping the future.

Investments in research, innovation and education are the requirements for a successful growth policy, as shown by the China example. Chinese expenditure for research and development runs to USD 281 billion. This research budget will be used, among other things, to create 50 new research centres by 2020. The research quota in Austria currently runs to circa USD 14 billion. This example shows how the challenges of the future can only be met with specific investments in education, science and research. A further development of the framework conditions for new ideas and an appropriately endowed fund as a stimulus provider for future projects is required to establish Austria sustainably in the European top league of research and innovation. The required future fund for science, research and innovation creates the basis for this. In addition to the research funding act, the excellence initiative and the research funding database, this will also offer increased financial planning security for the sustainable reinforcement of research and innovation location Austria.

⁵⁵ International Monetary Fund: World Economic Outlook, <https://www.imf.org/en/Publications/WEO/Issues/2016/12/31/Coping-with-High-Debt-and-Sluggish-Growth> (October 2012)

Use of RTD National Foundation funds for 2020 and the Austria Fund's funding for 2019 – Recommendation of 18 September 2019

recommendations

Preamble

Based on the decision of the meeting of 18 June, on 27 June 2019 the Foundation Board of the National Foundation RTD invited the Austrian Council in accordance with § 11 para. 1 item 1 of the RTD National Foundation Act to issue a recommendation on the use of the Austria Fund's funding for 2019 and the National Foundation RTD's for 2020.

The National Foundation RTD's funding is composed of contributions by the Austrian National Bank, the ERP Fund and the Austria Fund⁵⁶. With the decision to grant special funding⁵⁷ and the creation of a legal basis during the course of the Austrian Government's work programme of January 2017, for the annual funding of the National Foundation for Research, Technology and Development for the years 2018 to 2020 to the amount of EUR 100 million per annum, together with the resources of the Austria Fund⁵⁸ an allocation of funds in line with the Foundation's expenditure was achieved. Due to the limited period of validity of the currently applicable regulations for these special financings there should be no amendment to the National Foundation Act, adequate allocation for the following years should not be expected and the required planning security will not be a given.

The Austrian Council recommends guaranteeing the financing to secure research via the funds of the National Foundation RTD for the long term with the amendment of legislative regulations.

The Austrian Council's recommendations for

the thirty applications submitted, of which twenty-one applications were formally allocated to both funds, due to the priorities set, three to the Austria Fund and six to the National Foundation RTD, are based on the guiding principles and priorities set for awarding funds, the strategic importance and socio-political relevance of projects submitted and their classification in the overall context of Austrian research funding. The application volume for both funds together is EUR 319,268,000.

According to current assessments some EUR 137.2 million are available for the pending awarding of funds from the Austria Fund and the National Foundation RTD (of this EUR 33.7 million from the Austria Fund).

RTD National Fund

The Austrian Council also defined the following priorities for awarding funds from the RTD National Foundation for 2019 (in descending priority):

1. Reinforcing the research infrastructure with initiatives with appropriate critical variables and risk potential
2. Coordination and harmonisation of regional and federal RTI activities
3. Activities that have a broader innovation focus (open innovation, social innovations)
4. Reinforcing of the national human potential basis
5. Reinforcing competitive funding in basic and applied research
6. Austria Fund risk capital strengthening

⁵⁶ § 4 Federal law on the National Foundation for Research, Technology and Development (RTD National Foundation Act).

⁵⁷ Implications of the contribution from the banks' stability fee.

⁵⁸ Contributions from the deduction at source with the Government's share of income with income tax.

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Austria Fund

In accordance with Article 3, paragraph 2, of the RTD National Foundation Act the funds from the Austria Fund for 2019 are used for funding in the area of basic research and for funding applied research and the development of technology and innovation. The specific priorities according to the explanatory comments on the Tax Reform Act 2015/2016 (Article 13) are:

- Funding young talent researchers in basic research
- Increased knowledge transfer
- Cooperation between science and business

- Increased Industry 4.0
- Increased Life Sciences
- Industrial technologies (from the areas of productivity, mobility, energy, ICT, Industry 4.0)
- Promoting young talent
- Promoting frontrunner companies

Recommendation

On this basis the Austria Council issues the following recommendation on awarding the **EUR 103.5 million** to be expected **from the National Fund** for 2020 and from the **EUR 33.7 from the Austria Fund** for 2019.

Distribution of funds 2019/2020

Beneficiaries	Programme	Applied for (millions)	Recommended (millions)
National Foundation for Research, Technology and Development 2020			
aws	AI+ Programme	15.00	4.00
aws	Agile IP Management / AGIPM	14.90	2.00
aws	Creative Impact Programme	10.00	0.00
aws	First – from idea to entrepreneurship	15.00	1.00
CDG	CDL modelling and digitisation for innovative materials	12.213	3.50
CDG	CDL highly specific medical issues	3.076	2.25
FFG	Impact Innovation	10.00	5.00
FFG	R&D infrastructure funding	25.00	20.00
FFG	Fast Track Digital	10.00	3.750
FFG	Digital pro Bootcamps	4.00	1.00
FFG	Digital Innovation Hubs	5.00	5.00
FFG	Early Stage	6.00	1.50
FFG/FWF	Quantum research and quantum technology	10.10	8.00
FWF	doc.funds Programme	11.60	6.00
FWF	Research Groups	10.00	3.00
FWF	Matching Funds Initiative	8.00	4.00
FWF	SRA and DCs	34.276	12.00
FWF	PEARL network initiative	1.20	1.20
LBG	OIS Center – public involvement, continuation of the research & implementation priority	5.876	3.50
LBG	LOIS – OIS competence training	6.50	5.00
LBG	OIS – Enhancing Precision Medicine	8.40	0.00
ÖAW	APART – GSK	4.00	1.50
ÖAW	Cultural Heritage Data and Sciences /CHDS	15.50	4.50
ÖAW/FWF	Young Independent Researcher Groups	15.00	8.00
Austria Fund 2019			
aws	Industry 4.0	20.00	8.00
CDG	CDL Life Sciences	5.977	3.00
FFG	Bridge-building programme/BRIDGE	10.00	8.00
FFG	Research partnerships	4.00	2.00
FFG	Frontrunner	9.00	6.75
FFG	Big Data in Production	8.65	3.75
Total		319.268	137.20

Rationale

National Foundation for Research, Technology and Development 2019

● AI+ Programme

The AI+ Programme is a key element in a bundle of measures and is based on the “Artificial Intelligence Mission Austria (AIM) 2030” strategy paper and the “Shaping Austria’s future positively with robotics and artificial intelligence” white paper by the Council for Robotics and Artificial Intelligence. The programme focuses on the safe and responsible use of AI.

The funding enables an innovative cross-sector approach focussing on the use of AI for piloting and first implementation of new innovative digital services, products, business models in areas such as energy, environment, ICT, manufacturing, mobility and health (module 1). The development of the “Trustworthy AI Made in Austria” (module 2) brand is an interesting added value of the programme. The Austrian Council therefore recommends the project be funded with EUR 4 million.

● Agile IP Management (AGIPM)

The programme addresses the current challenges of protecting core technologies/business models and their accompanying IP awareness raising. The programme’s target group are growth-oriented, innovative SMEs, as IP also increasingly makes a value contribution to business success for small and medium-sized enterprises. Content-wise the Agile IP Management programme replaces the “aws-IP.Market” and “aws-IP.Licence” programmes that expired in 2019, continues the process begun with the “aws IP-Coaching” programme and adjusts to the respective individual corporate needs.

With the recommendation for funding of EUR 2 million, innovative companies can be supported and accompanied with their IP strategy.

● First – from idea to entrepreneurship

The programme offers young funding recipients the ability to test and implement their project ideas with professional support. The extension of the target age group from 18 to 30-year-old participants and a module 2 (for 30+ participants) based on the experiences gained are a correct step to be able to accurately support entrepreneurial engagement in an individualised society.

To continue the successful programme, on the basis of the available funds the Austrian Council therefore recommends funding of EUR 1 million.

● aws Creative Impact Programme

The Creative Impact Programme focuses on companies in the creative economy/social business segment and can provide stimuli for expanding the innovation concept to ecological and social innovations. Business start-ups that can be assigned to this sector are attributed diverse cross-over effects here.

Due to the necessary prioritisation of the available funds, this basically positively discussed programme cannot, however, be considered in this recommendation for funding with National Foundation funds.

With the programmes submitted for funding, in particular “Fast Track Digital”, “Digital pro Bootcamps”, “Digital Innovation Hubs”, “Big Data in Production”, “Frontrunner” and “Industry 4.0”, a key future topic is addressed, which focuses on the application and translation of digital technologies in companies and the economy. The Austrian Council supports this important transformation in research-oriented companies and recommends coordinating and submitting these individual programmes inter-institutionally between the agencies and participating departments as a programme bundle in the future. The goal should be a resource-optimised operative im-

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plementation at the agencies level, which will enable the most flexible and user-oriented programming possible.

- **Fast Track Digital – shaping new digital markets**

Additional support for SMEs is required for a swift transfer of new scientific findings as a result of digitisation. With Fast Track Digital, increasingly the required cooperation between science and economy is activated for a swift digital transformation. The funding of consortia with at least one SME and a research institution can accelerate the knowledge transfer and be quickly used to implement cooperation projects.

The recommended amount for this support programme is set at EUR 3.75 million.

- **Digital Pro Bootcamps**

This programme is set up to effectively deal with the scarcity of IT specialists on the Austrian market. To this end companies send employees to a bootcamp to be trained as IT professionals. Due to the high level of diversity in the entrepreneurial and individual further training requirements and required competences, the Austrian Council believes there is significant uncertainty here in the planning and performance. Plus, SMEs are often not in a position to compensate employees in the company in the long run. As described above, the Austrian Council believes integrating the support programme's content into another format should be considered. In this context the programme will then be funded with EUR 1 million.

- **Digital Innovation Hubs**

Digital Innovation Hubs consist of institutions with research priorities in digitisation areas that offer SMEs direct access to digitisation know-how. The Austrian Council believes the bundling of the service offerings presents an operative asset and should be continued as much as possible with the extension of the existing hubs. A rigorous needs assessment should precede the set-up and operation of additional hubs.

Funding of EUR 5 million is recommended to perform further calls.

- **Early Stage**

Early stage funding is an important mechanism. With specific funding of such projects without restricting the content and sectors and companies of all sizes, incentives will be created, future-oriented ideas addressed and research projects implemented, whose implementation is often delayed due to uncertainties. A basis for future product, procedure and service innovations will then be created. The tools for growth in new business or technology fields or for a transforming market environment will be created with industrial research. The Austrian Council therefore recommends the project be funded with EUR 1.5 million in line with a balanced portfolio design.

- **R&D infrastructure funding**

The performance of an R&D infrastructure funding with the National Foundation was enabled for the first time with a special grant and as funding of cooperation projects between the beneficiaries cited in the National Foundation Act. The funding addresses all potential target groups, and the guidelines worked out enable the funding of infrastructure investments for basic research and application-oriented research in all disciplines, as well as the funding of initial costs.

With its recommendation for funding research infrastructure the Austrian Council called for sustainable funding security, which cannot be provided from National Foundation RTD funds. This would require much greater amounts, which would go far beyond the scope of any funding from the Foundation or the Fund.

Due to the absence of sustainable financing approaches and the need to focus on research infrastructure, the Austrian Council recommends funding of EUR 20 million to perform a third tender, to endow cooperative and cross-sector investments and the use of research infrastructures.

● **Impact Innovation**

The Impact Innovation goal is to fund projects with a structured innovation process and more intensive integration of relevant stakeholders (SMEs, customers and others). SMEs in particular lack the resources to develop solutions via more diverse modern innovation methods. These are, however, more and more the basis for successful products and services. The programme is characterised by high funding effect and additionality. The continuation of the pilot phases is basically supported, however with a reduced funding amount of EUR 5 million.

● **Quantum research and quantum technology**

This project applies for the continued funding of “quantum research and technology”, in which Austria has already achieved a high international reputation. With the goal of setting up Austrian stakeholders to participate in further calls of the “FET-Flagship Programme Quantum Technologies” and to also accelerate the integration of companies, the Austrian Council recommends funding the measures in this cooperative project between the FFG and the FWF proportionately with EUR 7 million and EUR 1 million.

● **doc.funds**

This additional financing of excellent ongoing doctoral programmes (at least two years) with an existing training and research infrastructure enables the integration of new research groups and therefore the expansion of an existing network. The expansion of the research basis and funding of young talent here is therefore a key added value. With funding by the National Foundation RTD 2019/20 amounting to EUR 6 million, further highly qualified young talented scientists can participate in a highly competitive environment within the scope of structured doctoral programmes.

● **Research Groups**

This programme format provides an excellent basis for smaller, young scientific teams to

address interdisciplinary research topics in a highly competitive environment, and offers a basis for high-risk research aspects with high potential. With funding amounting to EUR 3 million it is possible to select further research groups in competitive processes and fund accordingly over a period of up to five years.

● **FWF Matching Funds Initiative**

With the FWF Matching Funds Initiative cooperative funding, the National Foundation has been promoting an extremely successful concept, which with transparent evaluation criteria contributes sustainably to the coordination and quality assurance of missions and priorities set at state level and guarantees efficient funding management. The Austrian Council recommends the Foundation provide EUR 4.0 million.

● **FWF Special Research Areas (SRA) and Doctoral Colleges (DC)**

The Special Research Areas are an excellent funding programme for reinforcing interinstitutional and interdisciplinary top research in Austria and represent medium-sized scientific consortia at the highest possible quality level. Combined with this there is also the key goal of the doctoral colleges of funding talented young researchers in this excellent research environment.

In line with the National Foundation's grants, funding of EUR 12 million by the Foundation is recommended to continue the special research areas and doctoral colleges.

● **PEARL network initiative (“Prospects for Entrepreneurship and Research”)**

This initiative activates the development of a “research radar” with companies and NGOs/NPOs. Research-intensive small and medium-sized enterprises in particular will be motivated towards scientific cooperation. These can then screen already positively appraised research projects relevant for them and benefit from a “matching” with re-

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searchers. A database for recognising research trends is therefore created (“emerging fields”).

The Austrian Council recommends this initiative be supported with the EUR 1.2 million applied for.

- **CD Labs**

Economic and socio-political goals are pursued by setting up Christian Doppler labs. The priority here is oriented on current issues, to be dealt with by one or more companies cooperating with scientific facilities, whereby the focus is on application-oriented basic research.

The Austrian Council recommends in the projects (i) CDL modelling and digitisation for innovative materials (funding application-oriented basic research in the area of modelling and digitisation for innovative materials in selected Christian Doppler labs) funding of EUR 3.5 million and for

(ii) CDL highly specific medical issues (funding of application-oriented basic research for highly specific medical issues in selected Christian Doppler labs) funding of EUR 2.25 million.

- **Open Innovation in Science Center – public involvement continuation & priority**

Within the scope of the existing OIS Center the integration of the general public, and patients in particular, should be a priority. With “Public and Patient Involvement and Engagement (PPiE)” the LBG OIS Center promotes active participation and co-shaping by the general public, stakeholders and patients in research processes and activities.

The Austrian Council recommends the project be funded with EUR 3.5 million.

- **Lab for Open Innovation in Science – OIS competence training**

The project’s goal, in terms of a mission-oriented innovation policy, is to support researchers in expanding their research and innovation activities in socially relevant areas. The submitted project is a further develop-

ment of the OIS competence training and formats (Lab for Open Innovation in Science – LOIS) already established in the LBG’s Open Innovation in Science (OIS) Center, but also includes experimental project development and funding as a key element, which goes beyond the scope of the “lab projects” conceived in the previous LOIS training.

The Austrian Council recommends funding the continuation of the “Lab for Open Innovation in Science” with EUR 5 million.

- **Open Innovation in Science Enhancing Precision Medicine – funding of a research programme to strengthen and further develop a specific application field of personalized medicine.**

Research methods based on Open Innovation in Science (OIS) open up new paths for public participation in science and research and forge connections in the discussions held in science, economy and society. With precision medicine (PM) the Ludwig Boltzmann Institute addresses a potential application area for OIS.

Due to the required prioritisation of the available funds this essentially positive programme in terms of its relevance for medical diagnostics and new clinical treatment possibilities cannot, however, be considered in this recommendation for funding with National Foundation funds.

- **Young Independent Researcher Groups (Zukunftskollegs – “Colleges of the Future”)**

The Young Independent Researcher Groups project is performed in cooperation between the Austrian Academy of Sciences (ÖAW) and the Austrian Science Fund (FWF). The Austrian Council believes there is high potential to promote talent in science in the programme’s focus, especially in promoting interdisciplinary project proposals of excellent young talented scientists (young postdocs) in international teams. The Austrian Council therefore recommends funding the “Young Independent Researcher Groups” programme with EUR 8 million.

The Austrian Council also suggests considering the possibility of merging these programmes, due to the extensive overlap with the FWF's "Research Groups" programme. The funding of both programmes is discussed in this context.

- **APART-GSK**

The programme focuses on the promotion of young talented scientists in the humanities, social sciences and cultural sciences. APART-GSK addresses the best young scientists in bases-oriented humanities, social sciences and cultural sciences at home and abroad, who want to perform their first independent research project at a suitable Austrian research institution. The funding will help recipients here to achieve a scientific level that, with successful application, boosts career opportunities or high-ranking promotions (START Programme, ERC Starting Grant, for example). The Austrian Council believes special orientation on graduates in the humanities, social sciences and cultural sciences enables better focus on urgent socio-political issues and makes an important contribution to their resolution.

It is therefore recommended the project be funded with EUR 1.5 million.

- **Cultural Heritage Data and Sciences (CHDS)**

The possibilities of digital technology and the use of AI completely redefine research. The CHDS programme bundles activities related to the generation, conservation and continuous availability of research results on cultural inheritance with the inclusion of relevant stakeholders at Austrian research institutions, repository operators and institutions that see themselves as heritage science stakeholders. Funded projects present AI as a scientific method in the service of digital humanities, ensure sustainable networking of the Austrian repository landscape or deal with multidisciplinary or interdisciplinary object-related research in cultural heritage and natural heritage.

To successfully perform these important tasks the Austrian Council recommends funding of EUR 4.5 million.

Austria Fund 2019

- **Industry 4.0 – a modular funding system for the producing sector – follow-up application 2019-2020**

The programme is modularly set up and supports Austrian companies in the producing sector or the production-related services sector with the digital transformation of business processes. The programme supports companies in different development phases with the strategic planning and analysis of their Industry 4.0 priorities, with setting up systems and installations and with employee training and further training.

The Austrian Council recommends the successful funding line be continued with EUR 8 million.

- **CD Labs**

Economic and socio-political goals are pursued by setting up Christian Doppler labs. The priority here is oriented on current issues, to be dealt with by one or more companies cooperating with scientific facilities, whereby the focus is on application-oriented basic research.

The Austrian Council recommends funding of EUR 3 million for the **CDL Life Sciences** project applied for (funding of application-oriented basic research in the Life Sciences area in selected Christian Doppler labs).

- **BRIDGE – FFG programme**

Bridge is an established programme and is highly attractive for initiating collaborations between science and economy. A recent evaluation confirmed the achievement of the programme goals (among others, further development and utilisation of basic research for economic applications, promotion of economic exploitation in the high-tech area, knowledge transfers via exchanges of person-

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nel between universities and companies, and so on).

Funding of **EUR 8 million** is recommended in the context of a necessary, increasing implementation of research results in application and innovations.

• **Research Partnerships**

In the Private Public Partnerships context the programme supports a direct knowledge transfer between universities and companies. The research issue raised and the common interests of companies and universities are pivotal for the successful initiation and performance of these dissertations.

The amount recommended for continuing this mechanism to strengthen a structured cooperation between industry and science is EUR 2 million.

• **Frontrunner**

The funding of internationally oriented technology leaders with headquarters in Austria and smaller, often still young companies on the way to becoming a frontrunner as part of

a sustainable location policy with long-term maintenance of research departments for big companies in Austria must be considered beneficial and important. The focus on “established frontrunners” and “future frontrunners” appears suitable to attract strong partners and develop new partners with disruptive business models in new markets.

Funding is therefore expedient and in view of the different measures in the programme should be set at EUR 6.75 million.

• **RTD offensive – Big Data in Production**

The scope with large data volumes is an increasing challenge to secure a data infrastructure for both research institutions and companies and the implementation of appropriate big data technologies throughout the production processes and the entire value creation chain. The provision of the required structures for transnational data exchange is essential for the connection to international initiatives.

The funding of project tenders is recommended at EUR 3.75 million.

Recommendations for the RTI policy in the 27th legislative period –

Recommendation of 16 October 2019

Recommendations

On the occasion of its 100th Council meeting, the beginning of a new legislative period and the forthcoming coalition negotiations, the Austrian Council recommends the future Austrian Government make future areas such as education, science, research, technology and innovation a policy priority. The Austrian Council presents the following eleven priority recommendations to support the coalition negotiations:

- 1) Policy prioritisation for the further development of the Austrian RTI system
- 2) Completion of an RTI Strategy 2030
- 3) Securing sustainable, long-term financing
- 4) Optimisation of the education system (without tertiary education)
- 5) Establishment of a change process in third
- 6) level education focusing on digitisation
- 6) Structural further development of the third level education system
- 7) Increase in the higher education expenditure rate and funds awarded in competition for basic research
- 8) Optimisation of the legal and financial framework conditions for business start-ups
- 9) Acceleration of the efforts to participate in projects of common European interest (Important Projects of Common European Interest, IPCEI)
- 10) Increased efficiency and effectiveness of research funding
- 11) Leverage the value of science and research among the general public

● **1) Policy prioritisation for the further development of the Austrian RTI System**

Basically and in harmony with the key results of the OECD Review of Innovation Policy⁵⁹, the Austrian Council recommends – in addition to working out a new RTI Strategy with the 2030 time horizon – that a policy prioritisation be made for the further development of the Austrian RTI system, in order to exploit its potential accordingly to join the leading innovation nations. Political focus on the relevant future areas should contribute to affording greater weight in Austria to the topics of education, science, research, technology and innovation, and therefore injecting essential dynamism into the country's future development.

The Austrian Council recommends institutionalising the RTI Summit here with the goal of anchoring regular communication for the definition and, where possible, consolidation of relevant RTI policy prioritisations at the highest political level.⁶⁰ The Austrian Council believes the annual summit should also be used to define binding implementation plans for strategic RTI activities with clear scheduling specifications, financial framework decisions and operative responsibilities.

● **2) Completion of an RTI Strategy 2030**

The Austrian Council recommends the working out of a new RTI Strategy with a time horizon to 2030 that has already begun be continued with greater emphasis and in line

with the strategic issues⁶¹ raised by the Austrian Council in January 2019. This future RTI Strategy should not understand research, technology and innovation as an end in itself, but rather as a contribution to achieving higher priority objectives on social, economic and ecological levels. The efficient use of existing resources and the importance of social challenges in achieving the goal of taking Austria into the group of innovation leaders should also be considered in greater detail here than has previously been the case.

To work out the RTI Strategy the Austrian Council also recommends the known problem areas of the Austrian RTI system be addressed as a priority in the key areas of the education system, the universities, the innovative start-ups, research funding and R&D financing that stand in the way of an increase in innovation performance.⁶²

In the context of developing a new RTI Strategy, the Austrian Council – in accordance with the corresponding proposals of the OECD⁶³ – also recommends, a specific expansion of the mission orientation to increase the quality and speed of progress in areas such as innovative economy and society, health, quality of life, environment and digitalisation. Measures to achieve a more efficient implementation and application of research results and innovations must be focused on here to exploit the potential to meet the grand challenges, such as climate change, resource

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59 OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris.

60 See Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation in Österreich. Vienna, p. 22.

61 Austrian Council (2019): Austria 2030: 50 questions on the way to the forefront of innovation. Input paper of the Austrian Council for RTI Strategy 2030. Vienna.

62 For this in detail see, Austrian Council (2018): Report on Austria's Scientific and Technological Capability 2018. Vienna, pp. 17 ff.

63 OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris, pp. 39 ff.



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scarcity, the ageing society or digitisation, that exists in Austrian research institutions and companies on a greater level and more systematically than has previously been the case. Special potential exists in the area of smart specialisation between different Austrian regions and with other countries.⁶⁴

The Austrian Council also suggests detailed strategies be developed for the innovation-oriented restructuring of the economy to support successful industries of the old economy in Austria in the development of new forward-looking business models – keyword: Platform economy – to be supported.⁶⁵ Prioritisations on RTI activities in the area of artificial intelligence and digitisation, as well as a reinforced expansion of the digital infrastructures required for this must in particular be accelerated here.⁶⁶

● 3) Securing sustainable, long-term research funding

Besides a structural reorganisation of the governance structures, the Austrian Council also recommends the required financial provisions for research funding be sustainably secured and the complexity in the funding system be reduced. The content of the draft of the research framework act already included

in the parliamentary appraisal must be agreed on and adopted and implemented as quickly as possible. The legal framework conditions will then be created to guarantee the medium to long-term stability of RTI funding in Austria.

In this context the Austrian Council also recommends a revision of the appropriate use of funding in the Austrian RTI system. Due to the low output efficiency compared with the innovation leaders (with given above-average inputs), the Austrian Council recommends this ratio be examined in even more detail, especially with regard to how Austria can improve in innovation efficiency terms.⁶⁷ In this respect, the Austrian Council also recommends the ratio between awarded in competition and core financed public funds be shifted in favour of the awarded in competition share. At the same time, as indicated by the OECD, the ratio between direct and indirect research funding must also be arranged in a balanced way.⁶⁸

The Austrian Council also recommends that the sufficient funding of the National Foundation for Research, Technology and Development and the Austria Fund be ensured with at least EUR 100 million and the level of previous years also be secured in the future.⁶⁹

⁶⁴ See also, Council of the European Union (2019): Recommendations for Austria's 2019 national reform programme. Brussels, p. 11.

⁶⁵ See Austrian Council (2019): Recommendation for the establishment of a holistic industrial and technology policy strategy for platform economy in Austria of 6/6/2019.

⁶⁶ See Austrian Council (2019): Report on Austria's Scientific and Technological Capability 2019. Vienna, p. 22; and Council of the European Union (2019): Recommendations for Austria's 2019 national reform programme. Brussels, p. 11.

⁶⁷ See inter alia, Austrian Council (2018): Report on Austria's Scientific and Technological Capability 2018. Vienna, pp. 32 ff.

⁶⁸ OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris, p. 19.

⁶⁹ See Austrian Council (2016): Recommendation for funding education, research and innovation in Austria of 5/9/2016, pp. 2 f.

Finally, as part of the new RTI Strategy, the Austrian Council recommends a reformulation of the quota target – currently oriented on the Austrian industrial structure – and to completely replace input goals with output goals, to counter the existing trends towards control and to focus even more on the effectiveness and efficiency of R&D investments.⁷⁰

● **4) Optimisation of the education system (without tertiary education)**

In terms of Austrian education performance the Austrian Council urgently recommends the problem of “education inheritance”⁷¹ be addressed more consistently than it has been to date and without ideological preconceptions. This is not only required for creating equal opportunities, but also and in particular in the interests of the Austria innovation and business location. Among other measures here, the second obligatory kindergarten year, the continued quality-assured expansion of language preparation of kindergarten children for later school entry and an improvement in the qualification of educational staff must be implemented. A significant increase in the number of multilingual educators and better financial and HR provisions are required to reduce social selectivity and to develop the potential of all young people as

much as possible – the keyword here is: support staff – for those schools that are confronted with particular challenges with regard to the socio-economic structure of their students (or “hotspot schools”). The socially indexed awarding of funds was actually already planned in the 2017 Education Reform Act, however to date there have been no implementation steps that would have had the appropriate effect either.

To tackle early social selection in the education system, in addition to the ongoing expansion of day-care, the Austrian Council also and in particular recommends the expansion of all-day schools with interwoven activities and the termination of early separation – which currently happens at the age of nine or ten and therefore far too early – by replacing it with later educational path decisions.⁷² At the same time the performance level must be raised across the board with specific support measures.⁷³ Improved permeability on all education levels, the tertiary sector included, must also be endeavoured here. With regard to a future RTI Strategy in particular, the Austrian Council also suggests a comprehensive international comparison of appropriate models and options in the form of an in-depth study.

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70 For this in detail see, Austrian Council (2018): Report on Austria's Scientific and Technological Capability 2018. Vienna, p. 32.

71 Austrian Council (2016): Report on Austria's Scientific and Technological Capability 2016. Vienna, pp. 15 ff.

72 See also, Council of the European Union (2019): Recommendations for Austria's 2019 national reform programme. Brussels, p. 10.

73 See Austrian Council (2019): Report on Austria's Scientific and Technological Capability 2019. Vienna, p. 27.



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● 5) Establishment of a change process in third level education focusing on digitisation

The Austrian Council recommends the change process made possible by the increase in the university budget from the performance agreement period 2019 to 2021 and by the step towards impact-oriented financing be implemented with the goal of establishing a student-centred third level system that enables efficient study courses. Exploiting the potential of digitisation for the strategic and structural further development of the universities should also be ensured here.⁷⁴ An increase in the share of competitive factors in the university budget must also be accelerated.

The Austrian Council recommends the framework conditions at the higher education institutes be adapted to meet the requirements of digitisation. Human resources development at the higher education institutes in particular must be arranged according to the new requirements, in order to perform such tasks in particular that require a higher division of work and team work (e-moderation, didactic design, supervision). Financial and human resources required for this must be provided. The required legal framework conditions for Open Educational Resources must also be shaped in the interest of the freest possible access to study and teaching material.

To expand the international brain circulation the Austrian Council also recommends a transparent arrangement of the career paths at the universities and the sustainable assurance of the expansion of additional career positions. For this reason, in the future the Austrian Council will also actively partici-

pate with the “Austrian Research and Innovation Talk” (ARIT), which is held annually in North America and networks the Austrian RTI community in the USA, Canada and Mexico. It would also require a significant expansion of structured doctoral programmes, a strategic modernisation of the research infrastructure, efficiency-oriented management structures and role-clarity of management committees, as well as more transparent selection processes in the area of management and scientific staff. Measures that contribute to a quality-oriented efficiency increase must be introduced here on all higher education management levels.

● 6) Structural further development of the third level education system

The Austrian Council believes it is urgently necessary to accelerate measures for the structural further development of the Austrian higher education area. To this end the tasks and functions of universities and technical colleges must be strategically coordinated with one another more intensively than before, whereby it must in particular be ensured that the respective institutions are reinforced in their key tasks and the funding mechanisms must also be coordinated on these tasks, in particular to strengthen the core tasks of the technical colleges. In this context, the Austrian Council has already called on the Austrian Government to swiftly push forward the expansion of the technical college sector oriented on social requirements, for which it recommends an annual five percent increase in the number of TC study places. The goal here should be to increase the percentage of technical college

⁷⁴ See Austrian Council (2018): create your universe – Recommendations for action for the future shaping of the universities of 15/2/2018.

study places in the overall number of study places in the tertiary area in the medium term to approximately 40 percent.⁷⁵

The Austrian Council also recommends the framework conditions of the higher level education system be improved to strengthen internationalisation. This requires additional incentives for international networking and cooperation, which would also offer individual researchers the required scheduling and financial freedom to set up international cooperation structures and to increase international visibility.⁷⁶

- **7) Increase in the higher education expenditure rate and funds awarded in competition for basic research**

The Austrian Council further recommends the goal of a university expenditure rate of 2 percent of GDP be further pursued with increased emphasis. This should also be anchored within the framework of the future RTI Strategy to establish a high-performance third level education sector, which can stay abreast in international competition with the best European countries and at the same time can also satisfy the rising demand for third level education, and consequently meets the growing requirement for highly qualified specialists in an innovative knowledge-based society.⁷⁷

In this context the Austrian Council also recommends a consistent increase in the funds awarded in competition to finance basic research to the level of the leading nations. An increase in the share of competitive factors in the university budget for research should also be endeavoured here. A parallel evaluation will support this process.

The Austrian Council also recommends the programmatic conception and financial funding of an excellence initiative on the basis of the already agreed expert paper.⁷⁸ This initiative must be embedded in Austria's science and research funding landscape, to enable more attractive research conditions for national and international top management and to guarantee better conditions for successful participation in international top-level research.

- **8) Optimisation of the legal and financial framework conditions for start-ups**

The Austrian Council recommends bureaucratic and regulatory framework conditions for funding start-ups be continuously improved and the financial framework conditions for start-ups in Austria be optimised.⁷⁹ The funding package for start-ups must be better coordinated and access for entrepreneurs must be made easier. Just a few pro-

recommendations

⁷⁵ See Austrian Council (2017): Recommendation for the further development of the technical colleges sector in the Austrian education and science system of 30/5/2017.

⁷⁶ See inter alia, Austrian Council (2017): Recommendation on the way to the forefront of innovation of 30/11/2017.

⁷⁷ Recommendation of the Austrian Council: (i) Recommendation for the further development of the technical colleges sector in the Austrian education and science system of 30/5/2017 (ii) Recommendation for policy prioritisation for the tertiary education sector, especially the universities of 14/9/2017. (iii) Recommendation on the path to becoming an innovation leader of 30/11/2017.

⁷⁸ Androsch, H. / Loprieno, A. / Nowotny, H. (2019): Exzellenzinitiative. Eine Zukunftsoffensive für den Forschungsstandort Österreich. Vienna, 11/3/2019.

⁷⁹ See, Council of the European Union (2019): Recommendations for Austria's 2019 national reform programme. Brussels, p. 13.



recommendations

grammes of critical financial spending should be offered. The adjustment of existing measures should take priority here over the creation of new programmes.⁸⁰

To improve the regulatory framework conditions the Austrian Council recommends in a first step for this, the (as a rule) legally mandatory presence of a notary as a formal requirement should be done away with, the inspection obligation of the register court should be limited and a liberalisation of the share classes with limited companies should be introduced. An appropriate tax relief and support with social security funds to reduce labour costs for start-up employees must also be introduced. To also ensure structural effects, this measure should be arranged as a permanent aid in the form of a basic waiver and a reduction in incidental wage costs in the first years after creating a new company.⁸¹

In addition to funding by banks, the Austrian Council also recommends developing further funding options for innovative entrepreneurs and SMEs here.⁸² The Austrian Council welcomes the planned drafting of a national funding creation strategy in this respect. Existing measures to improve the risk capital situation in Austria must be critically scrutinised here.

A suitable framework is required to increase equity capital intensity from the private side,

such as appropriate legislative and taxation framework conditions for private equity (venture capital, business angel investments, crowdfunding, and similar), an improvement in the quality of the Austrian capital market and assessment stipulations of pension and insurance funds, for example, as also proposed by the OECD.⁸³

The Austrian Council finally recommends focusing on alternative innovation concepts, in order to create appropriate framework conditions for the funding and successful development of a recycling economy, more frugal innovation or social entrepreneurship. In addition to the setting up and continuance of appropriate funding programmes, public sector co-investments of private investments must also be named here. The new Public Procurement Law or public benefit regulations of the Federal Tax Code also offer room to manoeuvre for support measures by the public sector in this respect.

● 9) Acceleration of the efforts to participate in projects of common European interest (Important Projects of Common European Interest, IPCEI)

Against the backdrop of geopolitical upheavals and the ongoing digital transformation, the Austrian Council recommends stronger Austrian commitment within the framework of European industrial policy. The European discussion on the importance of strategic value creation chains is extremely

80 See Austrian Council (2016): Report on Austria's Scientific and Technological Capability 2016. Vienna, pp. 32 ff.

81 Austrian Council (2018): Recommendation for the improvement of the framework conditions for starting innovative companies in Austria of 22/3/2018.

82 For this in detail, see Austrian Council (2014): Recommendation on the amendment to the Alternative Investment Fund Manager Act (AIFMG) of 6/3/2014; idem (2012): Recommendation to optimize RTI-related start-ups of 19/11/2012.

83 OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris, p. 26 and pp. 91 ff. See also Peneder, M. (2013): Von den "trockenen Tälern" der Risiko- und Wachstumsfinanzierung (The "dry valleys" of venture and growth funding). In: WIFO-Monatsberichte, 86 (8); pp. 637-648.

relevant for Austria. To increase research and innovation activities in this respect the Austrian Council therefore recommends an acceleration of the key technologies (Key Enabling Technologies, KETs) defined in the EU Commission in close coordination with other policy areas as key parts of the strategic value creation chains for Europe and a basic participation in projects that are of common European interest (Important Projects of Common European Interest, IPCEI). The Austrian Council believes Austria's cooperation in IPCEI in the KETs area is a location and technology policy necessity.⁸⁴

- **10) Increased efficiency and effectiveness of research funding**

The increase in the efficiency of research funding should be afforded greater attention in the future than it has been to date. This will require the consistent removal of obvious efficiency barriers, such as overlapping multiple structures, over-regulation, fragmentations, unclear responsibilities and a complex, non-harmonised body of rules for individual mechanisms. Necessary reforms should be worked out with the inclusion of relevant stakeholders, such as research institutions, industry and essential users. The simplification of funding structures and processes must be targeted here, and legal certainty must above all be guaranteed. The holistic consideration in the interests of multi-level control will raise the potential of all mechanisms and

ensure a more efficient interaction of EU level, national programmes and regional funding. A further concentration of research-specific spending on fewer organisational units is also required, as is a reduction in the number of funding programmes. The practice of updating once established mechanisms without limit should be consistently scrutinised. Under-funded and impact-weak programmes must be bundled. A further reduction in the number of funding agencies should be reflected at state level in particular, but at federal level as well.⁸⁵

The Austrian Council also recently recommended the setting up of an all-Austria research funding database, which would enable access to and scientific use of the available data of the ministries and funding agencies, with all confidentiality obligations complied with.⁸⁶ The inter-ministerially worked out implementation concept must be further specified here and the swift implementation of the research funding database must also be introduced.

- **11) Leverage the value of science and research among the general public**

The Austrian Council reiterates its previous recommendations to accelerate suitable initiatives to leverage the value of science and research among the general public.⁸⁷ Social cohesion is an important requirement here, which must also be reflected in the access to ac-

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⁸⁴ For this in detail, see Austrian Council (2019): Austrian Council recommendation for Austria's efficient integration into the European industrial policy of 22/3/2019.

⁸⁵ See Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation in Österreich. Vienna, pp. 18 ff.

⁸⁶ See Austrian Council (2018): Recommendation to set up a nationwide database to illustrate research inputs and outputs of 22/3/2018.

⁸⁷ See, inter alia, Austrian Council (2016): Report on Austria's Scientific and Technological Capability 2016. Vienna, pp. 45 f.

recommendations

ademic education opportunities. The currently dominant education inheritance as a gauge for existing deficits with discrimination-free access to knowledge and third level education must be countered with appropriate dialogue with all and a more robust integration of all social groups. The Austrian Council also recommends checking low-threshold incentives for scientists, with which the dialogue with society is rewarded as part of scientific careers, for example in the form of crediting corresponding ECTS points.

Background

Austria is currently at the beginning of a new legislative period. The starting position for the policy shaping of research, technology and innovation is good. The path to the top, however, requires stronger commitment by the future Austrian Government and a considerable increase in more effective implementation activity. For the forthcoming coalition negotiations the Austrian Council presents a series of recommendations that a future government programme must include to improve the Austrian RTI system's innovation performance.

In line with its statutory mandate, the Austrian Council is currently addressing the challenges of the domestic science, research, technology and innovation landscape. Key tasks here include monitoring the respective developments (international comparison included) and the evaluation of their importance for the domestic RTI system. The results of this monitoring, which the Austrian Council also publishes regularly in its reports on Austria's scientific and technological capability⁸⁸, form the basis for this recommendation.

● Austria in international rankings: Average innovation performance

In most international rankings on innovation performance or scientific and technological capability Austria generally occupies a position in the forward midfield. This shows how the performance of the Austrian RTI system is above the average in the international comparison.⁸⁹ The efforts of recent years to join the innovation leaders and consequently ensure economic development, prosperity, quality of life and environmental protection have therefore triggered a positive dynamic in quite a few areas.

On the other hand it must also be stipulated that this dynamic has not developed sufficiently to equal that of the leading nations. In relation to the comparison countries, Austria therefore continues to only rank in the midfield area.⁹⁰ The top of the field has been occupied for some years now by the leading European innovation nations, Denmark, Germany, Finland, the UK, Luxembourg, the Netherlands, Sweden and especially Switzerland. While these countries hold or extend their top positions, Austria is continuously losing ground.

If we look at Austria's positioning in some of the most relevant international rankings on innovation performance, competitiveness and so on, it becomes evident that domestic performance compared with the respective leading countries has been declining for years now. Even if individual rankings in recent years have seen upward movements again and again. On the whole, the trend is clearly downward (see figure 4).

⁸⁸ See the reports available on the Austrian Council's website: <https://www.rat-fte.at/leistungsberichte.html>

⁸⁹ OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris, p. 3.

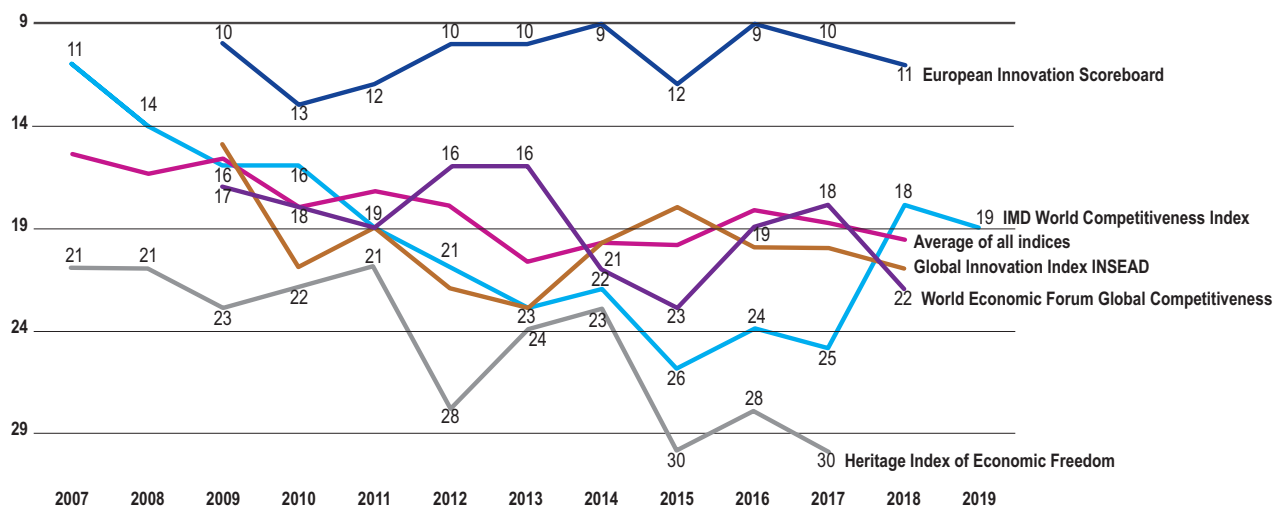
⁹⁰ For this in detail see, Austrian Council (2019): Report on Austria's Scientific and Technological Capability 2019. Vienna, pp. 16 f.

The indices listed in figure 4 are only some prominent examples among many here. Considered across all rankings we can see a trend that on the whole has been stagnating or even declining since 2005. At best Austria is mostly in the midfield, which does not correspond with its top place in the area of per capita GDP or R&D expenditure. These findings are confirmed in the annual Monitoring Report of the Austrian Economic Chamber, which summarizes Austria's

performance in more than 150 international rankings. Across and beyond all analyses and indicators it shows a clearly downward trend in recent years (see figure 5).⁹¹

Regardless of the respective survey methods and indicators used, on the whole these rankings only show, "average, for a high-income country with low rankings"⁹² and deterioration in many aspects. The lead places on the other hand are

Figure 4: Overview of Austria's position in the most important international rankings



Sources: World Economic Forum, Global Competitiveness / IMD World Competitiveness Index / World Bank, Doing Business / Heritage Foundation, Index of Economic Freedom / INSEAD, Global Innovation Index / EU, European Innovation Scoreboard / Fraunhofer ISI & ZEW, Innovation Indicator / as presented by the AC.

⁹¹ WKO (2019): WKO Monitoring Report 2018: Wo steht Österreich? Vienna.

⁹² Tichy, G. (2017): Mangelnde Effizienz als Erfolgsbremse. In: WIFO-Monatsberichte, 2017, 90(9), pp. 677–699, p. 690.

recommendations

mostly occupied by the innovation leaders, which are also chosen as reference countries for its reports. This is all the more remarkable, as in recent years a series of evaluations and analyses of the Austrian RTI system were performed, which explicitly include objectives, options for action and recommendations for measures, which could contribute to a performance improvement, provided implemented consistently. The most prominent example of this is the RTI Strategy.

● RTI Strategy 2020: Innovation leader objective not achieved

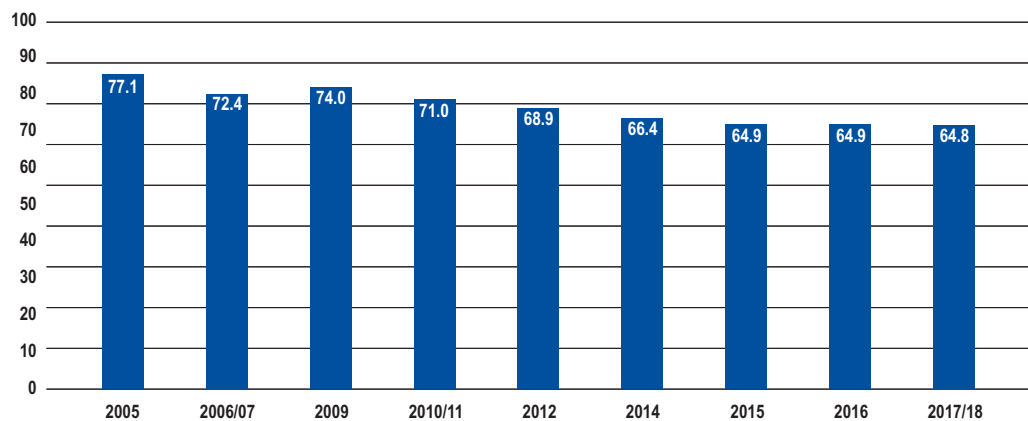
The goal of the Research, Technology and Innovation Strategy (RTI Strategy), worked out

since 2009 and adopted in March 2011, was to make Austria an innovation leader by 2020. The strategy document includes more than seventy-five detailed goals and packages of measures for all areas of the RTI system relevant for the respective goal achievement.

The 2020 time horizon specified therein is now almost upon us. Commissioned by the Cabinet, in recent years the Austrian Council has systematically analysed the advances made with the implementation of the RTI Strategy within the scope of its annual Report on Austria's Scientific and Technological Capability.

Almost ten years after the starting signal to work out the strategy document and parallel

Figure 5: Monitoring Report Index declining development based on 150 international rankings⁹³



Source: WKO (2019): WKO Monitoring Report 2018: Wo steht Österreich (Where is Austria today)? Vienna, p. 1.

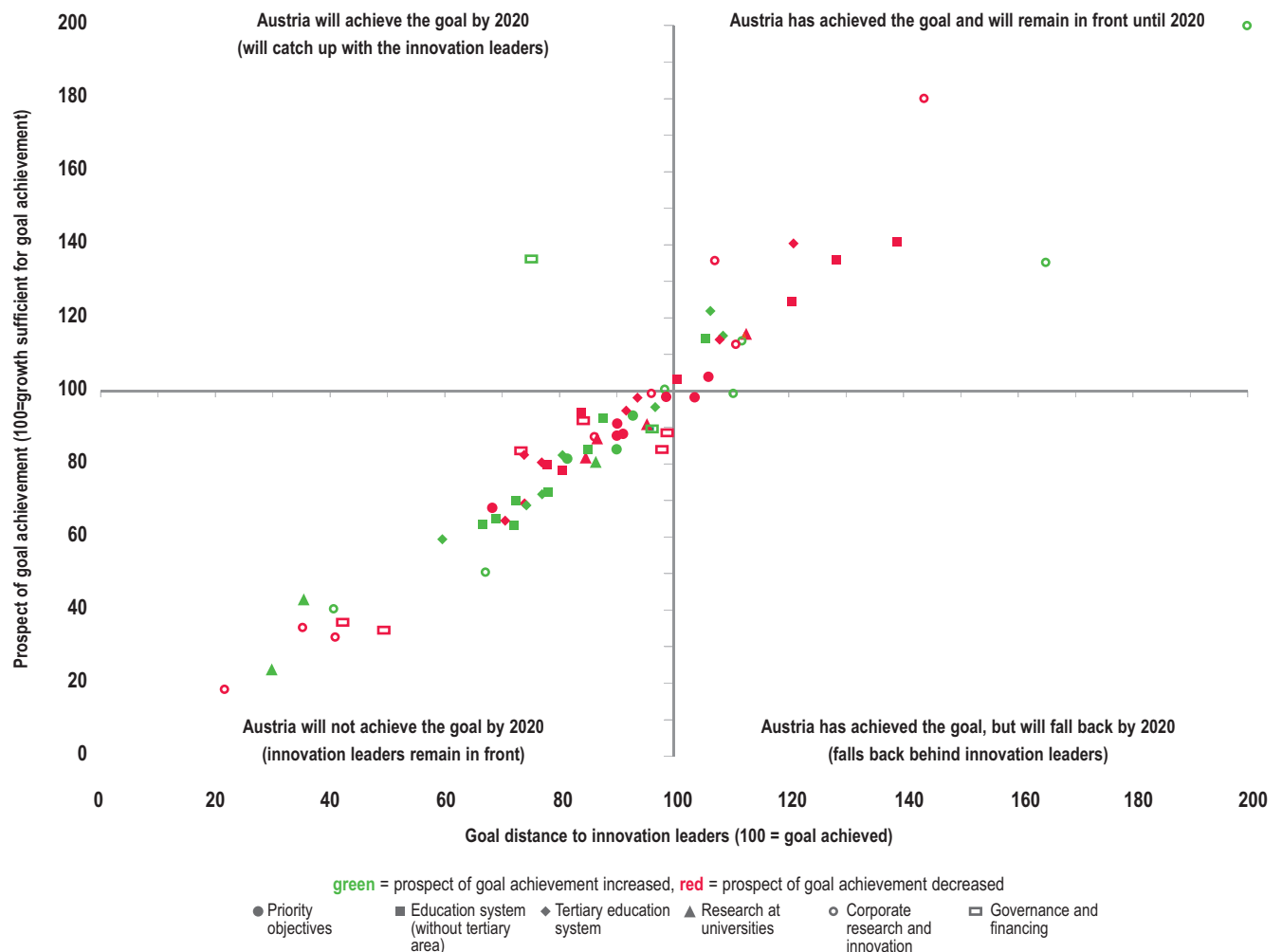
⁹³ The Monitoring Index shows how in 2017/2018, on average Austria was just outside of the top one third of business locations, among the top 35.2 percent to be precise. Overall this means Austria is rated better than 64.8 percent of the locations worldwide, but 35.2 percent are still ahead of Austria. Compared with 2015 and 2016 it has therefore fallen slightly. In 2005 some 77.1 percent of such locations were behind Austria, and only 22.9 percent ahead of it.

with the start of preparing a new RTI Strategy 2030, in its 2019 report on Austria's scientific and technological capability the Austrian Council has submitted an overall evaluation of the implementation status of the cur-

rent RTI Strategy. The objective here was to derive key lessons for the future from experiences to date and also to submit proposals for the new RTI Strategy 2030. The developments from

recommendations

Figure 6: Overview of Austria's performance in all areas of the RTI strategy and in relation to the innovation leaders



Sources: See appendix 1. WIFO graphic. Raw data, see appendix 2. Explanation, see appendix 3.

Note: Goal distance = Austria's actual value compared to the innovation leaders' actual value (average value most recent available year DE, DK, FI, LU, NL, SE, UK);

Prospect of goal achievement = ratio of value projected for Austria in 2020 relative to the national goal or the value projected for the innovation leaders in 2020.

Source: Austrian Council (2019); Report on Austria's Scientific and Technological Capability. Vienna, p. 56.



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2010 to the present day were illustrated here and the degree of goal achievement was conclusively assessed.⁹⁴ On this basis the Austrian Council subsequently worked out improvement proposals for every area of the RTI system and recommended priority areas of action for the future RTI Strategy.

Conclusion of the current report: The performance of the Austrian RTI system compared with the leading innovation nations has not improved sufficiently to join the top group by 2020. Figure 6 provides an overview of Austria's performance in all areas of the RTI Strategy and in relation to the leading nations. It maps all 74 indicators used by the Austrian Council for the objectives of the RTI Strategy in the comparison with the average level of the innovation leaders. The figure illustrates the areas in which the objectives of the RTI Strategy have been achieved and Austria's performance and development dynamic is better than that of the innovation leaders – all indicators in the right top quadrant – and in which it is behind the leading nations without a realistic chance of achieving the level of the leading nations by 2020 – so the development trends remain constant (all indicators in the left bottom quadrant).

It is quite clear that the greater part of the indicators are in the left lower quadrant of figure 6 and therefore below the level of the leading countries. This means that Austria's catch-up dynamic is insufficient on the whole to achieve the objectives of the RTI Strategy and the level of the innovation leaders.

If we consider the performance of the Austri-

an RTI system shown in the graphic compared with the leading countries in detail, we see that on the whole approximately two thirds of the indicators continue to be below the goal area. This overall situation has not changed much since 2009. Those areas prospect of achieving their goals by 2020 – as of now unrealistic – are predominantly the problem areas of the Austrian RTI system. These were already addressed several times by the Austrian Council, from the entire education system to the framework conditions at the universities, right through to innovative start-ups and research funding. On the whole positive trends can only be seen in just under half of the analysed areas.

• Difficulties in implementation activity

This finding is further backed up by another component, because if we take a look at some key RTI policy measures for example, which were most recently anchored in the 2017-2022 government programme and were specified in the Cabinet presentation on 16 August 2018,⁹⁵ the basic dilemma of the Austrian RTI policy of the past decade becomes clear: Despite the strategic objectives and policy announcements, the difficulties in implementation activity already result in adopted measures that do not implement competent concepts for the most diverse reasons. This is illustrated by way of example with three important projects:

• The Austrian Research Funding Act

The Minister of Science Johannes Hahn proposed the introduction of a research funding act as far back as the Alpbach Tech-

⁹⁴ It should be noted that quite a lot of data exhibit a considerable time-lag, and an effective evaluation will therefore only be possible in 2022/23.

⁹⁵ Austrian Government (2018): Future initiative for research, technology and innovation Presentation to the Cabinet on 16 August 2018.

nology Forum in August 2009. This should become the financial backbone of research and “substantiate and specify the then planned Government’s RTI Strategy [...] where it was about financing and securing new mechanisms”⁹⁶. The RTI Strategy adopted in 2011 consequently includes the objective of establishing a research funding act, in which the principles of the Austrian RTI policy would have been defined, output goals anchored and a long-term budgetary planning security would have been guaranteed.⁹⁷ The Austrian Council has since referred several times to the need to pass an appropriate law.⁹⁸

The issue was only addressed again with the 26th legislative period and anchored by the Austrian Government of the day in the 2017-2022 government programme. According to the Council of Ministers decision in August 2018 a draft for an appropriate research funding act was finally worked out. In line with the original plans this was to be presented at the cancelled RTI summit in May 2019, subsequently sent for parliamentary appraisal and adopted by summer 2019. Before the cancelled summit, however, agreement on the budgetary consequences could not be reached with regard to the act’s

content orientation, especially towards a stronger agentification recommended by the Austrian Council or a more efficient controlling of the RTI system via appropriate governance structures⁹⁹.

Conclusion From the first proposal in August 2009 to the anchoring in the RTI Strategy up to the present day more than ten years have now passed without an appropriate research funding act being adopted.

o **Excellence Initiative**

In 2005 the Austrian Council recommended the development of an excellence strategy for Austria in its “2010 Strategy”.¹⁰⁰ As commissioned by the Ministry of Science, the FWF subsequently published a concept paper for an excellence initiative.¹⁰¹ Based on this paper and other inputs the Austrian Council presented its excellence strategy at the beginning of the 2007 Alpbach Technology Forum.¹⁰² The goal here was to raise the quality and attractiveness of RTI location Austria at all levels and in all areas of the RTI system and to consequently improve its international competitiveness. This objective was taken into account in the RTI Strategy: On one hand a general excellence orientation was anchored as one of the six basic

recommendations

96 Hahn, J. (2009): The research funding act will be the financial backbone of research. OTS 0141 of 23/11/2009.

97 Austrian Government (2011): The Path to Becoming an Innovation Leader. Federal Government strategy for research, technology and innovation. Vienna, p. 47.

98 See Austrian Council (2015): Report on Austria’s Scientific and Technological Capability 2015. Vienna, p. 9; idem (2017): Recommendation on the way to the forefront of innovation of 30/11/2017, p. 25.

99 Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation. Vienna, pp. 18 ff.

100 Austrian Council (2005): Strategy 2010 – Outlook for research, technology and innovation in Austria. Vienna, p. 25.

101 FWF (2006): Exzellenzinitiative Wissenschaft: An FWF concept paper commissioned by BM:BWK. Vienna, Nov. 2006.

102 Austrian Council (2007): Exzellenzstrategie. Vienna.

recommendations

principles of the RTI Strategy, on the other hand specific objectives and measures with regard to the, “implementation of an Austrian excellence initiative with up to ten excellence clusters by 2020” were added in the strategy document.¹⁰³ The Austrian Council has since repeatedly referred to the need to strengthen excellence orientation in Austria (with special focus on basic research).¹⁰⁴

Apart from diverse non-binding declarations of intention the aspect of excellence orientation was addressed for the first time within the framework of the 2017-2022 government programme and the specific establishment of an excellence initiative for basic research was anchored accordingly in the coalition agreement.¹⁰⁵ On the basis of the Council of Ministers decision in August 2018 a team of experts was consequently deployed to create a concept to introduce an “excellence initiative for increasing competitively financed basic research”. Framework, goals and scope of this initiative were defined herein, and had already undergone a consultation and received broad support. The presentation of the excellence initiative was then

planned as part of the cancelled RTI summit. Conclusion From the first concept paper in November 2006 to the anchoring in the RTI Strategy adopted in 2011 and in the 2017-2022 government programme, thirteen years will soon have passed, without an excellence initiative having been initiated.

o Research funding database

In 2005 the Court of Auditors referred for the first time to the need to guarantee a better overview of the data available at federal level in the context of research funding.¹⁰⁶ This should be extended by the access to individual case-related anonymized microdata so an evidence-based policy consultation and a well-founded scientific analysis could be used as an effective policy control mechanism. This was also referred to in the CREST Report of 2008 and in the 2009 system evaluation.¹⁰⁷ And the RTI Strategy itself also includes a reference to the required development in this respect of legal framework conditions for using statistical databases.¹⁰⁸ The Austrian Council has since referred several times to the need to create the required legal bases and set up an appropriate database.¹⁰⁹

103 Austrian Government (2011): The Path to Becoming an Innovation Leader. Federal Government strategy for research, technology and innovation. Vienna, p. 21.

104 See, inter alia, Austrian Council (2017): Recommendation on the way to the forefront of innovation of 30/11/2017, pp. 24 f.; idem (2018): Recommendation for an excellence programme to promote science as key for more cooperation and competition in basic and top-quality research of 22/3/2018.

105 Austrian Government (2017): Zusammen. Für unser Österreich. Regierungsprogramm 2017–2022. Vienna, p. 77.

106 Rechnungshof (2005): Reihe Bund 2005/9, p. 34.

107 Guy, K. / Lambert, R. / Masson, A. / Mogenson, J. / Sandberg, O. / van der Zwan, A. / Jahn, S. (2008): Policy Mix Peer Reviews, Country Report: AUSTRIA, A Report of the CREST Policy Mix Expert Group (Fourth Cycle of the Open Method of Coordination in favour of the 3 % Objective); WIFO et al. (2009): System evaluation of Austrian research funding and financing. Synthesis Report. Vienna.

108 Austrian Government (2011): The Path to Becoming an Innovation Leader. Federal Government strategy for research, technology and innovation. Vienna, p. 23.

109 See Austrian Council (2011): Recommendation on setting up an all-Austria public sector research funding database of 24/11/2011; idem (2017): Recommendation on the way to the forefront of innovation of 30/11/2017, p. 24.

As part of its examination of research funding in Austria, in 2016 the Court of Auditors then repeatedly referred to the intransparency of the financing flows in the RTI system and the setting up of a standardised database to ensure recording of research funding across Austria.¹¹⁰ At the Federal Ministry of Education, Science and Research and the Federal Ministry of Traffic, Innovation and Technology's request the Austrian Council performed an extensive feasibility study¹¹¹, on the basis of which the setting up of a research funding database for Austria was recommended.¹¹² This recommendation was also included in the coalition agreement of the Austrian Government at the time.¹¹³ In autumn 2018 a work group was set up with the task of developing an implementation concept for setting up an Austria-wide research funding database. It was supposed to be presented at the cancelled RTI summit.

Conclusion Almost fifteen years have now passed from the first proposal in 2005 to the system evaluation recommendations,

CREST Report and Austrian Council report, through to anchoring in the government programme, without a research funding database having been set up.

Summary evaluation

From these examples, but even more so from the Austrian Council's systematically detailed analyses, it is clear that there is a requirement to improve in Austria with the implementation intensity of RTI policy measures. The performance of the Austrian RTI system could then be increased significantly. Although it has already been increased over the past decade, this increase remained on one hand clearly below the existing potential, and on the other hand, on the whole it was insufficient to substantially move the performance level towards the innovation leaders. Despite above-average R&D investments and successful developments in some areas, Austria's goal distance to the leading nations measured on the basis of the Austrian Council's set of indicators¹¹⁴ could not be reduced across the board. These findings essen-

recommendations

¹¹⁰ Rechnungshof (2016): Forschungsfinanzierung in Österreich. Reihe Bund 2016/4.

¹¹¹ Rütter Sococo, Senarclens, Leu & Partner und Quantum Analytics (2017): Feasibility study on setting up a nationwide research funding database. Study commissioned by the Austrian Council. Zurich.

¹¹² Austrian Council (2018): Recommendation to set up a nationwide database to illustrate research inputs and outputs of 22/3/2018.

¹¹³ Austrian Government (2017): Zusammen. Für unser Österreich. Regierungsprogramm 2017–2022. Vienna, p. 79.

¹¹⁴ The Austrian Council has developed an extensive set of indicators to map Austria's performance in the international comparison and the progress in achieving the goals of the RTI Strategy. This was discussed with experts and the ministries entrusted with implementing the RTI Strategy. It includes 74 indicators, which map the respective objectives of the individual chapters of the RTI Strategy and allows them to be operationalised. The indicators are based on internationally used classifications of the OECD, Eurostat etc. and corresponding databases. These are accessible to the public and are regularly surveyed nationally and internationally. A precise explanation of the indicators including the objectives they try to map and the calculation methods are provided in the annex of the individual reports on Austria's scientific and technological capability.



recommendations

tially also apply with the results of the EIS, which the overarching objective of the RTI Strategy¹¹⁵ (to move into the group of leading innovation nations) strives to achieve. Austria's distance to the group of innovation leaders since 2010 has remained unchanged in the EIS as well.

In summary, the Austrian Council's analyses therefore conclude that Austria will neither join the group of innovation leaders nor achieve the goals rooted in the RTI Strategy by 2020. Primarily responsible for this are the problem areas and efficiency barriers identified in the analyses, partially unchanged for some years, as well as serious imbalances in the distribution of funds.¹¹⁶ The Austrian Council believes these impede any further increase in the performance of the Austrian RTI system. Because if we compare the relatively high financial inputs with the only moderate outputs and outcomes generated from them, we see that the Austrian RTI system's performance does not correspond with the

existing potential. Obviously there has only been an insufficient conversion in Austria of the high input into corresponding scientific and technological output or into marketable innovations and business success resulting from them. The Austrian Council's long years of analyses reveal that this discrepancy results from a series of efficiency barriers, which block the domestic RTI system's performance. It is consequently not been possible to convert the above-average high R&D investments into performance that corresponds with Austria's advanced scientific and technological level of development.

The Austrian Council believes the future Austrian Government must therefore, while considering the optimization proposals¹¹⁷ quoted in the OECD's Review of Innovation Policy, also address the key challenges of the RTI system tropicalized repeatedly by the Austrian Council, from education to the universities and innovative start-ups, right through to research funding and R&D financing.

115 Austrian Government (2011): *Auf dem Weg zum Innovation Leader – Strategie für Forschung, Technologie und Innovation*. Vienna, p. 4. The Austrian Council has repeatedly criticised the fact that the EIS at least partially gives a distorted view of Austria's innovation performance. In its reports on Austria's scientific and technological capability, the Austrian Council therefore assesses innovation performance on the basis of a wider and more appropriate set of indicators. However, due to the importance of the EIS for the RTI Strategy and evaluating the achievement of the overriding goal of "Innovation Leader", the positioning in the EIS remains the frame of reference. See, inter alia, the statements in: Austrian Council for Research and Technology Development (2014): *Report on Austria's Scientific and Technological Capability 2014*. Vienna, pp. 15 ff.

116 For details see inter alia, Austrian Council (2018): *Report on Austria's Scientific and Technological Capability 2018*. Vienna.

117 See OECD (2018): *OECD Reviews of Innovation Policy: Austria 2018*. OECD Publishing, Paris.

Austrian Council recommendation for the mobilisation of venture capital to secure sustainable innovation and growth financing –

Recommendation of 16 October 2019

recommendations

Recommendations

If innovations are to be effectively driven forward, a continuously financed innovation chain from idea finding through to the widespread roll-out of the innovation will also be essential. To establish appropriate financing systems in the innovation and growth phases, the Austrian Council recommends the Austrian Government create founder-friendly, legally certain and competitive framework conditions based on a study commissioned by the Austrian Council¹¹⁸, to sustainably establish continuous financing of the innovation chain in Austria.

R&D expenditure achieves an all the more higher impact when the investments initiated with it are multiplied with active venture capital in the value creation chain. In view of its importance for innovation-driven growth, the Austrian Council recommends the Austrian Government afford an active, self-supporting venture capital sector the highest possible priority, and proposes the following measures portfolio in this respect¹¹⁹:

- **Removal of the equity capital taxation discrimination vis-à-vis loan capital.** To successfully push-start venture capital financing in Austria, taxation obstacles and the discrimination vis-à-vis loan capital must be removed. This includes the termination of taxing fictitious profits, measures to improve loss compensation and loss carried forward and deductibility of a normal return on equity. A

participation deductibility for individual investors could also be considered.

- **Competition neutrality:** Public funding institutions can “refinance” at the very best conditions and without risk with a public sector provided budget. To maintain competition neutrality and prevent a suppression of private initiatives, access to refinancing with private providers (privately organised umbrella funds, for example) must therefore be guaranteed just as it is in the public area.
- **Capital market law:** Internationally competitive framework conditions for affiliated companies must be created in Austria to ensure an active sector for venture capital financing. Austria also requires an entirely new legal form for innovative companies and start-ups. To accommodate the characteristics of these young entrepreneurs, both the start-up process and the legal framework conditions must be modernised.
- **Insolvency law:** An examination of insolvency legislation is indispensable, as the danger of failure is greater with innovative start-ups than in any other area. Insolvency law must therefore find a balance between creditor protection and providing a second chance for a restart. Based on the European Parliament’s recommendation for an efficient restructuring of the respective insolvency legislation¹²⁰, an appropriate national guideline with a bundle

118 Keuschnigg and Sardadvar (2019), commissioned by the Austrian Council: Ergebnisse aus der Wagniskapitalstudie zur Finanzierung von Innovation und Wachstum, https://www.rat-fte.at/files/rat-fte-pdf/fti-dokumente/RFTE_Wagniskapitalfinanzierung_20190604.pdf

119 Ibid.

120 European Parliament: Increase in the efficiency of restructuring, insolvency and debt clearance procedures, P8_TA-PROV(2019)0321, http://www.europarl.europa.eu/doceo/document/TA-8-2019-0321_DE.pdf

recommendations

of measures for establishing a preventative restructuring framework was already proposed.¹²¹ Only an appropriately arranged capital market law promotes the readiness of external capital market investors to finance risky innovations.

- **Austrian umbrella fund:** There is still no umbrella fund focused on equity capital in Austria.¹²² A partial-guarantee by the government could mobilise institutional investors and reduce the umbrella fund's refinancing costs. Pension funds and other institutional investors should, similar to that in the Scandinavian EU member states (Finland, Sweden, for example), also be integrated as capital providers and innovation development drivers. This would substantially increase the potential volume for affiliated companies, and removal of the obstacle of capital market volume that is too low for refinancing venture capital companies would be guaranteed.
- **Liquid stock exchange and institutional investment capital:** The creation of a liquid stock exchange would make the flotation of successful start-ups and therefore profitable exit for the venture capital investor easier.

Favouring foreign stock exchanges (Frankfurt, for example) would also be prevented and companies' location commitment would consequently be strengthened.

Background

Complete corporate financing over all development phases of a company must be possible to create optimum financing conditions, to then sustainably boost investments, corporate financing and the capital market in Austria.¹²³ While in the Austrian start-up scene more recently a significant upturn in the smart capital offering by business angels can be seen, the mobilisation of venture capital is still not meeting expectations.¹²⁴ Funding tends to be in the early start-up phase (seed and pre-seed phase), and especially in the high-tech start-up area (aws seed financing, for example¹²⁵). The financing for social impact innovations is far more difficult. With the revised framework for Basel III¹²⁶ banks have also further increased the obstacles for entrepreneurs to seek a credit. Added to this is the fact that these companies can still barely save funds from their own cash flow and therefore have little or no collateralizable financial assets.¹²⁷ The

121 Mohr, Franz (Hon.-Prof. Dr.): Die Richtlinie über Restrukturierung und Insolvenz, ZIK 2019/115, Heft 3/2019, https://lesen.lexisnexis.at/_/die-richtlinie-ueber-restrukturierung-und-insolvenz-ein-kurzer-g/artikel/zik/2019/3/ZIK_2019_03_115.html

122 Keuschnigg and Sardadvar (2019), commissioned by the Austrian Council: Ergebnisse aus der Wagniskapitalstudie zur Finanzierung von Innovation und Wachstum, https://www.rat-fte.at/files/rat-fte-pdf/fti-dokumente/RFTE_Wagniskapitalfinanzierung_20190604.pdf

123 Vision 2025 for location Austria, https://www.trendingtopics.at/wp-content/uploads/2019/09/Vision2025-AS_AAIA_AVCO.pdf

124 Austrian Startup Monitor 2018, http://austrianstartupmonitor.at/wp-content/uploads/2018/10/Austrian-StartUpMonitor2018_12MB.pdf

125 aws Seedfinancing, <https://www.aws.at/foerderungen/seedfinancing/>

126 Basel Committee on Banking Supervision, Basel III: Finalising post-crisis-reforms, <https://www.bis.org/bcbs/publ/d424.htm>, December 2017, also known as "Basel IV".

127 Recommendation for the improvement of the framework conditions for starting innovative companies in Austria, meeting of 22/2/2018.

requirement for venture capital financing then increases when the financing requirement grows sharply, the start-up capital is largely exhausted, self-financing capability is still very limited and public sector funds (such as aws or FFG) run out or do not grow along with funding requirements.¹²⁸ Alternative financing forms to guarantee a continuous innovation chain are therefore required in the growth and expansion phase in particular.

Innovative start-ups and rapidly growing companies above all suffer in these phases with an insufficient access to external risk capital and are met with a major challenge with acquisition.¹²⁹ This fact is also reflected in Austria's ranking in the Global Competitiveness Report. Austria is ranked 64th here in the market capitalisation sub-ranking and 44th from 190 countries with the availability of venture capital.¹³⁰ The overall volume of all venture capital financing in Austria in 2018 was EUR 95 million. Compared with this, venture capital financing in the neighbouring countries Switzerland and Germany is EUR 901 million and EUR 3.43 billion respectively.¹³¹ Although with existing funding programmes in the European comparison Austria occupies a top position, as it did in previous years, there is still a high catch-up requirement with follow-up financing in the expansion and growth phase.¹³²

The percentage of risk capital investors in Austria is traditionally low and stagnates with six percent in 2018 at a weak level.¹³³ This situation is due, among other things, to the fact that the existing company law is only moderately attractive for foreign investors. Plus, as before (i) a liberalisation of the industrial code, (ii) the reintroduction of the reformed GmbH-Light, (iii) the development of a new form of "small plc" with reduced obligations up to certain sales milestones in line with proven international role models, (iv) a simplification and legal clarity for start-ups and SMEs for the use of employee participation models, and (v) simplifying legal framework conditions for the use of foreign specialist staff in companies (keyword "Rot-Weiß-Rot-Karte" – the Austrian green card), are still overdue. Rapidly growing companies in particular can exploit their profitable innovation options quicker and better with venture capital financing. However it is also true here that, not only must open funding gaps still be closed as before, but the quality of the investment is also crucial. Unlike other forms of external corporate financing, in addition to the capital, risk capital investors also contribute their knowledge, experience and networks to the cooperation. This then also increases the productive potential of the holding, so companies are more likely to see

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128 Michael Peneder: The impact of venture capital on innovation behaviour and firm growth, *Venture Capital*, Vol. 12, 2010, <https://www.tandfonline.com/doi/abs/10.1080/13691061003643250>

129 Austrian Startup Monitor 2018, http://austrianstartupmonitor.at/wp-content/uploads/2018/10/Austrian-StartUpMonitor2018_12MB.pdf.

130 World Economic Forum, Global Competitiveness Report 2018, <http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf>

131 Pitch Book, European Venture Report 2018, <https://pitchbook.com/news/reports/2018-annual-european-venture-report>

132 Global Entrepreneurship Monitor 2018, FH Joanneum, https://www.rat-fte.at/files/rat-fte-pdf/publikationen/2019/GEM-Austria_2018_web.pdf

133 Ibid.

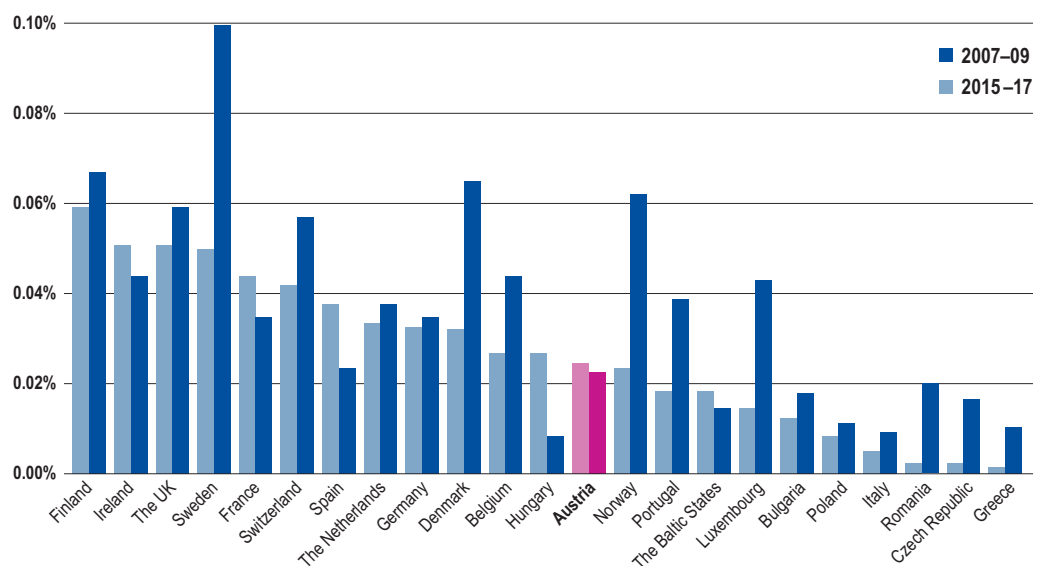
recommendations

their investments succeed and consequently achieve added value appreciation from the innovation funding.¹³⁴ This makes it more likely that innovative ideas will produce marketable products and services, which can later be successful on the market.

This management support provided by venture capital funds is a key component of this financing form's philosophy.

The future "Horizon Europe" EU research programme is also upgraded with an innovation in the form of the "European Innovation

Figure 7: Venture capital investments in percentage of GDP



Source: Based on INVEST Europe 2017¹³⁵, as calculated and presented (Keuschnigg and Sardadvar, 2019)¹³⁶.

¹³⁴ Keuschnigg and Sardadvar (2019), commissioned by the Austrian Council: Ergebnisse aus der Wagniskapitalstudie zur Finanzierung von Innovation und Wachstum, https://www.rat-fte.at/files/rat-fte-pdf/fti-dokumente/RFTE_Wagniskapitalfinanzierung_20190604.pdf

¹³⁵ European Private Equity Activity, Statistics on Fundraising, Investments & Divestments, <https://www.investeurope.eu/media/711867/invest-europe-2017-european-private-equity-activity.pdf>

¹³⁶ Keuschnigg and Sardadvar (2019), commissioned by the Austrian Council: Ergebnisse aus der Wagniskapitalstudie zur Finanzierung von Innovation und Wachstum, https://www.rat-fte.at/files/rat-fte-pdf/fti-dokumente/RFTE_Wagniskapitalfinanzierung_20190604.pdf

Council¹³⁷ (EIC)". For the first time the EU appears as a risk capital investor to participate directly in innovative companies ("blended financing"). The programme began this year with a pilot phase. With the EIC more venture capital will flow to Europe in order to finance disruptive, revolutionary and market-creating innovations.¹³⁸ These investments will act as catalysts for the market's investments and therefore other investors.¹³⁹

The EU Commission includes Denmark among the innovation leaders, even though in 2017 Denmark was only still just ahead of Austria with regard to the GDP share of venture capital financing (see figure 7). This suggests that the quality in particular and less so the quantity of financing is crucial for innovation growth. For this reason, in addition to venture capital procurement and selection of the companies, close support and counselling by the venture capital investor is also required. Along with this specific funding system, Denmark also successfully uses umbrella funds to stimulate private venture capital financing. According to the Danish strategy the umbrella fund invests in private specialised affiliated companies, which then invest the capital received on their side following careful selection in a number of portfolio companies. The Danish umbrella fund model unites direct holding companies, indirect holdings and syndicated loans under one roof, as a central entity.

The aws Venture-Capital-Initiative¹⁴⁰ can certainly be compared with the fund investments ac-

cording to the Danish model, however it is significantly lower in overall revenue and financing volume (EUR 10 million in 2019). Switzerland provides an effective example in this context. The pension funds here administer assets amounting to 120 percent of GDP and consequently make a substantial contribution to the liquidity of the capital market and the stock exchange. Even if, over the course of diversification, the pension funds and insurance companies were only to finance a small percentage of their fixed assets in venture capital, there would still be considerable volume for holding companies.

From an economic point of view venture capital investors appear where banks' business models reach their limits. This is because this model plans for credit financing and not equity financing with the provision of risk capital. Venture capital therefore closes the financing gaps to traditional financing mechanisms. The absence of a high-performance market for venture capital is therefore a serious structural problem. Without setting up a self-supporting venture capital sector, in the future Austria will continue to be a stagnating start-up ecosystem instead of an innovative one. The objective of a location policy for Austria must therefore be to attract venture capital investors (fund companies, for example) with attractive framework conditions and to finance SMEs and companies in the early phase. This is the only way to prevent key workers and innovative companies from emigrating.

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137 Enhanced European Innovation Council (EIC) pilot, <https://ec.europa.eu/research/eic/index.cfm>

138 Hermann Hauser, Austrian Council Member, Member of the EIC Pilot Advisory Board and Vice Chair of the High Level Group of Innovators, https://science.apa.at/site/kultur_und_gesellschaft/detail?key=SCI_20190823_SCI45051703650159218

139 Ibid.

140 aws Venture-Capital-Initiative, <https://www.aws.at/foerderungen/aws-venture-capital-initiative/>

Recommendation for increasing the protection and exploitation of intellectual property rights – Recommendation of 16 October 2019

Recommendation

Due to the respective geopolitical upheavals, the trade conflicts they entail and the resulting rise in problems with the protection of intellectual property rights, a new strategic procedure will in particular be required for the USA and China. To be able to continue operating successfully on the global market in the future, this not only requires national strategic approaches to build up competences and strengthen protection rights, but rather also and in particular, coordinated and joint action by the EU to guarantee legal certainty for European companies in direct exchanges with the USA and China.

The Austrian Council therefore recommends that the Austrian Government actively support the EU Commission's objectives and plans to protect and accelerate the enforcement of intellectual property rights (IPR). Furthermore the Austrian Council believes that with the integration of the relevant stakeholders and players of the domestic innovation system an Austrian position must be established, which would be introduced within the scope of the planned communication channels in political debates and the EU's opinion formation processes. Special attention must be afforded here to a concerted European industrial policy¹⁴¹, in order in this respect to also expand existing initiatives for better information for European companies on patent protection in global competition and to introduce all possible measures to improve the enforcement of property rights.

The Austrian Council also recommends measures be implemented at national and European

level to reduce the drain of patents from Austria and the EU and their economic exploitation in other countries. Although in a globalized market there are perfectly good reasons for the sale or licensing of rights of use, it would nevertheless appear that in Europe the use of patent rights and their economic exploitation have other causes – especially the economic structures that tend to be exploitation-weak in international comparisons. The goal must therefore be to counter the dominant trend towards innovation loss in the European Union and the individual member states – and especially in Austria. This is therefore extremely relevant in specifically addressing the “European paradox”. Appropriate measures at national and European level must be introduced to accelerate the framework conditions for a more efficient implementation of research results in marketable products and a strategic IPR exploitation.

The Austrian Council also recommends the Austrian Government intensify its efforts for the further development of the European Single Market to adjust and make various, innovation-obstructive regulations in the member states innovation-friendly, so European tech start-ups and knowledge-intensive companies can develop faster and be more successful in international competition. In this context further work towards removing the existing fragmentations, redundancies and overlaps between the national and European research and innovation funding programmes is required, to subsequently also increase their efficiency and accuracy.

¹⁴¹ See inter alia, Austrian Council (2019): Recommendations for Austria's efficient integration into the European industrial policy of 22/3/2019.

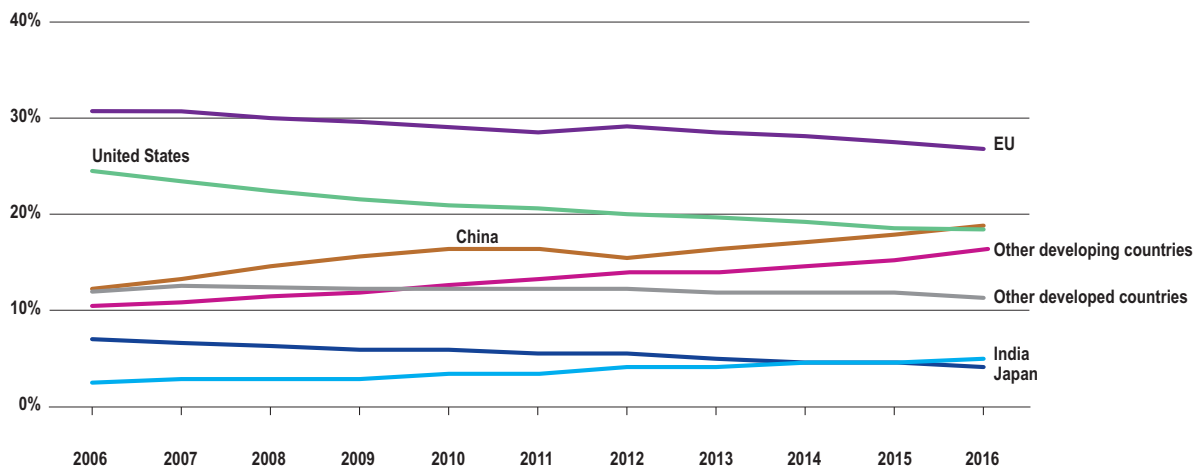
Background

Austria is a successful export nation. According to the Economic Chamber, Austria generates sixty percent of its turnover abroad. After Germany, the USA are Austria's second most important export market; growth market China is already at tenth place.¹⁴² Austrian companies operate very profitably both on the European Single Market and on the global market. The protection of intellectual property rights is of key importance to also secure the successful further development of this performance in the future. Due to increasingly protectionist economic policies and the erosion of the protection of intellectual property rights on the global market and in some of Austria's most important export markets that they entail, the body politic is called

upon to take all steps existing within the framework of national possibilities (outlined in this recommendation) and furthermore to also support the European Commission with its efforts in this respect. With the current isolationist course of the United States and their increasing economic protectionism, Europe must reposition itself to ensure compliance with all international agreements under the auspices of the World Trade Organisation (WTO).¹⁴³ As a former ally in guaranteeing a regulation-based globalized market, the EU must clearly show the USA the limits of its unilateral-oriented economic actions, which increasingly cause problems with the protection of intellectual property rights.

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Figure 8: Global percentage of scientific publications according to region



Source: National Science Foundation (2019): Science & Engineering Indicators 2018. Alexandria, VA, chapter 5, p. 110.

¹⁴² WKO (2019): Wirtschaftsgrafik 2018. A statistical review. Vienna, p. 6.

¹⁴³ See, for example, the objections to the tariffs on aluminium and steel imposed by the USA raised at the WTO by the EU with another six members. WTO (21 11 2018) Panels established to review US steel and aluminium tariffs, countermeasures on US imports. Press release of WTO Secretariat's Information and External Relations Division, Geneva.

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The number of patent trolls in the USA, who inappropriately use the patent rights of European companies, is a serious cause of concern for the EU Commission.¹⁴⁴

Europe must, however, also re-encounter China, because even if Beijing also officially announces that it supports the EU as a defender of a regulations-based global economy, according to the European Commission there is ample evidence to show that, in spite of the corresponding agreements under the auspices of the WTO, there are still massive gaps with the protection and enforcement of intellectual property rights.¹⁴⁵ This, of course, is a situation that has resulted in a European Union complaint to the WTO with regard to China's non-compliance with the protection of intellectual property rights.¹⁴⁶

The European paradox

International statistics and analyses confirm Europe's above-average scientific performance.¹⁴⁷ Globally Europe has the highest possible scientific output across and beyond all disciplines (see figure 8). Even with the quality of scientific

publications, measured on the frequency of citations, the EU scores exceptionally well on the whole. Although the USA continues to be relatively stable in its leadership in this respect, the EU is only just behind them both with the percentage of the most-cited publications and with the percentage of average citations of scientific publications.¹⁴⁸

Despite these excellent KPIs with scientific output and despite outstanding universities, research infrastructures and scientists, Europe can nevertheless only insufficiently turn these top results from research into marketable innovations.¹⁴⁹

This aptly named "European paradox"¹⁵⁰ is also expressed by the fact that more than a third of the twenty companies with the highest R&D expenditure around the globe come from Europe, while there are no European companies among the ten most innovative in the world.¹⁵¹ The conversion of research results into economic success appears to only function insufficiently in Europe.

There are several reasons for this: Firstly Europe was not in a position to fully exhaust the

¹⁴⁴ See EU Commission (2018): Report on the protection and enforcement of intellectual property rights in third countries. Brussels, p. 37.

¹⁴⁵ See EU Commission (2018): Report on the protection and enforcement of intellectual property rights in third countries. Brussels, pp. 7 ff., and European Union Intellectual Property Office (2019): Status Report on IPR Infringement. Alicante, pp. 17 ff.

¹⁴⁶ See, for example, WTO (66 2018): European Union files WTO complaint against China's protection of intellectual property rights. Press Release of WTO Secretariat's Information and External Relations Division, Geneva.

¹⁴⁷ See, for example, Nowotny, H. / Hauser, H. (2018): Europa ist wieder da: Die Zukunft von Forschung und Innovation in Europa. In: Austrian Council (ed.): Re:thinking Europe. Positionen zur Gestaltung einer Idee (Points on shaping an idea). Holzhausen, Vienna, pp. 196-211. For statistic details in this respect see Eurostat (2019): The EU in the world. 2018 edition. Luxembourg, pp. 112 ff.

¹⁴⁸ National Science Foundation (2019): Science & Engineering Indicators 2018. Alexandria, VA, chapter 5, S. 139 ff.

¹⁴⁹ Argyropoulou, M. / Soderquist, K. E. / Ioannou, G. (2019): Getting out of the European Paradox trap: Making European research agile and challenge driven. In: European Management Journal, Vol. 37, Issue 1, February 2019, pp. 1-5.

¹⁵⁰ European Commission (1995): Green Paper on Innovation. December 1995, p. 5.

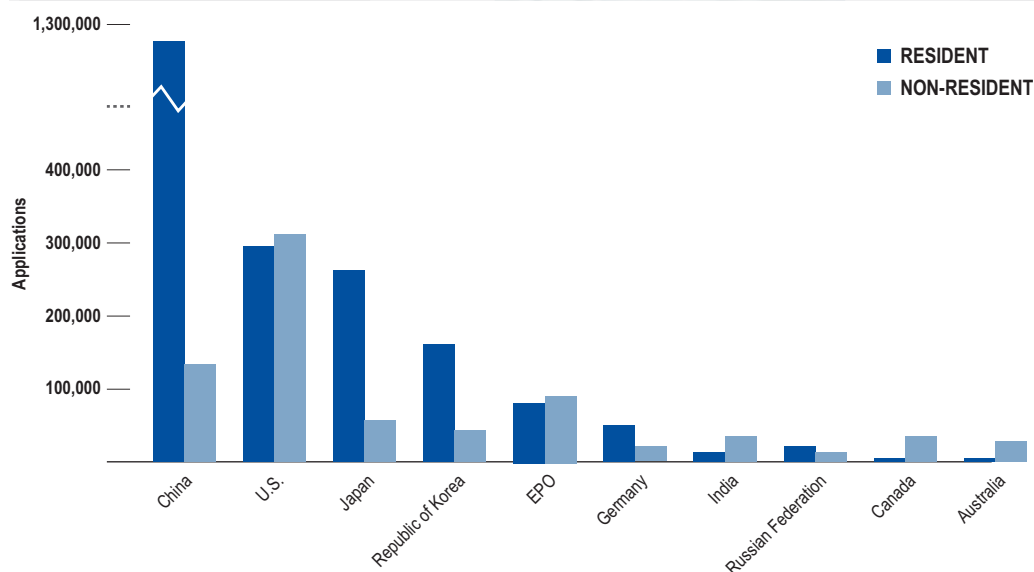
¹⁵¹ For this see, for example, The Economist (2019): Competing in technology: America still leads in technology, but China is catching up fast (special report as of 16 5 2019), and <http://innomine.com/blog/extended-european-paradox>

latest technological revolutions connected with digitisation. According to the EU Commission's Digital Economy and Society Index (DESI), less than one fifth of European companies utilise the benefits of digital technologies.¹⁵² European SMEs in particular have considerable potential, which has not been utilised to date.¹⁵³ According to the OECD, most recently only five economies – China, Taiwan, Japan, Korea and the United States – were responsible for the development of 70 to 100 percent of the 25 leading digital top technologies.¹⁵⁴

Secondly, innovation and its spread in the EU's member states are also confronted with the most diverse barriers: Over-regulation, insufficient investments, small domestic markets, low risk readiness or fragmented thinking are just a few prominent examples.¹⁵⁵ An innovation-friendly corporate environment is also still lacking in Europe, that is to say new companies to the market have fewer options compared with established ones that have already been on the market for some years.

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Figure 9: Patent applications with the top 10 patent offices around the world in 2017



Source: WIPO (2018): World Intellectual Property Indicators 2018. Geneva, p. 25.

¹⁵² European Commission (2019): The Digital Economy and Society Index 2019. Integration of Digital Technology, p. 5.

¹⁵³ Ibid, p. 8.

¹⁵⁴ OECD (2019): Measuring the Digital Transformation. OECD Publishing, Paris.

¹⁵⁵ Füller, J. (2018): Um Ideen besser: Innovation und Entrepreneurship in Europa. In: Austrian Council (ed.): Re:thinking Europe. Positionen zur Gestaltung einer Idee (Points on shaping an idea). Holzhausen, Vienna, pp. 252-260.

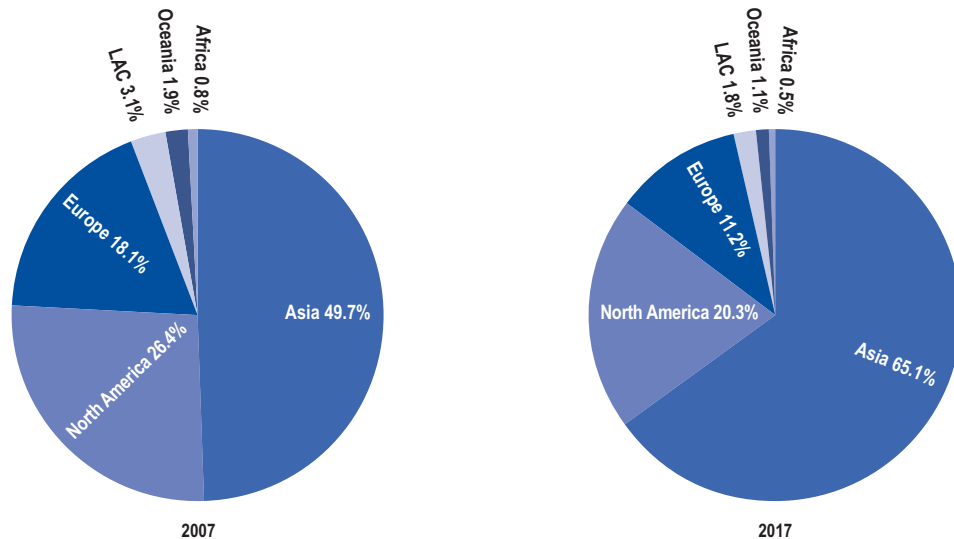
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Thirdly, there is a high level of fragmentation, redundancies and overlaps between the research and innovation funding programmes of the EU and the individual member states. The segmentation of the European Single Market and various regulations in the member states in particular prevent companies from developing to their full extent, being successful in international competition and therefore being able to assume a global leading role.¹⁵⁶ Ultimately this all results in a lower number of patent applications in the international com-

parison. According to the World Intellectual Property Organisation (WIPO) Europe ranks significantly behind the leading countries at number five; individual EU member states, with the exception of Germany, do not cross the perception threshold internationally in their own right (see figure 9). With 1.38 million submissions China leads the international patent statistics and is even twice as far ahead as the second-placed USA. China is therefore now responsible for approximately 40 percent of global patent applications.¹⁵⁷

Figure 10 shows how global patent activities

Figure 10: Patent applications according to region



Source: WIPO (2018): World Intellectual Property Indicators 2018. Geneva, p. 26.

¹⁵⁶ Moedas, C. (2018): Das Europa von morgen. Eine Vision für 2050. In: Austrian Council (ed.): Rethinking Europe. Positionen zur Gestaltung einer Idee (Points on shaping an idea). Holzhausen, Vienna, pp. 340-344.

¹⁵⁷ WIPO (2018): World Intellectual Property Indicators 2018. Geneva, p. 24.

continually move towards Asia, which taken as a whole is now globally responsible for significantly more than half of all patent applications: Patent offices based in Asia received approximately 2.1 million applications in 2017. This is equal to 65.1 percent of the total global number.

The swift growth of the Asian share over the last ten years results in its entirety here from the substantial increase in patent applications in China, which is responsible for approximately two thirds of Asian patent activities. By contrast, the total of all applications from Europe and North America is just below the one million mark.¹⁵⁸

A differentiated look at the quality of the submitted patents, however, brings a different picture to light. Although China is the first and only country where more than a million patents were registered for the first time, the impressive numbers of China's growth must however be examined for the actual technological maturity of many patents.¹⁵⁹ The number of so-called "triadic patents"¹⁶⁰ in particular, which are associated with technologically advanced inventions and exhibit a strong correlation with entrepreneurial research activities, is very low in China. While the USA, the EU and Japan, for example, register a global percentage of approximately 25 to 30 percent, China's share in triadic patent applications is only seven percent – and it has only increased marginally in the past ten years.¹⁶¹ The special economic effects of patents and in-

tellectual property rights must also be referred to in this context:¹⁶² IP-related sectors in Europe generally make an important contribution to economic performance; half of the EU's economic sectors are considered protection right-intensive. Approximately one third of employees in the EU work directly and indirectly in IP-intensive economic sectors. These are responsible for 42 percent of the EU's GDP; their share in EU foreign trade is just under 90 percent. Companies that own intellectual property rights have almost six times as many employees, achieve approximately 29 percent more in average revenue per employee and pay 20 percent higher wages. SMEs with intellectual property rights register higher revenue than those without appropriate measures, but only nine percent of SMEs in Europe have protected their IPRs in some way. This obviously has economic consequences: According to a recent estimate by the European Union Intellectual Property Office (EUIPO), losses due to brand and product piracy in eleven important economic sectors in the EU are up to EUR 60 billion per year.¹⁶³

Despite these important economic IPR effects and although the EU is relatively well positioned with regard to technologically mature patents, the drain of patents and their economic exploitation in other countries are a serious problem. This being because with new technologies in particular there is the source (inventor's coun-

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¹⁵⁸ Ibid., p. 25.

¹⁵⁹ EU Commission (2018): Report on the protection and enforcement of intellectual property rights in third countries. Brussels, p. 8.

¹⁶⁰ OECD (2004): OECD Science, Technology and Industry Working Papers 2004/02: Triadic Patent Families Methodology. OECD Publishing, Paris.

¹⁶¹ See China Power Team (2019): Are patents indicative of Chinese innovation? In: China Power, 19 4 2019; and OECD data (2019): <https://data.oecd.org/rd/triadic-patent-families.htm>

¹⁶² For this in detail, see European Union Intellectual Property Office (2019): Status Report on IPR Infringement. Alicante, pp. 6 ff.; Austrian Government (2017): IP Strategy for Austria. Vienna, p. 15.

¹⁶³ European Union Intellectual Property Office (2019): Status Report on IPR Infringement. Alicante, p. 25.



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try) of a significant number of patent applications at a different point to that of their exploitation. From this point of view Europe has a net drain of patent applications (negative IPR balance), that is the number of patent applications of inventors in Europe, submitted for entities outside Europe, is higher than the number of patent applications of inventors outside Europe for European institutions and patent applicants. The USA have by far the highest positive balance of intellectual property rights. Without a common European procedure and without effective policy measures to attract knowledge flows there is therefore the medium to long-term danger in Europe of a rapid innovation loss.¹⁶⁴

The consequences of the threatening trade war for Europe and Austria

According to international analyses the danger of innovation loss is increased by the fact that in the context of the trade war between the United States and China, the US administration has increasingly used its global market power as a weapon or makes use of unilaterally levied duties and sanctions, which partially also affect the security of intellectual property rights, from which Europe is also affected directly and indirectly.¹⁶⁵ The recent disregard of WTO dispute settlement rulings on intellectual property rights

by the USA in particular creates a negative precedent and undermines the credibility of WTO members who have a common interest in promoting the effective protection and enforcement of intellectual property rights, and in emerging countries in particular.¹⁶⁶ WTO regulations are also violated, “quite obviously by [...] many unilateral and protectionist preferences of companies based in the United States [...]”.¹⁶⁷

On the other side China is currently increasing the pressure when it comes to enforcing its own interests. If we follow the European Union Intellectual Property Office’s estimate, China is one of the world’s biggest manufacturers of fake products. Approximately 61.8 percent of all fake products come from the People’s Republic, and together with Hong Kong this even rises to more than 80 percent.¹⁶⁸ According to the European Union Intellectual Property Office, in the high-tech area in particular important patents of European companies are misused unchallenged.¹⁶⁹ Either Chinese companies use these technologies without paying appropriate license fees, or on the basis of the High and New Technology Enterprises Act (HNTE) they take foreign technologies directly straight away and “make them Chinese”, primarily in the key technological areas defined by the state. Chinese procurement procedures also require a technology transfer or

¹⁶⁴ Techmeter (2019): *Aufstrebende Technologiezentren. Regional and institutional priorities of emerging technologies from 1980 to 2020*. Brief study commissioned by the Austrian Council. Vienna.

¹⁶⁵ Harford, T. (2019): *How the US is weaponising the world economy*. In: *Financial Times* of 14 6 2019; European Council on Foreign Relations (2019): *Redefining Europe’s Economic Sovereignty*. Berlin, London, Madrid, Paris, Rom, Sofia, Warsaw, p. 1; Farrell, H. / Newman, A. (2019): *Weaponized Interdependence*. In: *International Security*, no. 44:1 (summer 2019; forthcoming).

¹⁶⁶ See EU Commission (2018): *Report on the protection and enforcement of intellectual property rights in third countries*. Brussels, p. 37.

¹⁶⁷ *Frankfurter Allgemeine Zeitung* (28/12/2017): *5 Euro am Tag reichen, um reich zu werden*; see also, *The Economist* (8 5 2018): *A tariffically bad idea: The looming global trade war. America is setting dangerous new precedents as it tries to curb imports*.

¹⁶⁸ See European Union Intellectual Property Office (2019): *Status Report on IPR Infringement*. Alicante, p. 18.

¹⁶⁹ *Ibid.*, pp. 7 ff.

disclosure of know-how by foreign companies. The EU member states are the victims, if they abide by the international rules of engagement under the auspices of the WTO, which both China and the USA also increasingly bypass.¹⁷⁰ These developments connected with the global advance of protectionism alongside increasing social inequality and weak global investment volumes are described as the greatest risks for the global economy in the International Monetary Fund's (IMF) current World Economic Outlook.¹⁷¹ Evidently global trade on the whole has grown more protectionist – with verifiable negative effects on the EU's economy. Following the imposition of US punitive tariffs on aluminium and steel “for national security reasons”, these findings are rather unsurprising. The EU Commission recently presented a report on the matter, according to which, with 37 individual measures, China was responsible in 2018 for the most blockades and harassments of EU companies. Russia (34), India and Indonesia (25 each) and the USA in fifth place with 23 trade barriers followed in the global ranking.¹⁷² Globally European companies are confronted with a total of 425 trade blockades and investment hurdles with regard to export. More than there have ever been.¹⁷³

As a small, open economy and export nation, Austria in particular is severely impacted by these developments, both directly and indirectly,¹⁷⁴ because on one hand trade restrictions or punitive tariffs, in the car manufacturing industry or the steel and aluminium sector, for example, are directly responsible for losses at Austrian companies. On the other hand, however, they also indirectly inhibit Austrian exports to other EU countries, especially Germany, as they are also affected by the protectionist measures. And ultimately the effects of a global economic slowdown as a result of these trade conflicts also impact on the Austrian economy.

The global value creation chains rely on international legal certainty. It is therefore also in both the national and European interest, and the Austrian Government's interest, to do everything possible to ensure that the smouldering trade conflicts do not ignite any further. Because if a further escalation were to emerge and the blockades of the WTO predominantly emanating from the USA further reduce the faith of international trade in legal certainty, an increasing de-globalization and a global loss in prosperity would be unavoidable – with direct consequences for Austria and the EU as well.¹⁷⁵

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170 Ibid, pp. 1 f.; see also EU Commission (2019): Report on Trade and Investment Barriers (1 January 2018 – 31 December 2018). Brussels, pp. 5 f.

171 IWF (2019): World Economic Outlook 2019: Growth Slowdown, Precarious Recovery. Washington, DC, S. XIV.

172 EU Commission (2019): Report on Trade and Investment Barriers (1 January 2018 – 31 December 2018). Brussels, pp. 5 f.

173 45 new obstacles were introduced by 23 countries in 2018. This is actually less than the previous year, when 67 hindrances were installed. The economic consequences are, however, considerably more serious, as according to the report, the measures introduced become more and more complex and more systematic. The trade volume affected by these 45 new obstacles ran to EUR 51.4 billion. This is more than twice as much in 2017, when only EUR 23.1 billion in exports were affected. And services are not included in these figures. Estimates by the EU Commission therefore assume the volume quoted is probably even far higher (for this in detail see, EU Commission, 2019: Report on Trade and Investment Barriers [1 January 2018 – 31 December 2018]. Brussels, pp. 5 ff.)

174 Wirtschaftspolitisches Zentrum (2018): Was kostet der neue US-Protektionismus Österreich und die EU? WPZ analysis no. 17. Vienna-St. Gallen.

175 Neue Zürcher Zeitung (5/2/2019): Wie sich die Deglobalisierung auf die Finanzmärkte auswirken könnte.

Austrian Council recommendation for the establishment of entrepreneurship-promoting competences in the Austrian education system –

Recommendation of 16 December 2019

Recommendation

Independent thinking and responsible action are the basis for an innovative society. This requires appropriate skills and competences to drive forward and implement the development of own ideas, or an aptly-named “entrepreneurial mindset”. Teachers, who along with school administrators are the most important disseminators for successfully implementing the topic, play a key role here. On the basis of a study¹⁷⁶ commissioned by the Austrian Council, the Council recommends the following measures portfolio to develop a holistic national strategy to promote this mindset:

- **Creation of a national platform** for bundling the numerous individual initiatives and programmes of various stakeholders who work with and accelerate the entrepreneurship education issue in various ways. Examples here include the Youth Start¹⁷⁷, *Unternehmerin macht Schule*¹⁷⁸, or *Lehrer*innen in die Wirtschaft*¹⁷⁹ programmes, to name just a few activities by way of representation. Experts critically remark here that these activities are increasingly implemented in secondary level II (vocational higher level schools in particular), but they are only rarely included in class-

es in primary education or secondary level I. Use of the offerings also varies sharply from school type to school type.¹⁸⁰ A full-coverage and sustainable focus on the issue across and beyond all education levels and school types is also still not a given. The bundling of these initiatives, programmes and activities via a national platform will enable holistic action to then increase the issue’s impact in the Austrian education system. It will also serve to promote exchanges between teachers on further training options, experience conferences, and so on. Furthermore teachers can network better with economic matters, commercial organisations and start-ups to, for example, jointly organise class content more practically. An action plan on the topic of entrepreneurship education, which, in addition to a detailed overview of existing initiatives, activities and learning offers, also includes measures for structurally preparing the topic, is currently emerging at national level. The objective must be to sustainably anchor entrepreneurship-promoting competences full-coverage across the education levels – from primary education to secondary education II and

176 BDO Consulting GmbH: Studie Entrepreneurship-fördernde Kompetenzen im österreichischen Bildungssystem, https://www.rat-fte.at/files/rat-fte-pdf/publikationen/2019/190627_Studie%20Entrepreneurship%20oesterr.%20Bildungssystem.pdf

177 Initiative for Teaching Entrepreneurship (IFTE), Projekt Youth Start Entrepreneurial Challenges, <http://www.ifte.at/projektyouthstart>

178 A joint effort by WKO, BMDW and BMBWF: <https://www.wko.at/Content.Node/kampagnen/unternehmerin-machtschule/start.html>

179 IFTE in cooperation with KPH Wien, Vienna Chamber of Commerce („Wirtschaftskammer Wien“) and Wirtschaftsforum der Führungskräfte, <http://www.ifte.at/lehrerinnenindiewirtschaft>

180 Ibid. BDO

on into the tertiary education area, and across all types of schools. This also requires the development and implementation of quality standards and suitable measures for quality assurance, as well as an accompanying evaluation of the offering portfolio, and last but not least, in addition to broad political consensus, the creation of the required budgetary flexibility in particular.

- **Teacher training and further training:** Two factors are important in this area of action – the content of teachers’ training and further training and their appreciation and recognition. In addition to school management, teachers are also direct and decisive influence factors with regard to the successful and sustainable implementation of the topic. The entrepreneurial mindset should therefore also be sustainably anchored in teacher training and further training. Teachers must also be able to dedicate themselves here to innovative tasks relating to the entrepreneurship issue outside of the purely material daily routine. Surveys show there is a positive correlation between extra-occupational teacher further training and better school performances by students.¹⁸¹ Modern (monetary and non-monetary) incentive models must therefore be created and suitable HR development measures must be introduced to motivate teachers to pursue new goals and explore new paths. Teaching staff also require top quality training here from a technical, didactic and edu-

cation sciences point of view, which is constantly appraised and evaluated for its quality.¹⁸² The “What Austria’s teachers learn” study¹⁸³ determines, for example, that the crucial leverage for changing school practice is found in teachers’ further training. The current existing general regulations in the School Education Act and Public Service Act should be adjusted to this end. A quantified further training obligation, for example, only exists for teachers at compulsory schools, for 15 hours per year.¹⁸⁴ And nor are there any guidelines with regard to obligatory training or training that goes beyond this. Hourly-based obligations for further training for teachers at secondary schools or vocational higher level schools are not provided for in the “old” public service act, which could still be chosen up to autumn 2019.¹⁸⁵

- **Modern class settings, flexible class times, new teaching content and an innovative test culture:** Appropriate offers for open and diverse learning arrangements are required so that students themselves try to be creative, innovative and entrepreneurial. This includes teaching content, class settings, supervision capacities and adjustments to lessons, as it does the arrangement of teaching and learning spaces and the integration of a more active economic experience. Experts also say that more flexible periods and the removal of rigid 50-minute classes are required for an interdisciplinary reworking of the entrepreneurship issue.¹⁸⁶ The expan-

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181 European Parliament (2008): Content and quality of teacher training in the European Union, Brussels,

http://www.europarl.europa.eu/thinktank/de/document.html?reference=IPOL-CULT_ET%282008%29397251

182 National education report, Austria 2018, https://www.bifie.at/wp-content/uploads/2019/03/NBB_2018_Band2_final.pdf

183 Agenda Austria, <https://www.agenda-austria.at/publikationen/was-oesterreichs-lehrer-lernen/>

184 Ibid.

185 Ibid.

186 BDO Consulting GmbH: Studie Entrepreneurship-fördernde Kompetenzen im österreichischen Bildungssystem, https://www.rat-fte.at/files/rat-fte-pdf/publikationen/2019/190627_Studie%20Entrepreneurship%20oesterr.%20Bildungssystem.pdf



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sion of the whole-day school offering for more temporal room to manoeuvre for creative and innovative lesson content is also referred to. This would also require an adjustment with regard to flexible work times and compulsory attendance for teachers. The experts also agree that entrepreneurship education must also be anchored as stand-alone content and established cross-discipline in its implementation.¹⁸⁷ An examination of the range of subjects and the current teaching content for the subject's relevance and an adjustment of the same would also be welcome.¹⁸⁸ This stipulation requires the establishment of modern class settings, which enable the issue to be communicated interdisciplinary and cross-subject. This also includes the critical consideration and revision of existing learning materials, in presenting the image of entrepreneurship, for example. The examination culture should also be rethought practice-related and application-oriented. In addition to the implementation of new teaching content, modern class settings and an innovative examination culture, the supervision capacities, administrative support for relieving teaching staff, for example, must also be considered here. The integration of a more active economic experience, boosting the option of lateral entry into the teaching profession for people from financial, industrial areas, for example, or even cooperation with start-up centres, could provide support with practical implementation.

The objective of these recommendations for action is to illustrate possibilities and paths to

specifically accelerate the acquisition of entrepreneurship-promoting competences and anchor this as broadly and sustainably as possible in the education landscape, from primary education to secondary education II and on into the tertiary education area. Similar to anchoring the "STEM" or "Digital education" initiatives, a successful mediation of entrepreneurship-promoting competences, as addressed above, requires changes and continuous improvements in the framework conditions for teachers, class settings and students. The measures named will not generate any "reform overload", but rather it must be illustrated that there is not this "one" measure for establishing an entrepreneurial mindset, and only a balanced interplay of all measures can contribute to successfully establishing entrepreneurship-promoting competences and skills as a holistic cross-subject education goal across and beyond all educational institutions. Successful reforms in the educational system are only first characterised by the sum total of numerous changes.

Background

Economic issues and financial processes are becoming increasingly complex, and recognising correlations and economic decisions take on a key value in everyday life, and therefore are not just important for entrepreneurs alone.¹⁸⁹ Children and young people are already confronted in their daily life with a number of economic life situations, which make demands on economic skills and competences.¹⁹⁰

Developing creativity and innovation, planning and using resources on one's own initiative and

¹⁸⁷ Ibid.

¹⁸⁸ Ibid.

¹⁸⁹ Greimel-Fuhrmann et al.: Die Vorstellung von Jugendlichen zu Wirtschaft und Geld – Implikation für die Entrepreneurship-Erziehung (2018), <http://epub.wu.ac.at/6037/>

¹⁹⁰ Kaminski et al.: Konzeption für die ökonomische Bildung als Allgemeinbildung von der Primarstufe bis zur Sekundarstufe II (2008), https://bankenverband.de/media/files/Konzeption_fuer_die_oekonomische_Bildung.pdf

motivated and implementing own ideas goal-oriented and independently are necessary skills, as described by the European reference framework for entrepreneurship competences (EntreComp¹⁹¹). In the narrower sense entrepreneurship education means building skills and capabilities required for a successful company start-up and management and for an independent and auto-responsible lifestyle, so they are also essential for independent working.¹⁹² The framework here consists of three competence areas combined and interconnected with one another: (i) Ideas and opportunities, (ii) resources and (iii) implementation. Each of these areas consists of skills and competences, which are developed across a progress model.¹⁹³

While at elementary level the focus is on playful exploratory learning, experts advocate the primary level as the best entry point for a specific focus on the entrepreneurship education topic.¹⁹⁴ Although from this school level onwards a number of the skills and competences

quoted in the EntreComp framework appear again, an explicit anchoring of the topic in the current curriculum is still absent.¹⁹⁵ This is also reflected in the international comparison, where Austria, according to expert estimates, is at the second last place (rank 18), with only Croatia scoring lower.¹⁹⁶ Figure 11 shows how Austria ranks in the middle (rank seven) of the European countries in the comparison for this with entrepreneurial training and further training in the higher education area (tertiary sector). For the university area measures are defined for, among other factors, the intensification of the entrepreneurship concept in the GUEP¹⁹⁷ (all-Austrian university development plan), which are designed to improve the entrepreneurial agenda, so the development and expansion of entrepreneurship, at Austrian universities. Initiatives in the tertiary sector are also illustrated in the Higher Education Innovate Report¹⁹⁸ and recommendations for the Austrian higher educa-

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191 EntreComp: The Entrepreneurship Competence Framework (2016), <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/entrecomp-entrepreneurship-competence-framework>

192 Federal Ministry of Education, Science and Research: Entrepreneurship Education, <https://bildung.bmbwf.gv.at/schulen/bw/bbs/entrepreneurship.html>

193 Bacigalupo, M., et al. (2016): EntreComp: The Entrepreneurship Competence Framework, <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101581/lfna27939enn.pdf>

194 BDO Consulting GmbH: Studie Entrepreneurship-fördernde Kompetenzen im österreichischen Bildungssystem, https://www.rat-fte.at/files/rat-fte-pdf/publikationen/2019/190627_Studie%20Entrepreneurship%20oesterr.%20Bildungssystem.pdf

195 Ibid.

196 Ibid.

197 All-Austrian university development plan, https://www.bmbwf.gv.at/dam/jcr:0f97bd04-a5ae-4d6c-ae64-e4441365e964/GUEP_2019-2024__Langversion.pdf

198 OECD/EU (2019), Supporting Entrepreneurship and Innovation in Higher Education in Austria. OECD Skills Studies, OECD Publishing, Paris, <https://doi.org/10.1787/1c45127b-en>.



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tion sector are formulated. Examples such as the i2C¹⁹⁹ of UAS Vienna or the StartUp-Center at JKU Linz²⁰⁰, to name just two, illustrate the positive effect of

such measures in the higher education area for stimulating the start-up spirit in the academic environment.

Figure 11: Experts' assessment of entrepreneurship training and further training in Austria

	2018	Average 2012–16	Europ. rank (19 countries) Rank	Frontrunner
Entrepreneurship training and further training in higher education area	3.2 1 ————— 5	3.0 1 ————— 5	7	The Netherlands (3.7)
Entrepreneurship education in primary and secondary education	1.6 1 ————— 5	1.6 1 ————— 5	18	The Netherlands (3.2)

Source: GEM National Expert Surveys (2012, 2014, 2016, 2018),
https://www.rat-fte.at/files/rat-fte-pdf/publikationen/2019/Global%20Entrepreneurship%20Monitor_2018.pdf

The Netherlands are the frontrunner in all three areas (primary, secondary and tertiary level). The Netherlands have developed an extensive national strategy on the topic of entrepreneurship and innovation.²⁰¹ Stronger cooperation between education and economy is propagated herein. Entrepreneurship-oriented teacher training is accelerated in the Netherlands. Based on a project

by the Dutch agency²⁰² for business support, which finished in December 2015, the implementation of entrepreneurship education in teacher training began successively at teacher training colleges. It is interesting here that a subsidiary implementation is lived in the Netherlands and the responsibility for the organisation of further training measures for teachers lies with

199 Innovation Incubation Center, TU Wien, <https://i2c.tuwien.ac.at/>

200 StartUp-Center des Instituts für Unternehmensgründung und Unternehmensentwicklung (IUG), JKU Linz, <https://www.jku.at/gruenden-innovation/ueber-uns/kompetenzzentren/startup-center/>

201 BDO Consulting GmbH: Studie Entrepreneurship-fördernde Kompetenzen im österreichischen Bildungssystem, https://www.rat-fte.at/files/rat-fte-pdf/publikationen/2019/190627_Studie%20Entrepreneurship%20oesterr.%20Bildungssystem.pdf

202 Rijksdienst voor Ondernemend Nederland, <https://english.rvo.nl/>

the respective school, which also autonomously manages the budget for further training as part of the entire staffing budget.²⁰³ As an innovative education method the Entreprenasium²⁰⁴ programme for secondary schools must in particular be mentioned. Students, teachers and school management also meet at least once a week to dedicate themselves to the entrepreneurship topic. Unique here is the fact that this programme offers students and teachers the ability to shape an entrepreneurial form of teaching together. The success of this programme can be measured by the high number of students that participate in it, and already set up a company during their secondary education years.

Nearby Finland can also claim its own national strategy²⁰⁵ for entrepreneurship education. The guidelines were compiled by a broadly arranged cooperation by various stakeholders from government bodies, educational institutions, regional authorities and economic organisations.²⁰⁶ A national definition²⁰⁷ of entrepreneurship and entre-

preneurship education with reference to the European Parliament and the EU Commission's definition²⁰⁸ of entrepreneurship is anchored herein. Finland is consequently robustly oriented on the recommendations of the EU Commission and the EntreComp reference framework. Neighbouring Sweden also has a national strategy²⁰⁹ with a specific budget for entrepreneurship education. These countries' lead role in the entrepreneurship education area is also reflected in this year's European Innovation Scoreboard²¹⁰: As it was last year, Sweden is number one here, followed by Finland, Denmark and the Netherlands.

According to national experts, the first positive steps are happening in Austria. The TRIO model²¹¹, for example, is anchored in the new curricula of the vocational schools in many different subjects. The centre of focus here is the promotion of an entrepreneurship approach and way of thinking, which supports the development and implementation of new ideas with

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203 OECD (2016): Netherlands 2016: Foundations for the Future – Reviews of National Policies for Education, Paris. <http://www.oecd.org/netherlands/netherlands-2016-9789264257658-en.htm>

204 Entreprenasium, <https://elo.entreprenasium.nl/>

205 Ministry of Education, Department for Education and Science (2009): Guidelines for entrepreneurship education, <https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/78871/opm09.pdf?sequence=1>

206 BDO Consulting GmbH: Studie Entrepreneurship-fördernde Kompetenzen im österreichischen Bildungssystem, https://www.rat-fte.at/files/rat-fte-pdf/publikationen/2019/190627_Studie%20Entrepreneurship%20oesterr.%20Bildungssystem.pdf

207 Ministry of Education, Department for Education and Science (2009): Guidelines for entrepreneurship education, <https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/78871/opm09.pdf?sequence=1>

208 European Commission (2005): Recommendation of the European Parliament and Austrian Council on key competences for lifelong learning, KOM (2005) 548, [http://www.europarl.europa.eu/meetdocs/2004_2009/documents/com/com_com\(2005\)0548_/com_com\(2005\)0548_de.pdf](http://www.europarl.europa.eu/meetdocs/2004_2009/documents/com/com_com(2005)0548_/com_com(2005)0548_de.pdf)

209 Regeringskansliet (2009): Strategi för entreprenörskap inom utbildningsområdet, <https://www.orebro.se/download/18.2bea29ad1590bf258c52a28/1484207075284/Strategi+f%C3%B6r+entrepren%C3%B6rskap+inom+utbildningsomr%C3%A5det.pdf>

210 European Innovation Scoreboard 2019, https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en211 Entrepreneurship Education, TRIO model, <http://www.ifte.at/entrepreneurship>



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young people. Based on EntreComp an Austrian reference framework²¹² for entrepreneurship education was also developed by eesi and IFTE. Secondary education level II features the noteworthy eesi-Initiative²¹³ for certification as an entrepreneurship school. This certification (ONR 42001), possible since 2011, confirms that the school location has implemented entrepreneurship activities holistically, goal-oriented and long-term in everyday schooling. Currently 41 Austrian schools at secondary education level II are certified as entrepreneurship schools; approximately 50 other schools are currently in the certification process.²¹⁴ Despite the measures introduced and the favourable offering of initiatives, especially from secondary education level II onwards, the experts are critical of the offering in the primary level and secondary ed-

ucation level I, because an early approach to sensitising the topic is essential.

Along with the technological transformation, which changes life and society for ever, education is also in a transformation process. Each and every individual can co-initiate and co-shape social developments. A quality development of entrepreneurship-promoting competences is a decisive factor for future economic growth in Austria. This requires, as in Finland or Sweden, for example, a holistic national strategy and an own budget to promote optimum teaching and learning conditions, which is managed by a national agency set up especially for this. The European Commission²¹⁵ also attributes greater value to improved skills in entrepreneurship education, based among other things on the high youth unemployment rate. Austria should not lose its connections within Europe here.

212 Projekt YouthStart Entrepreneurial Challenges, <http://www.youthstart.eu/de/about/>

213 eesi, Zertifizierung Entrepreneurship-Schule, <https://www.eesi-impulszentrum.at/zertifizierung/>

214 BDO Consulting GmbH: Studie Entrepreneurship-fördernde Kompetenzen im österreichischen Bildungssystem, https://www.rat-fte.at/files/rat-fte-pdf/publikationen/2019/190627_Studie%20Entrepreneurship%20oesterr.%20Bildungssystem.pdf

215 Eurydice report on the topic of "Entrepreneurship Education in School in Europe", https://eacea.ec.europa.eu/national-policies/eurydice/home_en

Statement by the Austrian Council on the draft for a research framework act 2019 – Statement of 16 October 2019

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Starting position for the draft for a research framework act

The Minister of Science Johannes Hahn proposed the introduction of a research funding act as far back as the Alpbach Technology Forum in August 2009. This should become the financial backbone of research and “substantiate and specify the then planned Government’s RTI Strategy [...] where it was about financing and securing new mechanisms”.²¹⁶ The RTI Strategy adopted in 2011 consequently includes the objective of establishing a research funding act, in which the principles of the Austrian RTI policy would have been defined, output goals anchored and long-term budgetary planning security would have been guaranteed.²¹⁷ The Austrian Council has since referred several times to the need to pass an appropriate law.²¹⁸

The issue was only addressed again with the 26th legislative period and anchored by the Austrian Government of the day in the 2017-2022 government programme. According to the Council of Ministers decision in August 2018 a draft for an appropriate research funding act was finally worked out. In line with the original plans this was to be presented at the cancelled RTI summit in May 2019, subsequently sent for parliamentary appraisal and adopted by summer 2019. Before the cancelled summit, however, interministerial agreement on the budgetary

consequences and the act’s content orientation could not be reached, especially towards a stronger agentification recommended by the Austrian Council or a more efficient controlling of the RTI system via appropriate governance structures²¹⁹. The draft for a research framework act presented on 19 August 2019 has now been understood as a compromise proposal.

Austrian Council statement on the draft for a research framework act

The Austrian Council explicitly welcomes the amendment-intended production of three-year planning security for funding agencies and research institutions. An important step will then be taken to equip Austria’s key RTI facilities with a medium-term planning horizon and therefore afford them added flexibility.

The Austrian Council also welcomes the annual implementation planning and intended monitoring and controlling, whose results will be published in the research and technology report. This is not only an important step towards more transparency, but rather and in particular also a relevant contribution to an efficient and effective controlling of the RTI system.

In relation to optimised RTI governance the Austrian Council finds appropriate further develop-

216 Hahn, J. (2009): The research funding act will be the financial backbone of research. OTS 0141, 23/11/2009.

217 Austrian Government (2011): The Path to Becoming an Innovation Leader. Federal Government strategy for research, technology and innovation. Vienna, p. 47.

218 See Austrian Council (2015): Report on Austria’s Scientific and Technological Capability 2015. Vienna, p. 9; idem (2017): Recommendation on the way to the forefront of innovation of 30/11/2017, p. 25.

219 Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation. Vienna, pp. 18 ff.



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ments in terms of agentification are lacking with this draft. The agencies would then have a greater degree of autonomy, while the departments would be responsible for medium to long-term strategic projects. The Scandinavian innovation leaders, Finland, Sweden and Denmark, for example, therefore pursue an approach that focuses on funding management with professional, autonomous agencies, whereby the ministries are responsible for the strategic controlling. Diverse forms of cooperation between the ministries and agencies currently exist in Austria. There is also a requirement here to establish overarching models.

Austrian Council recommendations

The Austrian Council basically recommends amending the draft for a research framework act towards the originally intended research funding act. As defined in the RTI Strategy 2011, the principles of the Austrian RTI policy must be specified herein, output goals must be anchored and long-term budgetary planning security must be guaranteed throughout a specific budgetary course. The RTI package as a mechanism for research financing should enable the definition of a multiannual financing agreement based on transparent measures planning and guarantee binding funding security. The Austrian Council recommends it orient itself in this respect on the German package for research and

innovation, which projects regular budget growth of currently three percent per year.²²⁰

The Austrian Council recommends the existing draft of the research framework act be expanded with relevant governance elements as part of the parliamentary appraisal. Already adopted recommendations, in particular those from the white paper on controlling research, technology and innovation in Austria²²¹, are referred to in this respect. Important here in any case is the further development of agentification for more autonomy of the research funding agencies as part of the departments' strategic projects, whereby the latter alone are responsible for strategic controlling.

In this context the Austrian Council again recommends a revision of the appropriate use of funding in the Austrian RTI system. Due to the low output efficiency compared with the innovation leaders (with given above-average high inputs), the Austrian Council recommends this ratio be examined in even more detail, especially with regard to how Austria can improve in innovation efficiency terms.²²² In this respect the Austrian Council also recommends the ratio between awarded in competition and core financed public funds be shifted in favour of the awarded in competition share. At the same time, as indicated by the OECD, the ratio between direct and indirect research funding must also be arranged in a balanced way.²²³

220 <https://www.bmbf.de/de/pakt-fuer-forschung-und-innovation-546.html>

221 Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation. Vienna.

222 See inter alia, Austrian Council (2018): Report on Austria's Scientific and Technological Capability 2018. Vienna, pp. 32 ff.

223 OECD (2018): OECD Reviews of Innovation Policy: Austria 2018. OECD Publishing, Paris, p. 19.

Statement by the Austrian Council on the “All-Austrian university development plan 2022-2027” – Statement of 25 October 2019

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General position of the Austrian Council

The Austrian Council believes important recommendations for the higher education sector are mapped in the goals of the all-Austrian university development plan (GUEP) 2022-2027 and the areas of action illustrated here. The investments in education and research required for this by a future Austrian Government must be addressed here swiftly and with top priority. The universities as an essential pillar of research and development in the Austrian economic area can only be successful at international level if they receive the necessary resources for international competition and can plan long-term. In its recently adopted recommendations for the RTI policy in the 17th legislative period the Austrian Council, among other things, also directed appropriate proposals to optimise the framework conditions for the universities at the future government. These are also included in this statement on the all-Austrian university development plan.

- Increased competitive research funding
- Implementation of the planned excellence initiative for more intensive profiling and improved positioning of Austrian universities in domestic competition
- Swift increase in investments in research and education to two percent of GDP for the tertiary sector
- Strengthening of knowledge transfer and co-operations at universities

- Investment in the expansion and modernisation of the research infrastructure at the level of international research-intensive countries

- Further development of teaching and learning formats focusing on digitisation

The following statement is made for selected system goals of this draft for the all-Austrian university development plan 2022-2027.

Further development and strengthening of the higher education system

In countries with a similarly structured higher education system, such as Finland, Germany, Switzerland and the Netherlands the percentage of students at technical colleges is considerably higher than in Austria.²²⁴ The expansion of the technical colleges sector and the transformation of the technical colleges sector that it entails was also significantly quicker in these countries. Under system goal 1, GUEP 2022-2027 also provides for, “finding solutions by considering the technical colleges sector, that reduce the level of teaching and training obligation of universities and enable the universities more room to manoeuvre in covering (basic) research”. If we consider the technical colleges development and financing plan 2018/19 to 2022/23, we see that a decisive step towards changing the percentage of technical college students in the higher education system has not been made.

²²⁴ See “Recommendation for the further development of the technical colleges sector in the Austrian education and science system”; Austrian Council. May 2017.

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From the viewpoint of developing the student population (an increasing number of “later” study beginners, for example), the framework conditions for teaching and research at the universities and the labour market’s requirement for specialists, the Austrian Council believes the technical colleges sector must expand a good deal faster. For the addressed and important measures to coordinate and differentiate the study offering between and within the higher education sectors, with regard to “collaborations between the higher education sectors”, measures to further develop higher education teaching and staffing collaborations between the higher education sectors should also be introduced.

The Austrian Council emphatically recommends a swift expansion of the technical colleges sector to provide top quality training places, especially to build the competences required to meet the challenges on the labour market. In addition to an appropriate reaction to the transformation in the world of work, the Austrian Council is primarily concerned with enabling more freedom for the universities for profiling in research (basic).

Stronger university research

Excellent research at a top international level is performed at Austrian universities. Important measures to further develop and strengthen research at universities are named under GUEP 2022-2027 system goal 2, and are supported by the Austrian Council. The key requirements, es-

pecially the increase in competitive research funding and expansion of the research infrastructure to the level of internationally leading research nations, were called for in numerous Austrian Council recommendations and reports²²⁵. The implementation and financing of an excellence initiative is an essential factor for the expansion of competitive research funding. The concept²²⁶ provided for this creates stimuli for trans-university collaborations and further profiling in research and development. The financing volume proposed for this must be considered the lowest limit here if we are to enable significant increases in research performance in the higher education sector.

The performance of a science and research system is also highly dependent on an internationally competitive, modern research infrastructure. The expansion of funding options for research infrastructures is also an indispensable investment necessity here. The Austrian Council refers to the deficits and investment backlog in creating and modernising research infrastructures since the study²²⁷ performed in 2009/10 and the recommendations derived from it²²⁸. Setting up research infrastructures requires a strategic objective and planning, appropriate funding security and long-term development periods, especially for large-scale research infrastructures.

The Austrian Council recommends suitable measures be introduced to increase the competitive funding of basic research, especially with a swift implementation of the excellence initiative,

225 Most recently in, “Report on Austria’s Scientific and Technological Capability 2019”. April 2019.

Recommendations for the RTI policy in the 27th legislative period.” October 2019. “Recommendation on funding the research infrastructure and shaping sustainable funding certainty”. November 2018.

226 Exzellenzinitiative – Eine Zukunftsoffensive für den Forschungsstandort Österreich. Androsch, H. Loprieno, A. Nowotny, H. (sent to the Federal Ministry of Education, Science and Research in March 2019).

227 Survey on the Austrian research infrastructure. Austin, Pock & Partners commissioned by the Austrian Council (March 2009; June 2010).

228 Recommendation for the research infrastructure in Austria (November 2011).

to thus better support excellent research activities at the universities. It also recommends an initiative to modernise existing and expand required research infrastructures at the universities be introduced.

Improvement of the quality and efficiency of university teaching

The Austrian Council believes the further development of teaching at the universities (but not only here) takes on an especially important role due to the changes in communication technologies and the possibilities of information transfer with digitisation. The (further) qualification of teachers at the educational institutions in general and at the universities in particular becomes especially important. New teaching and learning formats, improved competences in didactics, supported by digital mechanisms, will most probably expand intensively and change teaching and the learning successes connected with it. A “diversification” of the teacher’s job description at universities must be expected. The required education/training and a suitable change process for it must follow at the universities. The establishment of teaching teams, learning coaches, etc. must be addressed in good time for this. Stronger incentive systems/incentivizing in teaching must also be created and models must be developed. To implement the areas for action addressed for this in the GUEP the Austrian Council believes the further development of suitable study formats and teaching formats must be driven forward and massive investment must also be made in teacher training and further training.

This will also be required as the universities are faced with growing heterogeneity with first-year students and an individualisation of the

studies (possibilities) at the different types of higher education institutions will therefore be decisive in the most suitable study beginners being addressed and selected correctly. Suitable mechanisms in study access should be further developed for this and possibilities for preparing students (selection/profile meetings, online self-assessments, online advanced courses, STEOP reform) should be improved. Existing and broadly based study admission criteria should also be discussed and alternatives considered (certificate for higher education, university entrance examination, acceptance examination vs long-term school success, competence checks, etc.). For the medium-term new digital possibilities can also be used in advising, preparing and choosing an “ideal” combination (student – studies/training).

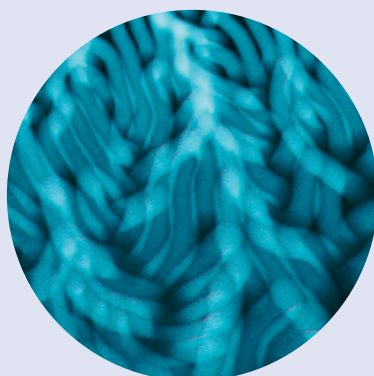
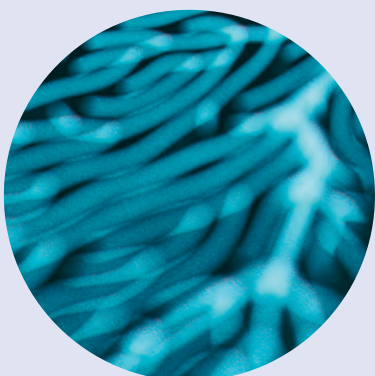
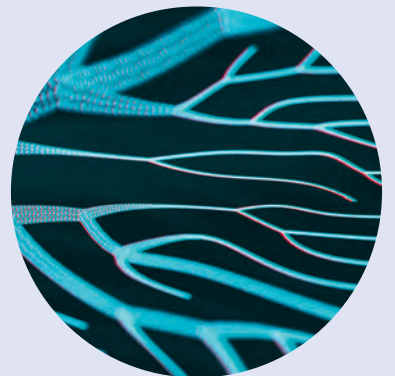
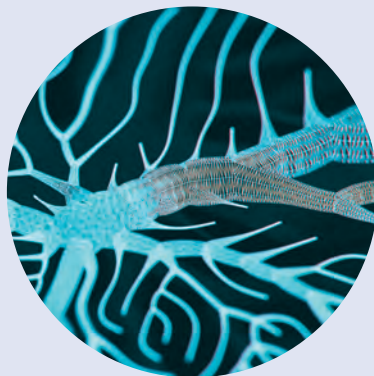
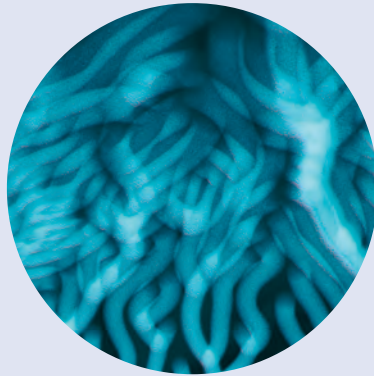
The Austrian Council recommends the measures for improving teaching mediation and studies organisation addressed in GUEP 2022–2027 be pushed forward with greater emphasis and the financial and staffing resources required for this be provided.

For efficient study courses the optimisation of the supervision ratio at educational institutions must continue as a top priority. To win over the best minds for this the Austrian Council recommends, among other factors, the incentive systems in academic careers be radically adjusted.²²⁹ By increasing the university budget for teaching and with it the possible appointment of approximately 360 additional professors and equivalent positions, an important step towards improving student supervision can be taken, whereby with the appointment and selection in addition to scientific excellence a future-oriented step should be taken with the “competences in new teaching formats” factor.

statements

²²⁹ See, Austrian Council recommendation: Create your UNiVerse – Recommendations for action for the future shaping of the universities Austrian Council, February 2018.





Work areas, reports and studies 2019

The parties' answers to the Austrian Council's questions on education, research, technology and innovation in the run-up to the 2019 National Council elections

In the run-up to the 2019 National Council elections on 29 September 2019 the Austrian Council invited all nationwide canvassing parties to present their projects and ideas on how the Austrian RTI system could contribute to Austria joining the group of innovation leaders. To this end the Austrian Council formulated questions that apply to both the implementation of current specific measures and those concerning the improvement of the RTI system's future opportunities.

The parties' answers received by the due date were collected and analysed. The key statements by the five parties on the individual questions are presented summarised below.

The first block of questions related to the implementation of specific measures to continue priority projects in the areas of science, research and innovation. The parties' positions, ideas and plans for the most important turning points in the RTI policy were included here.

- **1) In the first question the parties were asked to illustrate possibilities that would be suitable for communicating and discussing relevant RTI policy priorities at the highest political level.**

There was broad agreement here between the parties that research, technology and innovation should be a clear policy work priority. To discuss and plan medium and long-term projects, SPÖ (Social Democrats), NEOS (Liberals) and GRÜNE (Greens) favour regular exchanges between the body politic and representatives from the science area, funding investors and the most important stakeholders (uniko, non-university research, FWF, FFG, Austrian Council, responsible departments, and so on) as part of regular RTI round-tables and RTI summits. The ÖVP (People's

Party) proposes an RTI summit, which would be held once a year at the highest political level. The FPÖ (Freedom Party) basically plans for an exchange already legally anchored via the Austrian Council and proposes an expansion of the competence areas.

- **2) To stabilise RTI financing and anchoring of the legal framework conditions the parties were asked what content of a research funding act they think would be priority and by what date they would legally anchor it to ensure sustainable research financing.**

At the time of the survey there was agreement in all parties that a research funding act for better planning capability should be worked out and adopted. They disagreed on whether and in what form a financing method should be legally anchored. SPÖ, GRÜNE and FPÖ are for a clearly defined financing and growth method and advocate a legally fixed allocation of the respective funding; NEOS are for a sustainable and sufficient financing method; ÖVP would like to see a continuous increase in public and private spending in line with the 3.76 percent goal, however without budgetary commitment as part of a legislative measure.

- **3) In another question the parties were asked about the implementation of an excellence programme for science. The Austrian Council, and the OECD in its "Review of Innovation Policy: Austria 2018", have referred in numerous recommendations to the lack of competitively awarded research funds and requested an essential increase in such. The funding of an excellence initiative based on an expert paper already broadly agreed could not, however, be resolved as yet. The question therefore is: How can the existing draft of an**

excellence initiative be implemented as quickly as possible and what measures do the parties think are expedient to increase research funding efficiency and effectiveness?

All parties are for an increase in competitive funding for basic research and applied research. ÖVP, GRÜNE and SPÖ are committed to the implementation of the excellence initiative to expand top performance and excellence in Austria and to guarantee the funding of researchers, and to also create attractive research conditions for the “best brains” in the country. A consolidation of the partially fragmented funding will enable more transparency and efficient and effective research funding.

- **4) The fourth question was about the introduction of a research funding database. The Court of Auditors referred in 2016 to intransparent financing flows in the RTI system. At BMBWF and BMVIT's request the Austrian Council therefore performed an extensive feasibility study²³⁰. On its basis a research funding database for Austria was then recommended and an implementation concept was developed in autumn 2018 as part of an interministerial work group. The parties were asked if they thought setting up a research funding database was beneficial and if yes, then by what date they would implement it.** In the answers all parties agree that the Austrian research policy must increase funding efficiency and effectiveness in the research funding area. Setting up a research funding database would be an important contribution to making the research funding system more transparent, more efficient and more accurate. The protection of companies' business secrets must be ensured here. Funding bod-

ies such as the FWF for example, have public access databases. Creating transparency is important, and also with regard to other allocations (the states, for example).

In a second block of questions, in line with key questions on the future opportunities of the RTI system, the Austrian Council asked the parties to illustrate their concepts for further developing RTI location Austria.

- **5) On the question as to which concepts the parties would implement to make Austria's economy and society fit to meet the global grand challenges and to increase the quality and speed of progress in areas such as economy, society, health, quality of life and environment, the parties said the following points are priorities:**

All five parties represented in parliament want to increase and appropriately adjust funding for basic research and applied research. Competitive research funding in particular is to be strengthened.

The ÖVP also wants to improve the framework conditions for the research location, which promote international competitiveness and attractiveness of research location Austria and the development of highly innovative products and services, and their positioning on the global markets. Focus will be made on climate and environmental protection research, which requires additional investments in research and development to make Austria a frontrunner in this area. A “Rot-Weiß-Rot-Card” for highly qualified theory and practice climate scientists is proposed for this.

With this question the SPÖ prioritises the funding of innovative companies that have

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230 Rütter Sococo, Senarclens, Leu & Partner und Quantum Analytics (2017): Machbarkeitsstudie zur Einrichtung einer österreichweiten Forschungsförderungsdatenbank. Studie im Auftrag des Rates für Forschung und Technologieentwicklung. Zürich.



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high potential to create new jobs and are also climate frontrunners. Innovation premiums and investment tax breaks are addressed as mechanisms in this respect.

The **NEOS** refer to their programme, in which education and research feature greatly and which also includes the research-relevant priorities in the sections on renewable energies, future of mobility, environmental protection and agriculture or AI. Sufficient strengthening of competitively awarded funds in basic research is a requirement for securing the Austria higher education and research location. The **GRÜNE** stress the research priorities included in their election programme, in particular in species and nature conservation, climate and environmental protection and greening agriculture.

The shaping of the framework conditions for the Austrian economy and therefore domestic companies as employers is a priority goal for the **FPÖ**. This includes boosting the domestic economy's competitiveness with the goal of reducing excessive bureaucracy, avoidable administration work and the high tax and levies burden.

- **6) With regard to “measures in a future-oriented education system to best equip people in Austria with the required competences and to enable them to perceive future opportunities and overcome challenges” the parties named the following priorities:**

Making young people fit for the future labour market and motivating them for labour market-relevant careers and training courses is important for the **ÖVP**. Above all these are careers and studies in the STEM area. A master plan for digitisation in the education system, which improves technical equipping at schools, will be worked out and implemented. Teacher training, advanced training and further training will be improved and a uniform Austrian platform with digital content will be accessible for all Austrians.

The **NEOS** are for the introduction of compulsory education in place of compulsory school attendance. No child should leave school without having acquired basic competences. A teaching plan for the 21st century, digital competences, a learning account for all, appreciation of teaching and environmental education, among other elements, will be required for this.

The **SPÖ** advocate a move away from the traditional curriculum towards a class that teaches children to apply knowledge, network and critically scrutinise it, and therefore find solutions away from the predetermined paths. Digital basic education will also be an essential part of the teaching plan.

The **GRÜNE** advocate an education system that is oriented on students' strengths, and not their weaknesses, on cooperation instead of competitive thinking. Access to educational offers that enable continuous further development for lifelong learning will be available to all. By way of example in a few keywords: Comprehensive schools for 6 to 14-year-olds, all-day schools, integration instead of segregation, removal of special classes for German and promotion of bilingualism and multilingualism.

The **FPÖ** advocate keeping special classes for German, a differentiated schooling system, so no comprehensive schools for 10 to 14-year-olds, maintaining “special schools for children with fewer opportunities”, talent promotion and obligatory regular further training for teachers.

- **7) The parties advocated the following measures with the question as to, “how Austrian universities can be strengthened to produce more excellent scientific institutions and increase the international visibility and attractiveness of the science location”:**

Securing the initiated capacity-oriented study place financing and adopting an excellence initiative that is sufficiently financed to earn its name are priorities for the **GRÜNE** to

strengthen Austrian universities. Excellent scientific institutions will also be further strengthened instead of setting up new ones. With this question the **ÖVP** refer to the budget increase as part of the “Universitätsfinanzierung NEU” (NEW university funding) and the planned expansion of technical college places from 2020/21. Important content, structural and staffing priorities could then be specified. A sustainable improvement of the study, teaching and examination conditions is also required, particularly with regard to permeability. Better framework conditions for talented young scientists are also required to keep the best brains in Austria.

The **SPÖ** advocate 5,000 additional training places and therefore a swift expansion at technical colleges and universities, as highly qualified workers are lacking in the STEM area in particular.

The **NEOS** are for more autonomy at the universities. Students will be free in making their study decisions, but universities will also have the right, at their discretion and applying anti-discrimination law, to select students and levy study fees where applicable.

The **FPÖ** refer to numerous measures, which have already been defined in the 2017 government programme. These should be continued.

- **8) The parties were also asked what research policy mechanisms they think would be suitable framework conditions for an innovative start-up landscape and companies:**

In this respect the **SPÖ** are for an extensive innovation approach, which incorporates monetary, legislative and organisational measures, increased R&D spending included. Thematic prioritisation in the research area, funding high-risk projects and increased competitive awarding of funds will provide the best possible support for excellence in basic research and top technologies in the corporate sector.

The **FPÖ** are also for a strategic further development of the non-university and industry and economy-oriented research institutions towards internationally competitive institutions.

A basic financing model complete with standards and benchmarks should be worked out with the states for this.

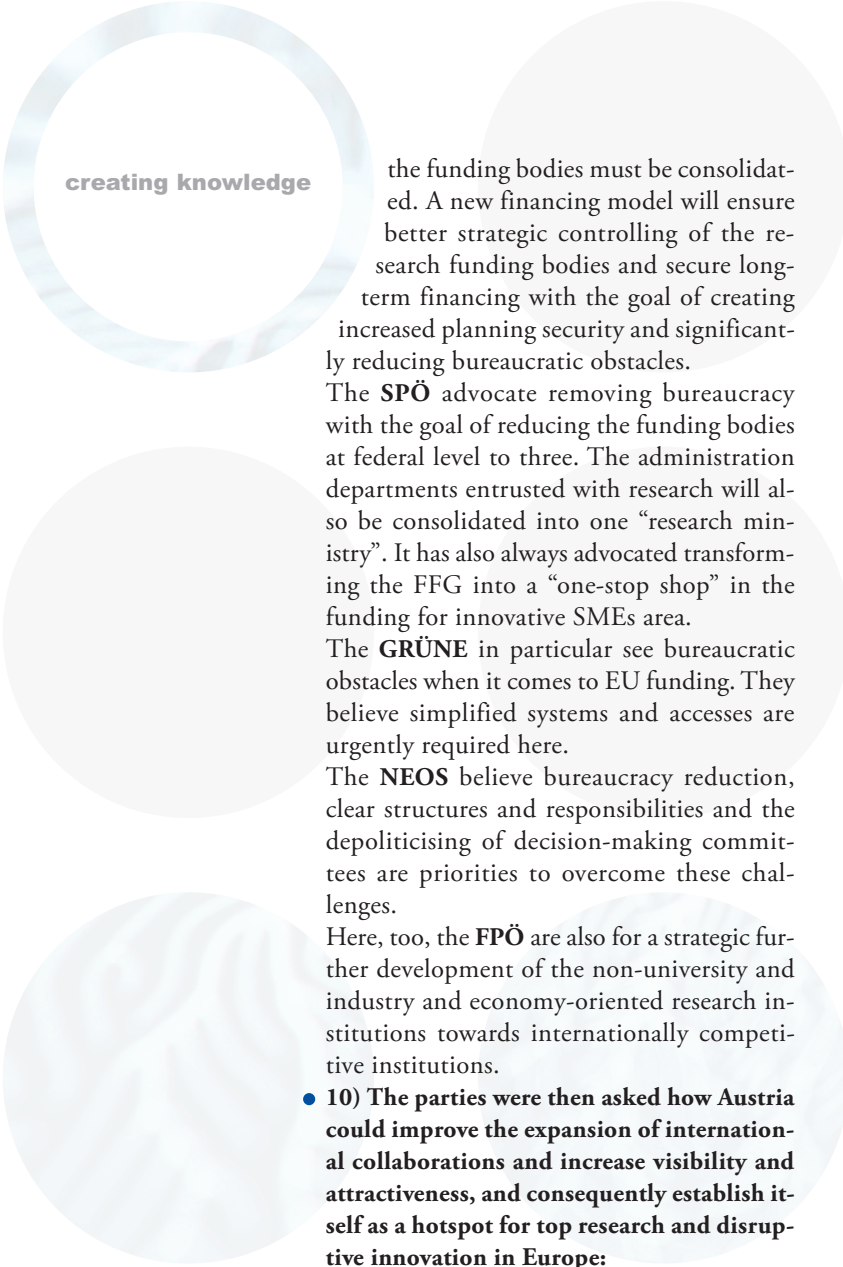
The **ÖVP** intend to boost cooperation between science, research and entrepreneurship. The university campus will become the point of learning, researching and starting companies. Tax and legal incentives will promote start-ups and spin-offs and the economy will cooperate more and directly with universities. The **NEOS** believe innovative SMEs are an important location Austria driving force, and spin-off/start-up funding should be boosted. Knowledge transfer, from the universities through to product market maturity, is considered an important factor for growth and prosperity in Austria. It also requires a culture change and bureaucracy reduction.

The **GRÜNE** believe “so-called” start-ups are hype that must be scrutinised, and that it is actually far more important to set up possible new companies on sound and solid bases. This could result in stronger start-up support, whereby an accompanying risk assessment is also offered.

- **9) When asked how they would shape the framework conditions to optimise RTI governance and contribute to systematically reducing bureaucratic obstacles with clear structures, to make the RTI system's performance more efficient and more effective on the whole and consequently increase the Austrian RTI system's competitiveness, the parties made the following proposals:**

The **ÖVP** believe the existing governance of the Austrian research and innovation system must be rearranged and the tasks and roles of the research institutions and research funding bodies must be defined more precisely and

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the funding bodies must be consolidated. A new financing model will ensure better strategic controlling of the research funding bodies and secure long-term financing with the goal of creating increased planning security and significantly reducing bureaucratic obstacles.

The **SPÖ** advocate removing bureaucracy with the goal of reducing the funding bodies at federal level to three. The administration departments entrusted with research will also be consolidated into one “research ministry”. It has also always advocated transforming the FFG into a “one-stop shop” in the funding for innovative SMEs area.

The **GRÜNE** in particular see bureaucratic obstacles when it comes to EU funding. They believe simplified systems and accesses are urgently required here.

The **NEOS** believe bureaucracy reduction, clear structures and responsibilities and the depoliticising of decision-making committees are priorities to overcome these challenges.

Here, too, the **FPÖ** are also for a strategic further development of the non-university and industry and economy-oriented research institutions towards internationally competitive institutions.

- **10) The parties were then asked how Austria could improve the expansion of international collaborations and increase visibility and attractiveness, and consequently establish itself as a hotspot for top research and disruptive innovation in Europe:**

The **SPÖ** believe urgent investment in research is required now. In the long term, especially the advanced technologies developed by researchers in Austria must be expanded to secure entire industry sectors and their jobs for the long run.

The **ÖVP** believes excellent scientific training and outstanding international universities must be achieved with better study conditions and increased student commitment. The implementation of the study place financing model with full-coverage access regulations should continue and quality training consequently also be secured, because universities can only be expected to offer top-level training when student flows are properly controlled. The third party funds raised or the number of structured doctoral programmes offered are crucial in research at universities with “NEU” financing.

The **NEOS** are for increased competitive basic research funding on the basis of an international assessment process, which excludes interventions and political influence in deciding topics and awarding funds. Defined excellence clusters will be established in competition and promote particularly talented young researchers. The FWF Science Fund, which is responsible for this, must be equipped with sufficient budgetary resources to achieve the level of the agencies in top countries such as Switzerland, the Netherlands or Sweden.

Here, too, the **FPÖ** strives to improve the strategic further development of Austrian non-university and industry and economy-oriented research institutions towards internationally competitive institutions.

The **GRÜNE** advocate the professional and successful research institutions be provided the money required for broad funding of top research to enable international collaborations and guarantee visibility and attractiveness. A change in immigration legislation (especially with regard to applicants from third countries) would also improve international exchanges and contribute to collaborations.

Entrepreneurship-promoting competences in the Austrian education system

Previously the Austrian Council has concluded with its analyses that economic and entrepreneurship content to motivate and prepare for start-ups and entrepreneurial activity is lacking in the Austrian training system. As part of its recommendation on Austrian start-up activity the Austrian Council also explicitly stipulated an increased inclusion of economic and entrepreneurship content in primary and secondary education, as well as the anchoring of role models in tertiary education.

Independent thinking and responsible action are the basis for an innovative society. This requires appropriate competences to drive the development of own ideas, plus the skills to implement them – in other words, the aptly-named “entrepreneurial mindset”. A holistic national strategy and the budget it requires to sustainably anchor entrepreneurship-promoting competences in the Austrian education system are, however, currently lacking in Austria. Discussions with experts and representatives of organisations, ministries, schools and universities also illustrated the need for a holistic strategy for

entrepreneurship education across all school types. An appropriate Austrian Council recommendation was worked out on the basis of the study performed by BDO Consulting GmbH and the discussions held by the Austrian Council.

Based on various past analyses we can assume that the entrepreneurship topic is insufficiently anchored in places in the individual levels of the Austrian education system and, for example, that it has a very diverse effect in different secondary education types of school, as well as in the various universities. A survey of the status quo in the Austrian education system was commissioned to examine such assumptions. A look at selected EU countries (Sweden, Finland and the Netherlands) and their implementation of entrepreneurship education content also followed. The study's objective was to determine short and medium-term implementable measures and action possibilities for individual stakeholders and areas from the findings delivered, and to also illustrate longer-term strategic impact directions.

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Venture capital for financing innovation and growth

In view of its importance for innovation-driven growth, the economic policy of the development of an active, self-supporting risk capital sector must be given the highest possible priority. The expenditure for R&D funding has a verifiable greater impact when the investments activated here are multiplied in their value creation with active venture capital. The economic policy must therefore create an appropriate supply and demand-side framework conditions for innovation and risk financing. Furthermore, it must remove market obstacles.

The objective of the study commissioned by the Austrian Council and performed by the

Wirtschaftspolitisches Zentrum (WPZ) was to present an in-depth analysis of how venture capital can be mobilised for innovation and growth financing and what mechanisms and framework conditions can support the use in Austria of venture capital in general and risk capital in particular. Beginning with the question of the economic importance of venture capital in Austria compared with other countries, a look at the approaches, methods and initiatives of these countries provides new insights into how the supply and demand of venture capital can be controlled better in Austria. Growth processes will also be supported and se-



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cured more here, in line with the overriding innovation and economic goal of moving Austria up into an “innovation leader” position. Ten options for action were derived from the study’s results. They

were entered into the Austrian Council recommendation for the “mobilisation of venture capital to secure sustainable innovation and growth financing²³¹”.

Global Entrepreneurship Monitor 2018

The Global Entrepreneurship Monitor (GEM) is the biggest international comparison study of entrepreneurship. The JOANNEUM technical college has carried out the GEM since 2005 with its Institute for International Management. The 2018 GEM (published in 2019) analysed the dynamics of the Austrian corporate landscape and its essential framework conditions. Key aspects were recorded here, such as start-up activity, start-up attitude and the special characteristics of entrepreneurs. On the basis of qualitative and quantitative findings, the report identified appropriate recommendations for action for Austria, which the Austrian Council also accepted into its recommendation for “the establishment of entrepreneurship-promoting competences in the Austrian education system” and in the recommendation for the “mobilisation of venture capital to secure sustainable innovation and growth financing”. The quantitative survey of the GEM Austria is based on a representative survey in the Austrian population of 18 to 64 year-olds. 4,580 people were surveyed in Austria for the 2018 GEM on the topic of start-ups and start-up attitude. Additionally, a survey of 38 experts on the status of the entrepreneurial ecosystem and the required framework conditions was performed. The report discussed the results in five topical areas:

● 1 Dynamics

The rate of early entrepreneurial activity reached a new record level in 2018 with 10.9 percent. Vienna is the federal state with the highest rate of young entrepreneurs; Austria is ranked number three in the European comparison.

The overall entrepreneurial activity, however, fell slightly in the period considered. Along with changing economic framework conditions, this development was also attributed to significantly more company exits with young entrepreneurs.

The study also shows that Austria’s entrepreneurs increasingly operate internationally. In the European comparison here both young and established companies are active at a high international level.

● 2 Stakeholders

Young Austrian entrepreneurs are becoming younger: 37 years on average. The percentage of women in survey period was 36 percent. With the majority of young Austrian entrepreneurs secondary qualification was also the highest level of education completed. In Austria there is also high catch-up requirement with entrepreneurship education (see also the “Entrepreneurship-promoting competences” study). The employment situation and expectations

²³¹ Austrian Council recommendation of 16/10/2019,

https://www.rat-fte.at/files/rat-fte-pdf/fti-dokumente/RFTE_Wagniskapitalfinanzierung_20190604.pdf

were shown to have improved in 2018. Despite the difficulties of a lack of specialists in some areas, thirteen percent of the entrepreneurs surveyed said they had high growth expectations.

Almost two thirds of all young entrepreneurs in Austria work in family-run companies. According to the estimates of surveyed experts in this respect, Austria is in the European top field with its legal framework conditions and the general public's confidence in family-run companies.

- **3 Motives and opportunities**

In 2018 half of those surveyed rated the start-up opportunities in Austria as good. On the other hand, the competences required for this were seen somewhat more pessimistically. Compared to other European countries, Austria is in the top third with both indicators. The overall entrepreneurship situation is becoming more positive. For half of those Austrians surveyed a start-up is now a career path worth striving for. The fear of failing, however, also remained high in Austria in 2018. The number of start-ups founded out of necessity rose slightly. The most frequent reasons for a start-up were still, however, the desire for greater independence and increased personal income.

- **4 Special topic: "Research, technology and innovation"**

In 2018 the GEM also provided a detailed look at research, technology and innovation-based companies. One of the results: approximately sixty percent of all young Austrian entrepreneurs in the period under consideration launched new products or services on the market.

The advancing digitisation is also reflected in Austria's start-up landscape: More than twenty percent of young entrepreneurs are already technology leaders. And over a quarter can already be described as innovative niche players.

RTI companies also have significantly higher growth expectations and exhibit a higher level of internationalisation compared with the average. A significant increase in research-based and research-intensive companies and spin-offs was also observed in 2018. The protection of intellectual property is therefore also increasingly more important. Catch-up requirement is also observed at the same time with the level of R&D transfer.

- **5 Environment**

Compared with other European countries, Austria ranks fifth in the overall evaluation of the entrepreneurial environment. The financial framework conditions for those starting a company were rated as average; those surveyed believe the growth phase in particular is difficult. The percentage of informal investors stagnated at a low level with approximately six percent. The Austrian funding regime for supporting young companies on the other hand is perceived as very positive. Experts also rated the physical infrastructure as extremely positive. Austria leads here in the European comparison. The economic and services infrastructure on the other hand was rated in 2018 as marginally worse.

The sociocultural norms in Austria by comparison are still assessed as less start-up-promoting, in the European comparison as well. The highest number of promoting and impeding factors were observed in the areas of "bureaucracy and taxes", "sociocultural norms" and "entrepreneurial training and further training".

In summary we can say that the Austrian corporate landscape and its essential framework conditions are increasingly dynamic. Subsequently recommendations on the five key areas of action, "female entrepreneurship", "entrepreneurship education", "financing and funding", "bureaucracy and taxes" and "knowledge transfer" were then determined.

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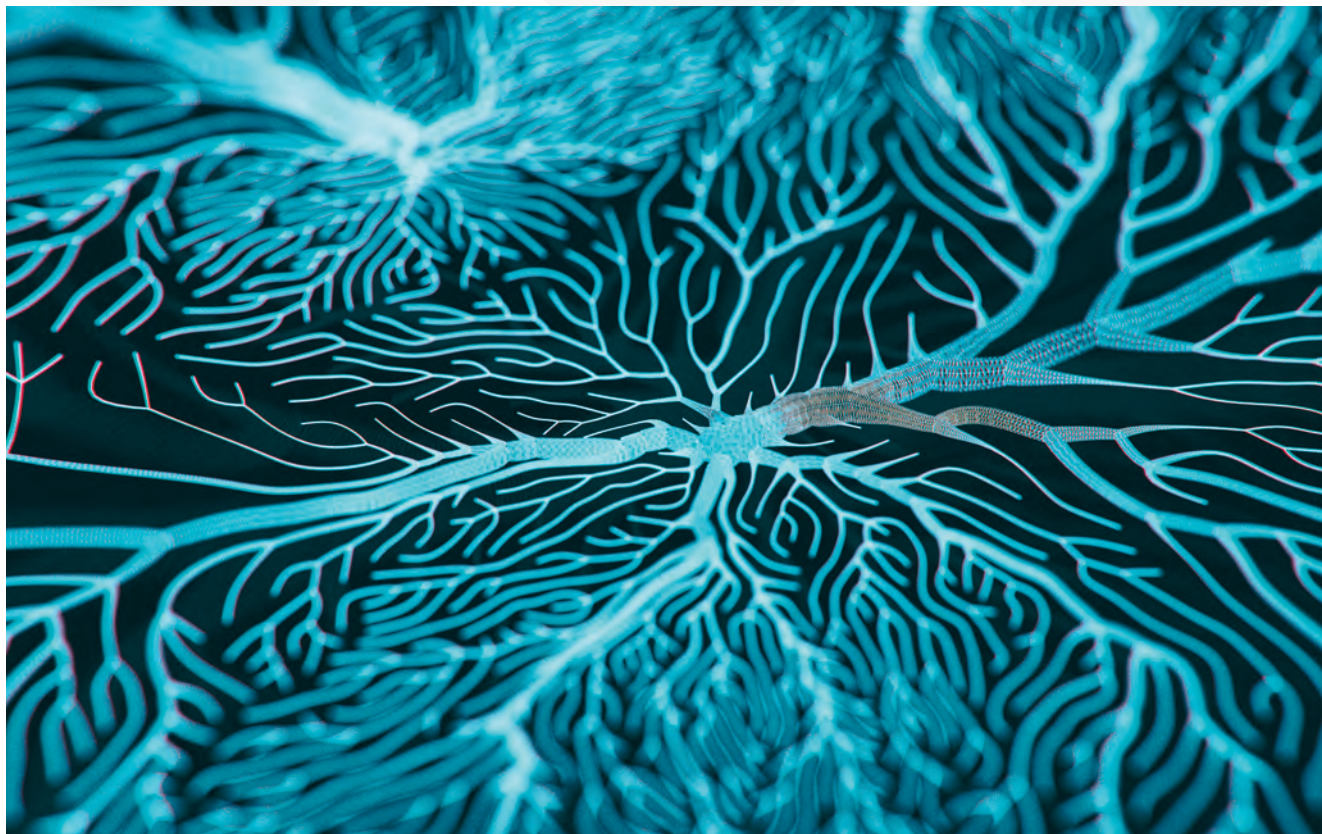
Austrian Startup Monitor 2019

An in-depth database on the formation and dynamic development of start-ups in Austria was generated with the Austrian Startup Monitor (ASM); it was published for the first time by the Austrian Institute of Technology (AIT) in 2018. The results showed that start-ups can be considered the spearhead of technological change and the growth motor of modern national economies. During the course of the 2019 ASM the development dynamic and outlook of the Austrian start-up sector were examined in greater detail. As already in the 2018 ASM, up-to-date information on start-up teams, business models, internationalisation efforts and on the financing structure, assessment of surroundings and future prospects were prepared ac-

cordingly for this. New issues also arise. The main focus in the 2019 ASM here was on the differentiated analysis of academic spin-offs and the importance of different future technologies (Key Enabling Technologies). Own analyses at the states' level are also presented, whereby regionally-specific trends can also be illustrated. All start-ups that were recorded during the ASM were invited to another survey in late summer 2019. With more than 700 participants, the numbers were significantly higher than the previous year.

Supplementary analyses

In addition to the general development of the start-up sector in Austria, some other specific





analyses were performed in the 2019 ASM. As commissioned by the Austrian Council, the importance of Key Enabling Technologies (KETs) in particular, as defined by the European Commission, was examined here. A total of thirty-two key technologies were evaluated in three areas and six sub-groups. The relevance of the top ten key technologies was illustrated here for the three most important sectors (software, hardware, life sciences). The importance of the KETs for academic spin-offs is also examined in further detail. The analyses illustrate the major importance of information technologies and artificial intelligence (AI) in particular across all sectors. The importance of the KETs with regard to revenue, equity capital acquisition and the development phase was also covered.

With regard to the revenues achieved in the last fiscal year there are only marginal differences with the ranking of the KETs. Generally speaking, technologies that can be attributed to the KET areas of digital technologies and cyber technologies dominate. With external capital acquisition with the bigger start-ups, which have already acquired more than EUR one million in

capital, security is increasingly important. They are therefore top of the league with the KET categories, “cyber technologies”, “data protection” and “data connectivity protection”, followed by “machine and deep learning”.

The importance of key technologies was examined after the development phase. The results show that in all phases (seed, start-up and growth), “intelligent software and decision-making technologies”, “machine and deep learning” and “data protection and privacy” technologies take the top positions. As there is a strong correlation between the development phase and the age of start-ups, this finding also applies for the age of companies.

The compilation of the ASM was financially supported once again by a series of institutions. Along with the Federal Ministry for Digitization and Business Location, the Federal Ministry of Education, Science and Research, the Austrian Federal Economic Chamber and the Austrian Council, several other key institutions were also brought on board from the states as financing partners.

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Radical innovation and company age

The Austrian Council has repeatedly the issue of low innovation efficiency in Austria in its performance reports, according to which the high innovation inputs in the country produce comparatively low innovation output. The average company age possibly explains this observation. The Austrian Institute of Technology (AIT) examined this hypothesis in more detail as part of a study commissioned by the Austrian Council.

The starting point for the analysis was empirical research that shows how younger companies try for higher risk and more radical innovations, which, when successful, have greater growth effects than the innovations of older companies. As a result, new companies with higher productivity push the less productive older companies from the market.

There are indications that such a mechanism does not function sufficiently in Austria. Rising to join the most R&D-intensive companies is extremely difficult in Austria for small, young companies. Falling innovation efficiency could therefore be the result of company population over-ageing and getting stuck in technological trajectories with fewer technological possibilities for innovation.

The results of the study initiated by the Austrian Council will help here to better understand the reasons for insufficient innovation efficiency and provide the body politic starting points for efficiency-increasing measures. The results will in particular help to better understand the correlation between company age, innovation output and sector structure.

Network analysis of disruptive technology interfaces

Patent publications are used around the globe by all patent offices as the basis for illustrating the spread of technologies. For this reason they can serve as reliable early indicators for the introduction of new technologies. The metadata of innovative countries about the applicant's institution, the publication date and technologies provides especially useful data foundations for a more in-depth analysis. Techmeter, a specialist for big data analyses of patent data, utilised this fact to compile a network analysis of disruptive technology interfaces as commissioned by the Austrian Council.

The study's results show, among other things, that the percentage of early and late patent applications for new technology combinations coming from Europe since 1980 is slightly above one. A ratio of patent shares in the early phase to patent shares in the late phase of below one means that the respective region participated especially intensively in the early development of the later exponentially growing technology combination. This means the region is an innovation pioneer. A ratio of above one shows a higher relative patent intensity in the late phase. Such regions accordingly are innovation followers.

European inventors constantly contribute to new technologies, from the early to the late phase. Another scenario emerges for the USA, which had

a low share in early patents in ETCs in 1980, which increased by 2010, before it fell again and is currently below one again. The dramatic changes in the invention strategies from technology follower to innovation pioneer can be seen in China and South Korea.

The study drew an important conclusion: If we take a look at successful innovation ecosystems we see the source of the innovation, so the location of the human capital. There is, however, another important location – the exploitation location. A considerable number of patent applications for new technologies have their source (inventor's country) at a different location to that of their exploitation (applicant's country). From this point of view, Europe has a net drain of patent applications (negative intellectual property rights balance, that is the number of patent applications of inventors' ETCs in Europe, submitted for entities outside Europe, is higher than the number of patent applications of inventors outside Europe for European institutions and patent applicants). The USA have by far the highest positive balance of intellectual property rights.

The study also indicates that the European innovation ecosystem is actually stable, but scores negatively in balance. Without effective policy measures to attract knowledge flows there is the danger of innovation loss.

Digital transformation in Austrian value creation networks

According to the current OECD report, digitisation has a direct influence on a country's innovation policy. To evaluate this influence on leading Austrian companies and SMEs, the Austrian Council commissioned a study with the "Industriewissenschaftliches Institut (IWI)", which examines the digital transformation in Austrian value creation networks on the basis of leading companies and SMEs. Among other things, the IWI analyses to which degree the digital transformation

can make the two essential production factors in value creation processes (labour and capital) more effective/more productive. In addition to the development of methods and lines of argumentation, the issue is examined on the basis of three or four selected case studies. The possibilities of analysis as part of macroeconomic models are also considered. Technology providers and recipients will, for example, be identified and analysed via a macroeconomic technology flow analysis.

Besides, digital transformation in Austria is analysed with exploratory methods against the backdrop of actual structures and the economic performance connected with them. Internal and external digital technology providers and recipients are determined on the basis of network views. The study's working hypothesis is: "Digital transformation takes place with joint efforts, across and beyond both employee and company boundaries". The more dynamic the underlying sub-

stance, the greater the overall competitiveness. It will also be shown how much the digital transformation gets quantifiable developments going in the domestic national economy, not just within company boundaries, but outside of companies as well – especially in the associated macroeconomic value creation capabilities.

The study will be completed and published in 2020.

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Digital transformation and ethics. Scientific-technical developments interacting with social acceptance

The digital transformation and the rapid progress it entails in many scientific-technical areas mean massive changes in almost all life and work areas. Enormous opportunities for the Austrian research, technology and innovation location are offered – from biotechnologies and medical technologies to neurosciences, artificial intelligence and robotics, through to their interdisciplinary networking. At the same time, however, a series of new socio-political and ethical challenges also emerge; they affect our values structure and therefore increasingly dominate the public discussion with respect to the social acceptance of these developments. The Austrian Council believes making a substantial contribution to objectifying the social discussion on the challenges, risks and opportunities of digitisation for each and every person and society as a whole is one of its most important tasks. With the European Alpbach 2019 Forum it therefore initiated the urgently required discussion process for this with the presentation of its "Digital transformation and ethics" brochure.

The brochure was supplemented by a video contribution with expert interviews on the topic of, "what challenges does artificial intelligence pose for us?" (go to: <https://www.rat-fte.at/publikationen.html#2019>).

With the brochure and using a questionnaire, the Austrian Council outlined an initial overview of the most urgent issues, which result from the current scientific and technological developments as the digital transformation progress. The challenges of digitisation and their various dimensions were structured in line with five topical areas – from "science, technology and society" and "biotechnologies and neurotechnologies" to the "healthcare sector" and "AI, robotics and big data", through to the "possibilities for shaping the future".

These issues were expanded on by contributions from selected experts, including Sabine Köszegi (Vienna University of Technology, Chair of the Austrian Council on Robotics and Artificial Intelligence), Clara Neppel (Institute of Electrical and Electronics Engineers – IEEE) and Barbara Prainsack (University of Vienna) and the two Council Chairs, Hannes Androsch and Markus Hengstschläger.

The next step will be about formulating possible answers to the questions raised by the Austrian Council, for which the Council plans a publication with contributions by renowned experts in autumn 2020.



creating knowledge

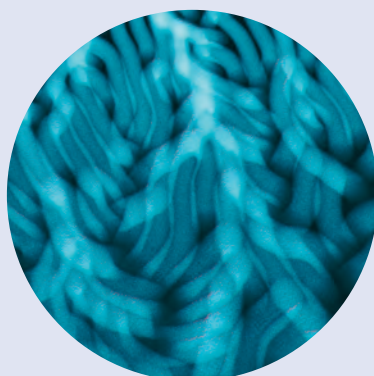
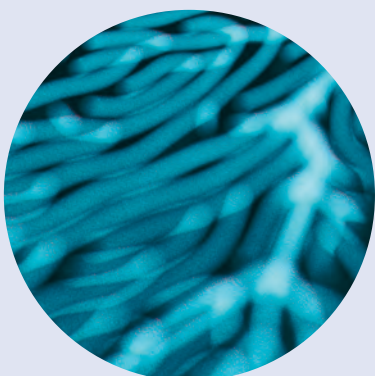
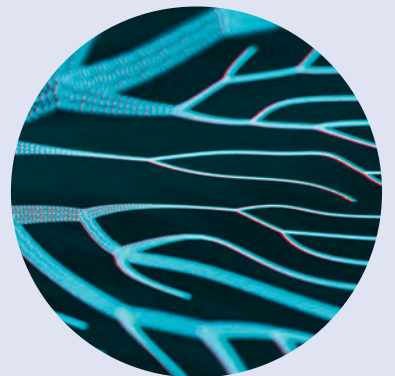
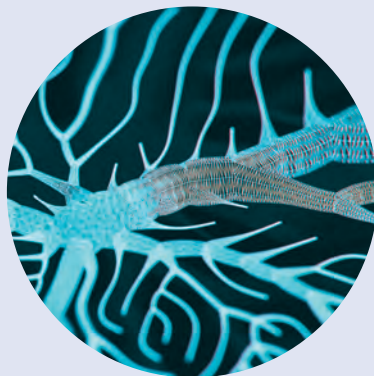
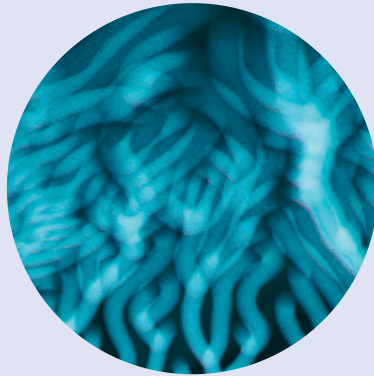
International activities

Councils meeting in Leuven – December 2019

The European Council formations meet once a year. In December 2019 the meeting was held by the Flemish Research Council in the Belgian city of Leuven. Klara Sekanina represented the Council Board of the Austrian Council. The exchange incorporated the councils' content and structural issues, which are connected in various

ways with the respective government of their country.

Presentations were made by the participating countries, Denmark, Germany, Estonia, Finland, Lithuania, the Netherlands, Norway, Switzerland and the Czech Republic. The respective content contributions can be requested from the Secretariat.



Austrian Council's New Year Reception in Vienna's Ringturm



Left to right:
Ludovit Garzik (Austrian Council)
BM Heinz Faßmann (BMBWF)
BMin Margarete Schramböck (BMDW)
Hannes Androsch (Austrian Council)
Karl Fink (Vienna Insurance Group)
BM Norbert Hofer (Austrian Council)
Markus Hengstschläger (Austrian Council)
Sabine Herlitschka (Austrian Council)

Hannes Androsch
 Chairman of the Austrian Council



Presentation of the Report on Austria's Scientific and Technological Capability 2019 – 29 April 2019

Approximately ten years after work began on the Austrian Government's RTI Strategy, the Report on Austria's Scientific and Technological Capability 2019 conclusively evaluates the current implementation status. The focus here was on the degree to which the priority goal of the RTI Strategy to join the group of innovation leaders by 2020 was achieved. Along with some successful developments, above all the discrepancy between this aim to become one of

the leading innovation nations and the reality of Austria's de facto unchanging distance to the group of leaders is illustrated here.

The report was presented in the Presseclub Concordia on Monday 29 April 2019 by the two Council Chairs, Hannes Androsch and Markus Hengstschläger, and Austrian Council Managing Director Ludovit Garzik and Content Project Manager Johannes Gadner.

“Digital transformation and ethics” brochure presentation in Alpbach – 21 August 2019

The Austrian Council invited interested parties to a press conference on the fringe of the technology discussions as part of the European Alpbach Forum on 21 August 2019. Austrian Council Deputy Chairman Markus Hengstschläger and Council Managing Director Ludovít Garzik presented the “Digital transformation and ethics” brochure and a video contribution with expert interviews on the topic of, “what challenges does artificial intelligence po-

se for us?”. The brochure and the video are the Austrian Council’s contribution to initiating the urgently required social and ethical debate on the challenges posed in the age of digitisation (see also, “Creating knowledge” chapter). Further constructive talks were therefore then held after the press conference with numerous stakeholders in the Austrian research, technology and innovation landscape and the media representatives present in Alpbach.

events

Left to right:
Markus Hengstschläger
Deputy Chairman of the Austrian Council
Ludovít Garzik
Head of the Secretariat



Policy Event on Social Innovation & Social Entrepreneurship of the GEMSE – 10 October 2019

Social innovation increasingly makes important contributions to meeting social challenges. Even social states such as Austria appear to be no longer able to deal with all social problems with tax revenues alone. Many countries have already started to draw on the solutions of innovative social entrepreneurs to approach the major upheavals our societies face. To remain an economically successful nation with a high standard of living it is essential that Austria focus more on social innovations and social entrepreneurship.

To discuss these topics a social entrepreneurship policy event was held by GEMSE²³², a multi-stakeholder group, in October 2019 as part of “Impact Days” in the Impact Hub Vienna. The Austrian Council has been part of the GEMSE, which consists of various stakeholders in the economy and innovation system, since 2014. The event was in particular about illustrating the sector’s increasing social and economic importance and highlighting the significance of its contribution to the attractiveness of business location Austria. Along with a keynote and presentations, workshops on various topical areas were also held throughout the policy event. GEMSE subsequently worked out a briefing paper with regard to current social challenges (climate crisis, economic downturns, migration, education and insufficient transparency) to illustrate the contributi-

on social innovations and social entrepreneurship can make to the solution. This paper incorporates the following strategic priorities and key challenges, among other points:

Topic 1: Economic downturn

Social entrepreneurship is a growing sector and therefore also of increasing economic importance. There are currently approximately 1,800 to 2,600 social enterprises in Austria, and their numbers are increasing.²³³ According to estimates by the European Commission every fourth new company is already a social start-up²³⁴. It is therefore a sector with consistently strong growth.

Social enterprises are job motors: Estimates show that they are a high job multiplier. There is also high follow-on demand compared with other sectors as well.²³⁵

Jobs in social enterprises remain in Austria: Jobs in social enterprises are frequently in the area of local social services for people. They are therefore increasingly “non-exportable jobs”.

Social entrepreneurs help with labour market integration: Many social enterprises work in the area of (further) training, labour market, transfer labour market and offer innovative solutions to mitigate the subsequent damages of labour market downturns.

²³² Gemeinsam mehr Social Entrepreneurship (GEMSE), <http://www.gemse.or.at/>

²³³ Vantor, Peter, et al. (2015): Das Potential von Social Business in Österreich. Social Entrepreneurship Center des NPO & SE Kompetenzzentrums der Wirtschaftsuniversität Wien.

²³⁴ Initiative für soziales Unternehmertum der Europäischen Kommission. GD Binnenmarkt und Dienstleistungen, Dezember 2015.

²³⁵ Vantor, Peter, et al. (2015): Das Potential von Social Business in Österreich. Social Entrepreneurship Center des NPO & SE Kompetenzzentrums der Wirtschaftsuniversität Wien.

Topic 2-5: Climate crisis, migration, education and transparency

Social enterprises are innovation labs for topics such as climate change, migration, education and transparency: Noteworthy non-state innovations of recent years have emerged as social enterprises and with the support of the emerging ecosystem. For example, Teach for Austria²³⁶ (education), Austrian Coding School²³⁷ (migration), Magdas Hotel²³⁸ (migration), Shades Tours²³⁹ and MyAbility²⁴⁰ (transparency and inclusion), Compuritas²⁴¹ (sustainability) or micromacro²⁴² (climate crisis), to name just a few here by way of representation. Social entrepreneurs' most frequent impact goals are:²⁴³

- Education (58 percent)
- Social services and migration (33 percent)
- Environment (30 percent)
- Politics and democracy (15 percent)

Implementation is frequently performed together with state and market: Social entrepreneurs develop and test innovative solutions for social issues with the support of the ecosystem. The solutions are frequently scaled together with public sector institutions or market stakeholders, for example, as new labour market measures of the AMS and with partners from economic affairs, for piloting new education cooperations via the Innovation Foundation for Education or via purely private sector demand (Magdas Hotel).

Social entrepreneurs respond rapidly to social problem areas: With the challenges of recent years (migration, climate crisis) the number of start-ups and ecosystem activities increased after just a few weeks.

Key challenges

The potential of social entrepreneurs has not been leveraged despite their increasing importance. In Austria the framework conditions in particular can therefore be expanded further, as according to a ranking²⁴⁴ by Reuters, in 2016 Austria was placed at only 38 from a total of 44 OECD countries.

This is due among others things to an outdated innovation concept. The Austrian innovation policy is currently dominated by a technologically-characterised innovation concept. A more modern innovation concept incorporates more than this and also includes service innovations, innovations in the creative sector and social/societal innovations.

The sector also suffers from insufficient financing: Public sector funding offers finish after pilot runs or do not have secured financing for the future. Private non-profit funding is still largely non-existent. Allocations by non-profit foundations in Germany and Switzerland are almost 50 times (!) higher.²⁴⁵ Projects such as Organic Tools²⁴⁶, Shades Tours or Compuritas, for

events

²³⁶<https://www.teachforaustria.at/>

²³⁷<https://www.newaustriancodingschool.at/>

²³⁸<https://www.magdas-hotel.at/>

²³⁹<https://www.shades-tours.com/>

²⁴⁰<https://www.myability.org/>

²⁴¹<https://www.compuritas.at/>

²⁴²<http://www.micromacro.at/>

²⁴³ Vandro, Peter, et al. (2015): Das Potential von Social Business in Österreich. Social Entrepreneurship Center des NPO & SE Kompetenzzentrums der Wirtschaftsuniversität Wien.

²⁴⁴ The best countries to be a Social Entrepreneur, 2016: <https://poll2016.trust.org/>

²⁴⁵ Die Rolle der Gemeinnützigkeit in Österreichischen Stiftungen, WU Wien: <https://epub.wu.ac.at/4059/>

²⁴⁶<https://www.organic-tools.com/>

events

example, successfully and innovatively address social challenges thanks to public start-up financing. Three evaluated pilot programmes with a total of ninety funded projects confirm the potential exhibited.

And ultimately contact partners in public administration are also lacking. There are no

clear contact points for sector representatives and social enterprises and there is no established system to enable innovation transfers and collaboration. Also problematic here is the fact that with social entrepreneurship it is still about cross-sectional material, which affects several ministries.

Presentation of the Venture Capital Study – 27 November 2019

Christian Keuschnigg, Head of the Wirtschaftspolitisches Zentrum (WPZ), compiled a study entitled “Wagniskapital zur Finanzierung von Innovation und Wachstum” for the Austrian Council (see “Creating knowledge” chapter). Content inputs for this were also provided by the Austrian Private Equity and Venture Capital Organisation (AVCO).

The event to present and discuss the study’s re-

sults was held on 27 November 2019 in Vienna’s Haus der Musik. A podium discussion moderated by Bernhard Ecker followed the study author’s keynote, with the participation of Stefan Buchinger (Federal Ministry for Digitization and Economic Matters), Alexandra Mazak-Huemer (Austrian Council), Christian Keuschnigg (Wirtschaftspolitisches Zentrum), Bernhard Sagmeister (AWS) and Rudolf Kinsky (AVCO).

Left to right:

Christian Keuschnigg (WPZ)

Alexandra Mazak-Huemer
(Austrian Council)

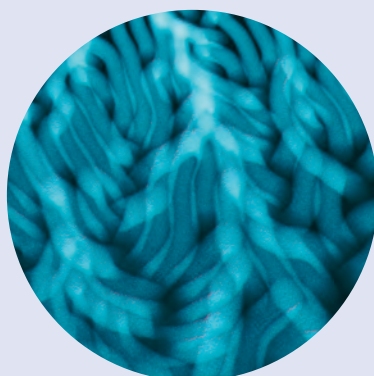
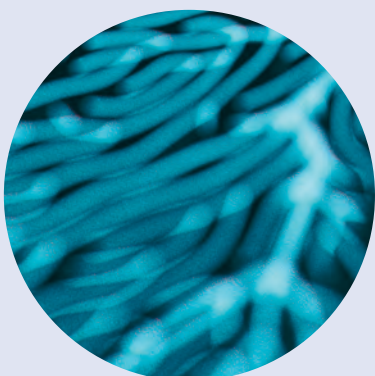
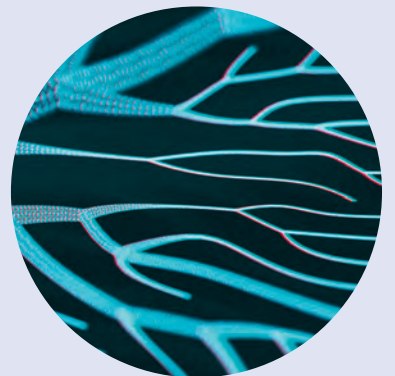
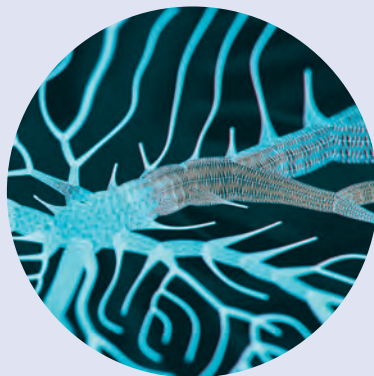
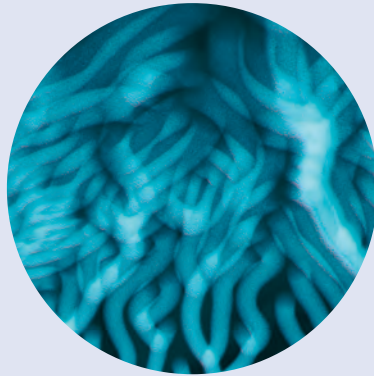
Rudolf Kinsky (AVCO)

Bernhard Ecker (presenter)

Bernhard Sagmeister (AWS)

Stefan Buchinger (BMDW)





Review and Outlook 2019/2020

Before we can begin to consider 2019 in the rear view mirror and take a look forward at 2020 we must make reference to the time at which this information was recorded. The perspective and assessments of what

can be described now or before as “normal conditions” shift on a daily basis. The time is March 2020, which makes it clear that the “normal” is considered under the shadow of the corona virus – so “normal” was actually before the crisis.

Review 2019



Ludovit Garzik
Head of the Secretariat

Not taking coronavirus into consideration, the assessment of 2019 would on one hand have been “politically turbulent”; on the other, it would have been the “daunting standstill of the transitional government”. In summary we can say: The RTI system had ambitious plans for 2019 and achieved nothing. The body politic started into the year with a whole list of correct and important points: The offering of projects that were to be implemented before a big research summit in May 2019 ranged from a 2030 strategy to a research funding act and the excellence strategy, through to

the research database. All players in the RTI system saw this implementation positively, but the plans were given improvements that would have to wait over a decade for implementation. However, this never happened. The summit was cancelled, primarily due to insufficient budgetary funding. Just a few days later the Austrian Government fell asunder with the appearance of an embarrassing video of political decision makers. The rest of the year (still more than seven months) can be written off as a “state of dozing”. Only the Strategy 2030 work groups met, albeit with the exclusion of the RTI community.

Outlook for 2020

The formation of a new and unique ÖVP-Grüne federal government already sparked new hope in the RTI community in the first days of the new year, but they were dashed again shortly thereafter – this time by a virus. The political priorities are clearly focused on maintaining the healthcare system and the social system, as well as preventing multiple organ failure in the economic system, complete with stagflation. But research in particular also plays an important role in the COVID-19 crisis. The search

for a vaccine is now the story in so many news programmes. The hope that the research budgets will increase in the long run due to the budgetary pressure of the corona crisis may not be met, but the political attention drawn to the importance of basic research and applied research is intensified by the virus. There is little point in looking beyond the corona period, as the development trajectories that the national and international turbulences might cause are too uncertain.



the austrian council



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Advisory members

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Univ.-Prof. Dr. Heinz Faßmann Austrian Federal Minister of Education, Science and Research

Leonore Gewessler, BA Austrian Federal Minister of Climate Action, Environment, Energy, Mobility, Innovation and Technology

Dr. Margarete Schramböck Austrian Federal Minister of Digitisation and Business Location

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Dr. Hannes Androsch

Chairman of the Austrian Council
Industrialist, former minister of finance and former consultant to the World Bank. Member of the Senate of the Austrian Academy of Sciences (ÖAW) and Head of the Supervisory Board of the Austrian Institute of Technology (AIT)



Univ.-Prof. Dr. Markus Hengstschläger

Deputy Chairman of the Austrian Council
Head of the Institute of Medical Genetics at the Medical University of Vienna, Vice Chairman of the Bioethics Commission at the Federal Chancellery (since 2009)



Univ.-Prof. Dr. Jakob Edler

Director at the Fraunhofer Institute for System and Innovation Research, Karlsruhe



Dr. Hermann Hauser

Company founder, computer and risk capital businessman in the UK, Co-founder of Silicon Fen ("British Silicon Valley")



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Council member of the Swiss Federal Foundation for the Promotion of the Swiss Economy through Scientific Research. Former Head of the Swiss Commission for Technology and Innovation (CTI)

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The Secretariat

The Secretariat supports the Austrian Council both in terms of organization and content, in particular with regard to preparing and organising the meetings of the Austrian Council and work groups, and in respect of communication both within the Council and externally. The operations of the Austrian Council are financed by the Ministry of Transport, Innovation and Technology. The Head of the Secretariat, Deputy Head of the Secretariat and members of staff (in alphabetical order):



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With Dr. Constanze Stockhammer and DI Walter Schneider two esteemed long-time colleagues left our Secretariat in 2019. We wish them all the very best for the future.

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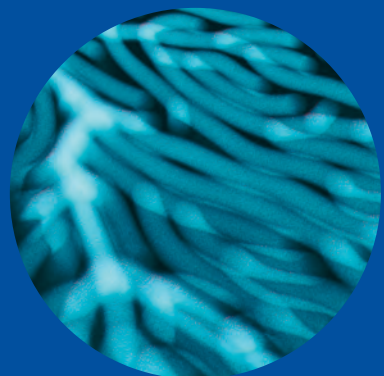
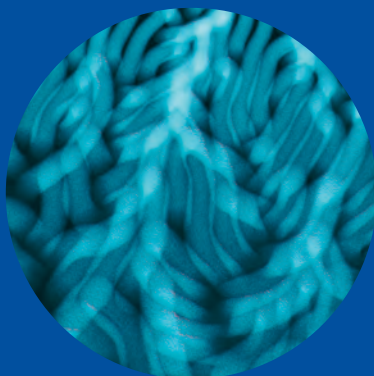
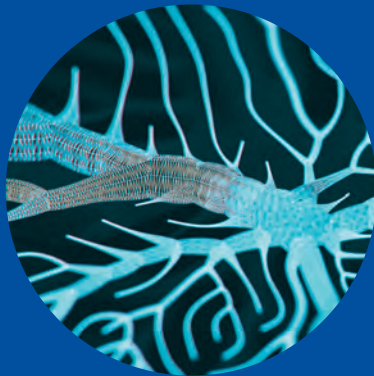
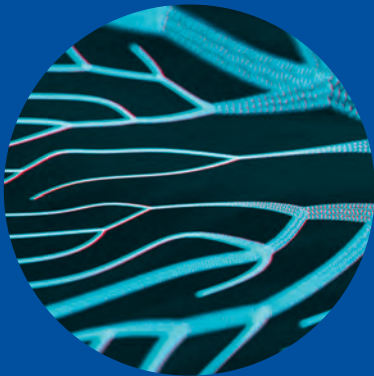
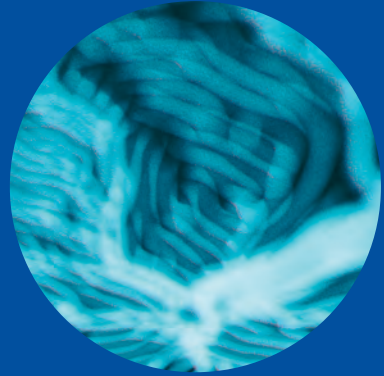
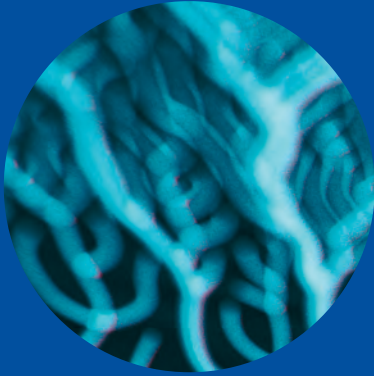
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