National strategies on Artificial Intelligence
A European perspective in 2019

Country report – Germany

In November 2018, the Federal Government of Germany launched its artificial intelligence strategy jointly developed by the Federal Ministry of Education and Research, the Federal Ministry for Economic Affairs and Energy, and the Federal Ministry of Labour and Social Affairs (Germany, 2018).

The strategy presents the progress made in terms of AI in Germany, the goals to achieve in the future and a concrete plan of policy actions to realise them. The range of policy initiatives outlined in the strategy aim to achieve the following goals:

- Increasing and consolidating Germany's future competitiveness by making Germany and Europe a leading centre in AI;
- Guaranteeing a responsible development and deployment of AI which serves the good of society;
- Integrating AI in society in ethical, legal, cultural and institutional terms in the context of a broad societal dialogue and active political measures.

For the implementation of the strategy, the Federal Government of Germany intends to provide around €3 billion for the period 2019-2025.

1   Human capital

Establishing the right framework conditions towards human development is primordial to prepare current and upcoming generations to the tremendous changes that will arise from the use and deployment of AI. This calls for efforts to increase the awareness of citizens of the benefits and use of AI, but also to considerably expand the education and training capacities and facilities in the field of AI. The German strategy proposes a couple of **policy reforms and initiatives for formal training and education**, with special focus to the formation of teachers in order to guarantee a high-quality level of education in AI:

- Creation of the 'Teach-and-learn AI' platform to develop a solid skill base in AI targeting specific user groups;
- Creation of at least 100 additional professorships in the field of AI to ensure that AI has a strong foothold within the higher education system.

On top of this formal education and training reforms, the Federal Government proposes a broad-based set of instruments to **expand and upgrade AI-related skills of the workforce**. As the required skills of individuals will change significantly with the upcoming AI technologies, the Federal Government launches some large-scale qualifications initiatives with attention for lifelong learning and for reskilling and upskilling employees across their entire careers:

- The creation of the National Skills Strategy to promote advanced vocational training in digital and AI-related aspects among others. The Mittelstand 4.0 centres of excellence for SMEs will have "AI trainers" contact at least 1000 companies per year;
- The formation of regional Centres of Excellence for Labour Research studying and organising labour in an AI working environment and imparting the necessary skills to management and the workforce.

Other policy instruments aim to identify upcoming skills demand and to **respond in a flexible way to the digital and demographic changes of labour demand** on the job market. Hence, these initiatives aim at satisfying and bridging the needs of both the workforce and companies:

- The creation of a Skilled Labour Strategy: a skills monitoring system to identify which skills are needed in the future;
- The formation of regional Centres for the Future to provide upgrade skilling opportunities for employees in rural areas.

2   From the lab to the market

This pillar includes support actions towards the expansion of AI research, programs to foster entrepreneurship and to promote growth of AI start-ups in particular. It covers also funding instruments and infrastructure to encourage innovation and to facilitate the process of launching AI applications on the market. Most of these initiatives may also be allocated to the networking pillar below as the research and innovation process often leads to knowledge transfers across institutional players.

Funding schemes and support initiatives to **foster research in the field of AI** comprise among others:

- Gruender platform: online platform to support start-ups – including AI ones – from initial research to concrete AI applications;
- Industrial Collective Research programme fostering joint business and science research on collective AI projects in order to close the gap between basic research and industrial applications;
- Advisory and funding services to foster the growth of AI start-ups (e.g. EXIST focusing on university spinoffs) through for instance venture debt (e.g. Tech Growth Fund). This can also include policies to promote company formations in the field of top-rate research in human-machine interaction.

Support initiatives towards **innovation and testing** include:

- Founding an agency for breakthrough innovations with AI as a focus;
- Developing in-company innovation spaces to promote innovative solutions for digitalisation;
- Strengthening the Central Innovation Programme for SMEs: funding programme for SMEs targeting individual and collective R&D projects;
- Speeding up the process of AI innovations by launching so-called transfer initiatives, test beds and regulatory sandboxes, and promoting pilot and flagship AI projects, for example those that benefit the environment and the climate.

3   Networking

The German strategy highlights a wide range of policy initiatives to **foster networks and collaborations** across the business community, academia and public research centres. The aim of networking is to encourage the development of multidisciplinary cutting-edge research and innovation projects and to fully exploit synergies and diversities across institutional players by promoting knowledge dissemination and transfers.

Support initiatives of the Federal Government of Germany to encourage collaborations include:

- The formation of a Franco-German R&D network ("virtual centre"): bilateral funding and training programme with bilateral AI clusters in specific industries (e.g. healthcare, environment, robotics, mobility);
- Expanding the Plattform Lernende Système into an Artificial Intelligence platform to host dialogue and networking between science, business community, civil society and the government;
- Platform Industrie4.0: a platform with a holistic approach to the shaping of digital ecosystems. It aims at supporting and promoting innovations and collaborations in a digital economy, with recently a more targeted focus on AI technologies;
- The development of Next Generation Clusters: The aim of the initiative is to transfer fundamental, developable results from cutting-edge research into products and services, with a strong emphasis on collaborative partnerships;
- Further development of the Digital Hub initiative and the Hubs for Tomorrow initiative in Germany, in particular those related to artificial intelligence, cybersecurity and other AI-related fields;
- Considering the launch of an Important Project of Common European Interest (IPCEI) in the field of AI, where necessary;
- Promoting cross-company and cross-institutional flagship projects in AI;
- Considering the building of data partnerships between companies and research institutes.

Concerning efforts to foster the **international attractiveness** of the country, the Federal Government of Germany aims to improve working conditions and remuneration to draw in and retain the brightest minds. Along this side, the German strategy also proposes reforms of legislation to facilitate immigration procedures for skilled workers (cf. regulation).

Other initiatives aim to monitor current progress and uptake of AI in Germany and to disseminate nation-wide information about digitalisation and AI:

- Setting up a German AI observatory to monitor the uptake and impact of AI in society and the world of work;
- Establishing a Digital Work and Society Future Fund to set up an information and policy campaign in the field of digital technologies such as AI and to promote multidisciplinary social technology design;
- Monitoring and mapping interesting AI applications and their stakeholders aiming to encourage collaborations and the development of creative ideas.

4   Regulation

A successful deployment of AI technologies goes hand in hand with a well-developed and effective regulatory framework. Therefore, an innovation-friendly regulatory framework is important for German's industry and economy to thrive. The Federal Government of Germany launches initiatives to tackle among others issues related to information management, data ownership, free flow of data, and standardisation.

Reforms of the legislation target many domains, including codifying the rights of the labour force, consolidating competitiveness of the industry and developing rules with respect to data usage and protection.

Following initiatives provide initial steps towards a **legislative framework for AI**:

- The launch of a Commission on Competition Law 4.0 serving as a political platform for a debate on how to further develop competition and copyright law;
- The launch of the Opportunities for Qualifications Act, a legislation providing reskilling opportunities and support to employees whose job is at risk due to AI technologies;
- The adoption of the Skilled Labour Immigration Act, a legislation to facilitate the migration of skilled workers to Germany;
- The formation of a Workforce Data Protection Act to codify data protection regulation and privacy (i.e. safeguard the control on personal data), compliant with EU law;
- Review and if necessary adaption of the legislation concerning the use of non-personal data as well as copyright;
- Implementation of the cyber security directive: this directive properly known as the Directive on security of network and information systems (NIS) requires Member States to adopt a national cyber-security strategy. In Germany it has been implemented by the NIS Implementation Act in June 2017.

The Federal Government advocates using an "ethics by, in and for design" approach throughout all the development stages and use of AI-based applications. It highly recommends engaging in dialogue with other leading regions to reach an agreement on joint guidelines and ethical standards on AI. Hence, the strategy foresees to work on a **legal and ethical framework** aligned with European guidelines and taking into account recommendations of the national Data Ethics Commission:

- Guidelines for developing and using AI systems in compliance with data protection rules;
- Ethical requirements to ensure transparency, verifiability and predictability of AI systems (e.g. ethical guidelines for self-driving cars);
- Initiative to enforce a better coordination of ethical values at European level.

Besides ethical guidelines and legislative reforms, standards form an essential aspect of an adequate and effective regulatory framework. Standards act as a seal of excellence in ensuring high quality products and services. It reinforces security and opens up possibilities towards collaboration due to higher degrees of comparability and interoperability. Overall, standards for AI increase the public trust in the use and deployment of AI applications. With respect to **standardisation**, the Federal Government of Germany proposes following support initiatives:

- Funding for the development of data standards and formats to encourage EU-wide collaborations;
- Funding for experts, particularly from SMEs and start-us in order to support their participation in international standardisation processes;
- Develop a roadmap on AI standardisation to review existing standards as to whether they are AI-compatible.

5 Infrastructure

Regarding infrastructure the Federal Government foresees to expand the current data infrastructure in order to create optimal conditions for the development of cutting-edge AI applications. The objective of data infrastructure investments is to obtain a trustworthy data and analysis environment to strengthen research in AI and to favour exchanges due to a more flexible data interoperability. In addition, the German AI strategy aims to develop the current telecommunication and digital infrastructure to ensure a better connectivity of the network and to improve cyber security. Lastly, the Federal Government is setting up funding to foster learning capabilities and experimentation in AI by improving the digital infrastructure in the education system.

In particular, the German strategy foresees the following initiatives for the **improvement of the infrastructure in AI**:

- Improving data sharing facilities by providing open access to governmental data and improving the infrastructure for access to the Earth observation data;
- Building a trustworthy data and analysis infrastructure based on cloud platforms and upgraded storage and computing capacity;
- Setting up a National Research Data infrastructure to provide science-driven data services to research communities;
- Improving security and performance of information and communication systems with particular focus on resilience of AI-systems in case of attacks;
- Providing funding from the Digital Pact for Schools programme to improve digital infrastructure in schools;
- Expanding the Learning Factories 4.0 initiative, which sets up professionally equipped laboratories and puts them at disposal of students for learning purposes in AI.

6 Update

The Federal Government of Germany published an interim report presenting the German AI Strategy after one year in November 2019. It provides facts and figures on the implementation of the strategy, fields of actions that are currently ongoing and perspectives for the future. At the beginning of 2020, the strategy will be developed further in line with the status of the debate and the needs, and will be brought into line with the latest developments and requirements.

Reference

Germany (2018). Artificial Intelligence Strategy. Federal Ministry of Education and Research, the Federal Ministry for Economic Affairs and Energy, and the Federal Ministry of Labour and Social Affairs.
https://www.ki-strategie-deutschland.de/home.html?file=files/downloads/Nationale_KI-Strategie_engl.pdf

Background information

This country report has been prepared in the context of AI Watch and the OECD AI Policy Observatory.

AI Watch is the European Commission knowledge service to monitor the development, uptake and impact of Artificial Intelligence (AI) for Europe, launched in December 2018.

The OECD AI Policy Observatory (OECD.AI) is an inclusive hub for public policy on AI. It aims to help countries encourage, nurture and monitor the responsible development of trustworthy AI systems for the benefit of society.

This country report has been created on the 25th of February 2020. Please visit https://ec.europa.eu/knowledge4policy/ai-watch/germany-ai-strategy-report for regular updates.