Artificial Intelligence

Economic importance, social challenges,
human responsibility

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1 Executive Summary

This position paper is addressed to

- Federal Ministries and regulatory authorities

- Policy makers in the digital economy and political parties

- Scientists from the fields of data management, big data, artificial intelligence (AI) as well as

- The (business) press and the general public.

The aim of the document is to present and enable discussions on the editors' views about the corporate and social responsibility of increased AI use in decision-making processes.

With the rapid progress in capturing data from the real world and the possibility of active interaction with virtual agents, essential prerequisites for successful and fundamental changes in the economy and society are established.

Cognitive systems are based on Big Data and AI and can already take on a wide range of tasks from the acquisition and consolidation of information to the performance of dangerous, dirty, physically strenuous work or the support of management decisions. In the next few years, cognitive systems will significantly expand their range of services. This makes it necessary to understand the economic and social consequences of the new cognitive age and to enter into a discourse – especially in the context of global political and economic challenges.

What does the increasing use of AI mean for private individuals (consumers), companies, political parties, further social groups and organizations, for the exercise of citizens' and liberties' rights, for political processes (diversity, opinion-forming) and decisions? Which ethical principles should apply to systems based on AI? Which space should algorithms be given in decisions concerning health, education, career or the financial situation? Who is responsible for algorithmic decisions? These are just a few of the issues that are equally relevant to business, politics and society.

Sections 2.1 to 2.10 summarise the core statements of this paper and recommendations to policy makers (blue). The editors Bitkom and DFKI offer themselves as partners for AI initiatives of politics, science, economy and public administrations.

2 Mobilize AI Potential

- Over the past decade, a bundle of technologies has given AI an enormous impetus in the global race for technological leadership in this area. In the meantime, the widespread use of AI has established itself as a global trend that no developed economy and hardly any company can resist. AI will revolutionize the way people work, learn, communicate, consume and live. AI can be used to strengthen social inclusion and give disabled people, persons with low language skills or with reduced mobility the possibility to participate as equally as possible in work and social life. The rise of intelligent technology will profoundly change the structure of the global economy.

- If AI launches into the world of work, the changes associated with it are not a completely new situation, as previous technological advances have provided extensive experience. Above all, there's no reason to panic – It is much more important to set the right course in a timely manner, especially when it comes to qualification.

- In just a few years' time, many of the products and services that determine the position of German companies in the global economy will be equipped or even shaped by machine intelligence. Germany has favourable local conditions to gain the lead in this race.[1]

- In order to secure its competitiveness in the long term, the German economy needs to play an active role in shaping these technologies and mobilizing the existing AI potential. This means setting the course towards AI and creating a supportive framework as well as a stimulating ecosystem for this bundle of technologies. A social consensus is helpful in this respect, which can be achieved through an informed public dialogue.

- The mobilization of AI potential requires focused efforts in many areas. This applies to the entire research landscape, school education, the system of continuing education and retraining, the companies and their institutions of self-organization as well as the various policy areas, right up to the design of a legal and regulatory framework.

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1 These include large, high-performance research facilities, globally active industrial companies with a focus on industrial automation, some German heavyweights in the world market for software and numerous hidden champions from medium-sized businesses. See also (Wallstreet-Online, 2017). However, important AI applications have so far become known primarily from the USA.

3 Preparing society for organizational changes through AI

- Intelligent automation and teamwork between people and intelligent machines will lead to far-reaching changes in companies and state institutions. The hierarchical structures that have been widespread so far are increasingly coming into conflict with the possibilities of project and team work supported by AI across structural and organizational boundaries as well as across time zones.

- Organizational changes are emerging in the following areas where AI deployment is particularly promising, including:

  - human interaction,

  - the situational awareness,

  - decision support and

  - the development of predictions.

- Fundamental organizational structure changes and competence development among employees are necessary to make the interaction between man and machine a success. The more complex the decision-making situations, the more qualitative evaluations by human judgement have to be incorporated into the decision-making process. Shifting the cognitive part of decision-making processes to AI requires conscious design, but also learning processes for man and machine.

- AI will lead to the fact that – especially routine activities – will no longer be in demand on the labour markets. At the same time, neither workers will be replaced nor is an automated realm of freedom to be expected in which work will no longer be necessary. It is to be expected that the wave of intelligent automation will create numerous new professions and that employment in areas such as social services, art and culture, entertainment, leisure, education and the environment will increase. Creative work will be strengthened. All processes associated with this social transformation must be actively promoted by politics and placed on a stable financial basis.

- Cognitive systems can take on some of the tasks that can be hardly filled with fitting employees due to the demographic development in Germany.

4 Generating increased investment in science, education and start-ups

- Germany needs an investment spurt in all areas of research, development and education, especially in AI. In the future, more funds should be made available for the funding of AI research projects, as well as incentives for business start-ups and the implementation of AI business models – including, for example, tax relief and multi-annual funding schemes that take into account long-term AI-specific R&D and marketing cycles. The willingness to do so must be strengthened – a common challenge for the economy, state institutions, politics and society.

- One focus should lay on interdisciplinary application research. Domain-specific knowledge from areas such as medicine, law, manufacturing technology, financial services, logistics, etc. must be more closely connected with AI knowledge. It is a matter of allocating funds for AI application in other research projects.

- A far-reaching research and networking initiative should be established with the aim of establishing Germany's long-term profile as a location for AI technologies and intelligent applications and making it more attractive for globally active companies. A robust, regional networking between AI start-ups and medium-sized companies can be the nucleus of this. An AI research cluster such as the hub for AI planned in Karlsruhe can also address the expected demand for skilled personnel in AI development in the coming years and promote the use of AI applications in the public sector.

5 Deepen the acquisition of digital skills

- The acquisition of digital skills is a central factor for the successful digital transformation in Germany and thus for the sustainable utilization of the potential of forward-looking technologies such as AI – not only at school, but also at universities and at work.[2]

- In the new, more AI-influenced world of work, people will increasingly focus on tasks related to solving problems, implementing activities, developing and using creativity – tasks that are out of the reach of machines.

- The central prerequisite for this, however, will be to further promote not only artificial intelligence but also human intelligence – for example in schools, by focusing more strongly on human strengths such as creativity and communication, social interaction and problem solving rather than pure knowledge transfer. From now on, massive investments at all levels must be made in digital education, information literacy and the courage to make one's own judgements and decisions.

- The transformation of the working world will soon lead to a high demand of numerous new qualification profiles that cannot yet be clearly defined.[3] Therefore, new qualification programmes should be tested, but above all, previous training programmes should be increasingly enriched with AI content.[4] Data science competences should be taught in the individual application areas. Cooperation between universities and the industry should be intensified in order to develop practical training and education modules.

- All in all, the aim is to invest more in high-quality retraining programmes as well as in certification and further training measures and, as a result, to achieve comprehensive recognition of these qualifications. Public-private cooperation should be stepped up in identifying retraining needs and creating tailor-made offers.

- AI will have a lasting impact on thinking, but will not suppress human judgment. It is not a question of playing machines against people, but of how they work together in a meaningful way. The combination of the relative strengths of humans with the different strengths of machines leads to the best kind of AI-supported decision-making. Algorithms find solutions to problems much faster than humans, but often lack the sufficient sensitivity, intuition and caution – here the 'human-in-the-loop' helps. Experience has shown that the more technical progress is made in automated decision-making processes, the more urgently human

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2   'Germany must invest more in the qualifications of its employees to ensure that their skills will continue to meet the requirements of high-tech industries in the future.' (OECD, 2017). The IW comes to similar conclusions and in particular the contribution of Vera Demary and Hans-Peter Klös 'Digitisation: Competencies for digital work' (p. 169-181)

3   Prior to the worldwide use of the Internet, no one was able to predict precisely which new qualifications would be in demand by companies.

4   This also applies to physicians, economists and lawyers, of course all the more so to engineers, data scientists and software developers.

judgment is needed. The aim should therefore be to bring man and machine together in such a way that results can be achieved with 'assisted decision-making'.

- Intelligent machines must serve people. People and machines should be able to communicate with each other in the same way as people do with each other – in some respects even better. This will enable many more people to use technology (inclusion, democratization). AI technologies can help democratise decisions and enable users to act in an informed manner by providing transparency, connecting people, information and knowledge, or recognizing emotional expressions.

6 Establishing and protecting Corpora

- Algorithms generate added-value by transforming data into information and processing it in such a way that the information can be used for societies' benefits.

- The basis for algorithms is data, which contributes to decision-making. Like a human decision-maker, algorithms can make wrong decision based on incomplete or erroneous data. Similar to human decision-making, the complexity of the system means that a relationship, based on trust to the data supplier, is the strongest guarantor for the correctness of the supplied information.

- The collection of 'correct' data and algorithms from which information is derived – also known as 'corpus' – is very valuable for companies and sometimes very resource-intensive. The legal protection of these corpora, e. g. via IP rights, is accordingly important. At the same time, copyright must not become a stumbling block to the creation of such corpora, only because some of the data collected is also protected by it. This requires an explicit exemption in the European legislation (currently in Brussels as well as also Berlin debates under the keyword 'Text-and-Data-Mining') for all AI-applications. It will be crucial for the company to be able to compete on the basis of high quality and comprehensive corpora as in domain-specific collections of content that have been developed or procured and are being continuously enriched.

- As a set of regulatory instruments for algorithms, AI and data, general competition law provides for appropriate solutions. It makes it possible to act ex-post in the event of an abuse of market power. There are concerns that ex-post responses can be, in view of the highly dynamic development of the market, too late and that delayed responses can have irreversible consequences. This view is ignoring the factual ex-ante effect of this set of instruments, whereby consequences of competition antitrust law is already taken into account in relevant corporate decisions. However, it is difficult to identify competition problems because the market forces operating on the Internet are still being researched.

7 Ensure quality for AI-supported decisions

- It is desirable that results of IT system – e. g. calculations, forecasts, follow-up processes and decisions – are transparent and comprehensible. This particularly applies to AI-based systems, which are often perceived as black-boxes. This is mainly due to the learning ability of AI systems, which is a basic principle as well as an advantage: Over time, the systems are becoming better and thus achieve better results than 'classical methods'. However, the downside is that a single result can no longer be understood with disproportionately high effort. This also applies for classical methods such as probability-based decisions. Experience with such classical systems makes it easier to deal with the blurred AI systems: Comprehensive documentation, including objectives, methods, data, test and approval processes, must ensure the highest possible degree of transparency and quality assurance.

- Many AI-based processes allow for error tolerance or have certain robustness, e. g. because in the event of an error in manual corrections are possible at a later stage. Examples are automatic (preliminary) classification of documents or the recognition and conversion of language into text. Should it happen that a document has been assigned to an incorrect follow-on process, the processor can correct the error by rejecting or manually classifying the document.

- Particularly responsible decision-making processes – e. g. autonomous driving or in medical diagnostics – should be designed in such a way that the ultimate decision-making authority remains with the responsible actors until the quality of the control system reaches a level which is accepted by all parties involved. This is why in approval processes – for example for autonomous vehicles – autonomy is only extended in small steps. The trust in AI – like the trust in people – is not achieved by understanding all methods, but through careful testing, learning and documentation of results.

- When introducing AI-based decision-making processes, it is important to ensure and respect the appropriate level of accuracy with regard to documentation and quality assurance. Regarding critical processes, the human being should be the ultimate decision-making authority in case of doubt.

8 Reaching agreement on ethical standards

- The changes brought by AI are fundamental and irreversible. They have an impact on the individual and society – the self-image of the human being (dominance over machines, autonomy), the social structure (social action and roles), the value and design of the work (structural and systemic) and the formation of political will and opinion.

- AI is supposed to be a technology that supports, expands and enhances human capabilities and serves the common good. The central ethical challenge is to develop intelligent systems that are compatible with human life and value-oriented to improve people's lives, preserve fundamental rights and autonomy and expand options for action.

- Regarding the principles to be applied in the design of intelligent systems, there should be interdisciplinary and transparent consensus. All stakeholders in business, politics and society must accept the ethical and data-ecological responsibility with regard to sustainable data economies. At the same time, it is necessary to agree on ethical standards of algorithmization.

- To apply AI's potential for improving life in a digital society, we will require a digital ethics agenda, for which policy makers should collaborate with scientists.

- The use of algorithms and self-learning systems must be ethically evaluated. Recommendations for legislators, regulators, the economy and the public sector must be developed. This also includes guidelines on which AI applications are desired and which are not accepted. These challenges should be addressed by policymakers.

9 Further developing data protection in Europe with attention to AI

- The General Data Protection Regulation (GDPR) was not aimed at AI. The basic regulation must be adapted retrospectively with a view to this mode of operation. For this purpose, dialogue with supervisory authorities and the European Commission is necessary. Businesses require recommendations and guidelines on how to implement data protection requirements for AI applications. 'Regulated co-regulation' is suitable for this purpose: Companies develop rules-of-conduct based on best practices, which are recognized by the European Commission or the supervisory authorities as legally compliant (and if necessary declare it to be generally valid). The processes for this are in the GDPR. Industry has already established organizations, which can assume responsibility for administration and monitoring (examples are SRIW in Germany and SCOPE in Belgium).

- Where restrictions and impediments to the further development of AI applications based on data protection regulations are identified, which are not absolutely necessary for the protection of personal data, amendments must be made or special legal regulations be created. Special laws are often used in areas, where it is sensible to have a specific approach (examples are insurance law, social code).

10 Political framework for intelligent technologies

- Without compromising on the protection of citizens' data, it is recommended to fully exploit digital business-models and forward-looking technologies (such as AI) for the benefit of society and to remove obstacles. In this context, it is recommended to develop a strategic process for AI and machine learning taking into account economic and location policy opportunities as well as political and economic challenges in order to examine options for action. The aim should be a potential- and risk assessment of artificial intelligence and related technologies from an economic and social point of view.

- At EU level, clarification should be given as to which AI areas are approved and which are not, so that individual countries do not suffer from location disadvantages.

- The protection of intellectual property is fundamental for technological innovations and must be designed to promote innovations. It must not become a stumbling block for investment and research. This requires a balanced approach and careful consideration. AI is a megatrend with profound implications for the economy and society. It must also be understood as a political challenge. The changes as proposed in this position paper in some areas — e.g. research-, technology- and education policy, law and regulation — should be integrated into a general political framework.

11 Understanding responsibility as a challenge

- Algorithms and corpora, artificial intelligence and cognitive systems remain part of the human activity – and thus under the influence of human beings and groups, with all their skills, short-comings, opportunities and threats. New technical possibilities can be used for positive and negative results. Learning and implementation processes can be designed carefully and reck-lessly, too slowly and too quickly.

- A meaningful delegation of responsibility and the avoidance of organized irresponsibility remain a challenge even with AI. The technology will not be able to take difficult decisions and should not be abused to avoid taking responsibility. Decisions remain a human domain, which is not always popular.

- The easier access to experience and orientation knowledge changes its social significance. Therefore, AI's introduction into societal processes is not merely a technical challenge, but a social challenge. Representatives of various areas should become more familiar with the new developments in AI and its inclusion in society. This also applies to areas such as pedagogy, psychology, sociology and political sciences.

- Technological change is altering established and routine structures of decision-making – and can be designed culturally. This opportunity must not be wasted. The greatest danger stems from discussions, in which one side only sees opportunities, whereas others perceive only risks. It's going to be essential that European societies include their own traditions and values in on-going technological changes and do not leave the design to others.

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