

Innovation Strategies

Georg Schütte Integrating Academia and Business: Teaming Up to Boost Innovation¹

The ifo Institute's 68th Annual Meeting, held in the Ludwig-Maximilians-Universität München (LMU Munich), symbolises how important exchanges and links are in academia. The ifo Institute enjoys close links with the LMU. The Directors of ifo's Centers also hold a chair at the economics faculty of the LMU. This highlights the significance of close links between non-university research – here that of a Leibniz institute – with university research. Nationwide and international scientific exchanges are equally as important. Together with CESifo, the ifo Institute and the LMU drive international networking. In June 2017 the ifo Institute co-founded the European research network EconPol Europe. These represent key features of a lively and successful research landscape.

At the ifo's Annual Meetings academia, business and civil society come together. If the title of this article were: 'Integrating Academia, Business and Society: Teaming Up to *Think* Innovatively', then it would be a little like taking coals to Newcastle. However, this contribution focuses on how the framework conditions can be improved so that business and academia can *innovate* together in the future. The ifo Annual Meeting is also a forum for illustrating economic analyses and offering orientation in a swiftly changing world. Politics needs such advice to handle the multitude of questions that we are facing.

Germany has emerged stronger from the global crises and challenges of recent years. It is currently in a good position. The ifo Business Climate Index shows that economic sentiment is good. In June 2017 the index reached its highest level since 1991.² In other

words, companies assess their current business situation favourably and are positive about the future. The ifo Institute has upwardly revised its economic forecast significantly and expects a GDP growth rate of two percent in 2018.³ Employment is at a record level and quality of life is high. We have a stable democracy and a balanced budget. This is all possible because Germany is one of Europe's leading innovators. A study by the European Commission (2017) shows that around two thirds of European economic growth is driven by investment in research and development (R&D). High innovative drive is the cornerstone for prosperity, quality of living and opportunities in Germany.

The German government has done a lot to ensure that the situation stays this way:

- Germany is currently investing double the amount in R&D than it did a decade ago. The German government alone increased its R&D expenditure by almost two thirds between 2006 and 2015. Government expenditure hit a record of 15 billion euros in 2015.⁴
- Since 2006 the federal government has bundled its R&D policy in a cross policy area research and innovation strategy. A wide range of research and innovation policy initiatives were launched under the umbrella of the High-Tech Strategy (HTS).
- On this basis, the government and business together have practically achieved the goal of investing three percent of gross domestic product in research and development. In 2015 over 600,000 people were employed in R&D in universities, companies and research institutes. This marked an increase of 34 percent, or a good 160,000 researchers *versus* the launch of HTS in 2006.⁵
- These efforts are reflected in results: Germany is one of the world's international leaders in terms of scientific output. It also ranks fifth in terms of the number of academic publications that are among the world's top ten percent most cited (excellence rate) – see Schmoch *et al.* (2016).



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¹ This article is an English translation of the keynote speech given by Georg Schütte, State Secretary at the Federal Ministry of Education and Research, at the 68th Annual Meeting of the ifo Institute, which was held in Munich on 28 June 2017.

² ifo Konjunkturumfragen, June 2017.

³ ifo Konjunkturprognose 2017/2018.

⁴ Federal Ministry of Education and Research Data Portal: Table 1.1.4., <http://www.datenportal.bmbf.de/portal/de/index.html>.

⁵ See Federal Statistical Office, *Stifterverband, Wissenschaftsstatistik*, <https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/BildungForschungKultur/ForschungEntwicklung/Tabellen/PersonalForschungEntwicklung.html>.

- We have a sustainably high world market share of technology products.⁶ In the past Germany has repeatedly succeeded in linking the most modern technologies with the traditional strengths of the German economy in chemicals, electrical technology and car manufacturing.

At the same time there is the question of whether Germany's success model is sustainable in the future: are the challenges that we see ahead growing too fast for us to keep up? In addition to digitalisation, modern life sciences are delivering ground-breaking insights at a breath-taking speed. The interplay of biotechnology, nanotechnology and digitalisation are creating new tools and methods for exploiting these insights. This opens up far-reaching perspectives for all areas of our economy. Biological systems, principles and processes are being adopted in a growing number of branches from the pharma and chemicals industry to car manufacturing. Germany is in international competition for ground-breaking ideas, creative talent and attractive location conditions for young start-ups and ambitious companies.

At the same time – and this is a paradox – the growth rate of labour productivity has been falling in advanced economies for several years.⁷ This is also the case in Germany. There are various scientific approaches to explain this phenomenon. Economists assume that ongoing digitalisation can no longer be measured using the traditional economic indicators. This means that part of productivity gains are not included in the growth measured. Let us take music streaming services, for example. In the past every record or CD had to be purchased individually. Now consumers can access a huge music library for a relatively small flat rate. How is such innovation reflected in productivity measurement? Does it lead to less 'value' creation and thus mean that working is less productive? Or can the value not be measured properly? Is this shown by the different rates of productivity growth that is increasingly dividing the world into innovation leaders and losers? Which place will Germany take in a new platform economy driven by digital technologies? Are we equipped to tackle the challenge?

In terms of digitalisation in particular Germany is facing major challenges. This is clear from looking at just one figure: in China there are 25 so-called 'unicorns', or internet start-ups that are now already worth over a billion dollars. They are growing dynamically. In Germany there is not one single such organisation. We need to respond to these challenges with a new research and innovation strategy. This strategy will have to set far more ambitious targets than in the past. Research and innovation policy has to reflect shorter innovation cycles and increasingly tough competition in terms of locations. Four aspects of this strategy are described here in greater detail.

⁶ German Federal Report on Research and Innovation 2016, <http://www.datenportal.bmbf.de/portal/en/bufi.html>.

⁷ OECD database.

OUTSTANDING, INDEPENDENT RESEARCH IS THE FOUNDATION FOR INNOVATION

Higher education institutions make an indispensable contribution to innovation, to supplying highly-qualified staff, to boosting economic growth and improving the employment situation. According to estimates by the Federal Ministry for Economic Affairs and Energy, investments in higher education result in a fiscal rate of return of nine percent (see Krebs and Scheffel 2016). To empower institutes of higher education, the Federal Ministry of Education and Research and the *Länder* (*Federal States*) therefore approved a strategic comprehensive package in summer 2016. The package features the Excellence Strategy ('Exzellenzstrategie') for top university research and an initiative to promote the strategic development of knowledge transfer and cooperation between University, industry and social actors ('Innovative Hochschule').

As of 2018 the annual sum of over half a billion euros will be spent on the continued pursuit of the Excellence Strategy, which is geared towards the long term. The LMU was particularly successful in the second round of the Excellence Competition in 2012 with four graduate schools, four excellence clusters as well as its LMU excellent concept for the future enjoyed. The continued pursuit of the excellence will make outstanding research conducted in Germany even more competitive internationally.

In addition to the primary and secondary missions of higher education, namely research and teaching, the German federal government also offers long-term support for their tertiary mission, namely transfer and innovation. To this end a tender for 'Innovative Hochschule' funding was issued at the end of 2016 and 29 applications involving a total of 48 applied science universities and traditional universities were selected in a first round. Transfer activities are too often bound to certain individuals. If a person leaves the higher education institution, it loses its competences in a given area. The 'Innovative Hochschule' initiative follows a systematic approach by supporting smaller, individual transfer projects. Higher education institutes had to focus far more on a coherent transfer strategy and present a convincing concept for implementing this strategy. The Ministry and *Länder* have pledged a total of 550 million euros in funding for this initiative over a 10-year period.

Another key approach to improving the German knowledge system is promoting 'Open Access'. A comprehensive and unrestricted access to knowledge is essential to building networks and knowledge transfer. Scientific insights should be easier to access and research results should be more transparent. The direct and timely exchange of knowledge, data and information across borders and institutions is a prerequisite for keeping up with the current pace of the innovation dynamic. As a result, the Federal Ministry of Research is systematically implementing the Open Access Strategy and is developing it further into a national strategy.

CREATING AN OPEN AND PARTICIPATIVE INNOVATION CULTURE

The Federal Ministry of Education and Research is planning to create new free and experimental spaces, which should go far further than conventional forms of networking activities. The aim is to support and establish new forms of cooperation and to offer scope for development for the knowledge and commitment of citizens and the know-how of experts by giving them their rightful place. Corporate risk-taking should be rewarded, the courage to implement new, ground-breaking ideas should be promoted and assuming social responsibility should be acknowledged. Academia, business and society should work together across disciplines. Users, providers and producers, as well as large and small players should come together and innovate.

New forms of cooperation can unleash creative potential. Measures and programmes that create diversity and enable new solutions need to be supported as a result. Research results that have the potential to trigger ground-breaking innovations and promise a huge amount of added value for our quality of life should be checked for their relevance in other areas. A new initiative to promote validation should support the transition to market and application maturity. The initiative must be geared towards business and science and needs to involve players from society.

The Federal Ministry of Research plans to initiate a new Leading-Edge Cluster Competition ('Spitzencluster-Wettbewerb'), which addresses emerging research and innovation fields. The focus should also be on new interdisciplinary models of cooperation for research institutes, companies and start-ups working on disruptive technologies. Open innovation campuses should support the targeted and strategic launch of innovation processes by implementing the demonstration projects of universities, research institutes, companies, experts and users. These processes should take two directions: applications *and* development in open innovation laboratories. The government is planning to bundle its initiatives related to the transfer of ideas, knowledge and technology in an excellence programme for cooperation and exchange between academia, business and society. This should generate synergies between individual measures and professionalise the structures for promoting cooperation.

Start-ups are tomorrow's market leaders and an important source of innovative business ideas, creative processes and new products. People, young and old, men and women, should be encouraged to take on entrepreneurial responsibility themselves. Excellent research can be a cornerstone for the emergence and success of innovative business ideas. In science and research we need to be more successful in paving the way for start-ups as a means of exploiting research results. That is why the Federal Ministry of Education and Research is expanding its support of founding activities.

New approaches to developing entrepreneurial independence and the ability to exploit from research: this should contribute to a stronger culture of start-ups and exploiting results in science. The Ministry is planning to extend its research funding programme with modules on supporting start-ups and to integrate young start-ups more intensively in promoting clusters. It also aims to simplify access to the federal government's existing open funding programmes for company founders and should be more specifically customised to meet the needs of young entrepreneurs. At the same time the Ministry also supports further improvements to the tax framework conditions for risk capital. This will close gaps in the government's start-up funding to date.

It is primarily Germany's small and medium-sized enterprises (SMEs) that introduce new ideas into the markets and partly determine our economic and innovative power. That is why those SMEs that were not particularly innovative in recent years need to be activated. At the same time, SMEs that are strong in research need to be steered along innovation paths that are important for Germany. The Ministry of Education and Research is expanding its ten-point programme 'Vorfahrt für den Mittelstand' (Making SMEs a Priority) in order to strengthen SMEs. The joint development of core competences in areas like digitalisation by politics and business should support SMEs in key sectors of Germany's economy. The Ministry of Education and Research will also help to ensure that enough qualified staff is available. Universities and public research institutes should become more open to cooperation with SMEs as key research and innovation partners as part of a new research and innovation pact ('Pakt für Forschung und Innovation'), for example. Funding procedures need to be simplified. More specifically, the Federal Ministry for Economic Affairs' overarching technology initiatives should ensure a consistent and transparent architecture for promoting R&D funding for SMEs.

The Ministry for Research's understanding of innovation is based on a comprehensive innovation concept that attaches equal importance to both technological and social innovation. New business models, organisational practices or new forms of learning, working and living together can have a greater impact than individual technologies. In many cases they reinforce each other. That is why specialist research funding programmes should increasingly be opened up to social innovation and geared towards key social targets, as is currently the case in nursing, for example. To this end the Ministry of Education and Research is planning to create experimental spaces for social innovation in which innovators, as well as potential users come together. Here forms of the sharing economy, institutional instruments, new financing models and exploitation channels and citizen involvement can be tried out. Field tests should also be conducted to see how technological and social innovation can be implemented under realistic conditions. The Ministry of Education and

Research also intends to expand its ‘Citizen Science’ research programme.

BUILDING COMPETENCE ADVANTAGES IN KEY AREAS OF TECHNOLOGICAL CHANGE

Germany’s federal government has shown foresight in terms of Industry 4.0, which was developed and supported as part of its High-Tech Strategy and research union of the time. That is why Germany enjoys an advantage in terms of Industry 4.0. That is what we want to achieve in other areas too. The Ministry of Education and Research would like to drive the following four examples of ‘missions’.

- ‘Learning systems’: systems are now in a position to evaluate data from their environment independently, to analyse them and autonomously deduct rules that nobody has programmed them to. Self-driving cars that can navigate complex traffic situations are a prominent example of this. Only vehicles that learn how to deal with different traffic situations can be autonomous. There is great and diverse potential for learning systems. They offer huge advantages for the health sector by, for example, quickly analysing large quantities of X-rays in mammography and identifying suspicious cases for specialists. Learning systems are also used in IT security for they recognise patterns in large volumes of data that no human could possibly recognise and can report attack tactics early. In this area there are still many open research questions, which is why the Ministry of Education and Research has launched a future-oriented project called ‘learning systems’.
- ‘Security research cluster’: in view of the growing risk of terror, providing security in an open, globally connected society is more challenging than ever. Science can be seen as a trustworthy authority in this instance. The Ministry of Education and Research has already proven that with its IT security centres. As a next step national security research clusters will be built up that benefit experts and practitioners from science, business and even emergency personnel like, for example, the fire brigade and technical relief. The central component of a new security research programme should be competence clusters.
- ‘National active agent initiative’: infectious diseases are becoming a growing threat due to a lack of active agents and increasingly widespread resistance to antibiotics. Many pharmaceutical companies have withdrawn from research into active agents for infectious diseases due to cost-intensive research and excessively narrow profit margins. The Ministry of Education and Research will offer support in this key area with a national active agent initiative.
- ‘Energy turnaround’: as far as the energy turnaround is concerned, the Ministry of Research sup-

ports research geared towards long-term targets with its ‘Copernicus Projects’. One Copernicus project, for example, has set itself the target of saving excess renewable energy by transforming it into other energy carriers. Funding for these projects is granted for ten years and follows a systematic approach from the very outset. All players in the innovation process are involved and transfer from basic research to its application is taken into consideration from the very beginning.

DIGITALISATION AS A CENTRAL CROSS SECTIONAL TASK

We are on the threshold of a data-driven economy and ecology. Developing competences, instruments and methods for collecting, storing and analysing large data volumes; and gaining new insights and aids to decision-making from them will become a key competence. The Federal Ministry of Education and Research sees digitalisation as a cross-sectional task. Accordingly, nearly all education and research questions are directly or indirectly affected by digitalisation. The thematic spectrum ranges from digital education at our schools to information infrastructures in science to the next industrial revolution based on ‘intelligent machines’. A clever education and research policy should help Germany to shape up for the digital living worlds of the future.

The Federal Ministry of Education and Research wants to support and drive the new potential for interdisciplinary data analysis and therefore offers advice on a national research data infrastructure: the Council for Information Infrastructures set up by the Federal Government and the *Länder*, has proposed a distributed infrastructure, which can serve as a future backbone for research data management in Germany. A supra-institutional and regional structured and sustainable Council for Information Infrastructures will open up new research opportunities due to broader and better access to data and research results for academia, business and society. Good infrastructure and research data management must go hand in hand. That is why Germany requires a new generation of data scientists, which, in turn, calls for new and/or more specialist courses of study, as well as additional further training courses.

Digitalisation accordingly creates a new educational mandate for schools. Digitalisation is changing both society and the world of work. The education mandate of schools consists of preparing students for an autonomous life in society. This means meeting the requirements of a working world shaped by digitalisation. The key conditions for good digital education are relevant pedagogical concepts, well-trained teachers and high-performance digital infrastructure in schools. This was the substance of the ‘Education Offensive for the digital knowledge society’ strategy published in October 2016 by the Ministry of Education and Rese-

arch. To this end, the Federal Minister of Education and Research Johanna Wanka proposed the ‘DigitalPact’ for schools to promote the set-up of digital infrastructure and the implementation of digital education in all German schools. With this in mind, the relevant dialogues between the Federal Government and the *Länder* began in January of this year. The Federal Government and the *Länder* intend to present a finalised agreement on a ‘Digital Pact for Schools’ by the end of 2017.

Digitalisation, health, security and energy are the areas in which our country has outstanding opportunities; and this list could be extended. To seize these opportunities, we need to invest in our country’s major future projects. That is why the Ministry of Education and Research wishes to increase the R&D rate to 3.5 percent of GDP by 2025. Two thirds of additional R&D investments will also have to come from business in the future. A policy that boosts public investment, but negatively impacts the framework conditions for private investment at the same time, would marginalise our country. Germany therefore needs a learning strategy for research and innovation policy that lives up to these new challenges. This strategy must be geared towards the central fields of action presented in this article.

The basis for the Ministry’s current and future programme was to closely accompany the HTS through independent councils from academia, business and society. The German federal government has repeatedly heeded the recommendations of the Commission of Experts for Research and Innovation, the High-Tech Forum and the Innovation Dialogue between the Federal Government, business and science and has developed corresponding measures. Politics needs scientifically-grounded evidence of which measures function and which do not. Progress towards digitalisation makes it possible to empirically test theories very thoroughly. Policy measures can thus be evaluated on a timely basis and can improve the effectiveness and precision of policies as a result. The new opportunities presented by big data and growing computer capacities have created considerable scope for analysing problems in academia. More specifically, the new data volumes have naturally revolutionised the research potential in economics and social sciences.

To this end, the Ministry of Education and Research granted research funding aimed at providing new stimuli in the field of measuring innovation.⁸ The term innovation should be made broader and be measured empirically. The aim in the future is also to be able to access indicators of social innovation, business model innovation and other new forms of innovation. The Ministry of Education and Research depends on research *via* evidence-based policy advisory work. Economics research institutes like the ifo Institute make

a significant contribution to assessing policy results and ensuring that better strategies can be formulated based on them. The Ministry will also use these research results to implement a successful innovation policy for the citizens of our country in the future.

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⁸ See Bundesanzeiger, Official Section of 20.01.2017, B4: *Richtlinie zur Förderung von Forschungsvorhaben zur Weiterentwicklung der Indikatorik für Forschung und Innovation*, Federal Ministry of Education and Research, <https://www.bmbf.de/foerderungen/bekanntmachung-1302.html>.