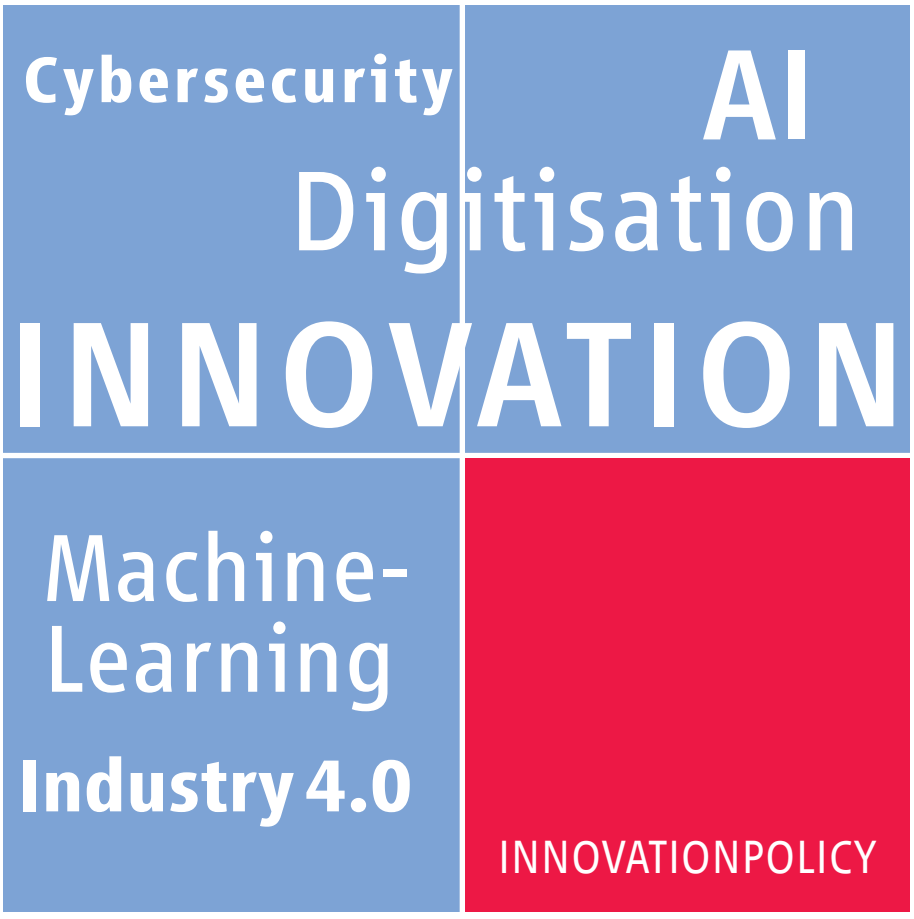
ZVEI:
Die Elektroindustrie

Position Paper

Human-Centric Industrial AI: 10 Recommendations for Europe



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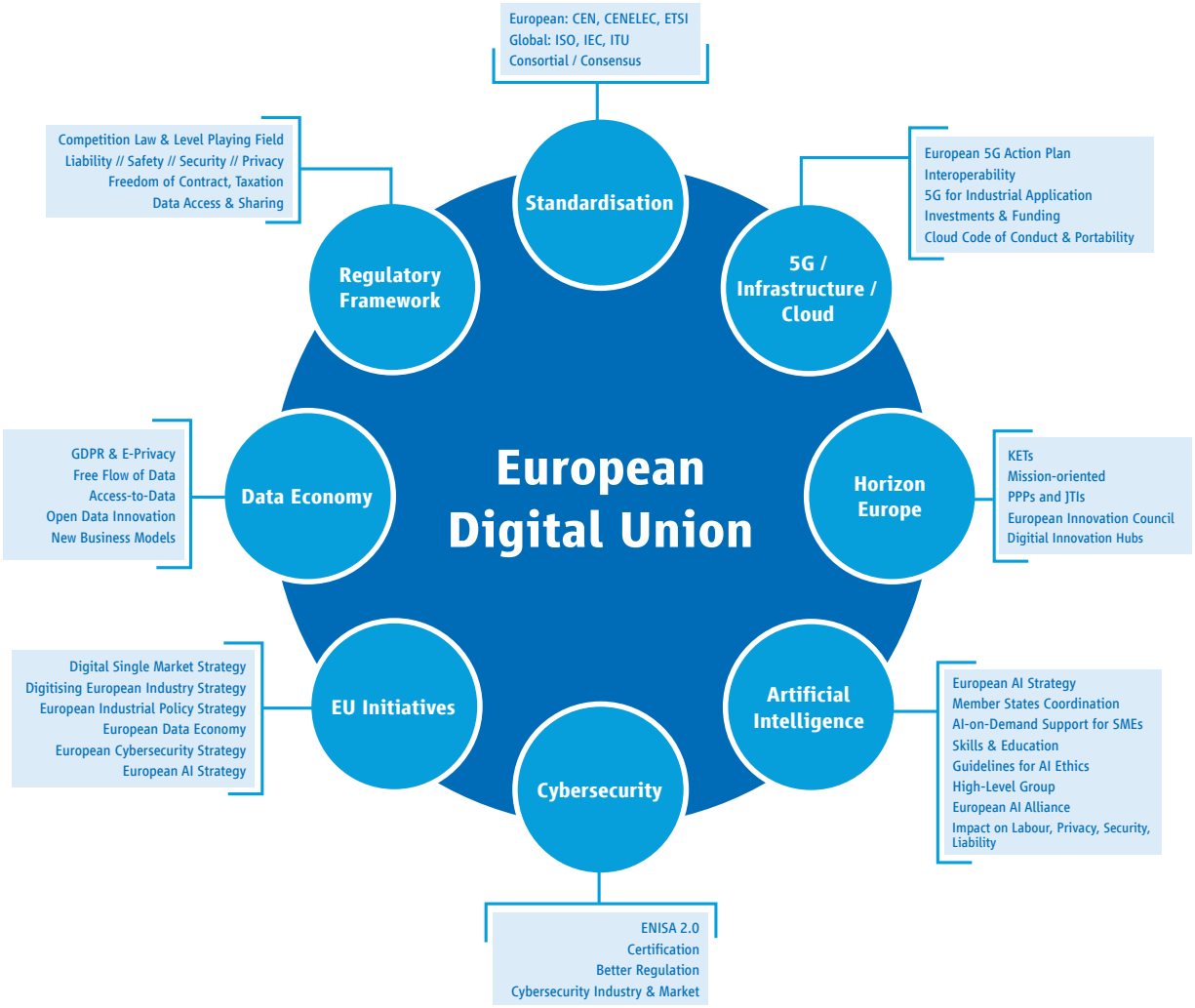
German Electrical and Electronic Manufacturers' Association

Industrial Artificial Intelligence

As a consequence of the digital revolution, platforms and data-centric business models are becoming increasingly important in industry. Artificial intelligence (AI) is a key driving factor. ZVEI considers it fundamental that technological developments and changes in the underlying regulatory conditions should not be addressed separately; the data and platform economy ecosystem must instead be considered integrally.

The Ecosystem of the European Digital Union



Source: ZVEI

Digitalisation of the existing industrial infrastructure – i.e. factories, buildings, energy and transport systems – leads to huge volumes of data being generated. Data analytics and processing technologies are required to harness the enormous potential of big data. AI is particularly important in this context and is developing into a key technology of the digital revolution. Through the exponential growth in the volumes of data, the latest technological advances in AI, particularly in machine learning, and the increases in computing power, AI is now ready for industrial application.

Definition of AI: Artificial intelligence is the generic term for applications in which machines perform with an intelligence resembling that of human beings. This includes machine learning, natural language processing (NLP) and deep learning. The fundamental concept is for machines to attain an approximate emulation of the primary functions of the human brain: learning, discernment and problem-solving.

As yet, other parts of the world are leading in AI applications in the B2C sector and, through concerted technical and industrial policies, are in some cases extending this leadership to the industrial sector. Nevertheless, an opportunity exists for Europe to assume a leading position in AI applications in the industrial and B2B sectors. Europe must swiftly and effectively consolidate and extend its favourable current position in the international competition for industrial AI locations. The European Union therefore needs an industry policy with a strategy for creating an industrial data and platform ecosystem in which AI is a key element.

The industrial application of AI presents great opportunities that can contribute to resolving major challenges facing society, for example in the power and mobility sectors (including autonomous driving), industrial manufacturing or medical diagnostics. Of all sectors of the economy, manufacturing is regarded as that in which AI presents the greatest prospects for added value[1]. The electrical industry is particularly important in this context as an enabling sector[2] and an interface between the spheres of IT and production, since as a provider and user of AI technologies, it plays a fundamental part in shaping digitalisation.

Besides the economic aspects, the social dimension must also be considered from the outset. The electrical industry is aware of its responsibility and is contributing to the debate concerning both the economic orientation and the responsible use of AI. The key principle here is for industrial AI applications to serve the interests of both individuals and society as a whole.

Leveraging the potential offered by AI technology while addressing the societal challenges at the same time can be managed only by a joint European initiative. ZVEI thus welcomes the European Commission's "AI for Europe" communication of 25 April 2018 as an important first step in the right direction. Synergies between different national initiatives such as the planned French-German AI centre will enable the strengths and excellence of sectors, regions and member states to be exploited to the full. The electrical industry considers the following 10 measures crucial if the potential of AI in industry is to be realised:

[1] Accenture 2017

[2] The electrical industry covers five of the six Key Enabling Technologies (KET) defined by the European Commission: advanced manufacturing technologies, photonics and micro- and nano-electronics, life sciences technologies, artificial intelligence, digital security and connectivity technologies. Source: European Commission (2018) "Re-finding industry", Report from the High-Level Strategy Group on Industrial Technologies

10 Recommendations for Action from the Perspective of the Electrical Industry

1. Creation of a coordinated joint AI strategy for Europe

Owing to the magnitude and significance of the topic and the importance of economies of scale, in the face of global competition, AI must be considered and supported from the outset as a European issue in the Digital Single Market. This necessitates a coordinated and strategic approach in Europe that is supported collectively and agreed closely between the national and European levels. Activities in the spheres of legislation, regulation, communication and funding policy must be coordinated such that the opportunities presented by AI can be exploited to the full.

The mechanisms, activities and platforms of the 2016 Digitising European Industry Initiative (DEI) that are already in place and the recently announced "Digital Europe Programme" (DEP) under the next European Framework Programme 9 provide a good indication of the path ahead. Further development and consolidation of the EU-wide digital innovation hubs and competence centres, for example, is a sound basis for the promotion of AI in the Member States.

Close intermeshing of national digital initiatives and the ensuing growth in the exchange of expertise, networks, research projects and joint ventures fosters regional strengths in the area of AI in Europe. In this context, the German electrical industry expects the German federal government and the European Commission to channel financial resources effectively and to implement policy swiftly and thoroughly.

This necessitates regular inclusion of interest groups in a transparent, representative and accessible manner through public consultations or associations. At EU level, the increasing involvement of expert groups, consulting committees, round tables and broad-based stakeholder fora in the process leads to a risk of fragmentation, duplication of work or even precipitous favouring of certain interests.

2. Reinforcing existing strengths: gearing the AI strategy to the B2B sector

Support must focus upon AI applications in the areas in which Europe is an economic leader („reinforcing existing strengths"). The aim must be to raise the industrial infrastructures, particularly in the sectors of industrial manufacturing, power, mobility, buildings and health, to a new level of efficiency and quality through AI applications, to open up and develop new business models, and thereby to safeguard European competitiveness with other world regions.

In order to rise successfully to the challenges facing Europe's industries, such as autonomous mobility and the growing availability of complex production systems, the EU's AI initiatives need a dedicated B2B focus differing from that for applications in B2C markets. AI applications based upon big data, which in industry particularly arise in conjunction with machine data, also need access to high-performance data centres. In Europe, particular attention should be given to „low-data" AI and the combination of AI with cybersecurity and with edge computing data analytics.

Of paramount importance is that AI evolve hand in hand with cybersecurity, creating an environment of trust in a digital, connected, AI world. AI evolution should by design be intertwined with cybersecurity. Algorithms must not be compromised, and need to be protected (and encrypted) according the required level of (cyber-) security, depending on the criticality of the application. Conversely, AI algorithms must be used as a tool to detect anomalies in communications or processes to increase cybersecurity. The combination of smart data, AI, cybersecurity and edge computing has the potential to be a "European quality brand", representing a competitive advantage for our continent over other regions of the world.

3. Funding of AI research

Basic research and, in particular, application-oriented AI research must be stimulated more strongly and strategically in Europe in order to preserve its status as a leading international location. Large-scale AI research and innovation superclusters driven by industry and science should be established in Europe that can compete with those in the United States and China. Undertakings to this end such as the planned joint French and German AI centre must therefore be launched swiftly and extended systematically to other European locations. With the creation of industry and science-driven superclusters, European AI experts and relevant stakeholders will be able to concentrate their forces in the interests of fast innovation. From the perspective of industry, research aimed at market-ready implementation is particularly crucial in order to assure survival in the global race for AI. No more so than in the European electrical industry, located as it is in the spheres of both IT and production and at the interface between the two, are applications for image recognition, autonomous vehicle and robot control or fog/edge computing-based distributed AI crucial to competitiveness. This particular focus in research upon the concrete application of AI in joint ventures and value-adding networks should therefore be funded intensively.

This is also important in view of the world-wide competition for talent and AI experts. For the wide implementation of AI solutions, companies need not only more qualified employees but also support from partners in academia. Across Europe, many outstanding centres of excellence already exist and partnerships between industry and scientists in academia has proved to be effective in the view of industry. Besides further reinforcement of these centres of excellence, AI must however be introduced across the breadth of the research community. Only then will greater diversity of research strategies, the adequate penetration of academic tuition and the industrial application of AI be attained. This must also include universities of applied science, since these institutions are often in close contact with industry and cooperate closely with medium-sized companies.

4. Support of SMEs with regard to AI applications

Owing to the great significance of SMEs in the industrial ecosystem, it will be essential for the performance of the system as a whole for AI applications to be implemented across the full breadth of industry, and for smaller companies not to be left behind in the process.

Specific measures to ensure this could be support for secondment programmes for (prospective) AI engineers in SMEs, or the creation of AI experimentation spaces in which SMEs are provided with the infrastructure required for tests and experiments at low cost. The funding of projects should be designed agile and unbureaucratic following the agile design of software projects. This aspect is important within AI projects as speed and flexibility are crucial during the design and development process.

5. Promotion of public debate of the opportunities and risks presented by AI

An informed, enlightened and open public debate is needed of the opportunities and risks presented by AI. This in turn requires informed and fact-driven reflection upon AI technologies in the education and academic system. This debate must also address the transformation of labour markets, future jobs and skills. Education systems and curricula must be reviewed and adjusted where necessary, and new AI-specific education and career paths must be created. The enormous potential of AI applications for society cannot otherwise be presented and the possible risks discussed rationally. In the industrial sphere and beyond, numerous AI applications of considerable value to society (such as accident avoidance, medical diagnostics, nitric oxide reduction etc.) already exist that should be brought into the discussion.

6. Guidelines for responsible use of AI

AI is set to play an increasingly significant role in all areas of social and economic life. This development brings with it major opportunities to resolve urgent social challenges, and at the same time to assuage serious anxieties among the public, for example regarding a loss of control or the violation of fundamental rights such as the right to privacy or non-discrimination. Responsible and transparent handling of the data and algorithms is therefore absolutely essential in order for the necessary confidence to be created in the European data economy and in particular in AI applications.

Companies in the electrical industry will therefore address the social challenges intensively against the backdrop of the technological revolution. The principles for the responsible handling of data[3] developed by ZVEI, and ZVEI's position paper entitled „A Responsible and Innovation-Friendly Approach to Building a European Data Economy"[4], form the basis and will be extended to include the subject of AI. ZVEI considers it important for the perspectives and interests of industry also to be adequately represented on the policymaking committees and stakeholder platforms addressing this topic. These include the data ethics commission set out in the agreement between the political parties in Germany's governing coalition, the European High-Level Group on Artificial Intelligence, and the European Artificial Intelligence Alliance.

[3] https://www.zvei.org/fileadmin/user_upload/Presse_und_Medien/Publikationen/2015/november/Leitlinien_der_deutschen_Elektroindustrie_zum_verantwortungsvollen_Umgang_mit_Daten/Leitlinien-der-deutschen-Elektroindustrie-Version_1.0.pdf

[4] https://www.zvei.org/presse-medien/publikationen/den-aufbau-einer-europaeischen-datenwirtschaft-verantwortungsvoll-und-innovationsfreundlich-gestalten/

7. Forward-thinking regulation: facilitating AI, observing differences

Opportunities to access comprehensive bodies of data and algorithms are crucial for the performance of AI systems ranging from automated diagnostic tools (e.g. for computer tomography data) to autonomous driving. Accordingly, AI applications are crucially dependent upon the statutory arrangements governing the handling of data. Attention should be paid to the fact that basic rules for the handling of data (e.g. the General Data Protection Regulation) are needed, but that ethical questions and the regulatory framework differ from sector to sector. A „one size fits all" approach to the use of AI will not therefore be expedient, especially where fundamental differences exist between B2B and B2C markets.

The following areas will acquire particular importance:

- Assurance of the free flow of personal and non-personal data within the European Single Market, and the promotion of data access in B2B business in the context of freedom of contract. The European Commission's communication „Towards a common European data space"[5] and its Staff Working Document[6] formulates important guidance for data exchange in B2B scenarios. Uniform one-size-fits-all legal regulations for monetising data cannot do justice to this data application diversity and harbour the risk of inhibiting innovation in certain areas. In conjunction with political representatives, ZVEI wishes however to develop further and shape the technical and contractual opportunities set out in these documents for data exchange and access to data, between companies and also in the B2G (business to government) sphere.
- Creation of a level playing-field in the application and enforcement of data protection and privacy provisions, in order to protect European companies against de-facto competitive disadvantages.
- Consideration of the potential offered by AI applications during implementation and interpretation of the General Data Protection Regulation: enabling privacy requirements for the handling of personal data in AI applications, for example in the health sector, to be met by anonymisation and pseudonymisation.
- The issue of liability of / for AI systems is also an important aspect. In this context, the need for areas of responsibility (with respect to product liability) to be set out must be weighed against preventing an environment adverse to innovation from being created by unquantifiable liability risks.

8. Transparency & explainability of AI decisions: assuring IP protection

Society's trust in AI applications is dependent upon the principles by which decisions are made being comprehensible ("explainable AI"). A need still exists for research in this area into ways in which AI systems can best be designed such that their behaviour can be plausibly justified, and into how much will be truly and necessarily explainable. Building upon these facts, research concerning the verification of AI systems in order to demonstrate their correctness or at least the quality of their design will be more and more important. Existing international standards such as ISO 13849 and IEC 61508 must be further developed or used as a blueprint for new standards.

[5] COM(2018)232 final

[6] SWD(2018)125

Conversely, companies should not be forced to reveal underlying algorithms, which enjoy protection as trade secrets or commercial or intellectual property. Forcing companies to disclose these algorithms would give rise to major competitive disadvantages, besides not making AI decisions more comprehensible.

9. Establishing AI within the education system

Only limited numbers of AI developers and data scientists are available. Companies in the electrical industry face major global competition for (the best) AI experts. A reform is needed in the academic sector that integrates new technical developments more swiftly into the technical courses of study, adds data science modules to traditional engineering degree courses, and generally introduces AI more widely into academic tuition. In school education, vocational training and in-house-company further training, too, data analysis and AI must also play a greater role and be given correspondingly greater consideration in the curricula. As a basis, schools (including elementary schools) must place a focus on STEM subjects in order to facilitate further AI training and skills for their graduates later on. In the short term, specially designed AI classes could be added to the current school and vocational training curricula. In particular, skills concerning the application and interpretation of results from data analysis and AI applications will acquire major importance in the coming years for the routine work of a large part of the workforce, since these two technologies will become valuable tools used to support employees.

10. A basis for AI: secure hardware

Hardware for AI applications must meet certain conditions. Microelectronic chips (e.g. sensors and processors) are particularly important since they constitute the link between the real and digital world. These semiconductor technologies produce the data that will be the basis for all AI applications. For AI applications not connected to the cloud, in particular, suitable hardware with processing performance suitable for the application concerned and low power consumption at the site of use are crucial.

A general principle is that the security of data and confidence in AI algorithms can be assured only on the basis of secure hardware (for example by means of hardware security anchors) in combination with secure software. AI evolution should by design be intertwined with cybersecurity, not only for the algorithms, but equally importantly for hardware. In this context, the relevant expertise in the area of microelectronics must be maintained and extended in Europe by way of suitable framework programmes, such as ECSEL and similar public-private partnerships, which can contribute significantly to fostering the implementation of AI in innovation ecosystems. At the same time, strategic support and forward-thinking planning for the promotion of such key technologies is needed at the highest European level (Important Project of Common European Interest (IPCEI), European High Level Group on AI).

ZVEI: Manufacturers´ Association of Germany´s Most Innovative Industry

ZVEI - German Electrical and Electronic Manufacturers' Association promotes the industry's joint economic, technological and environmental policy interests on a national, European and global level. ZVEI represents more than 1,600 companies, mostly SMEs.

The industry has round about 868,000 employees in Germany plus 706,000 employees all over the world. In 2017 the turnover was Euro 191 billion.

The electrical and electronics industry is the most innovative industry sector in Germany. One-third of the industry´s sales are based on new products. The industry spends Euro 17.2 billion in R&D every year, Euro 6.2 billion in investments and Euro 2 billion in training and further training. Every third innovation in Germany´s manufacturing sector stems from solutions of this industry.

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