

SEMI Europe Comments
on the Proposal for Regulation laying down Harmonized Rules
on Artificial Intelligence 2021/0106z(COD)

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Summary

SEMI Europe welcomes the European Commission's "Proposal for Regulation laying down harmonized rules on Artificial Intelligence" and appreciates the opportunity to provide its feedback on this crucial matter for Europe's microelectronics industry.

With the rise of Artificial Intelligence (AI), the European Union (EU) remains determined to play a leading role in setting a global standard in the responsible development and use of AI technologies. The microelectronics industry supports such efforts but with a key caveat. While the industry acknowledges that development and deployment of AI requires a coordinated approach, it asserts that AI systems and related technologies should be regulated where possible by existing EU laws and regulations, including sector-specific ones. By building on already existing frameworks such as the EU Machinery Directive and the Product Liability Directive, appropriate rules concerning the safety and reliability of novel AI systems can be introduced without creating additional regulatory and administrative burdens on AI developers, in particular SMEs.

Building on Europe's competitiveness and strategic position in the global electronics supply chain, sound, industry-backed approach to regulate AI should be the cornerstone of Europe's technological ambitions. Only by creating the right regulatory environment, Europe can seize new growth opportunities arising from the next wave of AI generated in connected devices and technologies at the edge.

SEMI Europe makes the following policy recommendations pertaining to Europe's new approach to AI for the consideration of the European Commission, the Parliament and the Council:

- I. Definition of AI systems is too vague and broad, requires further clarification
- II. AI use cases should be regulated by adapting existing EU product regulation
- III. Introduce data quality thresholds on data sets used in training, testing and validation of all AI applications
- IV. Establishing standards for AI systems addressing potential risks and enabling innovation
- V. Introduce Industry Advisory Expert Groups as part of the European Artificial Intelligence Board

Introduction

AI technologies have become a transformative force, enabling technology breakthroughs across industries. Because of AI, autonomous driving, advanced medical diagnostics, accelerated drug development, voice-activated devices, self-healing digital grids, predictive weather monitoring systems and self-replicating robots have become part of our daily life.

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Europe's microelectronics industry, as a world leader in embedded electronics, MEMS, sensors and imagers, holds a unique position to drive the development of AI-based solutions. Many semiconductor manufacturers already use AI in devices deployed across factories increasing manufacturing efficiency and improving yields. For instance, AI enables the real-time collection and monitoring of big data, informing system administrators of any hardware failures or deviations from intended operation. AI also makes it possible to automate adjustments and corrections to production processes by providing feedback that can drive higher manufacturing efficiency. Such benefits resulting from the use of specific AI applications such as machine learning, have proven that AI has become an invaluable asset for European manufacturers.

AI technologies are critically important for economic and industrial leadership globally. While businesses in China and U.S. are counted among top adopters of AI, European enterprises are quickly catching up with their global competitors. According to a 2020 study published by the European Commission, 42% of Europe's enterprises make use of at least one AI technology, quarter of them use at least two, while 18% are considering to adopt AI technologies in the next two years¹. While AI is initially introduced as a measure to improve existing processes such as production task optimization, many enterprises are likely to develop the AI further, modifying existing AI algorithms for new use-cases, spurring innovation and uptake of the technology.

The success of developing and deploying AI depends not only on business and their innovation strategies. In recent years, governments worldwide introduced research and development frameworks in support of national AI development and uptake. These range from China's "Next Generation Artificial Intelligence Development Plan", U.S. "Executive Order on Maintaining American Leadership in Artificial Intelligence" to South Korea's "National Strategy for Artificial Intelligence". However, governments face more than challenges of creating the right R&D conditions to support domestic development of AI. Many are assessing how accountability, transparency, control, and safe development of AI technologies can be ensured without curbing innovation and economic growth.

The Commission's Proposal for Regulation laying down Harmonized Rules on Artificial Intelligence indicates EU's willingness to move forward and capture the huge potential of AI enabled technologies. Building on Europe's competitiveness and strategic position in the global electronics supply chain, a sound, industry-backed coordinated approach on the development and use of AI should be the cornerstone of Europe's technological ambitions. Only by creating the right regulatory environment, Europe can seize new growth opportunities arising from the next wave of AI generated in connected devices and technologies at the edge.

¹ European Commission, 2020: European enterprise survey on the use of technologies based on artificial intelligence

Against this background, SEMI Europe would like to share its views on the proposed regulation on Artificial Intelligence with the European Commission to reflect the interests of the electronics manufacturing industry:

I. Definition of AI systems is too vague and broad, requires further clarification

AI and its applications are rapidly evolving, increasing the portfolio of products and services available to consumers worldwide. As new use-cases for AI emerge, tailored AI-enabled solutions are adopted across industries, responding to the specific needs of manufacturers and end-users alike.

Over the years, advances in AI enabled the maturing of many of its applications, introducing new algorithms to advance production processes optimization in manufacturing, improve sensing capabilities of automated vehicles or enhance image labeling in medical robots. This leap has contributed not only to the advent of new AI software, but also hardware technology across different domains.

Embedded into an increasing variety of products and solutions, AI itself has proven difficult to define. Currently neither industry or the scientific community have reached a consensus on an exact definition or mechanisms to classify AI. This is largely because of the growing variety and specific properties of AI technologies, but also the intersection with other fields such as statistics.

The definition of AI proposed by the Regulation in Article 3 focuses largely on any software using machine learning methods or logic-based procedures. In larger context, this includes any software using optimization or statistical methods. Since almost every existing or future software could be covered by such set of rules, unpredictable risks could arise for any company using or developing any program based on logical computation.

In this light, SEMI Europe considers the definition of AI in the proposed Regulation too broad and vague, attributing AI characteristics to methods that can also be assigned to more conventional software. We encourage the European Commission to take into account a definition of AI, that precludes to a high extend first order human interpretation (“fast thinking”) and instead operates on the basis of solid logic using sufficient relevant data. It should be stated that most likely in the end AI should not be restricted to a given type of technology, and for sure the definition of AI will have to evolve while learning the scope and (ethical) impact of its applications in the years to come.

II. AI use cases should be regulated by adapting existing EU product regulation

Applications of AI can vary across industries and use-cases. Deploying and developing AI in different sectors often results in outcomes, accompanied by various sets of problems, leading to the conclusion that a one-size-fits-all approach particularly on High-Risk AI use cases is not suitable for an AI regulation.

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The microelectronics industry is already a subject to multiple use case specific regulations, providing a solid foundation for the regulation of AI. For instance, incorporation of AI in semiconductor manufacturing equipment has been done in a way that is compatible with the existing framework of the Machinery Directive (2006/42/EC). This Directive is well-adapted to emerging technologies and is the appropriate compliance mechanism for the semiconductor manufacturing industry.

The Machinery Directive provides a comprehensive set of essential health and safety requirements while remaining technology neutral. Its Annex I, the Essential Health and Safety Requirements (EHSRs) are foundational requirements, and the provisions are deemed applicable for the risks associated with incorporation of AI in the machine. The Machinery Directive also incorporates appropriate flexibility and by promoting the use of safety standards, it can address particular requirements for machine types and their unique uses and hazards. It entrusts organizations competent in standards development taking the current stage of technology into account to achieve compliance by defining technical specifications. This framework was and is instrumental in the Machinery Directive maintaining its relevance as a cornerstone of semiconductor manufacturing equipment design.

The Machinery Directive requires that machinery placed on the market is safe to operate based on its intended use. To assure safety compliance, Annex I requires the machinery manufacturer or an authorized representative to conduct a risk assessment to determine the particular health and safety requirements applying to the machinery, then design and construct the machinery to meet those mandates. Also required by Annex I, machinery control systems must be designed to prevent any hazards in the event of system hardware or software errors such as failures in the control system logic. Only when the output from machine learning constitutes a part of functional safety (e.g. the output from machine learning is used to adjust a parameter of safety-related control system (SCS) that executes functional safety), transparency of algorithm and datasets may become critical to satisfy the safety requirement, but in such case applicable harmonized standard for functional safety will address this issue.

Machine learning algorithms never change the function or the intended use of semiconductor manufacturing equipment or the response of the interface between the equipment and the human operator and therefore do not create any unforeseen health and safety risks. The control system of any machine under the scope of the Machinery Directive is already designed and constructed in a way that it prevents the use of machine beyond its intentional use conditions.

Based on the stated above, SEMI Europe recommends to the Commission to review existing product safety and liability regulations and if necessary, revise and update conditions to safely regulate potential applications of AI. Considering the broad spectrum and complexity of some AI systems (e.g. neuromorphic computing), specific characteristics of such applications should be taken into account.

III. Introduce data quality thresholds on data sets used in training, testing and validation of all AI applications

Today, development and use of AI is practically impossible without access to large amounts of data. The more data is available, the better AI may become. Access to large amounts of data is however not the only criterion to determine accuracy and reliability of AI systems. To operate efficiently, quality data are essential for AI systems to generate value and deliver desired results for developers and end-users alike.

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In the Proposal the European Commission suggests “the training, validation, and testing data shall be relevant, representative, free of error and complete.” While the condition to have error free data sets is highly desirable, it is rarely the case.

Many criteria can be looked upon when assessing the quality of data used for AI applications. In general, factors such as data accuracy, timeliness, consistency, interoperability, or validity determine the quality of data sets. Such characteristics can be met with high degree of sufficiency, but rarely in perfect, error free condition. For example, data used for training, validation and testing of AI often originates from numerous sources and is collected in ways varying in purpose, meaning the standards on what is considered a good or right quality characteristics for data can vary. For some use-cases data sets are formed out of undefined, raw data, while others require data to be well defined, structured and consistent. For example, continuous learning systems such as neuromorphic AI use data collected throughout their use, making it extremely difficult if not impossible to determine a universal set of data quality requirements.

Against this background, SEMI Europe encourages the European Commission introduce quality thresholds on data sets used in training, testing and validation of all AI applications. Such thresholds should provide a clear set of quality conditions, characteristics, and key performance indicators below which failure to satisfy would be deemed as unacceptable.

In addition, dataset descriptions and labels for providing information on the quality and structure of datasets should be taken into consideration. This approach would allow AI datasets to be described similar to hardware components, assessing their compliance with any set of quality thresholds. Datasets including sensitive information on a company’s IPR could include detailed information on the data collection process, dataset creation, pre-processing and validity of the dataset. Especially for data for use in health applications high-quality labels for data integrity should be considered. In order to ensure cross-database consistency we will have to think as well about defining a common taxonomy and ontology in this field. There is currently no standardized way of describing datasets agreed upon in the field of AI. Such a standardization would have to allow for flexibility to be able to include the variety of possible data for-mats and collections used in AI applications. It goes without saying that developing an objective method to validate data sets will have to go hand in hand with experience on how AI will be defined over time, and therefore be a dynamic process.

Moreover, it is essential also to look at protection of the databases. There are two different elements in here. The first being that we need technical measures to safeguard that when a database is shared with regulatory/ government the knowledge will not become public. The second being that we should strive

for a general statement in the database directive that takes into account the protection of valuable own generated data rather than only data collected by other sources.

IV. Establishing standards for AI systems addressing potential risks and enabling innovation

In the global manufacturing ecosystem, standards play a key role in advancing the innovation of numerous technologies and systems, enabling the integration of smart manufacturing solutions across industries. As businesses embrace AI, they increasingly look for standards to guide their efforts to improve interoperability, communication, security, efficiency and productivity of existing and emerging manufacturing technologies.

European standardization efforts are an important step in guiding ethical research and development of AI, addressing potential barriers and risks that could hinder efficient and secure operation of AI systems and technologies. AI standards are a valuable asset to Europe's industrial competitiveness reducing system operation costs, easing emerging markets penetration, advancing the dissemination and exploitation of technological expertise among SMEs and start-ups. It is crucial for the EU and the electronics manufacturing industry that standardization efforts keep pace with the global AI development, so that Europe remains at the forefront of standardization of emerging technologies.

According to Article 41 of the proposed regulation on AI, the Commission may by means of implementing acts, adopt common specifications (for high-risk AI applications) where harmonized standards do not exist or where the Commission considered that relevant harmonized standards are insufficient.

SEMI Europe appreciates the European Commission's efforts to drive standardization of AI, while considering the need for addressing insufficient or missing standards. To generate reliable, innovation-friendly AI standards, a consensus-based approach among regional and international standardization bodies, organizations and industry players is crucial. The collective effort should focus not only on the improvement of existing AI standards, but also on areas where standards are limited or non-existent, referring to standardization of categories of systems that are directly influenced by AI. Examples are systems with impact on Medical procedures, impact on Smart mobility (Automotive, Aerospace), and impact on Defense actions. These categories and more will have to be defined and standards (including definition of overriding AI control) will have to be agreed upon.

SEMI Europe would like to bring to the attention of the Commission the SEMI International Standards Program. The initiative brings together industry experts, stakeholders and professionals, driving the development of standards in regards to technological innovation and needs of the global industry. Since the inception of the program, over 1000 developed standards have assisted the global manufacturing industry in engaging the challenges of increased productivity, improved product reliability, operations quality and resource efficiency.

As a neutral platform, the program enables the exchange of information among competing manufacturers, suppliers and users resulting in technically accurate, specific standards. SEMI standards development spurs collaboration among industrial partners and competitors, resulting in joint ventures, technological partnerships and increased competitiveness. SEMI produced standards are developed for a broad spectrum of audiences, serving engineers and managers as guidelines for enhanced productivity and innovation enabled by emerging technologies.

V. Introduce Industry Advisory Expert Groups as part of the European Artificial Intelligence Board

SEMI Europe fully supports the Commission's plans to set up a European Artificial Intelligence Board to ensure effective and consistent implementation and enforcement of the proposed AI regulation.

Considering Europe's key strength as regulatory power in the global AI landscape, SEMI Europe urges the Commission to introduce sector-specific industry expert advisory groups as part of the Board to play a key role in the application and enforcement of the regulation. In this respect, industry working groups should advise the Commission and Member States on specific issues in areas that need complementary expertise such as AI standards, AI safety, product compliance or labeling. Such collaborations are necessary in creating the right regulatory environment to accelerate the development and market uptake AI applications, amongst others, in smart health, mobility, manufacturing and agriculture.

For example, the microelectronics industry which is already a subject to numerous regulations on product compliance and safety, is well positioned to offer its expertise, best practices and recommendations regarding the development and use of AI technologies in Europe.

It should be noted as well that supervision and guidance provided by competent authorities must include a requirement that information and results disclosed to the competent authorities be kept confidential until, at least, a decision has been made on whether registered IP rights, such as a patent application or utility model, can be filed.

As a good practice, SEMI Europe would like to bring to the attention of the Commission SEMI's Smart Data-AI Communities. SEMI is actively developing collaborative platforms to build communities through the Smart Data-AI Industry Advisory Council and the Chief Technology Officer Forum. These strategic platforms bring together key industry players, gathering expertise and knowledge on big data and AI to drive growth and improve collaboration of businesses on these critical technologies. Further, these initiatives create a cross-disciplinary community platform to drive pre-competitive innovation of AI technologies in the microelectronics industry.

Conclusion

The Commission's proposal for a regulation on AI indicates Europe's willingness to move forward to capture the huge potential ahead in the rapidly emerging AI technologies. SEMI Europe would welcome the opportunity to discuss the above-mentioned recommendations with the European Commission, the Parliament and the Council. The microelectronics sector is a key enabler and remains ready to work together with all interested stakeholders to develop new avenues of growth to reinforce Europe's AI leadership.

About SEMI Europe

SEMI Europe is the European arm of SEMI, the industry association connecting more than 2,400 semiconductor and electronics manufacturing companies worldwide, including nearly 300 European headquartered businesses. SEMI members are responsible for the innovations in materials, design, equipment, software, devices and services that enable smarter, faster, more powerful and more affordable electronic products. Since 1970, SEMI has built connections that have helped its members prosper, create new markets and address common industry challenges together.

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