ARTEMIS-IA Brokerage Event for ECSEL 2018 Calls

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ARTEMIS
Industry Association

https://artemis.eu

Presentation content

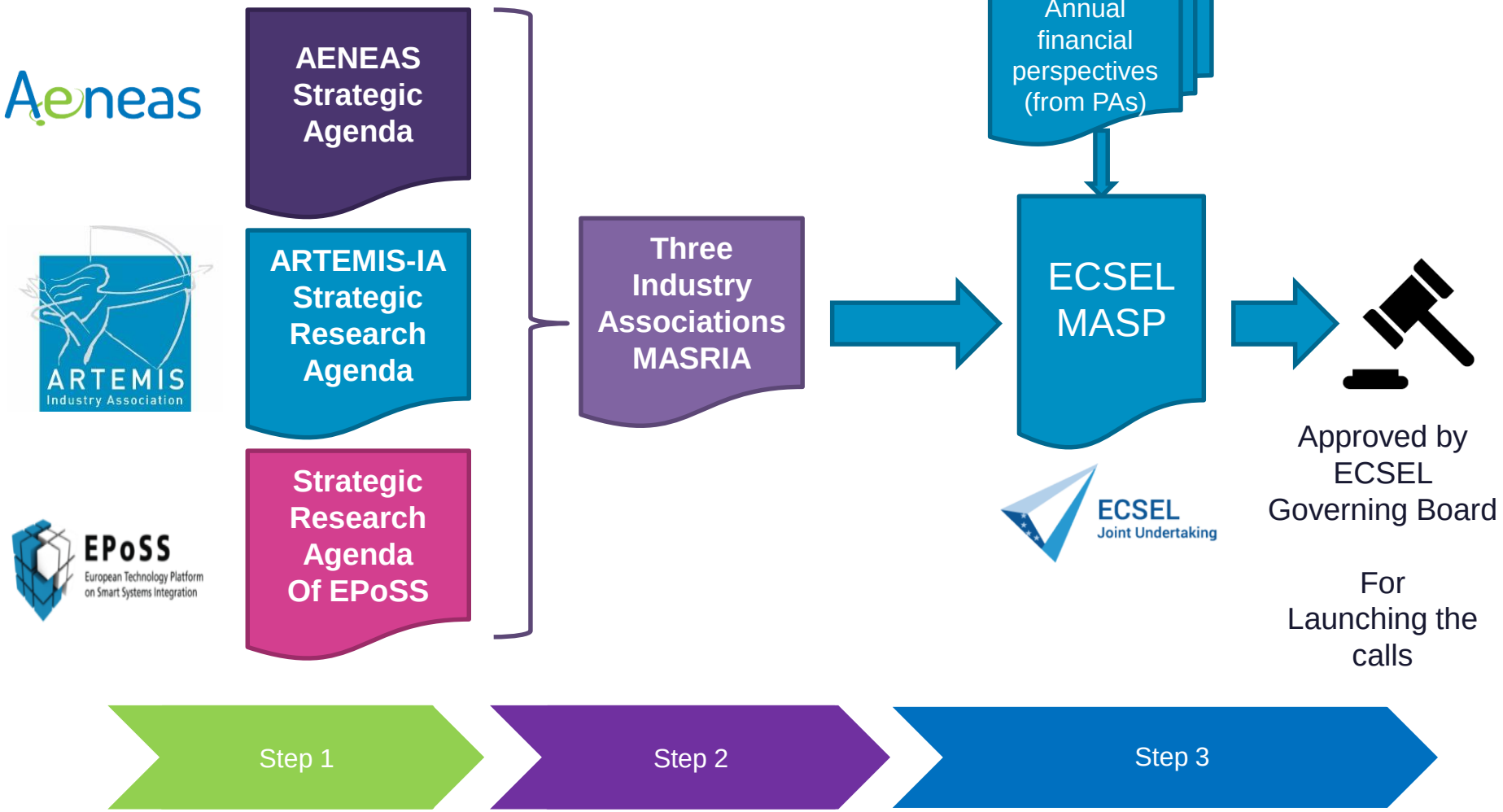
- About MASRIA and MASP
- MASRIA 2018
- The ECS SRA content

About MASRIA and MASP the Principle

The Multi-Annual Strategic Research and Innovation Agenda MASRIA

- **Describes the Vision, Mission and Strategy of the ECSEL JU as well as the strategic research and innovation activities**
- **Is prepared on behalf of the ECSEL Private Members Board (PMB) for ECSEL JU to:**
  - Reflect its input/recommendation into the nYear Multi-Annual Strategic Plan (MASP)
  - Use its Parts A and B for its “Calls” and thus enable the ECSEL JU to fulfil its objectives.
- **Serve as input/recommendation for the nYear Multi-Annual Strategic Plan (MASP) of the ECSEL Joint Undertaking.**

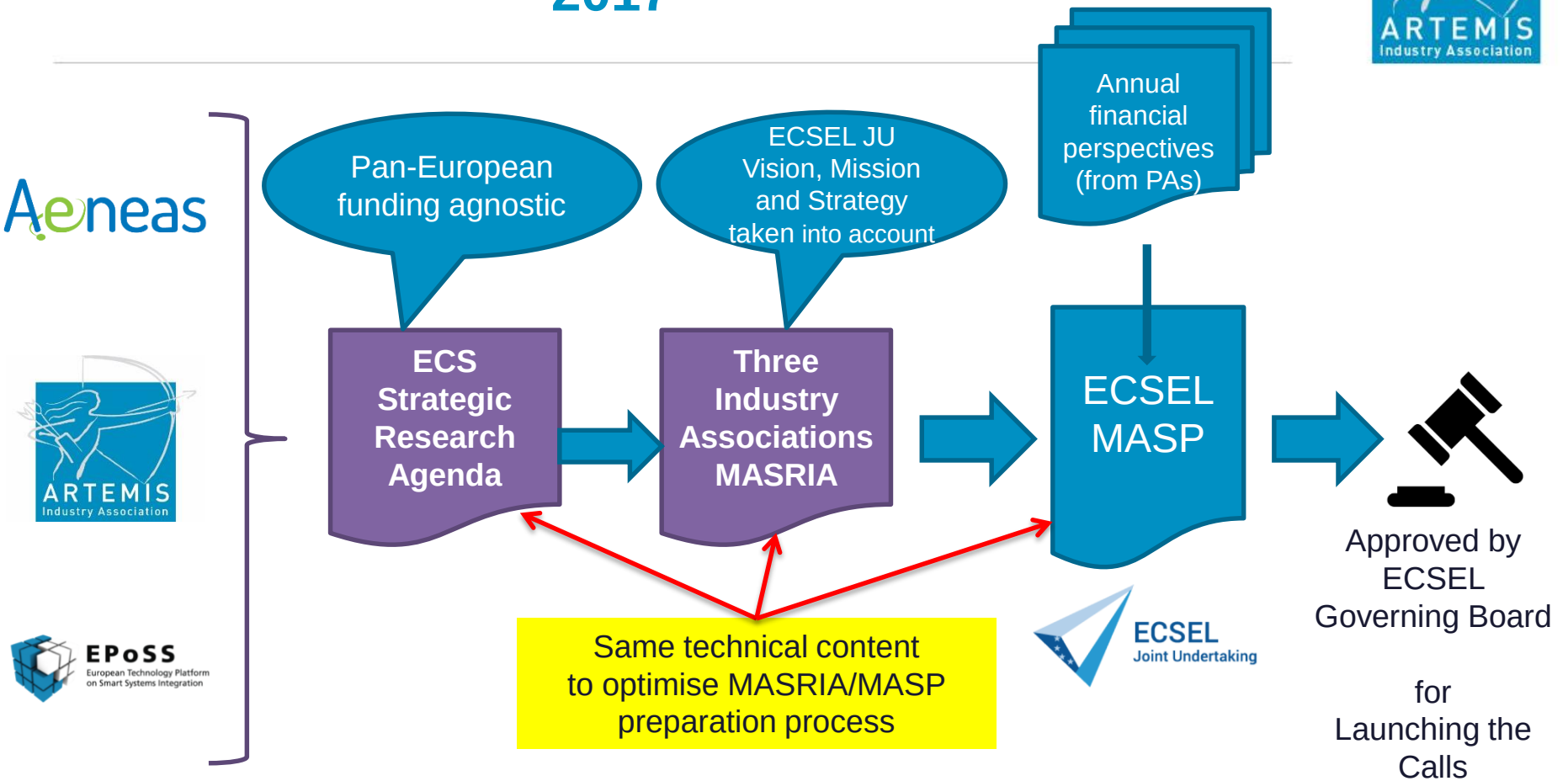
MASRIA and MASP elaboration process
Up to 2016



ECSEL MASRIA : What's new for 2018

- **Compared to the MASRIA 2017 the set-up of this MASRIA 2018 is significantly renewed due to the decision of the PMB to issue a MASRIA with a strong link with a new initiative of the Private Members to a common pan-European SRA on Electronic Components and Systems.**
- **Although this ECS SRA is funding programme agnostic, it:**
  - First disclosed during the EFECS on December 5-6 2017
  -
  - in a final draft form during the 4th quarter of 2017 and will be issued in its final form during the spring of 2018

MASRIA and MASP elaboration process 2017

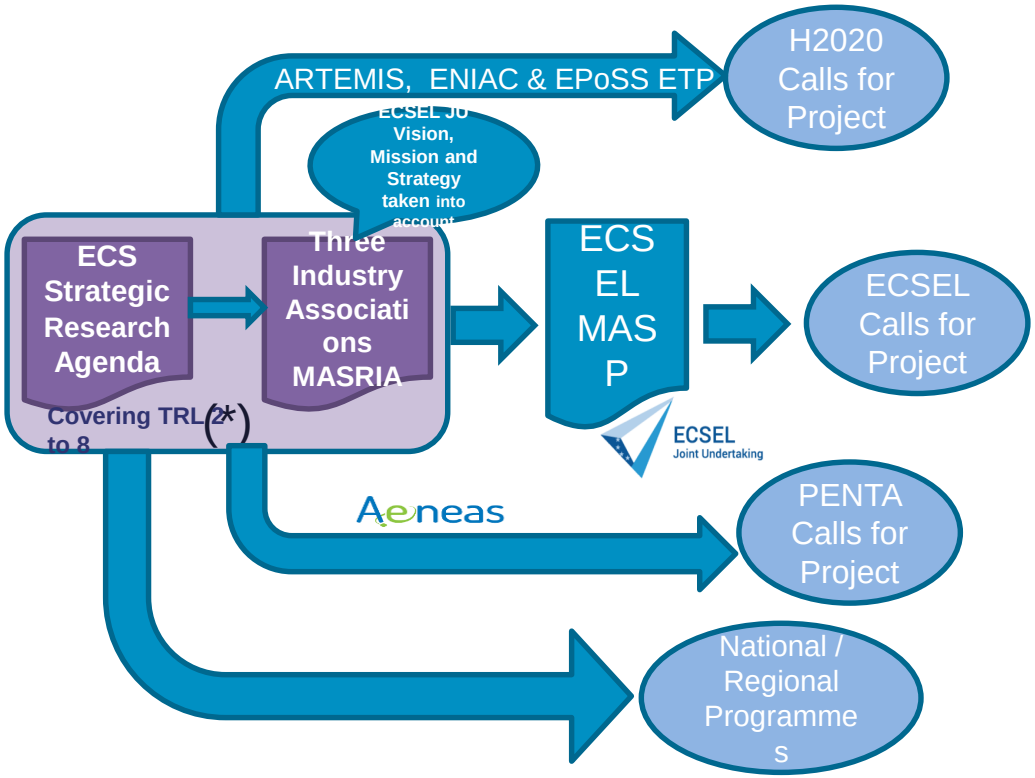


Step 1

Step 2

The motivation : ECS SRA to play a pivotal role

- First disclosed at EFECS on December 5-6 2017
- Published on January 25th ,2018
- Will be up-dated every 3 years



But the ECS SRA : It is not “yet another SRA”!

But a common ECS SRA from ECSEL JU Private Members AENEAS , ARTEMIS-IA and EPoSS

- Speak in one voice on the ECS complete Value Chain
- Improve the MASRIA and MASP elaboration processes

With the ultimate goal of generating the right set of RD&I projects

The People behind

Over 200 experts lead by a Core team and chapters owners

Chair: Laila Gide (Thales)

Core team: Patrick Cogez (Leader, AENEAS), Renzo Dal Molin (Cairdac), Marc Duranton (CEA), Mart Graef (TU Delft), Paul Merkus (Philips), Sven Rzepka (Fraunhofer), Arnaud Samama (Thales)

Chapters co-Leaders

Chapt 1: Transport and Smart Mobility: Michael Paulweber (AVL) ; Patrick Pype (NXP)

Chapt 2 : Health and Well-Being: Ronald Begeer (Philips Healthcare) ; Renzo Dal Molin (Cairdac)

Chapt 3: **Energy**: Wolfgang Dettmann (Infineon); Pertti Raatikainen (VTT); Antonio Imbruglia (STM)

Chapt 4: Digital Industry: Knut Hufeld (Infineon) ; Mika Karaila (Valmet) ; Olli Ventä (VTT)

Chapt 5: Digital Life: Paul Merkus (Philips) ; Mario Diaz-Nava (STM)

Chapt 6: Systems and Components: Architecture, Design and Integration: Jürgen Niehaus (SafeTrans) ; Ralf Popp (EdaCentrum) ; Reinhard Neul (Robert Bosch)

Chapt 7: Connectivity and Interoperability: Frédéric Gianesello (STM) ; Jerker Delsing (Lulea U.T)

Chapt 8: Safety, Security and Reliability: François Tuot (Gemalto) ; Daniel Watzenig (Virtual Vehicle)

Chapt 9: Computing & Storage: Marc Duranton (CEA) ; Huy-Nam Nguyen (ATOS)

Chapt 10: Electronic Components &Systems Process Technology, Equipment, Materials and Manufacturing: Jo de Boeck (IMEC) ; Arco Krijgsman (ASML)

ECS SRA drafting guiding principles

ECS SRA rationale : Better integration of the FULL ECS Value-chain

The ECS Value Chain stands for everything “smart” and impacts all aspects of life and all industrial sectors

Smart products enable many applications

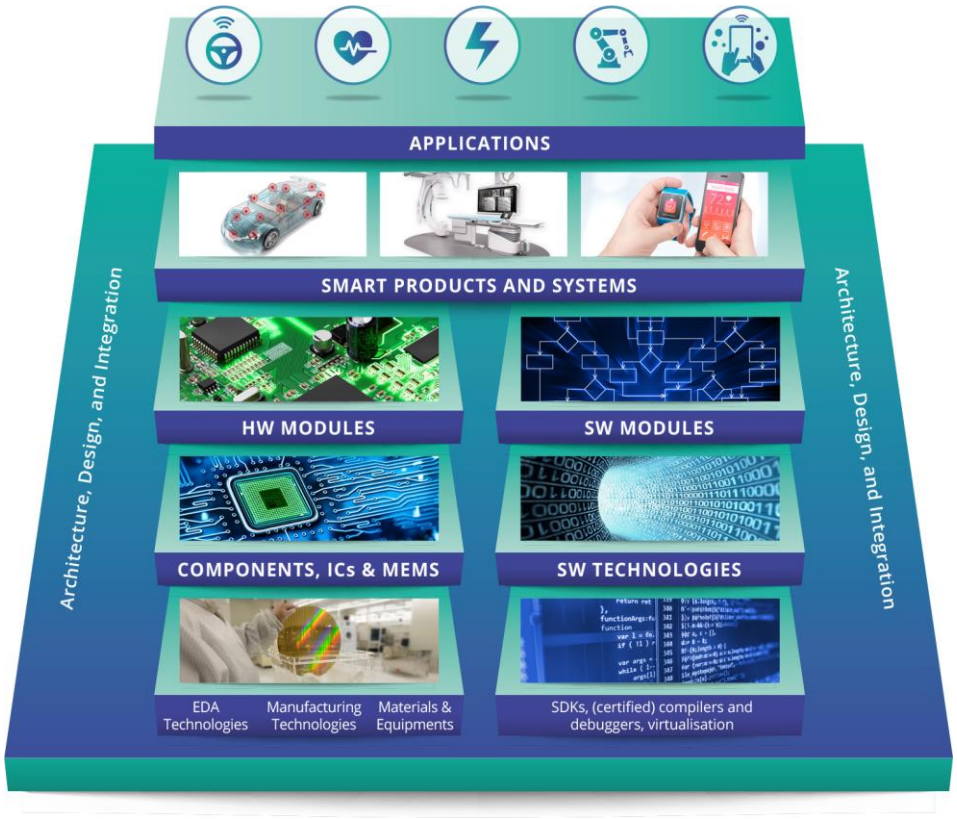
to improve citizens quality of life and supports the creation of a

smart competitive industry for increasingly digital economy.

Nano-electronics, smart systems integration, embedded intelligence and cyber-physical systems
Play dominant role in creating
innovative, smart, connected yet safe and secure products,
They are Essential building blocks for Internet of Things and Systems of Systems

Designing and manufacturing

semiconductor chips, sensors and actuators, and integrating software and specialised interfaces that bring products to life.



ECS have a strong case in Europe digital transformation

Europe digital transformation is a great opportunity, as well as a pressing need, to undertake ambitious R&D&I to bring to the market products and services for the benefit of citizens, businesses and society.

Our key differentiators for the success:

- **The European companies are world market leaders in the application specific semiconductor technologies 'More-than-Moore technologies' (e.g. RF, MEMS, and Power semiconductors), as well as very low power CMOS-technologies (e.g. FD-SOI)**
- **The traditional European strength in Cyber Physical Systems, and the on-going revolution of the Ubiquitous Computing is an opportunity to position European actors as world class leaders;**
- **The design of highly complex, efficient and reliable software solutions operating from micro-controllers up to complex products such as aircrafts, satellites, cars and trains to cite a few;**
- **highly miniaturized and tailored packaging and assembly technologies to integrate the heterogeneous components of the ECS into a low space, energy efficient package;**
- **a world class equipment industry which not only serves the local S/C industry but also the manufacturer of high volume standard products like microprocessors and/or memories which mainly are produced outside Europe but which performance and reliability are the base for the success of the SW within any ECS.**
- **A world class industry sectors in aeronautics and space, automotive, health and energy.**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The game changers and major drivers for Europe digital transformation

With the ultimate purpose of generating the right set of R&D&I projects in each area, whether an application or a capability, the SRA is built on an analysis combining factors external and internal to the European ECS industry.

The major game changers disrupting the environment within which the R&D&I strategy developed in the SRA include technical and non-technical trends, among which:

- The falling cost of all semiconductor components,
- The ubiquitous connectivity and mobility,
- Heterogeneous integration
- The advent of artificial intelligence, Data deluge, High Performance Computing,
- The new political, societal, environmental, and legal expectations
- The feel safe and secure factor
- New business model paradigms (Everything as a Service, networked enterprise,
- Vertical integration, consumers becoming prosumers,….).
- New transaction mechanisms for improved trust and security: Blockchain

The game changers and major drivers for Europe digital transformation

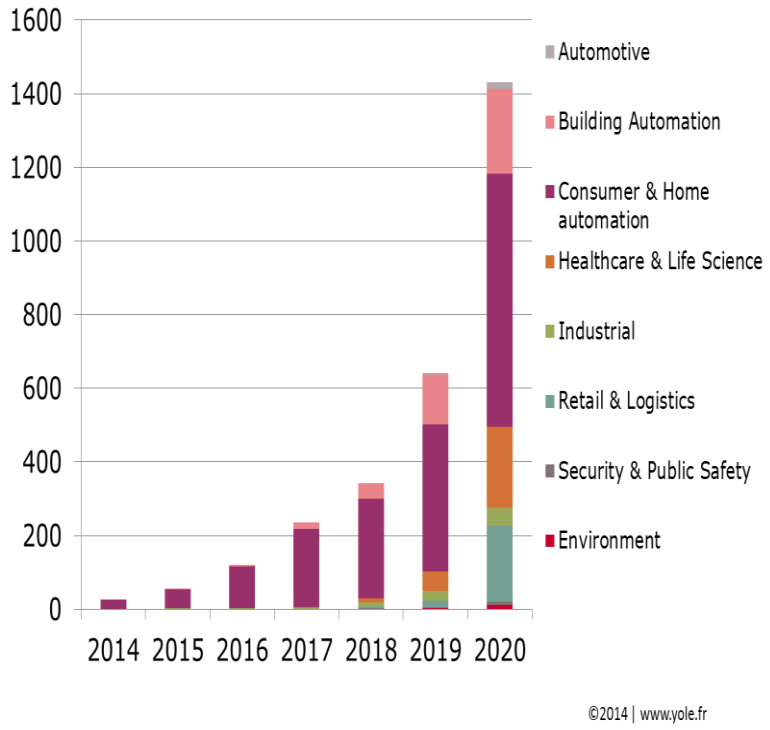
The example of: Application specific semiconductor technologies

Application specific semiconductor technologies have been, over the past years, taking an ever-increasing role in our day-to-day life.

A clear demonstration of this is the impact and the advances in sensor and actuator technologies, and the embedded software, current ADAS systems, passive and active safety solutions , minimized chargers, electric power trains in cars, the smartness of smart phones, ……. Etc …

This would not be even thinkable before.

Forecast MEMS-Worldmarket for IoT (m$)



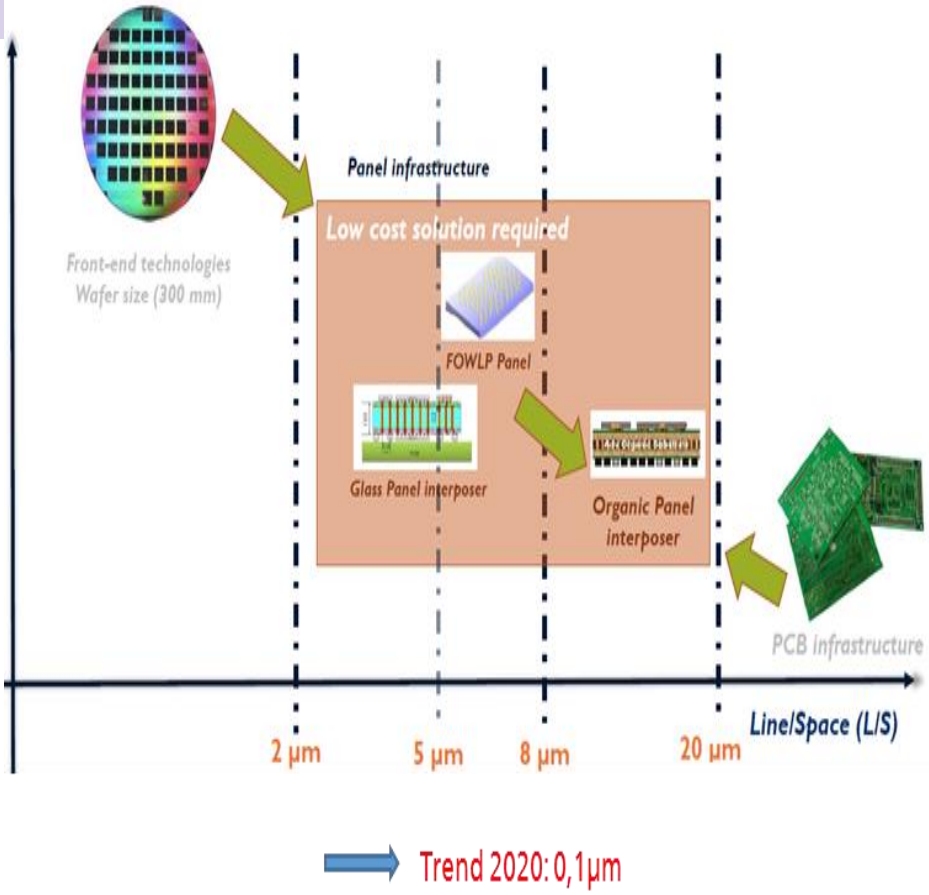
The impact of the IoT expected development on the MEMS market.

The game changers and major drivers for Europe digital transformation

The example of: Heterogeneous Integration / Comprehensive Smart miniaturised Systems

Heterogeneous integration and packaging/assembly technologies have become a key issue for the performance/reliability and cost of an ECS

Smart ECS for Europe's critical applications requires complementing logic and memories with additional features and non-scalable with Moore's Law needed to handle functions like sensing, actuating, communication, data protection and power management.



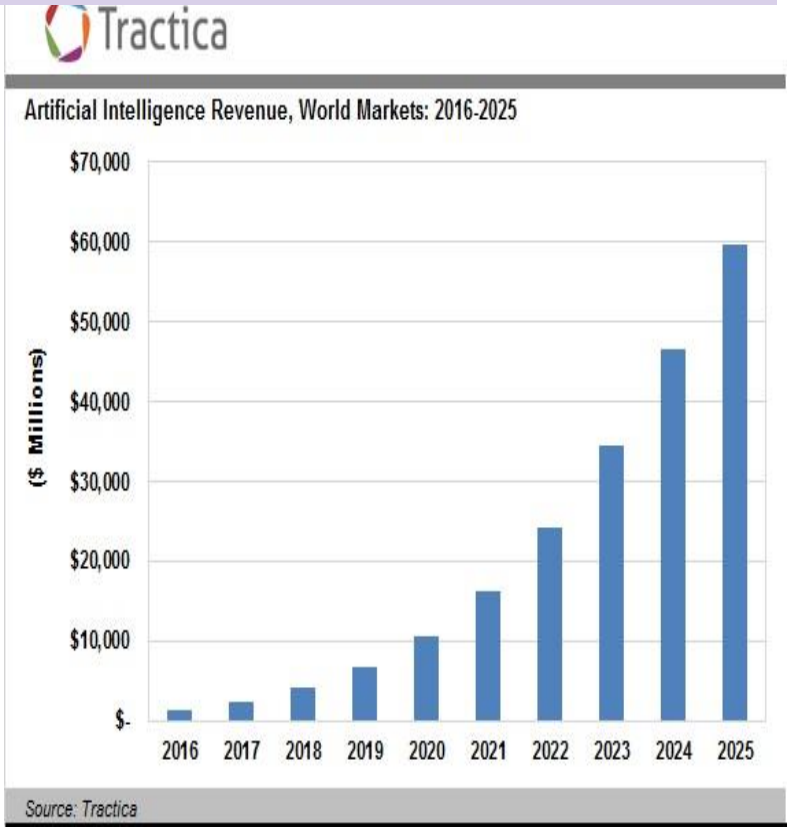
The game changers and major drivers for Europe digital transformation

The example of: The advent of artificial intelligence, Data deluge, High Performance Computing

AI will provide Smart systems with a range of novel functionalities and become a driving force behind almost all product innovations in almost every application field in the digital world, and drive research and innovation priorities.

What's in for us :

Cognitive computing , intensive embedded intelligence capabilities, cyber-physical systems with new ways to interface with the real world and humans, virtual reality, augmented reality, brain-computer Interfaces, deep learning, humans/machines interact



Revenues generated by the direct and indirect application of AI software will grow from $1.4 billion in 2016 to $59.8 billion by 2025

ECS SRA Vision, Ambition

ECS SRA Vision, Ambition

Our Vision and Ambition are for Europe to take a leadership role in the digital transformation by developing its capability to:

- provide the needed European digital innovation and technologies.
- generate growth, create value, jobs and prosperity, and safeguard Europe's competitiveness and sovereignty.

To achieve this Vision and Ambition, the European ECS industry, supported by Public Authorities at European, national and regional levels, must:

- Address the major technological challenges identified in the SRA.
- Pool research efforts on a number of shared priorities to avoid fragmentation and reach critical mass; setting greater synergies across the complete ECS value chain and its eco-system for a high Return on Investment.

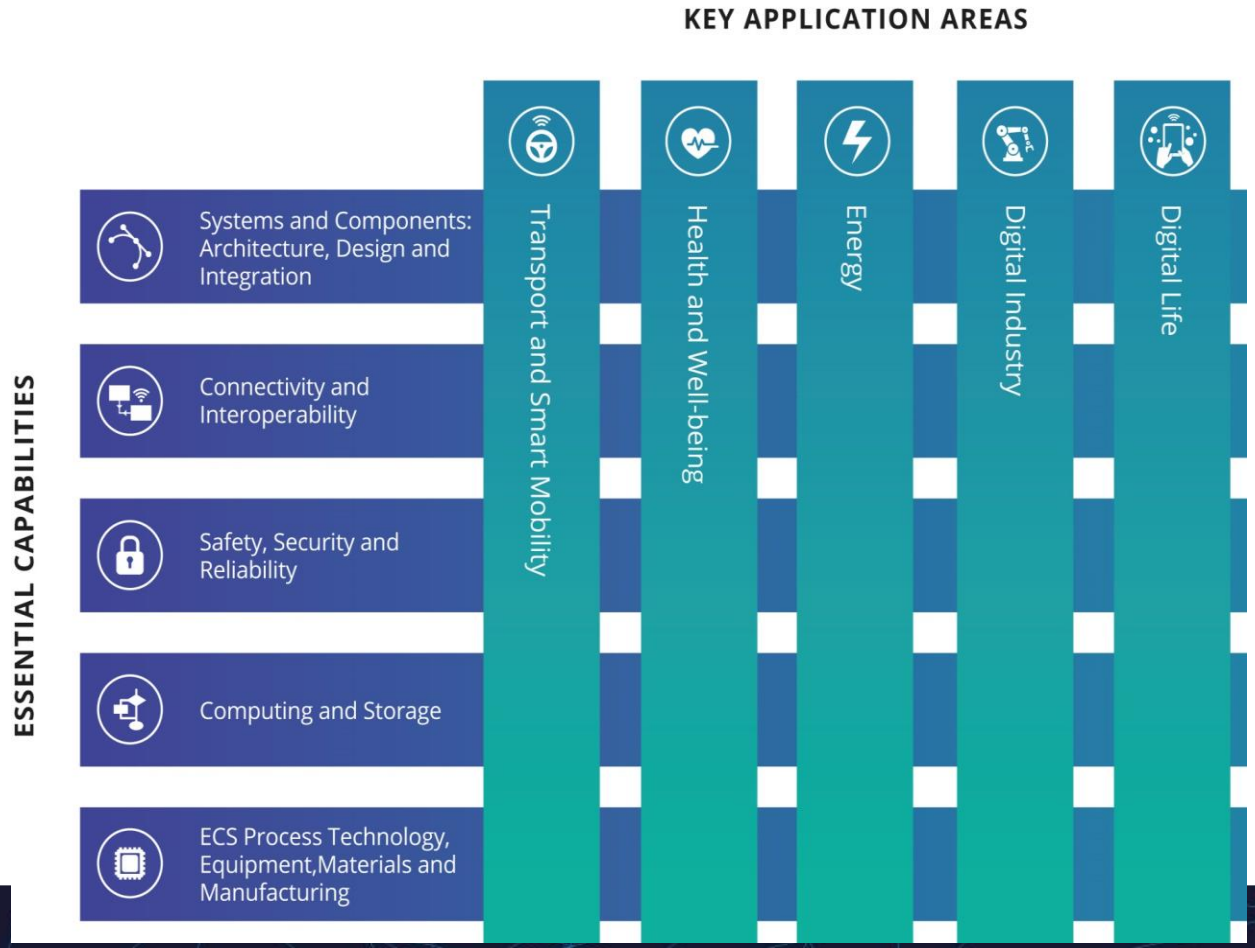
Proper execution of the above will reinforce EU based ECS industry, allowing it to remain among the forefront players in this domain.

ECS SRA Strategy and strategy implementation

ECS SRA Strategy and strategy implementation

Top down guidance focus on 5 key applications areas & 5 essential capabilities.

- Selected market sectors represent altogether over 50% of Europe's GDP.
- Synergetic cross-domain essential capabilities



ECS SRA Strategy and strategy implementation

Two Threads
Strategy Implementation

A Strong
EU based ECS Industry

An Efficient Europe

Addressing next generation digital technologies and breakthroughs
Mission Oriented

Pooling ECS research efforts on a number of priorities to remove barriers between application sectors

R&D&I programmes
and
Lighthouses

+

And a longer term vision

ECS SRA Strategy Implementation

Strategy implementation:Thread One

Address next generation digital technologies and potential breakthroughs to build a strong EU based ECS, Europe on the forefront in the digital Economy

Achieve excellence on priority areas taking into account the European societal needs, quality of life, safety and security, ethics, and sustainability

Build on European existing technological strengths: for both sovereignty and market strong positions in areas such as low power consumption, high performance computing, sensors, smart systems integration, safety & security

Develop technologies up to high TRL: (e.g. Pilot Lines) for innovation market up-take

Think big and act fast: speed is of essence to achieve economy of scale, innovate and act efficiently on the global market

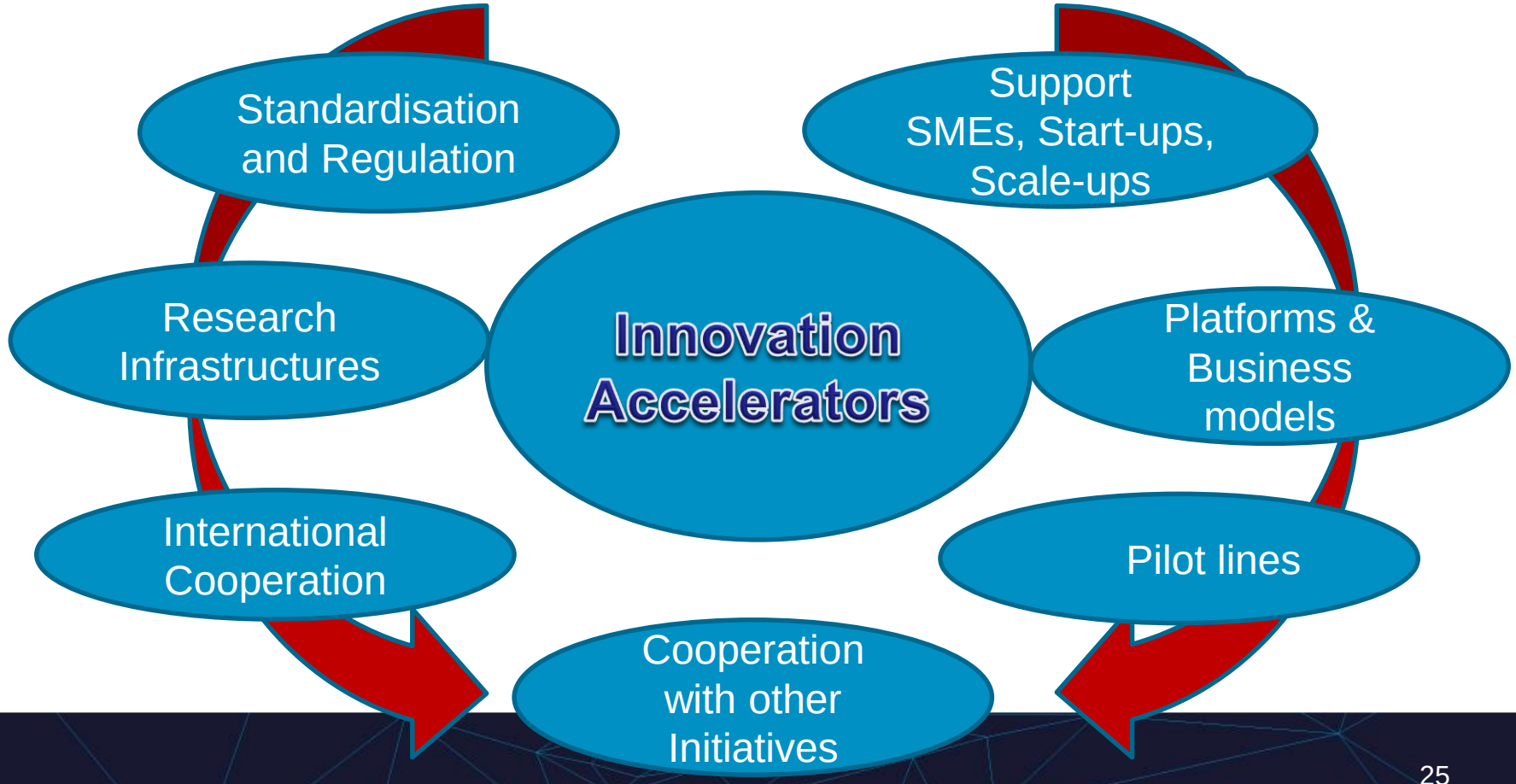
ECS SRA Strategy Implementation

Strategy implementation Thread Two

- Pool research efforts on priorities that remove barriers between application sectors
- Build better and more efficient European technological solutions for greater combined strength in the context of global competition
- Foster proposals where there is real value creation
- Encourage projects addressing the whole value chain & leveraging vertical integration
- Platform approach adoption as an “innovation accelerator” for a faster “go-to-market”.

The Innovation accelerators to make it happen

"However successful they may be, research projects do not resolve societal challenges and create economic value and bring results to market for Europe without a proper environment that foster innovation"



Chapter 1: Transport and Smart Mobility

- The mobility sector faces crucial societal challenges: reducing CO2 emissions, improving air quality, eliminating congestion for improved logistics and traffic efficiency, while advancing towards an accident-free and casualty-free mobility scenario).

- This implies new methods to power vehicles, such as electric motors, batteries or fuel cells, power electronics, intelligent energy saving control algorithms, as well as better automation of vehicles and increasing interaction between vehicles, infrastructure and drivers enabled by innovative sensors and communication hardware, to make safe and efficient use of our transport network, the ultimate goal being autonomous driving.

- By 2030, expected market share of electrified road vehicles will be between 20 % and 70%. Automation could result in new business models, such as shared and seamless intermodal mobility which could have an impact on the number of vehicles on roads.

- The increasing automation of traffic will lead to new interaction systems between human in and around vehicles and automated transport systems taking into account the different needs from young digital natives, elderlies or citizens with special needs.

Chapter 1: Transport and Smart Mobility

- **4 Major Challenges**
  1. Clean, affordable and sustainable propulsion
  2. Secure connected , cooperative and automated mobility and transportation
  3. Interaction between humans and Vehicles
  4. Infrastructure and Services for smart personal mobility and logistics

Chapter 2: Health and Wellbeing

- Moving healthcare from hospitals into our homes and daily life enabling preventive and patient centric care;
- Restructuring healthcare delivery systems, from supply-driven to patient-oriented;
- Engaging individuals more actively in their own health and wellbeing;
- Ensuring affordable healthcare for the growing amount of chronic, lifestyle related diseases and an ageing population;
- Developing platforms for wearables/implants, data analytics, artificial intelligence for precision medicine and personalized healthcare and wellbeing.

Chapter 2: Health and Wellbeing

- **5 Major Challenges**
  1. Healthcare from hospitals into our homes and daily life enabling preventive and patient centric care.
  2. Restructuring healthcare delivery systems, from supply-driven to maximizing value for patients.
  3. New solutions for engaging Individuals more actively in their own health and wellbeing.
  4. Affordable healthcare for the growing amount of chronic, lifestyle related diseases and an ageing population.
  5. Platforms for wearables/implants, data analytics, artificial intelligence for precision medicine and personalized healthcare and wellbeing.

Chapter 3: Energy

- Energy world is in transition - different energy sources are linked to get higher efficiency, reliability and affordability.
- Alternative energy sources are changing the nature of the world's power grids
- Increasing distribution of power generation leads from today's uni-directional to a distributed and bi-directional power flow.
- Situation requires intelligence and security features at each level of the grid and interfaces.
- Micro- and nano-electronics integrated into power electronic modules and systems are essential for an efficient, reliable and secure management of power generation, transmission, storage and consumption through smart grids, safe and secure system applications and devices.

Chapter 3: Energy

3 Major Challenges

1. **Ensuring sustainable power generation and energy conversion**
2. **Achieving efficient community energy management**
3. **Reducing energy consumption**

Chapter 4: Digital Industry

- Digital Industry will require new applications and methods to get current factories work at the maximal flexibility & efficiency and optimized production level.
- As there will be less workers they should get more information: to support information flow is to use new innovations and integrate them to normal work flow.
- Access to information as needed for Users: This easy access requires security and back-end server capacity to process information ready to be used.
- Optimal system will setup itself according the designed and installed system. This means we should have self-organizing intelligence at the factory level.
- Disruption can happen as wireless sensors and new field connectivity solutions are needed with industrial internet.
- Cloud based network and integration will change value chain. One challenge is to use this kind of network fast and dynamic way.

Chapter 4: Digital Industry

4 Major Challenges

1. Developing Digital twins, simulation models for the evaluation of industrial assets at all factory levels and over system or product life-cycles;
2. Implementing AI and machine learning, to detect anomalies or similarities and to optimize parameters;
3. Generalizing conditions monitoring, to pre-warn before damages and to help on-line decision-making;
4. Developing digital platforms, application development frameworks that integrate sensors and systems.

Chapter 5: Digital Life

- In our modern life, digital services are part of almost everything we do, be it at work or during our free time. Living our modern life, we are mostly busy working, travelling or leisuring.
- If not on the move we are at home or at work and many people have jobs in an office environment. In all cases we want to have a safe, comfortable and fulfilling life,
  while reserving the sustainable environment.
- Digital Life covers the intelligent (and preferable anticipating) applications that support our lives in all these different environments, wherever we are and whatever we are doing.

Chapter 5: Digital Life

4 Major Challenges

1. **Ensuring safe and secure spaces** ;
2. **Ensuring healthy and comfortable spaces;**
3. **Ensuring anticipating spaces;**
4. **Ensuring sustainable spaces.**

Chapter 6: Systems and Components: Architecture, Design and Integration

- **Effective and efficient architectures, design and integration technologies are essential for**
  - predictively transforming ideas and requirements into innovative, high quality, testable and deployable products on all levels of the value chain.
  - supported by verification, validation and testing techniques, methods and tools, aim at increasing productivity, reducing development costs and time-to-market.
- **Continued development of those technologies is a prerequisite to the realisation of the ever more complex systems required to meet Europe's societal challenges. Expected achievements include:**
  - Development of modelling and specification techniques and languages, as well as appropriate verification, validation and test methodologies, for critical, autonomous, cooperating, and evolvable systems;
  - the establishment of common platforms and libraries of parts/components, that enable modular development, reusable IP, standardized software and middleware solutions, etc;
  - improved capabilities to develop, validate, and optimize functional and non-functional system properties; new materials development and integration at component, board and system level.

Chapter 6: Systems and Components: Architecture, Design and Integration

7 Major Challenges

1. **Managing critical, autonomous, cooperating, evolvable systems;**
2. **Managing complexity;**
3. **Managing diversity;**
4. **Managing multiple constraints;**
5. **Integrating miniaturized features of various technologies and materials into smart components;**
6. **Providing effective module integration for highly demanding environments;**
7. **Increasing compactness and capabilities by functional and physical systems integration.**

Chapter 7: Connectivity and Interoperability

- **Connectivity and interoperability are today key enablers to support innovative applications in various markets, as illustrated by the booming development of apps made possible by the ubiquitous availability of smart phones and 4G wireless networks.**
- **The availability of new innovative connectivity technologies (IoT, 5G, car to car, etc…) will provide a wide range of new business opportunities for European industry (smart cities, autonomous driving, etc…).**
- **Meeting the performance, power, latency and cost requirements of these networks will require heterogeneous integration of various materials, different devices (logic, memory, sensors, RF, analog…) and different technologies (electronics, photonics, MEMS and sensors).**
- **The hardware integration challenge has its equivalent in the software world, where the ambition is to achieve nearly lossless interoperability across protocols, encodings and semantics while providing technology and engineering support foundations for low cost integration of very complex and evolvable systems of systems.**
- **Finally, it is expected to be able to engineer data protection along a heterogeneous communication chain at 20% of current costs.**

Chapter 7: Connectivity and Interoperability

3 Major Challenges

1. **Meeting future connectivity requirements leveraging heterogeneous technologies;**

2. **Enabling nearly lossless interoperability across protocols, encodings and semantics;**

3. **Ensuring Secure Connectivity and Interoperability.**

Chapter 8: Safety, Security and Reliability

- **Safety, security and reliability are fundamental components of any innovation in the digital economy. Novel products and services such as personal healthcare monitoring, connected cars or smart homes will bring strong benefits to our society only if users are assured that they can depend on and trust them.**

- **Expected achievements are: secure, safe, dependable and trustable design methodologies, practices, and standards for products and infrastructure that customers can rely on; methods and framework enabling the deployment of privacy, data protection and human interaction for different market without impacting customer acceptance;**

- **Providing all means and methods needed for the new ECS solutions to meet the reliability and functional safety targets.**

Chapter 8: Safety, Security and Reliability

4 Major challenges

- **Ensuring safety, security and privacy by design;**
- **Ensuring Reliability and Functional Safety;**
- **Ensuring secure, safe and trustable connectivity and infrastructure;**
- **Managing privacy, data protection and human interaction.**

Chapter 9: Computing and storage

- **Computing and storage are the fuel of the digital revolution in providing always higher performance for existing and emerging applications at a constant or decreasing cost, which requires to investigate new paradigms.**

- **For HPC:**
  - the step from petascale towards exascale computing is challenging: an in-depth reworking of application codes in conjunction with radical changes in hardware to optimally exploit high levels of parallelism in solving ever increasing complex problems.
  - On the other end of the spectrum, pervasive computing requires architectures fully optimizing the energy consumption with dedicated processing cores, accelerators and energy management systems.
- **New efficient accelerators for AI tasks need to be developed for edge processing, allowing to embed intelligence near the user and limiting the use of remote accesses to ensure safety, privacy and energy efficiency;**

- **Achieving more computing power asks for the investigation of disruptive technologies, including quantum computing, optical computing and neuromorphic computing.**

Chapter 9: Computing and storage

4 Major Challenges

1. **Increasing performance at acceptable cost**

2. **Making computing systems more integrated with the real world**

3. **Making "intelligent" machines;**

4. **Developing new disruptive technologies: Quantum technologies, neuromorphic computing, optical Computing.**

Chapter 10: ECS Process Technology, Equipment, Materials and Manufacturing

- **Technological challenges arising from future technologies such as Internet of Things, Big Data, 5G and beyond networks and Industry 4.0 require advances in Moore's Law, in More than Moore additional functions, optimizations of existing technology nodes and advances in IC integration and manufacturing schemes well into the next decade.**

- **Furthermore, the European industry in sectors as diverse as healthcare, automotive, energy, smart cities or manufacturing strongly depends on the timely availability of highly specialized tailor-made electronics devices enabling added value and new functionalities in their products.**

- **Independent access to semiconductor technology for manufacturing of function-critical Electronics Components and Systems (ECS), and their development and manufacturing in Europe are indispensable for meeting the challenges of the European society. Consequently, the European position must be reinforced through leadership in all relevant technologies by driving the major challenges**

Chapter 10: ECS Process Technology, Equipment, Materials and Manufacturing

4 Major Challenges

1. **Developing advanced compute, logic and memory technology for nanoscale integration and application-driven performance;**

2. **Integrating heterogeneous functionalities, technologies, processes and devices;**

3. **Developing advanced smart System-in-Package (SiP) technology and integration;**

4. **Maintaining world leadership with Semiconductor Equipment, Materials and Manufacturing solutions.**