Action Plan for Electronics Industry in Europe

An IEEE European Public Policy Initiative
Position Statement

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Since 2013, the European Commission (EC) has launched a number of initiatives to support Electronics Strategy for Europe. In 2014, the Electronics Leaders Group (ELG) submitted the Implementation Plan of the European Industrial Strategic Roadmap. This plan engages the whole electronics value chain, including those industries that depend on digital components and systems. At the core of the strategy is also the creation of ECSEL, a Joint Technology Initiative (JTI) for electronics in Europe, to combine resources at project level in support of cross-border industry-academia collaborative R&D&I. Over time, this series of initiatives have been taken, without a fixed plan having been crafted. This strategy should facilitate industry investments of 100 billion euros, allow for flexibility, and help create 250,000 jobs in Europe up to 2020.

In order to support and facilitate the European strategy, the IEEE EPPI believes that the European Union (EU) should develop the following policies and processes:

1. European semiconductor foundries and circuit design companies should speed up the build-up of capabilities in silicon optoelectronics, spintronics, and future graphene-based or plasmonic systems. Focused research programs should be accelerated beyond actions taken under the Horizon-2020 program , leading to spin-offs or start-ups devoted to advanced semiconductor-based sensing or activation devices, supported by easier access to small scale manufacturing processes at semiconductor foundries;
2. It is recommended that the development of high performance computing compilers and tools should not be fragmented, and that novel interconnect technologies used in such platforms be standardized for interoperability; this recommendation strengthens the statements in the Horizon 2020 eInfrastructure Workplan 2016 – 2018 (EINFRA- 12-2017: Data and Distributed Computing e-infrastructures for Open Science – Part a);
3. Tighter collaboration is recommended between all the companies and alliances involved in the embedded electronics and computing in future cars and vehicles, especially in terms of communications with road infrastructures and electrical loading points, and that specification and validation software for fault tolerant electronics take their full place; this recommendation strengthens the statements in EU research and innovation policies;
4. Energy savings technologies, and customer care and testing, should be put in focus on coming 5G developments, and not just stated as envisaged KPI's. Generally speaking, research priorities should mandate the ease of use and end-user performance;
5. Is recommended the creation and distribution of an open source technology platform, which would enable personalized data mining by businesses and individuals of their own knowledge and information assets; this must be supplemented by educational programs.

Background

The Action Plan of the Electronic Strategy for Europe (https://ec.europa.eu/digital-single-market/en/electronics-strategy-europe) aims to reverse the decline of Europe's share of the supply of micro and nanoelectronics, and to ensure in a decade from now a level of production in the EU that is more in line with the size of its economy. In order to achieve these goals, the strategy proposed:

- to build a European industrial roadmap to be implemented through investments by the EU, Member States and regions;
- to set up the ECSEL Joint Technology Initiative to support R&D&I actions in micro and nanoelectronics under Horizon 2020;
- to implement complementary measures, such as support to business development and SMEs, and actions addressing the skills gap.

The JTI of ECSEL combines resources at the project level, in support of cross-border industry-academia collaborative R&D&I. ECSEL replaces, for example, the two existing joint undertakings on embedded computing systems (ARTEMIS) and nanoelectronics (ENIAC). It covers three main interrelated areas:

1. Design technologies, manufacturing processes and integration, equipment and materials for micro and nanoelectronics;
2. Processes, methods, tools and platforms, reference designs and architectures for embedded/cyber-physical systems;
3. Multi-disciplinary approaches for “smart” systems.

The new JTI supports capital-intensive actions, such as pilot lines or large-scale demonstrators at higher technology readiness levels, up to level 8. A tri-partite funding model involving the European Union, Member States, banks, and industry helps align relevant investment strategies across Europe.

The electronics and information technology efforts are also, as enabling technologies, essential to carry out other goals, such as the “Digital Single Market”, “Broadband Europe”, “Wireless 5G”, “e-Health Agenda”, “Digital Inclusion”, “Intelligent transport” Agenda, energy savings, human ageing, and many others, with a scoreboard set for these https://digital-agenda-data.eu/ .

The IEEE EPPI believes that the European initiatives summarized above are both ambitious and sound with respect to developing a stronger electronics and IT industry. The IEEE EPPI recommendations address the following forward-looking technical areas.

Semiconductor industry. The evolution of semiconductor foundries will take time as design and testing tools will change completely, and materials supply may be scarce. Also, driven by higher bandwidths, the nature of system interconnects will change and go beyond silicon. This should involve manufacturers of semiconductor manufacturing and test equipment that is not only lithographic systems but also ion implantation, sputtering, vacuum technologies for large surfaces, and more types of equipment.

High Performance Computing (HPC). Major EC platform and embedded software flagship realizations have taken place in the HPC area, ranging from almost exascale computer demonstrators, to the development and porting of parallelized software, in a number of key application areas for wide use (biology, weather, materials), brokered by the Partnership for Advanced Computing in Europe (PRACE) umbrella.

Regarding *quantum technologies and computing*, the EC plans to launch a flagship initiative, which is critical for the electronics industry, and basic research, which should aim at technologies, products and dedicated systems.

The European car industry makes tremendous efforts towards greener engines, electrical engines, hydrogen-based engines and autonomous driving. None of these can succeed if safe, real-time embedded electronics, communications and software, and standardized reloading interfaces are not addressing the greater complexity of such platforms, and if better measurement methods are not engineered.

5G networks. As the first wireless 5G networks are bound to enter service in the near future, much remains to be developed to reap their full functional and performance benefits and maintain systems interoperability. The increased number, diversity and density of base stations raise test, installation, configuration and energy savings challenges, not to mention a wide array of regulatory, privacy, and business issues. Likewise, the RF-based user terminals will become far more diverse and numerous, opening up for major electronics manufacturing, including software and media opportunities.

Internet of Things (IoT). To exploit the full potential of IoT, a continued inter-sectoral effort to support the research and development in areas such as optoelectronics, digital signal processing, sensors, instrumentation, micro and nanoelectronics, and RF devices will contribute to the on-going success of the European electronics industry. IoT is expected to change the business models of many companies from being product-centric to being data-centric or service providers. Since IoT products generate large amounts of data, a straightforward choice for implementing data analysis will be data and knowledge mining tools.

Micro and nanoelectronics have a growing impact in other *consumer electronics fields* than above, such as energy savings, health and robotics, as illustrated by the European and national flagship projects in intelligent buildings and neurorobotics. Not only does electronics, coupled to sensors and actuators, enable the realization of home appliances, medical and biological equipment's and assistive devices, but they cater to growing markets, such as the so-called "silver economy". The new microcontrollers required by these applications will have more adaptive intelligence and will be networked, while monitoring biological or behavioural human functions. The IEEE EPPI recommends that efforts should be devoted to the design and data updates of new *adaptive controller architectures* (mixed analog, digital, MEMS, RF, optoelectronics, embedded operating system and adaptation knowledge), and to couple them with novel, energy-harvesting technologies. Likewise, the IEEE EPPI recommends that focused research programs, leading to spin-offs or start-ups, be devoted to new sensing or actuation processes and devices, where discrete electronics is replaced by semiconductor and optoelectronics, as the specialization and diversity has often held back technology uptake. More accessible, small-scale manufacturing processes at foundries should be put more at use to this effect.

In the context of Europe's plans and special thrust areas, it should be highlighted that Europe is catching up in numbers and impact of start-ups and cooperative ventures in the electronics and information processing areas. Not only do public research and development programs more and more mandate the involvement of small and medium size enterprises (SME), but these SMEs now frequently address world markets and raise international capital. At the same time, university research groups are also embarking into focused developments and sometimes patent licensing, for which their support staffs are often not well-prepared because of the universities' broad scopes. The IEEE EPPI recommends that a scheme be crafted and supported by political authorities whereby, especially in electronics and information technology, SMEs take on the operational technology transfer responsibility on behalf, but under the control of, universities and public research institutes. This would vastly cut the time to market, speed the tests in real use, and choose the right business model for the targeted market segments. This would also allow SMEs to cross-license on par with multinationals.

Standardisation is an essential element in fostering interoperability and economies of scale. In the standardisation package of 1 June 2016, the European Commission set out its vision for a single and efficient standardization policy that adapts to the changing environment, supports multiple policies, and brings benefits to companies, consumers and workers alike. As an example, the EU has combined three standards drafting organizations (CEN, CENELEC, ETSI) (www.cencenelec.eu/aboutus/Pages/default.aspx) to form the Smart Grid Coordination Group to lead the Smart Grid standards activities in the EU. Also, the EU has set forth specific standardization packages as part of all projects in the wireless 5-G space. The IEEE EPPI suggests that, as part of the regular contractual duties in EU-funded Horizon 2020 projects, the Commission requests the primary contractor to provide evidence of having used the project results to provide inputs to on-going standardization efforts or to propose new standardization initiatives (where standards are needed) in the most relevant global or European standardisation organisation.1 This could be in the form of a fixed percentage of the project's dissemination budgets.

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[1] The Priority Plan for ICT Standardisation (item 3.2.5)) stresses the importance of participation in global standards-setting.