The
Federal Government

THE NEW
HIGH-TECH
STRATEGY
Innovations for Germany

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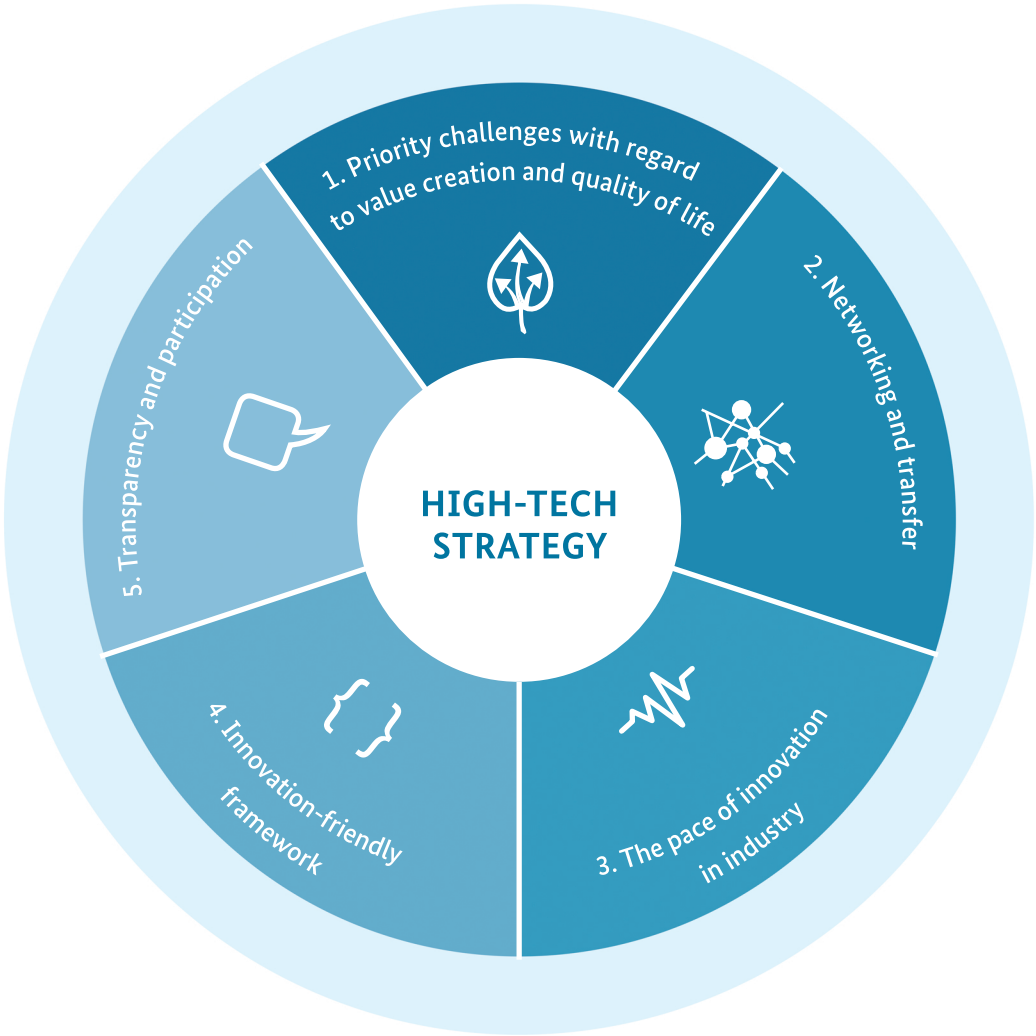
Contents

A summary of the most important aspects

The new High-Tech Strategy stands for the aim of moving Germany forward on its way to becoming a worldwide innovation leader. The goal is for good ideas to be translated quickly into innovative products and services. This is because innovative solutions are the factors that drive our prosperity and support our quality of life. They strengthen Germany‘s position as a leading industrial and exporting nation. And they make it possible to find creative answers to the urgent challenges of our time – including challenges in such areas as sustainable urban development, environmentally friendly energy, individualised medicine and the digital society.

The High-Tech Strategy is now being developed further, as a comprehensive, inter-departmental innovation strategy. To that end, we are adding new topics and introducing new instruments for funding innovation. We are emphasising an expanded concept of innovation that includes not only technological innovation but also social innovation – and that includes society as a central player. We are looking at the big picture and conceptually putting those things together that really belong together. We are continuing the upward trend that has been taking place in investments in research and development.

Core elements of the new strategy



I. We are prioritising future challenges relative to prosperity and quality of life.

With the new High-Tech Strategy, we are establishing thematic priorities in research and innovation. In the process, we are concentrating on areas that feature especially dynamic innovation and that hold potential for economic growth and prosperity. And we are concentrating on areas in which we can help address global challenges and thereby enhance the quality of life for everyone.

Our six priority tasks relative to future prosperity and quality of life are as follows:

The digital economy and society
with innovative solutions, we are addressing the challenges inherent in digital technologies, and we are seeking to use opportunities for value creation and prosperity in Germany.

The sustainable economy and energy
the manner in which we produce and consume needs to become more resource-efficient, environmentally friendly and socially compatible. In short, it needs to become more sustainable.

The innovative workplace
we are focusing on the profound changes taking place in the modern workplace, since good jobs are an important basis for creative ideas and economic innovation.

Healthy living
we are strengthening research aimed at helping people live healthy, active and independent lives.

Intelligent mobility
we are pursuing research in support of integrated transport policies that optimise the different modes of transport in terms of their efficiency, capability and interactions.

Civil security
complex systems and infrastructures – for example, for energy supply, communications, mobility and logistics – need to work properly in the everyday lives of people.

II. We are consolidating resources and promoting transfer.

Innovations occur at the interfaces between different disciplines, topics and perspectives. We thus plan to strengthen cooperation between companies, universities and research institutions, to bring such organisations together with international partners and to continually expand existing cooperation arrangements. To those ends, we will use new measures to strategically expand universities‘ options for cooperation with industry and society, to close gaps in commercialisation and to advance internationalisation of leading-edge clusters, forward-looking projects and other, comparable networks.

III. We are strengthening the dynamism of innovation in industry.

We are promoting the development of a competitive, employment-strong industry whose products and services are fully competitive with the products and services of the most innovative competitors worldwide. To that end, we plan to use the potential inherent in key technologies, for the benefit of industry – for example, the great potential of microelectronics and battery technologies. We plan to expand the group of companies that participate in programmes for innovative small and medium-sized enterprises (SMEs) by making the funding conditions for such companies even more user-friendly. We want to increase the numbers of innovative start-ups in Germany, by improving the existing pertinent instruments and by connecting start-ups to global centres of growth and value creation. And we want to develop new potential for innovation in structurally weak regions.

IV. We are creating favourable conditions for innovation.

Innovation requires stimulating environments that promote creativity, excellence and entrepreneurship. We thus plan to focus more intently on promoting innovation-friendly conditions, with a view to intensifying the pace and strength of innovation. We are planning new initiatives aimed at ensuring that we have enough skilled personnel – including initiatives in STEM/MINT subject areas, in efforts to enhance the attractiveness and permeability of vocational training and in efforts to improve a culture of welcome for foreigners working in Germany. We plan to further harmonise technical regulations and standards. We plan to develop an open-access strategy that will improve the framework for effective, continuing access to publicly financed publications. Via innovative public procurement, we plan to provide new incentives for innovation in industry. In addition, we plan to make Germany more internationally attractive as a centre for venture capital investments.

V. We are strengthening dialogue and participation

Innovation needs to be enshrined in the very heart of society. We are thus working, by expanding and improving science communication, to strengthen the openness of all people to societal and technological innovations and changes. We plan to enhance the options and opportunities for interested citizens to help shape innovation-policy processes. We will develop new participation formats to that end, including formats for citizens‘ dialogues and public participation in research. We plan to make research funding more transparent, and we intend to establish new processes for strategic foresight.

We are working together toward a common goal: Under the umbrella of the new High-Tech Strategy, all of the Federal Government's departments are developing joint aims and implementation steps to which all players in innovation activities – at the municipal, national and European levels – can orient their efforts.

We are assuring the effectiveness of the funding we are committing: The impacts and cost-effectiveness of our funding allocations are being assured via high-quality evaluations of funding instruments and via enhanced coordination and structuring of specialised programmes.

We consider the new High-Tech Strategy to be a living, learning process, and that is why we plan to work together on an ongoing basis with a consulting body, consisting of representatives of the science, industry and society sectors, to implement and refine the strategy.

We are strengthening our competitiveness and our fitness for the future: Germany's innovative strength is greater than ever. We now plan to move forward on this path. We invite all those who are interested to join us and to view research and innovation as one of the central keys to a bright future in Germany.

A new innovation policy for a new time

Innovations are the key to growth, employment, prosperity and quality of life. A common theme can be seen in key past inventions, simple and complex – e.g. the dynamo, the diesel engine and even the dowel – and in today's developments for important new areas such as sustainable mobility, digital production, new services and individualised medicine: innovations, small and large, can change the world for the benefit of people. Scientific breakthroughs and innovative solutions create opportunities to harmoniously combine a) dynamic economic growth and social cohesion and b) efforts to protect natural resources and to respect the carrying capacity of ecosystems.

As one of the world's leading centres for innovation, Germany has a good technological and economic basis. But the global innovation competition is intensifying, and new competitors are seeking to enter international markets. Companies today are more flexible than ever in choosing locations for research and development. Their value creation chains are becoming more and more international and complex. At the same time, innovations adapted to local and regional demand are acquiring ever-greater significance.

It is thus all the more important for Germany, with a view to enhancing its growth and prosperity, to develop knowledge advantages, and to rapidly disseminate and apply new findings. The necessary foundations for enhancing competitiveness and creating jobs with a reliable future include good education, strong basic and applied scientific research and a strong pace of innovation in industry and services. In Germany's case, the country's innovation base needs to be expanded, if Germany is to be successful in key technologies and in lead markets. That expansion process, in turn, will call for a comprehensive dialogue between science, industry, society and policy-makers. Only collaboration and participation by all stakeholders will make it possible for curiosity to lead to ideas and for ideas to lead to innovations for competitive, sustainable products and services. With such a participatory framework, new solutions to significant social questions will be able to emerge – and to meet with societal acceptance.

The Federal Government is thus applying a comprehensive, interdepartmental innovation policy. It will enable resources to be consolidated more effectively, and it will provide new impetus for innovation in industry and society.

The model for an innovative Germany

The Federal Government's research and innovation policy is shaped around a model for an innovative Germany. The aim is to move Germany forward on its path to becoming an innovation leader in Europe and the world.

- We want a society that is open to innovation and that lets itself be inspired by new technologies and innovation.
- We want a society that views differences primarily as opportunities. A modern social policy provides the framework for this. Innovative Germany needs to be shaped by all of us working together.
- We are orienting our efforts to a model for sustainable development that generates innovation from a position of responsibility for the present generation and future generations.
- We want a competitive, employment-strong industrial sector whose products and services can compete successfully with the products and services of the most innovative competitors worldwide. To that end, we want to spur a new dynamism in start-ups – and improve the necessary framework accordingly.
- We want to continue investing systematically in research and innovation. The foundations for prosperity in Germany depend on a continuing high level of investments in this area. We want it to be possible for research findings to be rapidly translated into innovative products and services.
- We are promoting innovations and future technologies not for their own sake but for their ability to provide clearly recognizable social benefits. Within our innovation culture, we are integrating processes for identifying and assessing the societal opportunities and risks that are tied to the introduction of new technologies.
- We want employees to work on new products and services in healthy and safe environments, and to work competently, with commitment and motivation. Good qualifications and good working conditions play a key role in enabling people to be innovative.
- We want to make efficient use of the innovation potential inherent in both men and women. To keep on solidifying and expanding our position as an internationally leading centre for innovation, we must enable both men and women to translate their innovative ideas into new products, services and technologies.

- In both industry and in science, we want to further intensify the competition to produce innovative solutions. Intensive competition is the most effective factor in sparking forward-looking innovations.

- At the same time, we want to intensify resource consolidation in science, industry, society and policy-making, and we want to use the resulting synergies to enhance competitiveness and generate sustainable prosperity.

- We want to continually expand cooperation between a) universities and research institutions and b) companies and international partners, and we want to promote new cooperation.

- We want to pool our resources in Europe, make full use of the opportunities in the EU's Horizon 2020 Framework Programme for Research and Innovation – and thereby contribute to the shaping of the European Research Area.

Further development of the High-Tech Strategy

Over the past few years, the High-Tech Strategy has helped to improve Germany's position within the global competition significantly. As a result of the strategy, investments in research and innovation have been successfully expanded and consolidated.

While initially the High-Tech Strategy focused primarily on the market potential in specific technology areas, as of the year 2010 it has concentrated especially on the society's need to develop and implement forward-looking solutions. The task now is to bring the themes of such solutions together and to view all central aspects of a comprehensive research and innovation policy within the proper overall context. This will produce an optimal environment for ideas, for their implementation in the form of marketable products and services, for greater value creation and for new, secure employment. Needless to say, all relevant measures have to be in conformance with the federal budget and with the new German government's coalition agreement.

The new High-Tech Strategy is based on five pillars:

1. **Priority task areas:**
   With the new High-Tech Strategy, the Federal Government is establishing priorities for research and innovation in areas with enormously dynamic innovation: the digital economy and society, the sustainable economy and its energy, the innovative workplace, healthy living, intelligent mobility and civil security.

2. **Better transfer:**
   With the new High-Tech Strategy, the Federal Government is creating new instruments for improved regional, national and international networking between science and industry. In the process, it is taking existing strengths into account, promoting their expansion and creating opportunities for new forms of cooperation and new interfaces for networking.

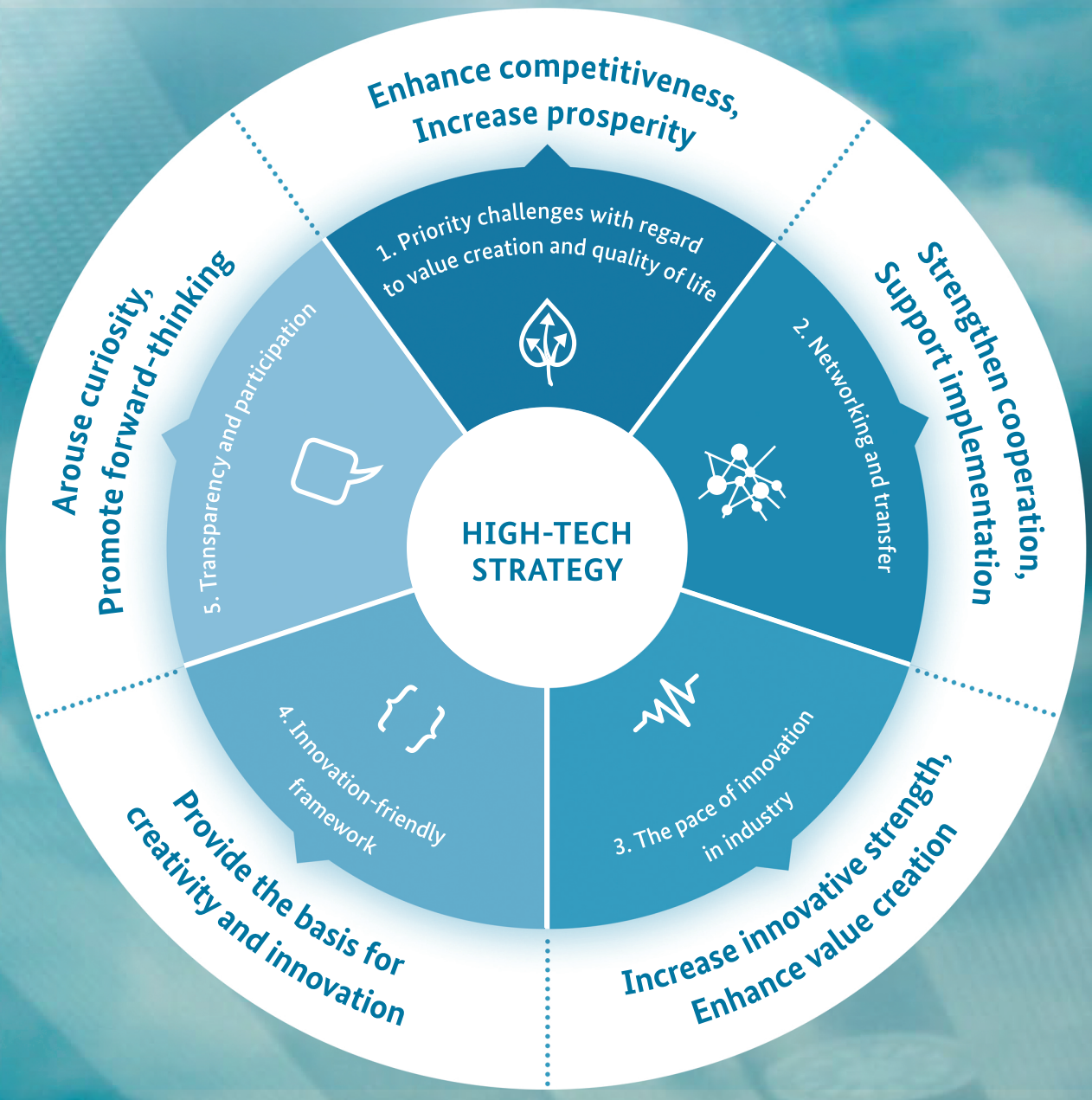
3. **Greater dynamism in innovation:**
   With the new High-Tech Strategy, the Federal Government is strengthening the pace of innovation in German industry, and it is providing special support for small and medium-sized enterprises (SMEs), and technology-oriented start-ups, with a view to enabling such companies become technology leaders that can shape future markets.

4. **Improved framework:**
   With the new High-Tech Strategy, the Federal Government is optimising key framework conditions of the German innovation system in the areas of assuring the supply of skilled personnel, assuring the availability of innovation financing and providing other societal, technical and legal foundations.

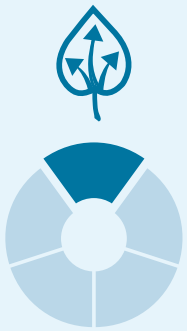
5. **Intensified dialogue:**
   With the new High-Tech Strategy, the Federal Government is working to enhance active participation by society, as a central player, and it is strengthening important factors such as openness to technology, public participation and social innovation.

Five core elements of a completely consistent innovation policy

The new High-Tech Strategy systematically considers the entire innovation chain – from creative idea to implementation in new products and services – and thereby links all aspects and players within innovation processes.



I. Priority challenges with regard to value creation and quality of life



The starting point for the new High-Tech Strategy consists of questions regarding the sources of our future prosperity (by what means do we want to assure our economic capability?) and of our quality of life (how do we want to live tomorrow?). With this approach, the Federal Government is focusing on innovative solutions that are being shaped and driven by powerful scientific and technological momentum and with which Germany can achieve innovation advantages in international competition.

This is important because of what has taken place in many sectors: product cycles have noticeably shortened, the requirements applied to system solutions have increased and unavoidable development overhead has grown in relation to the potential returns on innovation. In times of global change, and especially in such times, the focus thus needs to be on competitiveness and potential for value creation and employment in Germany. Simple implementation of technological innovations in production processes no longer does justice to such a focus. Being innovative now means more; increasingly, it has to confront the necessity of achieving sustainable consumption patterns and behaviour and to address societal change processes such as the development of resource-optimised forms of production and lifestyles. For this reason, the Federal Government is emphasising not only technological innovations, but also new organisational solutions and innovations pertaining to services and societal functioning.

The Federal Government is concentrating its thematically oriented research and innovation policy on six priority key-task areas:

1. The digital economy and society

Information and communications technologies (ICT) now pervade all areas of life and economic activity. New challenges are emerging: How do we want to live, learn and work in the digital world? How can we exploit the opportunities that digital technologies present for industry, administration, society and political participation, and how can we master the relevant challenges? How can we improve security in use of such technologies? What requirements is demographic change creating with respect to digital technologies? What strategies should people be using in order to juggle their family and workplace responsibilities? What new opportunities do digital technologies open up in this connection?

Successful development and integration of digital technologies within industrial application sectors plays a decisive role in Germany's competitiveness, since ICT are important drivers of innovative value-creation chains and products in many economic sectors. Media literacy and education oriented to secure, resource-efficient and responsible use of ICT, and strategies for managing social interaction, are acquiring growing importance in a world of digital technologies.

The central areas of action within the key task "digital economy and society" are as follows:

Industry 4.0

Industry now stands at the threshold of a fourth industrial revolution. Via the evolution of the Internet, the real world and the virtual world are increasingly converging, to form an "Internet of things". The key characteristics of the industrial production of the future will include production of extensively individualised products, within highly flexible production environments; early-stage integration of customers and business partners within design and value-creation processes; and linking of production and high-quality services, to yield "hybrid products".

The Federal Government is aiming to support industry and science in implementing industry 4.0 – also with regard to IT security – in order to position Germany as a leading provider for such technologies and as a future centre for production. At the same time, the impacts on the labour market and on the various employee groups involved are being considered, with a view to shaping such impacts in the interest of both companies and employees.

Smart services

In industry, products, processes and services are increasingly being "refined" by being linked to form smart services. For both providers and users of IT services, Internet-based services offer great potential for growth. Such services, for example, can lead to changes in product portfolios, optimisation of industrial-plant operation – via new knowledge platforms – and virtualisation of ICT infrastructures, with proper consideration of attendant IT security issues. In light of the potential of smart services, the Federal Government plans to support German companies in ensuring that they maintain complete control over their entire value creation chains and related production processes.

Smart data

Big data technologies improve and accelerate decisions and optimise business processes. The big data applications and technologies available to date are hardly suitable for small and medium-sized enterprises (SME). With its "Smart Data" programme, the Federal Government is addressing this issue by promoting the development and testing of innovative services, using big data technologies, provided by and for medium-sized enterprises.

Cloud computing

Cloud computing offers industry many opportunities for growth and development. This applies especially for young companies and for SME. Via cloud-based applications, such companies can access innovative technologies that previously were reserved primarily for large companies. This is why the Federal Government has launched its "Trusted Cloud" technology programme, an effort to promote innovative, secure and legally conformal cloud-based solutions.

Digital networking

The central bases for the intelligent applications and innovative services of the future will be high-performance, secure communication networks and full interoperability between different relevant technologies. For this reason, the Federal Government is working for the construction and expansion of complete-coverage high-performance networks. To make full use of ICT's potential, in areas such as education, energy, health, mobility and administration, the Federal Government plans to develop an overarching "intelligent networking" strategy.

Digital science

Digital technologies are also bringing profound changes to the science sector. They are opening up a wide and diverse range of new possibilities for research and cooperation. The Federal Government plans to support the science sector in successfully managing the digital transformation, to strengthen digital scientific information infrastructures and to assure the broad accessibility and usability of digital information. To that end, it is working together with the Länder to establish a Council for Information Infrastructures, an overarching coordination and advisory body that will provide recommendations to support the science sector in its self-organisation process. Plans also call for promoting selected strategic projects on this basis, projects that will exert strong leverage in promoting permeable, open and compatible structures.

Digital education

The education system needs to be even more effective in preparing people for optimal use of digital media and for the requirements imposed by the knowledge society; it needs to provide a broad range of skills in these areas. The Federal Government thus plans to work together with the Länder, and with other stakeholders in the education sector, to promote greater use of digital media in education and throughout people's entire lives. Via this cooperation, it is developing a "digital learning" strategy that will develop and implement the opportunities that digital media provide for enhancing education. At the same time, the effects of digitally based education on learners of many different ages and sociodemographic backgrounds will be evaluated, in the framework of supporting, empirical education research.

Digital life environments

Digital technologies now also reach into everyday family life. Significantly in this regard, digital progress is now expanding the possibilities for flexible combination of family and work responsibilities – while at the same time making it more difficult to keep the two areas apart. Digital technologies are creating new challenges in parental responsibility, but they are also creating new potential and possibilities for organising everyday life and the interactions between generations. At the same time, they are also opening up new gaps between those who are moving with the changes and those who are being left behind. The Federal Government also plans to focus on these new dimensions of societal policy. Families need to be supported in making use of the opportunities inherent in the spread of digital technologies. The social sciences and humanities can contribute significantly to the management of these societal challenges by generating and providing specific knowledge that can give all people cultural and social orientation. Such issues, for example, are being addressed in the framework of the agenda process "Assuring and shaping the future – research on major societal challenges" ("Zukunft sichern und gestalten – Forschung zu den großen gesellschaftlichen Herausforderungen").

Well aware that Germany's long-term ability to thrive depends on how it manages the digital transformation, the Federal Government has developed the "Digital Agenda 2014-2017" with the aim of actively shaping this transformation and helping the country's citizens profit from it. With this effort, we want to make Germany the European leader in digital growth. In the process, a properly aimed innovation policy will help the country achieve important advantages in innovation.

2. Sustainable economy and energy

The ways in which we produce and consume need to become more resource-efficient, more environmentally friendly and more socially compatible. In short, they need to become more sustainable. New research findings are improving our understanding of how human actions affect the climate and complex ecosystems. With its strength in research and technology, and with its commitment to sustainability, Germany has the opportunity to become an international model for a sustainable economy and to build on its leading position in green technologies. In the context of European and international forums and agenda processes, the Federal Government plans to provide new international impetus for sustainability.

The key emphases in this area include:

Energy research

The Federal Government's energy research measures are combined within its 6th energy research programme, which places a central focus on implementing the "Energiewende" – the transformation of Germany's energy sector. Along with research policy issues, the programme also addresses industry policy questions, such as the use of modern efficiency technologies in energy-intensive industry, in small and medium-sized companies and private households, and the potential that exports of modern energy technologies "made in Germany" have for powering employment and prosperity in Germany. And such support measures are also helping to expand the technological basis in the energy sector and thus are helping to manage risk for the entire society.

The emphases of the energy research programme in the areas of renewable energies and energy efficiency include:

- **Energy storage systems:** The "Energy Storage Funding Initiative" is backing efforts to develop stationary energy storage systems. The research projects involved include projects on battery systems, wind-hydrogen coupling (power to gas) and thermal storage systems.

- **Electrical grids:** The "Sustainable Electrical Grids" funding initiative is promoting the development of innovative technologies in the areas of electrical grid management; electrical grid simulation, modelling and design; and electrical grid monitoring. It is also supporting demonstration measures and programmes in the areas of grid planning, system behaviour and system security.

- **Solar construction / energy-efficient city:** A research initiative will promote the use of innovative technologies and concepts for increasing energy efficiency and improving integration of renewable energy technologies in buildings and city districts. This will contribute to the implementation of the City of the Future project.

These measures are being supplemented by additional efforts in the area of energy research. Such efforts include activities in the areas of energy efficiency in industry and the construction sector; application-oriented research on wind energy, photovoltaics, biomass and solar-thermal systems; energy-optimised buildings and cities; integration of renewable energies within Germany's future energy system; and the socially compatible transformation of the energy system.

Energy research policy is a strategic element of the Federal Government's energy policy. The Federal Government is launching central initiatives for research progress in connection with the transformation of Germany's energy system. Key groups in society are being involved in the development of new measures, at the earliest possible phases.

The following initiatives are especially worthy of mention:

In the framework of its energy policy and the "10-Point Energy Agenda", the Federal Government plans to reorganise existing measures and activities in the "Energy Research Policy Coordination Platform", and conduct them through a "Research and Innovation" platform. The Federal Government's energy research programme is being developed further in cooperation with the various relevant government departments, and with the participation of the Länder, and pertinent cooperation with European funding institutions is being intensified. In addition, government departments are coordinating new, interdepartmental measures via the programme. The "Federal Report on Energy Research", which appears annually, will regularly include results from the "Energy of the Future" monitoring process – a process, established by the Federal Government, for reviewing progress made in the transformation of Germany's energy system (Energiewende). This effort will be supported via use of "EnArgus", a newly developed, centralised information system for energy research. The reports on energy research will also include results of the "Energy Systems of the Future" project, an effort being carried out by German science academies. The "Federal Report on Energy Research", which provides information on energy research for both the German parliament and the general public, presents a transparent overview of funding policy in the energy research area.

In its "Energiewende Research Forum", the Federal Government is bringing together high-ranking representatives of the industry, science, civil-society and specialised-policy-making sectors, from both the Federal Government and Länder levels. A strategic research agenda is being developed via dialogue with all participants. The agenda will gather together research topics that now demand high priority and that, in terms of their implementation, will be of central importance, in the medium-to-long term, for the Energiewende energy system transformation. The strategic research agenda will support the further development of the Federal Government's energy research programme.

In the areas of construction research (e.g. research on building standards), transport research (including research on electromobility), ICT research and research into sustainable development, the Federal Government is promoting research and development on technologies that relate specifically to energy issues, and is doing so in ways that complement its energy research programme.

Green economy

The “green economy” model is a model for economies that are at once internationally competitive, environmentally compatible and socially compatible. It outlines how environmentally compatible, qualitative and sustainable economic growth can be possible on the basis of a comprehensive understanding of the interconnections prevailing in the economic, financial and political sectors, and in light of recognised ecological limits. The Federal Government is aiming for comprehensive ecological, cost-efficient modernisation of the country‘s entire economy and its sectors, with a view to strengthening Germany‘s competitiveness as an economic centre – and it wants the “green economy” model to guide and drive this modernisation. To this end, the Federal Government is carrying out a “Green Economy” agenda process.

Bioeconomy

The “bioeconomy” offers the opportunity to link economic growth with ecologically responsible action. New processes and technologies from the biosciences offer the possibility for structural change leading to sustainable methods of production. Modern production technologies and new, resource-efficient technological solutions, for example, now offer important approaches to agricultural and industrial production that is environmentally friendly and sustainable.

Alternatives to the petroleum-based economy need to be developed. Greater use of renewable resources and valuable secondary raw materials from biogenic waste can help to reduce dependence on fossil resources. New approaches need to be developed in use of materials in industrial processes, in both energy-related and feedstock applications, in order to enhance productivity, conserve resources and relieve stresses on the environment. At the same time, the supply of renewable resources required for food production needs to be assured, and competition between the different types of resource uses needs to be avoided. Water, land and biodiversity are also scarce resources for which sustainable forms of use need to be found.

The basis for efforts in this area is the Federal Government‘s “National Bioeconomy Policy Strategy” of 2013 and the “National Research Strategy BioEconomy 2030”, which was detailed in 2014 via a “BioEconomy guide” (“Wegweiser Bioökonomie”) action plan. In the coming years, efforts in this area will focus on strengthening the system approach in the bioeconomy, intensifying participatory discussion and discourse with society, developing and improving science-industry innovation alliances and improving efficiency in use of biological resources.

Sustainable agricultural production

Modern production technologies, new resource-efficient processes and process chains and automation technologies that increase work productivity (such as precision farming technologies) offer important avenues to environmentally friendly and sustainable agricultural production. The continually growing demand for high-quality plant and animal proteins needs to be met via innovative technology and processes for animal and plant production. At the same time, hazards to people, animals and the environment need to be minimised. Modern, site-adapted, resource-conserving and efficient agricultural technology can make crucially important contributions in this area.

Assuring the supply of raw materials

As the basis for industrial production processes and innovations, a reliable, sustainable and transparent supply of raw materials for industry plays an important role in development of future technologies. Germany's high-tech sector requires a range of industrially strategic raw materials. Research helps provide the basis for using such resources – which are finite and often difficult to obtain – more efficiently, for increasing levels of recycling of such resources, for finding substitutes, where possible, that are more easily available and for countering undesirable developments in resource markets. This is why the Federal Government, working through its programme "Economically Strategic Raw Materials for the High-tech Location Germany", is promoting research and development throughout the value creation chain for non-energy-related mineral resources. With a new measure, "r+Impetus – Innovative technologies for resource efficiency – impetus for industrial resource efficiency" ("r+Impuls – Innovative Technologien für Ressourceneffizienz – Impuls für industrielle Ressourceneffizienz"), the Federal Government is providing targeted R&D impetus for overcoming obstacles in development and dissemination of industrial efficiency technologies in resource-intensive production areas. This effort promises to provide competitive advantages for German industry, and it will help to further sever the links between a) economic growth and b) resource consumption and environmental impacts.

To help assure the supply of raw materials, the Federal Government is supporting further expansion of the spatial data infrastructure in Germany for provision of standardised spatial data. The German Mineral Resources Agency (DERA), sited within the Federal Institute for Geosciences and Natural Resources (BGR), is developing a process for resource monitoring that will make it possible to recognise potential risks in resource markets at early stages.

City of the future

In Germany, most consumption of energy and resources takes place in cities and their environs. This is an issue that affects all policy areas, and in which all stakeholders in society need to become involved. Efforts to address it must thus seek to bring all policy areas and stakeholders together, in both conceptual and practical frameworks. The National Platform for the City of the Future was founded for the purpose of developing, in an agenda process involving policy-makers, and representatives of science, industry and society, a strategic research agenda for identifying pathways to resource-efficient, low-CO2, climate-adapted and transformable economic patterns and lifestyles in our cities.

Future of Building

The Federal Government's applied and practically oriented construction research is taking place in the framework of the "Future of Building research initiative". The initiative is playing a key role in efforts to greatly upscale use of state-of-the-art technologies in the construction sector. Initial model projects regarding the "efficiency house plus" ("Effizienzhaus Plus") building standard have already been successfully tested. In a next step, use of the newly developed construction standard will be expanded, and its efficiency and cost-effectiveness will be further improved. Much future progress in construction will come via greater use of digital methods that will enhance efficiency and facilitate resource-efficiency. The Federal Government thus plans to promote pilot projects for use of "building information modelling".

Sustainable consumption

Research can provide findings and explanations that can help identify pathways to major societal shifts toward sustainable lifestyles – and, thus, toward sustainable consumption. In this area, the central research topics include relevant rebound effects, regional consumption patterns and flows of goods, social innovations and consumption-related emissions and waste (such as CO2 and CH4 emissions and microplastic ocean pollution) – and the effectiveness of various types of informational instruments. These current issues will be intensively studied in the Federal Government's Framework Programme Research for Sustainable Development (FONA).

The Federal Government is consolidating its research efforts in the interest of an environmentally friendly, secure and affordable energy supply, and of changes leading to sustainability, in its 6th energy research programme, the FONA framework programme and the national research strategy "BioEconomy 2030 – our Route toward a biobased economy".

3. Innovative world of work

We want an innovative world of work with “good work”. By this, we mean workplaces with healthy and safe working conditions that allow employees to develop their capabilities, and we mean fair remuneration that is in keeping with the services performed.

New forms of work organisation, greater orientation to services, changing qualification profiles and occupation profiles, more-interactive value-creation processes and increasing digitalisation – all of these things are driving the profound changes now affecting the modern workplace. Today, more than ever, being innovative means using complex processes that rely on interactions between technological development, organisational development and personnel/skill development. “Good work” is thus an important basis for economic innovations.

Digital technologies in particular offer employees potential for new types of spatial and chronological flexibility. Such technologies make it easier for people to harmonise family and work responsibilities and to work effectively, competently and safely. At the same time, digital technologies are also leading to new qualification and skill requirements. Occupational profiles are changing. On the other hand, such technologies also entail a number of risks – for example, people can find themselves having to be constantly available and being unable to keep their working and private lives separate. The Federal Government is focusing on the workplace challenges that technological change is bringing. It is doing so, for example, with regard to consequences for employment and for labour markets, for health protection and work safety, for social insurance systems and for training and further training.

The key emphases in this area include:

Work in a digital world

In the workplaces of the future, work systems and skills will need to be adapted to the new technological requirements and to the needs of workforces evolving in step with demographic change. Online work, and work in networks, using digital tools and work content, already accounts for a predominant portion of work now carried out. The need to train employees in keeping with dynamically changing requirements is becoming ever-more important. Holistic concepts for organising work and structuring organisations, and advanced concepts for personnel and skill development, need to be developed and tested in actual workplace environments. At the same time, the technical possibilities should not be allowed to dictate the pace of development by themselves. Work-time regulations, and work-safety and health-protection standards, need to be refined – also in order to safeguard existing standards of protection.

By promoting research for the future of work in a digital world, the Federal Government is helping to develop suitable measures and precisely adapted frameworks for "good digital work" that both support technical progress and comprehensively take account of social factors such as employee rights, competency development, work and process innovations and health protection and safety in the workplace, so that people – and not technology – can continue to be the central focus in workplaces..

Innovative services for future markets

More and more, the competitiveness of modern economies depends not just on providing products pure and simple, but also on providing carefully tailored complementary services – i.e. integrated solutions from a single source. Such combinations of products and services – system offerings – are leading to new forms of value creation and, thus, to new growth opportunities.

The demand is especially great for new technological and social innovations that can lead to new services for new markets, while also providing societal benefits. Special types of innovation patterns apply for services. Innovation in services focuses centrally on company processes, strategies and organisational strategies that take account of the relevant users in each case. Service innovations form optimal solutions by combining different types of services. They thus can address widely differing types of requirements.

The Federal Government's support for research related to services will help enable companies with services to remain competitive in the future, to adapt to changing economic and societal conditions, to create significant value and to create value with high degrees of employment in Germany.

Competency building

Competencies and skills play a decisive role in enabling people to use modern technologies. The competencies that people need are often outside the realm of the individual skills and capabilities that people obtain through training and further training. Consequently, with a view to developing new potential for value creation, innovation-relevant competencies need to be anticipated, and strategically built, from the perspective of the society as a whole. Training and education, and measures for qualifying employees and employment seekers, need to be adapted to new requirements – such as requirements related to digital technologies and ever-shorter development cycles. To be able to recognise and address requirements for action at early stages, the Federal Government plans to build a system of strategic competency monitoring. Skills in using new media have to be taught in schools, using techniques designed especially for the pupils involved in each case.

The programme "Innovations for the production, services and work of tomorrow", along with relevant new initiatives of the Federal Government, is addressing these central challenges via a holistic approach.

4. Healthy living

Health is something very precious, since it profoundly influences well-being – at both the individual and societal levels – in lasting ways, just as it affects performance, productivity and growth. In many industrialised countries, the prevalence of common diseases and multiple illnesses is increasing, in connection with demographic change. This trend is creating major challenges for our economy and society. At the same time, growing demand for health-care services is creating a wide and diverse range of opportunities for the German health-care sector, also in international markets. As a result, with new, innovative solutions, the sector can make decisive progress in the interest of health and well-being and develop new markets worldwide.

The key emphases in this area include:

Fighting major diseases

The increasing prevalence of chronic diseases such as cancer, cardiovascular disorders, metabolic disorders and pulmonary and neurodegenerative diseases is creating enormous challenges for health research. In their efforts, researchers need to consider the lifestyle patterns that contribute to this trend. In addition, rapid global spreading of pathogens, and the emergence and of new pathogens and multiple resistances, continually present new challenges calling for new solutions. Not only do health-care researchers need to produce new findings, their research findings need to be brought to patients more rapidly, in the interest of more-effective combating of chronic and communicable diseases.

With six “German Health Research Centres”, two major research networks and the Berlin Institute of Health (BIH), founded in 2013, the Federal Government is promoting highly productive networks that link basic research and patient-oriented research.

Individualised medicine

Individualised medicine offers great potential for the development of more-effective therapies and efforts to reduce the frequency and severity of side effects. It also opens up new opportunities for the German health-care sector to become more competitive. The Federal Government's emphases in this area include implementing the existing "Individualised medicine" action plan and promoting closer links between the life sciences and the information technology sector, in the framework of the "Medical Informatics" strategy process. In addition, individualised medicine is a focus topic of the first work programme, in the area of health care, for implementation of the EU's "Horizon 2020 Framework Programme for Research and Innovation".

Prevention and nutrition

In a holistic sense, health means much more than simply the absence of disease. It also includes the desire and ability to remain active and vital for as many years as possible. This perspective brings issues of prevention and nutrition into focus – and does with a view to the well-being of both people and the economy. Effective, carefully targeted prevention has the potential to generate significant savings in the health-care system in the medium term.

The Federal Government has consolidated its research funding in this area, and expanded it efficiently, via a "Prevention and Nutrition Research" action plan. Implementation of the action plan is being complemented by measures at the European level. The Federal Government's efforts to promote the quality of life of individual persons, and the long-term viability of the country's health and social systems, will include targeted research funding in the area of "Health in a life-course perspective" ("Gesundheit im Lebensverlauf") .

Innovations in the care sector

The Federal Government has launched an "Innovations in caregiving 2020" ("Pflegeinnovationen 2020") initiative with a view to assuring the availability of suitable, high-quality care. Development and use of new technical and organisational solutions are playing a central role in this effort. In both geriatric and nursing care, such solutions can help enhance the quality of life and self-determination of persons needing care, and they can reduce burdens on both professional caregivers and family members who are providing care.

Strengthening drug research

The need for new, effective medications with small side effects is growing worldwide. Although relevant research activities are increasingly being shifted out of Europe, and although very few major pharmaceutical manufacturers still have their main locations in Germany, the pharmaceutical industry is still one of the most research-intensive sectors in Germany. The Federal Government plans to establish an interdepartmental dialogue, with the participation of scientists and pharmaceutical manufacturers, with a view to strengthening Germany's pharmaceutical research and production sector.

Innovations in medical technology

A medical-technology funding initiative, based on the national strategy process "Innovations in Medical Technology", is being continued and refined. It is aimed at requirements in the medical and care sectors. In addition, it is designed especially to strengthen Germany's medical technology sector, which features a preponderance of SMEs, and to help consolidate and expand that sector's leading international position. The Federal Government plans to continue its dialogue with stakeholders in the medical technology innovation system, in order to develop coherent, requirements-oriented research and innovation policies.

For the "Healthy living" ("Gesundes Leben") key task, the Federal Government is establishing important programmatic objectives via its "Health Research" framework programme and "The New Future of Old Age" research agenda.

5. Intelligent mobility

New mobility concepts are needed that will ensure that it remains possible to move people and goods rapidly, safely and comfortably – and that transports are efficient, produce low emissions and involve minimal use of resources. Increasing networking of modes of transport and of individual vehicles, via information and communications technologies, is playing a central role in this development. Efforts are focusing on new vehicle, aircraft and marine technologies, as well as on sustainably produced fuels. For mobility to be "intelligent", integrated transport policies must be in place that optimise the different modes of transport in terms of their efficiency, capability and productive interactions. Only with such policies can new, integrated solutions emerge that also offer opportunities for innovative business models.

The key emphases in this area include:

Intelligent and capable transport infrastructure

Via data exchange and precise, reliable satellite navigation and positioning, intelligent vehicle and traffic management systems can help make transports safer, more efficient and environmentally friendly. The Federal Government is supporting research projects throughout a broad spectrum ranging from driver assistance systems to highly automated vehicles.

Reliable, capable transport infrastructures are the lifelines of highly developed industrialised countries. Changes in the population structure, along with increasing urbanisation, are creating new requirements – and new possibilities – for both individual and public transports. The Federal Government plans to address these developments, especially with a focus on rural areas. For this reason, we are promoting innovative solutions for sustainable, environmentally compatible and robust (with respect to both climate and weather extremes) transport infrastructures and for maintenance of transport structures and systems.

The Federal Government is well aware that increasing mobility and growing traffic volumes present growing challenges in the form of a number of negative developments – such as increasing noise levels, for example.

New technologies, and suitable organisational and operational measures, can help sever the close connections between transport volumes and noise emissions. The Federal Government is aiming to significantly reduce noise emissions in the transport sector.

Innovative mobility concepts and networking

A number of new and innovative transport concepts and mobility services have been developed over the past few years. And such developments have been accelerated by a number of trends that have not originated in the transport sector, such as new forms of communication (social networks, smartphones). Car sharing and bike sharing, and linking of such services with local public transportation, are relevant examples of such developments that are especially worthy of mention.

The Federal Government is supporting these developments, and it is working to increase efficiency by optimising the interfaces between the various modes of transport. In keeping with this orientation, it is promoting innovative developments in local public transportation, such as the DELFI continuous electronic timetable information system and the introduction of a complete-coverage interoperable electronic ticket management system (eTicket), and it is supporting integration of bicycle rental systems and car-sharing fleets within local public transportation networks.

Electromobility

Electromobility is expected to contribute significantly to the reduction of emissions and fossil-fuel consumption, and the electromobility sector is a growing market of major industry policy importance.

The central basis for efforts in this area consists of the government's electromobility programme. The key research focuses in this area include battery technologies, power electronics and lightweight construction. Enhancements and improvements are being achieved in all three of these focuses. In addition, entire value-creation chains, from materials to battery production and to finished vehicles, and including systems for reuse and recycling, are being taken into account. Intelligent, systematic networking of technological and services innovations is needed for the development of new business models that can function across the boundaries of systems and sectors. The participating companies and research institutions in this area thus have opportunities to build their technological and system strengths, and to consolidate their positions in the international competition to produce the best vehicles. State-of-the-art ICT technologies need to be applied to the task of integrating intelligent electric vehicles (smart cars) with intelligent energy systems (smart grids) and intelligent traffic infrastructures (smart traffic systems). The Federal Government's "ICT for electromobility" funding programme is making important contributions to such efforts.

Demonstration projects such as the Federal Government's electromobility "showcases" and "model" regions are playing an important role in efforts to reliably test the acceptance of relevant technologies, concepts and business models and to develop pertinent forward-looking solutions.

Vehicle technologies

New vehicle technologies can help make the mobility of persons and goods on rails, roads and waterways more efficient. Important priorities in this area include systematic further development of lightweight construction methods, and application of such methods in new vehicles. Transfer of technologies from other industrial sectors and transport sectors can make complementary contributions in this regard. ICT solutions for anticipatory, energy-optimised driving, and optimised logistical concepts, can be used to assist drivers, for example.

Improvements in conventional drive systems will also contribute significantly to the transport sector's energy efficiency in the future. At the same time, alternative fuels and drive systems will become increasingly important as the economy becomes more sustainable.

The Federal Government's "mobility and fuel strategy" is an important specific transport-sector contribution to efforts to achieve the objectives defined in the Federal Government's energy concept. Applying a special learning strategy, it will identify ways in which Germany's energy system transformation can be carried out in the transport sector, with long-term effectiveness. The Federal Government is also promoting the further development of fuel cell and hydrogen technologies – especially for transport applications – in the framework of the "National Hydrogen and Fuel Cell Technology Innovation Programme" (NIP). Along with vehicle technologies, this effort is also focusing on infrastructure issues related to strategies for complete-coverage networks.

Aviation

As a result of high population density, capacity shortages in all modes of transport and the urgent need to protect the climate, maintain air quality and reduce noise emissions, environmental compatibility, resource efficiency and noise reduction will all play a highly significant role in enabling aviation to remain a viable option for the future. With its "Aviation Strategy", the Federal Government is seeking to make Germany a world technological leader for environmentally friendly, safe, capable, competitive and passenger-friendly aviation systems. In keeping with this orientation, it is promoting research and development on innovative technologies for aircraft and aircraft engines, for efficient use of aircraft and engines throughout entire life cycles and for use of alternative, sustainable fuels. In addition, the effort calls for achieving further improvements in the safety, reliability and networking of air transports. To this end, assistance systems are being developed that will provide additional support for pilots.

Maritime technologies

The increasing use of the world's oceans is an important factor in a great many key present-day issues, in areas as varied as resources, energy generation, transport and logistics. Only cutting-edge technologies can meet the stringent requirements that arise in efforts to use the world's oceans sustainably and safely under demanding conditions such as those encountered at great ocean depths or in waters with heavy ice drift. The Federal Government's range of funding instruments in this area addresses such requirements. With its "National Maritime Technologies Master Plan", the Federal Government is developing strategies for supporting the strengths of the innovative German maritime sector.

6. Civil security

In today's world, everyday life increasingly depends on the proper functioning of, and smooth interaction between, complex systems and infrastructures – including systems for energy supply, communications, mobility and logistics. Even small disruptions can lead to supply shortages and major economic damage.

In addition, protection against cyber-attacks, such as theft of electronic identities, is also playing an increasingly important role in our globalised, networked world. Protection of privacy and individual freedom within the Internet are important priorities with regard to the aim of ensuring that all persons have the opportunity to participate in the public sphere and develop their own ideas.

The key emphases in this area include:

Civil security research

Efforts in this area are focused on the development of strategies for protecting the population and critical infrastructures against natural disasters and major accidents, terrorism, sabotage, organised crime and piracy. The Federal Government's aims in this area include helping to safeguard individual freedom. Solutions in this area also help enhance citizens' security and quality of life – and they help to strengthen the civil security sector.

Already, a number of operational services are in place that can rapidly deliver information over large areas and thus – inter alia – support emergency response personnel in emergency and disaster management situations. One such system is Copernicus, a European earth-monitoring system. The Federal Government has launched a national programme of measures aimed at ensuring that such technologies are used in the best-possible ways. In addition, by participating in the ongoing establishment of the Galileo European satellite navigation system, the Federal Government is helping to create a secure, independent system for positioning – and promoting the spread of a number of new applications, such as mobile payment systems and automatic emergency call systems such as "eCall".

Cyber security

We now make use of the power of cyberspace in virtually all areas of social and economic life. Government, critical infrastructures, industry and the public in Germany – all taking part in an increasingly networked world – depend on the reliable functioning of information and communications technologies and of the Internet. We want to make use of the opportunities inherent in this reliance. At the same time, we want to ensure that privacy will continue to be protected in the Internet. Cybercrime, which includes a broad spectrum of criminal actions, such as computer fraud, industrial espionage and interception of access data, is a growing threat. For this reason, in its security research programmes, the Federal Government is also giving priority to criminological and forensic IT research.

The "Cyber Security strategy for Germany" is improving the overall framework for safeguarding cyber security. Innovative solutions for implementation of the cyber security strategy are now needed in all economic and societal sectors.

IT security

The Internet has become one of the most important factors driving innovation. At the same time, it has also become a springboard for new developments in society, for diversity of opinion and for media diversity. As the pervasiveness of digital technologies increases, however, so do the requirements for the security, trustworthiness and reliability of digital infrastructures and services. IT security is becoming an important factor in innovation and growth in Germany, and thus competencies in the development and protection of trustworthy IT solutions need to be expanded. This also affects the area of technology-assisted data privacy (privacy by design).

The Federal Government's IT security research is addressing these new challenges and promoting the development and research of suitable technologies and holistic concepts for protection and defence. With its new research programme "Self-determined and secure in the digital world" ("Selbstbestimmt und sicher in der digitalen Welt"), the Federal Government is promoting the development of user-friendly solutions for the protection of private data and for the IT security of new technologies.

With its "IT security in industry" ("IT-Sicherheit in der Wirtschaft") initiative, the Federal Government is working especially to support small and medium-sized companies in improving their own IT security.

Secure identities

For trust to be cultivated and protected in the Internet, people must be able to know that a) their own identity is secure on the Internet and b) the other people they encounter on the Internet are who they claim to be. With secure identities, users will be able to exercise their "rights to informational self-determination" and to privacy in the global network (i.e. rights to control the manner in which their personal information is handled).

In addition, secure identity functionalities are expected to provide a solid foundation for business and commerce in cyberspace. Such functionalities can thus be expected to open up long-term growth perspectives for network-based business models.

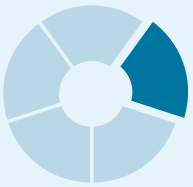
The Federal Government is supporting research into new approaches to privacy protection in a digital world with an interdisciplinary research forum entitled "Privacy – self-determined living in the digital world" ("Privatheit – selbstbestimmtes Leben in der Digitalen Welt").

The Federal Government is combining work on solutions for this key task within its "Security Research Programme" and its new programme "Self-determined and secure in the digital world" ("Selbstbestimmt und sicher in der digitalen Welt").

Implementation of the priority key tasks is being supported via definition of specific milestones and objectives, and it is being evaluated in keeping with a "transparent funding" policy. The key tasks are being specified, inter alia, in interdepartmental specialised programmes. In addition, the Federal Government plans to initiate agenda processes for integrating industry, science and the society within the definition of priorities for research and innovation. Additional added value will be created by systematically dovetailing such activities with relevant European and international initiatives, in order to realise the best-possible results and contribute to the achievement of European objectives. After all, to be coherent, European innovation policy needs to be jointly shaped and designed by all European countries.

Concentration on these priority key tasks in research and innovation policy will help to build and expand the capabilities of our economy. It will emphasise the opportunities that creative solutions can provide for our industry and for achieving a greater quality of life for all people.

II. Networking and transfer



Close cooperation between science and industry in research and development is one of the traditional strengths of the German innovation system. In a wide range of cooperative arrangements, the capabilities of all partners are used to best effect, for mutual added value. This is especially significant in that research findings are produced by universities, research institutions and companies. And research findings can develop snowball effects, by enabling still other companies, universities and research institutions etc. to achieve findings of their own. The Federal Government's departmental research at the interfaces between science, industry and policy-making makes important contributions in this area.

The capabilities of innovation centres no longer depend solely on close integration within international knowledge networks; they also depend on integration in international, and interdisciplinary, knowledge networks. Knowledge grows through sharing – at the regional, national and international levels. In the framework of the High-Tech Strategy, over the past few years numerous cooperative efforts, clusters and networks have been established in which numerous partners from the areas of science, industry and society collaborate.

The Federal Government plans to build on its achievements to date in this area and to provide fresh impetus for cooperation between science, industry and users of innovative products and services, and to do so with new methods, instruments and tools. Funding in this regard is to be increasingly concentrated on societal innovations and social aspects:

Strengthening the potential for innovation in science:

Over the past few years, Germany's science sector has continually intensified its transfer activities. At the same time, a great deal remains to be done. In order to improve use of innovation opportunities in the future, the Federal Government is helping to strengthen the science sector's innovation orientation. This involves raising awareness of how science can provide innovations for industry and society. It also calls for providing new impetus for transfer, via suitable incentives, and for further professionalization of transfer structures. The aim is to foster a culture of work in which transfer activities and successes are suitably appreciated and recognised.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UKRAINE
POLEN
LITAUEN
Westeuropäisches Becken
Nordsee
GROSS BRITANNIEN
DANEM
Kopenhagen
Malmö
Amsterdam
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Berlin
Warschau
Minsk
Kiew
Krakau
Lemberg
Riga
Wilna
Moskau
Tula
Gomel
Woronesh
Pensa
Tambow
Saratow
Wolgograd
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Palma
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In the interest of enhancing the quality of cooperation between science, industry and society, relevant existing strengths need to be reinforced, new resources need to be developed and numerous types of cooperative arrangements have to be established. Application-oriented research at universities of applied sciences, universities, science organisations and departmental research institutions is creating important foundations for innovations. Innovation alliances with industry need to be intensified with a view to accelerating innovation processes. In order to improve commercialisation of research findings, the Federal Government plans to intensify its efforts to promote spin-offs from research institutions. In the ongoing updating of the Pact for Research and Innovation, agreements are to be reached, with science and research organisations, on intensifying exchanges and the resulting interactions with industry and society.

Strategically expanding universities' opportunities for cooperation with industry and society:

Via a new funding approach, the Federal Government plans to support universities in testing new strategies for cooperation in their surrounding regions, and in developing innovative cooperation formats. This effort is expected to contribute to the development of German universities' profiles as attractive innovation partners for industry and society.

Universities of applied sciences in particular carry out research that is application- and solution-oriented, and they cooperate closely with companies in their regions. They thus help to establish new and improved products and services within competitive environments. To enable regional industrial structures to make better use of the innovation resources available at universities of applied sciences, networking and strategic cooperation between such universities and companies, in joint areas of research and development, is to be efficiently promoted.

Closing gaps in commercialisation:

With its measure "Validation of the Innovation Potential of Scientific Research – VIP", the Federal Government is helping to close the innovation gap separating academic research and industrial applications. Further development of validation funding is being based on a broad innovation concept that addresses both technological and societal innovations. Promotion of technology transfer from public-sector research into industry, in the framework of the "SIGNO" programme, is being further flexiblised with regard to funding terms, especially in connection with further development of patented early-phase technologies. Sector dialogues throughout entire value-creation chains are another important instrument for strengthening networking between players.

Promoting internationalisation:

Industrial value-creation chains are becoming increasingly globalised. Many organisations now distribute their operations – research and development, design, production and sales, etc. – among different locations throughout the world. To be competitive, German companies need to be integrated within international flows of knowledge. For these reasons, the Federal Government plans to continuing supporting the trends toward internationalisation and toward networking between the research and business enterprise sectors. In particular, internationalisation of top clusters, forward-looking projects and comparable networks is to be promoted with new funding efforts. The "go-cluster" initiative, for example, is providing further stimulus for internationalisation of regional innovation clusters.

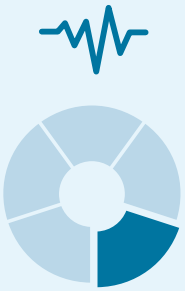
Strong research depends on cooperation with the best minds. For this reason, the framework for European and international cooperation is being improved in the interest of developing a new dimension of cooperation quality. In the process, existing cooperation arrangements are being expanded, and new mechanisms for international cooperation are being developed. The Federal Government plans to strengthen European cooperation through close dovetailing of national and European research and innovation funding and through the further development of the European Research Area. With a view to building the European Research Area, the Federal Government has presented a strategy with political guidelines and a national roadmap. Joint presentations by German science research and industry, under the umbrella of foreign science policy – for example, via German science and innovation institutions – not only can highlight Germany abroad as a centre for research, innovation and technology, they can also promote international cooperation.

Internationally harmonised rules, norms and standards help to eliminate barriers to trade. For this reason, it is important that such harmonisation be carried out at early phases and in connection with pertinent development. To this end, the Federal Government is cooperating actively in the relevant international bodies and organisations.

This new impetus, and these new initiatives, for the consolidation of regional, national and international competencies within cooperative arrangements, clusters and networks, are helping to facilitate efficient, comprehensive transfer of research findings into applications. They are strengthening the development of viable national and international cooperation between companies, universities, research institutions and other stakeholders.

III. The pace of innovation in industry

German industry is strong in innovation. This is illustrated, for example, by its high innovation expenditures, which have been growing for years, and which most recently amounted to EUR 137 billion (2012). On the other hand, growth in this area is being driven primarily by major companies. Innovation expenditures on the part of SMEs have not increased further in recent years. In this light, government research and innovation funding is giving special priority to enlarging the group of innovative, strongly growing SMEs, via suitable measures.



Companies with innovative products and technological innovations often meet with difficult market environments – for example, because not enough private financing resources are available. Public funding measures can provide valuable assistance in such cases, to enable companies to have successful go-to-market phases, and to be able to generate new growth and jobs. Small companies and innovative start-ups produce innovations particularly frequently, thanks to their flexibility and their close focus on markets. They are particularly reliant on public funding resources and on private venture capital, because they often lack sufficient equity of their own and external financing options.

The Federal Government's innovation funding emphasises technology-specific funding programmes for all companies – usually in cooperation with research institutions – and non-technology-specific funding programmes for SMEs. Non-technology-specific funding offers transparent, easily accessible and uncomplicated opportunities to quickly implement new ideas or unconventional solutions in marketable products or services.

In this legislative period, the Federal Government is emphasising the following measures:

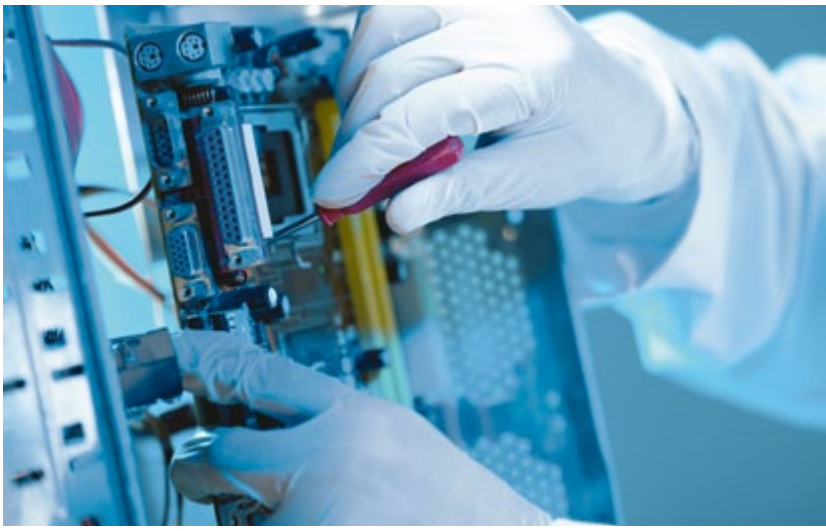
Using the potential of key technologies for the benefit of industry:

Key technologies are of special importance due to the economic leverage they can develop. Examples include digital technologies integrated within production processes, which is referred to as "industry 4.0", as well as microelectronics, battery technologies and biotechnology. Germany's competitiveness as a centre for production depends in large measure on its ability to exploit the economic potential in such key technologies. The Federal Government plans to support use of key technologies for new products and services especially among SMEs and "hidden champion" SMEs.

Sectors such as mechanical and plant engineering, electrical engineering and the automotive industry depend on having a competitive microelectronics sector in Germany and Europe. For this reason, the Federal Government plans to strengthen the microelectronics sector, in cooperation with the industry and science sectors. The Federal Government and the state of Saxony plan to intensify Germany's participation in the Electronic Components and Systems for European Leadership (ECSEL) research programme, and to jointly provide up to EUR 400 million for it. The aim of the programme, which runs until 2024, is to considerably increase the European microelectronics sector's share of the world market. In the area of battery development and production, which will play a decisive role in any further progress in electromobility, for example, the entire value-creation chain is being considered, with a view to keeping and expanding value creation in Germany. Funding for photovoltaics will be concentrated more intensively in future, and adapted to changing market circumstances.

Information and communications technologies (ICT) have special importance. The use of digital technologies in industry is being further advanced. In the process, a special focus is being placed on the potential seen in the networked, intelligent production of the future. The continuing development of the Internet of things, for industrial production, is being supported with the programme "Autonomics for Industry 4.0".

Space technology plays an important strategic role in German industry. It is a leader in the development and testing of new technologies, and it affects other industrial sectors, as an innovation driver, via technology transfer. For this reason, the Federal Government is funding innovative applications in space research and is working to boost the competitiveness of the German space industry. The country's national funding and supporting structures are being enhanced accordingly. With a view to promoting spin-off and spin-in effects, the initiative "INNOspace" is bringing space-industry stakeholders together with other sectors and thereby promoting technology transfer.



Strengthening innovative SMEs:

The Federal Government supports small and medium-sized enterprises (SMEs) with a coordinated, effective system of innovation funding. The important elements of its SME support include non-technology-specific programmes and relaxations of eligibility requirements for access to technology-specific, specialised programmes. This established system of innovation funding for SMEs needs to be further optimised. The basic measures for doing this include intensifying dovetailing with European funding programmes, for use of synergies; enhancing the coherence of existing programmes; and standardisation of relevant publicity efforts, in the interest of providing transparent information about funding options. The Federal Government's priority aims include creating conditions that will encourage the group of innovative SMEs to continue to grow.

The Central Innovation Programme for SMEs (ZIM) promotes non-technology-specific research and innovation projects, usually projects carried out in cooperation with research institutions. The programme, which has simple and fast procedures, is oriented especially to the requirements of SMEs. Plans call for further optimisation and simplification of the relevant application and approval procedures. In addition, international cooperation is being promoted via conclusion of additional agreements, with other countries, on joint funding of research and development projects by SMEs.

The "Industrial Cooperative Research programme for SMEs (IGF)" project, which has a pre-competitive orientation, and in which numerous companies, most of them SMEs, are participating, is aimed at closing the gap between basic research and industrial development. Through this effort, SMEs that lack research departments of their own can enter into contact with research institutions and major companies and develop innovations together with them. Even more network-forming and international projects are to be financed in future. The Federal Government plans to review whether, and to what extent, industrial research associations should be eligible in future to submit applications for theme-oriented project funding.

The "KMU-innovativ" programme for funding cutting-edge research by SMEs is aimed at SMEs that are especially strong in research. It helps such companies enter ambitious and sophisticated specialised programmes. In addition, the programme funds especially risky projects, including high-volume projects. The spectrum of technology areas in which projects can be carried out in this context is to be expanded to include additional funding areas of various government departments. This effort is thus designed to further improve the already good integration of SMEs within the Federal Government's specialised programmes. The Federal Government is aiming to intensify integration of SMEs within major research and innovation networks. Plans call for SMEs to be involved from the outset in research on key topics and key technologies.

A number of measures are designed to reinforce the competencies of innovative SMEs. The "SME-Digital" ("Mittelstand-Digital") initiative is promoting greater use of ICT and eBusiness among SMEs, especially among crafts companies. The "go-Inno" initiative is supporting SMEs in improving their innovation management and enhancing their resource and material efficiency. The advising services provided via the initiative are being optimised, and coordination of the services is being improved.

While small and medium-sized companies have major opportunities in world markets, they often face considerable challenges, due to their size, in transboundary cooperation in the area of research-driven innovations. For this reason, the Federal Government is supporting use of the SME-oriented funding guidelines in the EU's "Horizon 2020 Framework Programme for Research and Innovation", and it is offering an advising service designed to improve the quality of funding applications. The EUROSTARS programme for funding SME research, an effort being carried out in the framework of Europe's EUREKA intergovernmental research initiative, is also playing an important role.

Increasing the numbers of innovative start-ups:

The programmes “EXIST”, “GO-Bio”, “IKT Innovativ”, “INVEST” and “High-Tech Gründerfonds” are helping to increase the numbers of start-ups – and doing so especially in the early phases of new technological developments:

The non-technology-specific funding programme “EXIST – promotion of university-based start-ups” (“EXIST – Existenzgründungen aus der Wissenschaft”) supports technology-oriented start-up teams originating within university environments, and does so while they are still in such environments. In addition, “EXIST” also supports the development of a culture of entrepreneurship at universities and research institutions. The funding programme is being expanded via two funding lines, “EXIST–Start-up Grant” (“EXIST–Gründerstipendium”) and “EXIST–Transfer of Research” (“EXIST–Forschungstransfer”), and its funding terms are being improved – for example, with a view to better addressing requirements in the areas of energy and clean technologies. To give innovative start-ups in Germany better access to venture capital, the Federal Government, via its funding programme “INVEST – Subsidy for Venture Capital” (“INVEST – Zuschuss für Wagniskapital”), awards investment subsidies to business angels who invest in start-ups and young companies. To enable the INVEST incentives to have their full effect, such subsidies are to be exempted from taxation.

The “High-Tech Gründerfonds” (“high-tech-start-up fund”) provides capital-intensive, newly established technology companies with initial financing and supports them with know-how and relevant contacts. With its extensive connections to the venture capital scene in Germany and abroad, and its connections to financially powerful private investors, High-Tech Gründerfonds is able to mobilise significant funding each year for follow-up financing. Industry participation in the financing for a second fund has been further expanded through the acquisition of additional private investors.

The approach used in the “German Silicon Valley Accelerator” is being expanded in the interest of enhancing networking of German high-tech start-ups with global growth and value-creation centres. A second Accelerator is being established in New York City, to enhance access to the U.S. East Coast and its markets. In the medium term, additional locations in other growth markets will be identified and reviewed.

Matching of established companies and innovative start-ups plays a role in any forward-looking innovation and growth policy. The measures carried to promote such matching include events designed to reinforce the willingness of established companies to cooperate with young companies. A first event in this connection is the “YOUNG IT Start-up Summit” to be held in Hamburg in 2014. The Federal Government is working to enable initial public offerings of young growth companies in Germany to be more effective in attracting investors. Currently, the possibilities for revitalising the German market for initial public offerings (IPO) of growth companies are being explored, in cooperation with the Deutsche Börse Group exchange organisation, and additional market participants.

“Gründerwettbewerb IKT Innovativ”, a competition for innovative ICT start-ups, is an effort aimed at significantly increasing the numbers of innovative start-ups in the information and communications technology (ICT) sector. In it, aspiring start-up entrepreneurs receive well-founded feedback on their own ICT-based start-up ideas. Outstanding ideas can be awarded prizes that can serve as seed money for start-ups. In addition, advising support is provided via a nationwide network of experts established especially for the effort.

The programme “Gründungsoffensive Biotechnologie (GO-Bio)” (“campaign for biotechnology start-ups”), supports start-up teams in the life sciences in their pre-start-up and start-up phases. GO-Bio is tailored to the lengthy, cost-intensive and highly risky development processes encountered in the life sciences sector. The Federal Government is also helping to strengthen the entrepreneurial culture for start-ups via the “Innovationsakademie Biotechnologie” (“Biotechnology Innovation Academy”), an annual event. In addition, new models for funding start-ups are being tested. For example, the Life Science Incubator is being expanded via the addition of a new location in Lower Saxony.

In the space technology sector, German start-ups are being supported via two “ESA Business Incubation Centres”, with the aim of promoting transfer of space technologies into other industrial sectors, for commercial applications. In the process, companies are being assisted and supported throughout their entire efforts, from initial phase to market entry.

Enhancing the innovation resources of structurally weak regions:

In eastern German Länder, development and expansion of technological, scientific and economic competencies, and relevant networking, are being continued, in order to further strengthen innovation, economic growth and employment. Funding from the Solidarity Pact II programme for eastern Germany is available for this purpose.

"Innovationskompetenz Ost (INNO-KOM-Ost)", a programme designed to promote innovation in eastern Germany, supports research projects of non-profit external industrial research institutions. In this context, such institutions carry out market-oriented research projects in close cooperation with SMEs. The effort is strengthening the technological capabilities and competitiveness of eastern German industry in a lasting way. The relevant funding is awarded to the best institutions, via competitive procedures.
The "Entrepreneurial Regions" innovation campaign is designed to promote formation of internationally competitive, science-industry centres of excellence, and to support rapidly developing clusters, in eastern German Länder. It is thus helping to develop additional innovation resources in eastern German regions. The relevant alliances bring together SMEs and research and educational institutions. One of the initiative's central priorities is to promote young scientists. The "Zwanzig20" ("Twenty20") programme is providing additional impetus for strengthening innovation resources in eastern German Länder, for establishing and strengthening trans-boundary research cooperation and for enabling relevant new structures to form.

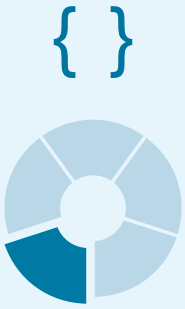
The western German Länder have a number of structurally weak regions whose innovation capabilities can be enhanced via targeted measures. The Federal-Länder Finance Commission that is to be appointed will thus review whether certain programmes oriented especially to eastern German states, such as a programme for promotion of non-profit industrial research institutions, can gradually be transferred into a complete-coverage programme for structurally weak regions.

The Joint Task for the Improvement of Regional Economic Structures ("Verbesserung der regionalen Wirtschaftsstruktur" – GRW) is to serve as the starting point for this effort.

Plans also call for improving innovation resources in peripheral rural regions in connection with efforts to enhance basic public services. In addition, the economies of regions that are especially affected by demographic change are to be strengthened, the regions' health-care sectors are to be enhanced and the regions' links to transport and data infrastructures are to be improved. The starting point for these efforts consists of the Joint Task for Improvement of Agricultural Structures and Coastal Protection" ("Verbesserung der Agrarstruktur und des Küstenschutzes" – GAK), which is to be developed into a joint task for "rural development" and thus is expected to open up new possibilities. Research projects such as the "Modellvorhaben LandZukunft" ("model project for the future of rural areas"), which promotes entrepreneurial approaches and private projects for assuring public services in structurally weak regions, provide relevant findings in this regard.

These measures are enhancing the pace of innovation in industry and SMEs, and they are strengthening Germany as an internationally renowned industrial centre. A viable, vital industrial sector, with many innovative companies and start-ups, is developing new products and services that can shape international markets and attract foreign investors to Germany. Social innovations can now support the management of challenges tied to societal and regional change.

IV. Innovation-friendly framework



One of the important tasks of the state is to provide a framework and conditions that are conducive to innovation. Only with such a framework will it be possible for good ideas to develop and lead to economic success. The keys to the development of creative ideas, and to their implementation in innovations, include a level playing field for competition – also at the international level – along with open markets, adequate financing options and effective protection of intellectual property rights.

Internationally harmonised norms and standards enable companies to bring innovations to new markets rapidly. Secure and safe products, and efficient market surveillance, promote openness to technology in both industry and society. In addition, government procurements of new products and services can leverage innovation performance by industry and the research institutes cooperating with it. In addition, the Federal Government plans to continue supporting companies by helping to assure the continuing supply of adequate numbers of skilled personnel, since well-trained, specialised personnel are the basis for creativity and innovation and, thus, are a key to Germany's own competitiveness.

The new impetus in this area includes:

Assuring the supply of skilled personnel for technical and innovation-oriented occupations:

Highly qualified, skilled personnel are central to growth, prosperity and progress. The largest still-untapped potential for skilled gainful employment is seen among women, but such potential also exists among older people, immigrants and young people in the transition from school to working life. The Federal Government's Skilled Labour Concept is a comprehensive approach for assuring the supply of skilled personnel. It consists of five "skilled-labour paths": activation, and securing employment; improved compatibility of family and working life; educational opportunities for all, from the outset; qualification: initial and continuing training/education; integration and immigration of qualified personnel.

Intensified efforts are being made in the area of training and further training. In cooperation with industry, unions and the German Länder, we want to develop the "National Pact for Career Training and Skilled Manpower Development in Germany" into an "Alliance for training and further training". A new initiative, "Chance Beruf – Zukunft der beruflichen Bildung gestalten" ("Opportunity via occupations – shaping the future of vocational training"), is aimed at improving school-leaving and training qualifications; at improving the compatibility of vocational training; and at strengthening participation in further training.

Vocational and academic education are of equal value. Such equal status needs to become more visible in practical implementation, however, since both areas are needed for innovation. A capable, permeable education system plays a central role in such implementation. It contributes significantly to assuring the future availability of skilled personnel. To that end, along with suitable training programmes, it provides flexible options for further training and career advancement. When an educational system is highly permeable, it can inspire university dropouts to enter training programmes, and it enables skilled personnel to begin studies oriented to career advancement. The new "JOBSTARTER plus" projects are designed to help SMEs attract university dropouts to their training programmes. The Kompetenzzentrum Fachkräftesicherung, a competence centre for assuring the supply of skilled personnel, supports SMEs in their search for skilled personnel, and it provides practical tips on how to succeed in the competition to attract skilled and talented people. Its programmes are continually being expanded. Initiatives for qualified young people in the areas of science, technology, engineering and mathematics (STEM; also known as "MINT") are to be intensified in cooperation between industry, science and schools.

The Federal Government and the Länder have responded to the increased demand for higher education studies, and they have increased their commitments for the expansion of study opportunities. The submitted amendment of the Federal Education and Training Assistance Act (BAföG) will noticeably improve the opportunities for financing studies [subject to updating]. The intended reform will include substantial increases in grant rates and allowable income deductions, as well as structural changes that more effectively address the life and training circumstances of people receiving support. In addition, as of 2015, the Federal Government will assume all costs relative to the Federal Education and Training Assistance Act. An agreement has been reached whereby the German Länder will use the resulting freed-up funding to finance educational expenditures at universities and schools.

Along with training and further training, recognition of foreign vocational qualifications is also an effective instrument for assuring the availability of skilled personnel. In addition, the Federal Government is actively seeking to attract skilled personnel from abroad. The portals "Make it in Germany" and "Research in Germany" stand for a new culture of welcome and provide information about working and living in Germany. The portals and their accompanying pilot projects are being continued and optimised, and new target groups are being defined. In addition, additional players, such as the German international chambers of commerce and Germany Trade & Invest, are being integrated as cooperating partners. Furthermore, measures carried out by the working group "developing the supply of foreign skilled personnel and creating a culture of welcome" ("Ausländisches Arbeitskräftepotenzial erschließen und Willkommenskultur schaffen"), in the framework of a summit process on demographic strategy, are being continued, along with "research marketing", and relevant existing measures are being refined.

Better financing of innovations:

The Federal Government plans to make Germany more internationally attractive as a centre for venture capital investments. Better financing and development opportunities are to be created especially for rapidly growing, innovative start-ups. We plan to provide suitable pertinent incentives, also in the area of taxation. Another step, along with discussions regarding revitalisation of the German IPO market for growth companies, will be to introduce tax exemptions for the "INVEST – Subsidy for Venture Capital" programme.

In addition, the Federal Government is aiming to provide a reliable framework for new forms of financing such as crowd investing and crowdfunding. Increasingly, private citizens are taking the lead in initiating, financing and supporting innovative projects. The Federal Government is seeking to support such commitment and involvement, by ensuring – while taking the needs of investor protection into account – that the applicable regulations properly address the interests of young companies financed via crowd investments.

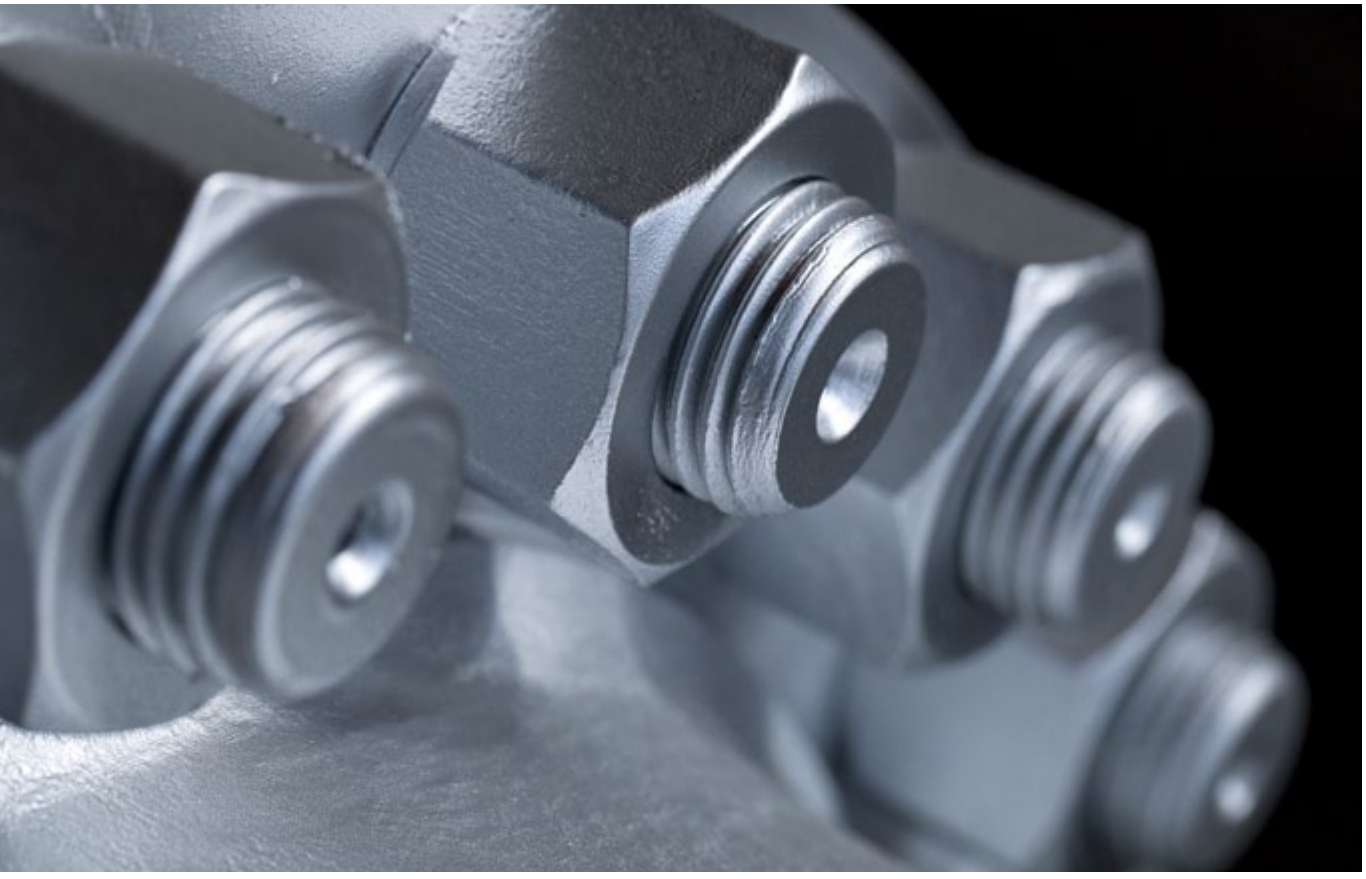
Enhancing the legal framework and standards in the technical sphere:

Norms and standards define the state of the art of, and the requirements for, products and services in virtually all areas of life. With their market-liberalising and deregulating effects, they strengthen Germany‘s competitiveness as an industrial nation and exporting country. Norms and standards function as catalysts, and they can accelerate the acceptance of innovations, as long as standardisation aspects are taken into account in relevant research.

Only safe, secure and high-quality products and services have any chance for long-term survival in international markets. Requirements for products and services are increasingly being reviewed in the framework of so-called “conformity assessments”. Conformity assessments can significantly accelerate worldwide market access, especially for innovative products. Within the EU, the placing on the market of certain products, and certain groups of products (such as medical products), is subject to conformity assessments to prove conformance with specified basic requirements.

Excellent metrology capabilities are required in connection with many innovative products. This is in keeping with the basic fact that, ultimately, only those things can be developed and produced that can also be measured.

The Federal Government thus plans to intensify its efforts in the interest of standardisation, accreditation, conformity assessment, market monitoring and metrology, all of which are important basic pillars of industry. It plans to work for international harmonisation in this areas, and thus contribute to the elimination of non-tariff trade barriers. Bilateral cooperation with emerging markets such as China and India is being expanded with a view to facilitating coordinated action at the international level.



Providing more-efficient protection for intellectual property:

The "European unitary patent" is to be ratified as quickly as possible, so that innovative companies can rapidly profit from the resulting more cost-efficient, effective intellectual property protection. For innovations to become successfully established in markets, effective intellectual property protection must be in place.

Promoting open innovation and making new knowledge available:

New forms of cooperation between producers, users and customers, with the help of digital media, can be of use in developing additional creative potential. The Federal Government is aiming to support the adoption of open innovation in companies, research institutes and innovation clusters. Establishment and expansion of suitable open-innovation platforms can generate new opportunities for companies – especially SMEs – to produce creative solutions and find new market potential.

Developing strategies for open access:

In all types of research activity, researchers depend on having access to scientific findings. In addition, they need for knowledge to be able to flow unhindered, so that it can provide impetus for new ideas and a framework for implementation of research findings in innovations. The Internet and digital technologies have opened up completely new possibilities for exchange of information and access to information. The Federal Government plans to develop a comprehensive open-access strategy for the purpose of making better use of such possibilities. This effort is expected to improve the framework and conditions for effective, continuing access to publicly financed publications.

Creating copyright laws that address educational and research needs:

The Internet and digital technologies have revolutionised the ways in which people gain access to knowledge and in which knowledge spreads. Currently, the opportunities that digital technologies and the Internet present for education, science and research are being exploited to only a limited extent. The Federal Government plans to help develop the potential that the Internet offers for the digital knowledge society – and to do so with copyright laws that address the needs of science and education. Greater priority is to be placed on meeting the important needs of the education, science and research sectors, and limitations and exceptions to copyright are to be introduced that are designed to support education and science.

Creating incentives via innovative public procurement:

Government procurements of new products and services can leverage innovation performance by industry and the research institutes cooperating with it. For this reason, the Federal Government plans to intensify its innovation-oriented procurement. In addition, German states and municipalities are to be encouraged to opt more frequently for innovative products and services. To this end, the economic ministers of the Länder have adopted a resolution aimed at having procurement guidelines apply sustainability and innovation criteria. Expansion of the "Competence Centre for Innovative Procurement" (KOINNO) is to continue. In addition, pilot projects for pre-commercial procurement are to be initiated, in order to promote development projects also in Germany (i.e. following examples seen abroad) in which multiple developers compete in developing new solutions for public requirements. Innovative aspects will also be considered in the upcoming transposition of the new EU procurement regulations into national law. This will apply especially to purchases of energy-efficient products.

These measures will make the procurement framework in Germany even more conducive to innovation. They will provide the basis for a broad range of innovation activities, and they will encourage innovation-related risk-taking, creativity and entrepreneurialism.

V. Transparency and participation

Innovations result from the interplay between societal demand, scientific development and technological possibilities. If Germany's innovation strength is to be increased, both government and entrepreneurs need to invest in research, and all parties involved in innovation activities need to help shape innovation processes. The society needs to become involved in these areas even more extensively than has been the case to date. Only when all stakeholders participate can desirable and accepted technologies and Internet content be integrated within everyday life. With such participation, research findings can enter more rapidly into the practical sphere and be effective there – i.e. ideas can quickly turn into innovations.

The key to intensifying participation by all stakeholders – including the science and industry sectors and the general public – is to transparently document and present research and innovation funding. Transparency facilitates dialogue, promotes balanced consideration of opportunities and challenges and fosters openness to new things.

The Federal Government is thus providing the following new impetus:

Strengthening openness to technology, and creating opportunities for participation:

The key bases for participation, and for early-phase, open and serious dialogue with citizens, include ensuring that information is provided impartially and objectively and that discussion regarding new technologies is conducted transparently. The Federal Government thus plans to promote development of a participatory, innovation-friendly culture, with the help of new initiatives and formats. For example, it plans to enable interested citizens to help shape innovation policy and it plans to improve its information provision regarding new technologies.

New instruments, such as the so-called "real-world laboratories" ("Reallabore") in which technologies, solutions and change processes are tested and scientifically monitored, can help promote openness to new technologies, detect implementation problems at early stages, and find answers in cooperation with citizens.

Another important task in this connection consists of expanding "innovation and technology analyses (ITA). The purposes of innovation and technological analyses are to provide orientation for our highly technological society and to help promote technology that is in keeping with human and social needs and that is environmentally compatible. Relevant systematic analyses can facilitate early identification of the opportunities and risks of new technologies and social trends, and they can propose ways of managing and preventing potential risks. In addition, scientifically based trend research is to be enhanced.

Promoting dialogue with citizens, and promoting citizen science:

Innovations succeed only when they are understood, accepted and applied by people. The Federal Government plans to refine its programme of "Dialogues with Citizens" (Bürgerdialogs), via a range of different formats.

All citizens need to have easy access – either in person or online – to discussion forums and available information. The aims in this regard are to ensure that ideas relative to policy design and strategically important issues are received – also via digital media – and to promote broad-based dialogue.

The Federal Government is also supporting citizen science. Citizen scientists monitor the weather; provide computing resources online to support scientific research; make their medical data available online in support of medical research; and help decipher protein structures in the context of cancer research. The public can profit greatly from systematic efforts to strengthen citizen science and its networks. One such effort is "Citizens create knowledge" ("Bürger schaffen Wissen") , a recently established central information platform for citizen science projects in Germany (www.buergerschaffenwissen.de).

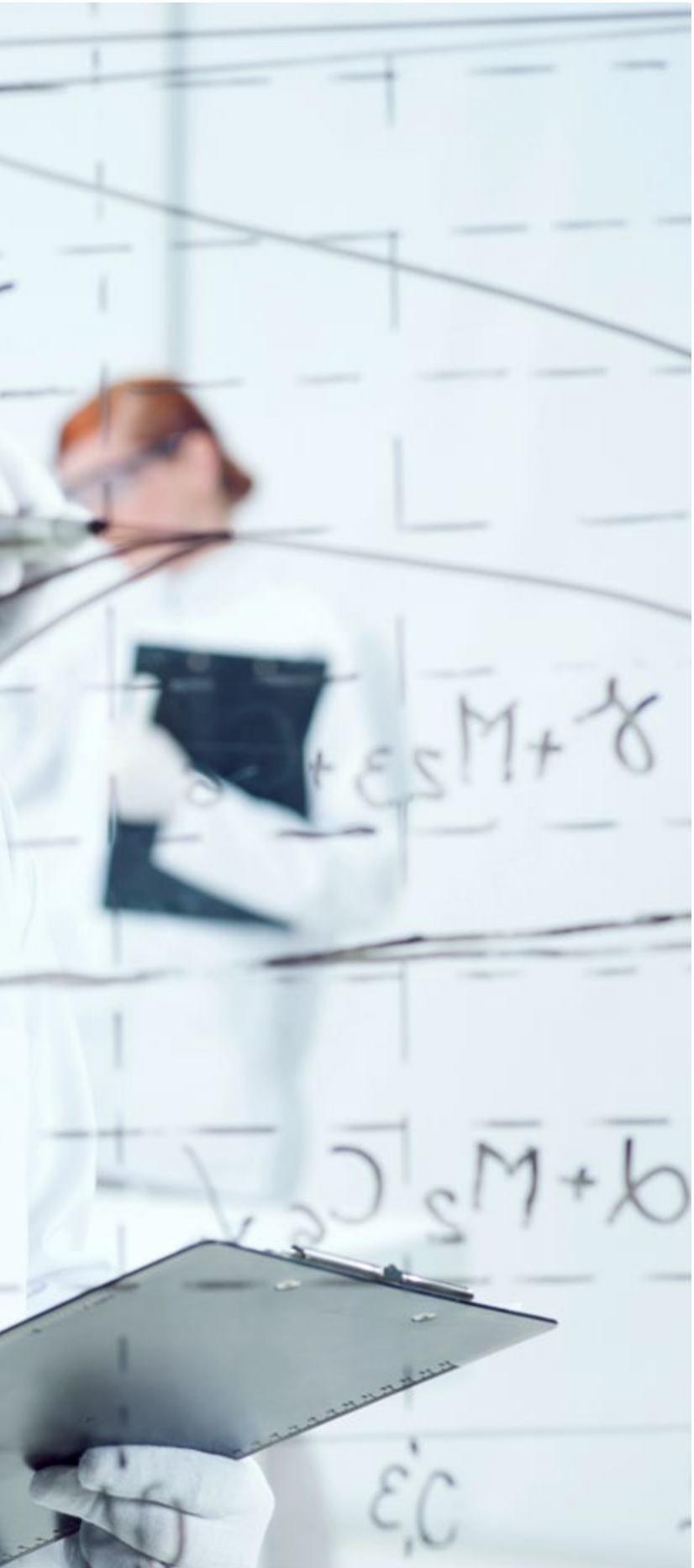
Expanding science communication:

Translation of research findings and innovation processes into easily understandable language is to become a regular part of research projects and agendas and innovation processes. People tend to be more open to new technologies when they receive suitable information about them that they can understand. For this reason, the Federal Government plans to enhance its science communication. Dialogue formats will play an important role in this. Such formats have been increasingly featured in the "Years of Science", for example, which highlight key topics of relevance to society.

The "House of the Future" ("Haus der Zukunft") and its special exhibition concept will promote open dialogue, between policy-makers, science, industry and society, regarding ways of managing future challenges. The House will serve as an important forum for public discussion of such urgent key issues. The House will be designed to enable visitors to experience the future as it is taking shape in creative minds. It will thus highlight the profound ways in which science affects future developments. The "House of the Future" is expected to open its doors to the public in 2017.

Agenda processes – en route to the innovative society:

Agenda processes provide a new level of quality in cooperation between science, industry and society, throughout the entire innovation chain. Such processes begin by defining the content and emphases of future funding programmes in cooperation with stakeholders, via an efficient dialogue process. Then, the participating stakeholders support and help shape the resulting innovation processes – and do so, in each case, through to the stage at which the resulting innovation is actually applied. This approach has the advantage of ensuring that the knowledge and research requirements of potential users enter into the process from the outset, and that the relevant multipliers themselves function as co-designers. Acceptance for implementation is thus built into the process. Agenda processes are open for integration of international stakeholders.

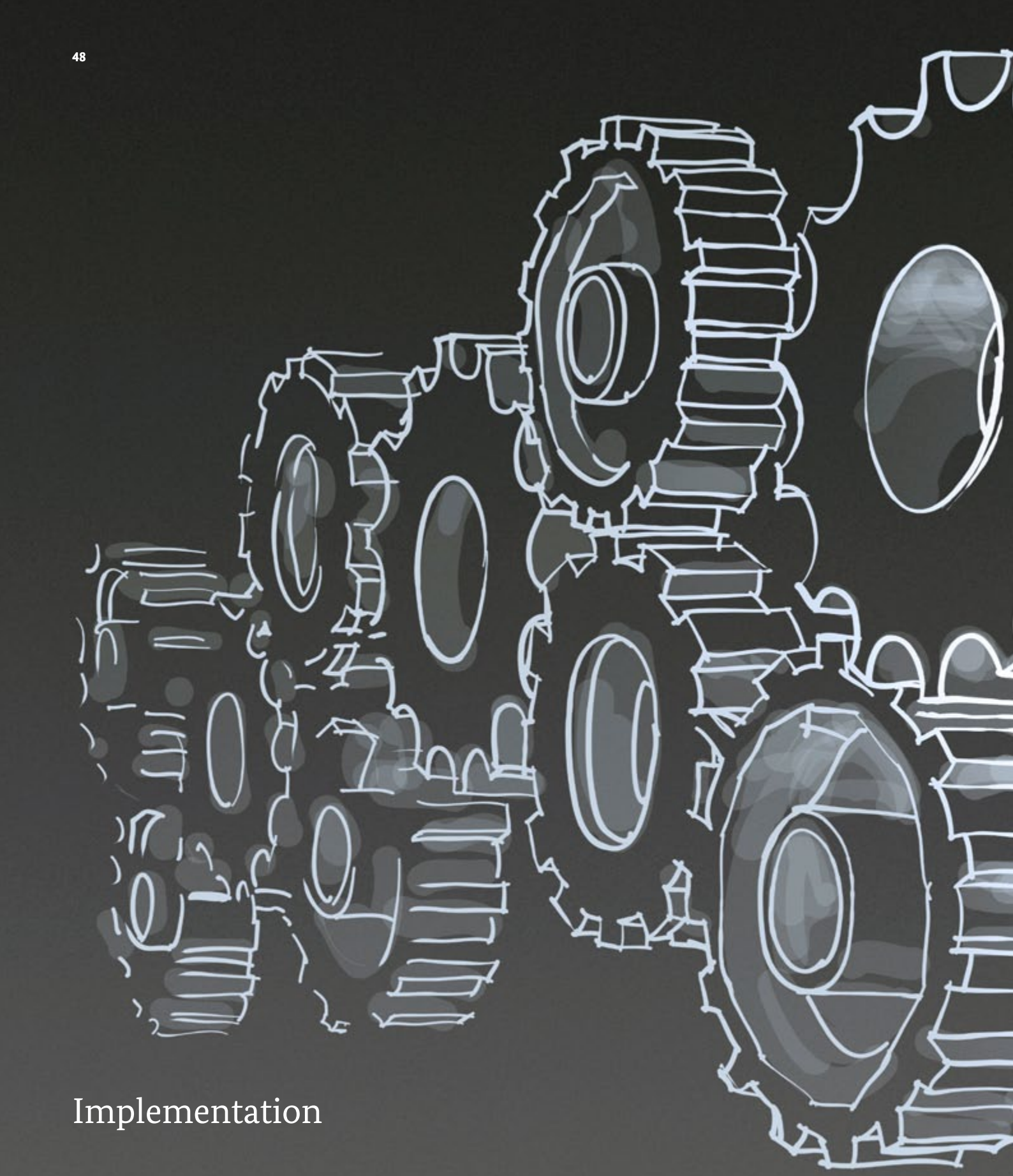


Creating transparency, strengthening strategic foresight:

Transparency in research funding strengthens the involvement of science, industry and society in research. The Federal Government is thus placing great priority on clear, consistent and easily accessible presentation of objectives, emphases and initiatives in research funding. In addition, it is developing a comprehensive communication strategy with a view to improving public perception of research and innovation policy. Also, it is expanding the presence abroad of stakeholders in German innovation activities.

In its strategic foresight process, the Federal Government, drawing on a broad base of expertise, identifies, assesses and calls attention to future societal and technological developments. And this process increasingly directly involves the country's citizens. The framework for policy-making is to be further improved, to ensure that the right policies can be chosen at the right times. Consequently, the Federal Government plans to strengthen strategic-foresight responsibilities and capacities in ministries, with a view to detecting and identifying the opportunities and risks of medium-term and long-term developments more effectively.

With these measures, the Federal Government is helping to ensure that the public is able to discuss new developments and technologies openly, and with an open mind – and thus is able to weigh the relevant opportunities and risks objectively. This effort is thus helping to promote a society that takes an interest in social and technological innovations, that contributes its own ideas and that actively participates in the innovation process.



Implementation

The Federal Government considers the new High-Tech Strategy to be a living, learning process that continually needs to be adapted to new challenges.

The following approaches are being emphasised in connection with implementation:

1. The Federal Government‘s forward-looking projects

Forward-looking projects focus on societal and technological trends and formulate specific research and innovation policy models. All forward-looking projects share a common central characteristic: in each case, all players involved in relevant innovation in Germany cooperate in working toward a specific goal. Each forward-looking project helps find systemic solutions that enhance our quality of life, protect our bases for life and give our industry competitive advantages in important lead markets.

These projects are being developed further in this legislative period. In areas where the projects‘ thematic orientation and structures have been successful, the projects are being continued and adapted to new challenges and developments as necessary. Where projects have not been successful in this regard, new solutions are being sought. In the process, the focus is always on bringing the various relevant stakeholders in the areas of policy, science and industry together, so that they can jointly develop and implement research and innovative innovation agendas aimed at the common vision of an innovative Germany.

10 forward-looking projects were launched in the last legislative period:


The CO2-neutral, energy-efficient, climate-adapted city


Renewable resources as an alternative to oil


The intelligent transformation of the energy supply


Treating illness more effectively, with individualised medicine


Better health via effective prevention and healthy diets


Living an independent life well into old age


Sustainable mobility


Internet-based services for business and industry


Industry 4.0


Secure identities

2. Coherence through cooperation between the Federal Government, the Länder and Europe

The implementation of the new High-Tech Strategy is a process that continually requires review, via dialogue, and that is aimed at producing a fully consistent, coherent policy. To this end, the various funding measures need to be dovetailed, coordinated and communicated more effectively.

Coordination between the various government departments, in programme development, and strengthening of interdepartmental agenda processes within the Federal Government, thus play a central role in implementation of the strategy. Such coordination depends on continual dialogue between the various government departments, taking account of the departmental principles involved. With such dialogue, different strategies can be coordinated, and any deficits in existing innovation approaches and instruments, and weaknesses in implementation, can be jointly identified and eliminated.

The Federal Government plans to further improve the funding system – for example by combining smaller funding measures into larger measures, and even into interdepartmental funding programmes. Via the "Research and Innovation" joint programme for advising on funding, and the contact points for the "Horizon 2020 Framework Programme for Research and Innovation", the Federal Government offers a comprehensive advising service for determining suitable funding opportunities. Interdepartmental advising regarding funding opportunities is being expanded.

In the interest of improving visibility and transparency, the Federal Government and the Länder consult with each other in describing and presenting the various relevant programmes and measures. Examples of such efforts include the Cluster Platform Germany, which provides an overview of measures within national, regional and European initiatives for cluster promotion, and the portals "Research in Germany" and "International Cooperation" ("Kooperation International"), which help international partners enter the German innovation sector, also via international cooperation opportunities. Synergies and possibilities for cooperation with the EU's "Horizon 2020 Framework Programme for Research and Innovation", and for interaction with the requirements pertaining to further development of the European Research Area, are being used

3. Effectiveness through impacts analysis

One of the key tasks of the Federal Government is to ensure that allocated funding achieves its objectives and intended effects, and does so cost-effectively. Increased investments in research and development need to be justified to the public. These needs make regular quality assurance and impacts analysis all the more important. The strategies for this include high-quality, systematic evaluation of funding instruments with regard to their efficiency and weighting.

Impacts analysis has to be carried out in light of objectives and backed with proper monitoring of progress. For this reason, the Federal Government plans to report on implementation and further development of the new High-Tech Strategy at regular intervals.

4. Support from a central advisory body

Implementation of the new High-Tech Strategy will continue to be supported by a central advisory body consisting of experts from the areas of science, industry and society. This body is charged with developing proposals for the strategy's further development and implementation.

Published by
Bundesministerium für Bildung und Forschung/
Federal Ministry of Education and Research (BMBF)
Division Innovation Policy Issues
11055 Berlin

Orders
In writing to
Publikationsversand der Bundesregierung
P.O. Box 48 10 09
18132 Rostock
E-Mail: publikationen@bundesregierung.de
Internet: http://www.bmbf.de
or by
Phone: +49 (0) 30 18 272 272 1
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August 2014

Printed by
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Berlin

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Berlin

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