ECS SRIA 2025
ECS Key Application Area

Chapter 3.3 Digital industry

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Chapter 3.3 Digital industry Context

Electronic components and systems (ECS) are the future of Digital Industry.

- "Digital Industry" chapter intends to highlight the evolution of traditional industry through the introduction of cutting-edge digital technologies in production, management and distribution processes.

- These technologies include the Internet of Things (IoT), artificial intelligence (AI), data analysis, co-robotics, 3D printing and all digital innovations that can be usefully adopted in industry (advancements on sensing, powering, communications, computing, etc...)

Chapter 3.3 Digital industry Scope

Electronic components and systems (ECS) are the future of Digital Industry.

- Fast evolution of cutting-edge digital technologies

- Industrial Exploitation of: Internet of Things (IoT), artificial intelligence (AI), data analysis, co-robotics, 3D printing, additive manufacturing

- Integrating the Industrial Physical word with Digital Twins & Industrial Metaverse

- EU level manufacturing ecosystem together with future sustainability and greener industrial processes and artefacts, covering and exploiting: Discrete manufacturing, process industries, provisioning, production services, machinery and connected machines, UAVs and robots

- Digital Industry is value chains, supply chains and lifecycles, new materials for structures and electronic components.

- Digitalisation as a key enabler of sustainability of European industry

- Flexible and Resilient EU Supply Chains are a must

Chapter 3.3 Digital industry Major Challenges 1/2

- **Major Challenge 1**: **Responsive and smart production**.
  - Robust optimal production, scalable first-time-right production
  - Mass customization and personalized manufacturing, customer-driven manufacturing
  - Resilient and adaptive production, including the shortening of supply chains and modular and flexible factories
  - Cognitive production
  - Manufacturing as a service
  - Embedded/Edge/Cloud architectures
  - Standardisation

- **Major Challenge 2**: **Sustainable production**.
  - Monitoring flows of energy, materials, waste and Lifecycle assessment
  - Virtual AI assistants
  - Human–machine interfaces and machine-to-machine communications
  - Human operators in more autonomous plants and in remote operations
  - Human safety
  - Competence and quality of work in a human-centred manufacturing
  - Green Deal

- **Major Challenge 3**: **Artificial Intelligence in digital industry**.
  - European AI framework
  - AI in manufacturing,
  - AI for decision-making,
  - AI for monitoring and control

Chapter 3.3 Digital industry Major Challenges

- **Major Challenge 4**: **Industrial service business, lifecycles, remote operations and teleoperation**.
  - Remote operations, teleoperation
  - AI Services for monitoring and collaboration
  - Fleet management, Edge and local/global decision making
  - Business services integration

- **Major Challenge 5**: **Digital twins, mixed or augmented reality, telepresence.**
  - Digital Twin: Design process digitalisation, telepresence
  - Virtual commissioning, interoperability
  - Simulators: Tracking & Simulator based design
  - Digital twins combined with data-driven models (knowledge and data fusion)
  - Humans & Knowledge integration

- **Major Challenge 6**: **Autonomous systems, collaborative robotics**
  - Autonomous functions of systems
  - Safety and securityin autonomous systems
  - Requirements management and conceptual modelling of autonomous systems
  - Human–machine interaction in autonomous systems
  - Digital design practices including digital verification and validation (V&V)
  - Simulators and autonomous systems

Chapter 3.3 Digital industry Key Trends

- Digitalization

- Smartness and Resilience

- Autonomy

- Flexible Supply Chains

- Sustainability

Chapter 3.3 Digital industry R&I Focus Areas

- Computations Capabilities, Simulations, Data Lakes Structures, Digital Twins

- Exploitaiton of RISC V architectures for challenging- industrial design, production and product performances

- Exploitaiton of Photonics for Industrial Metaverse

- Supply Chains Flexibility and Resilience

- AI/ML on the Edge/Cloud

- Energy efficiency on communication, processing, production & AI training

- AR/VR/XR, Robotics, Autonomy, TeleOperation

- Production Quality, Product Health Management System, Sustainable production and Life Cycle Management

Chapter 3.3 Digital industry Wrap-up

- European Industry requires quick evolutions toward:

  - **Resilience** of EU production capabilities and supply chain towards Industrial EU sovereignty.

  - **Sustainability** of EU manufacturing renovation and evolution towards a greener and safer EU.

  - **Digitalisation** of EU Industry towards a quicker and better Innovation vocation, cost production and energy consumption saving and capacity to forecast market and societal needs.

- Production Quality, Product Health Management System, Sustainable production, supply chains and Life Cycle Management are all key aspects requiring:
  - Adoption of trustworthy, responsible **AI, XR and robotics**.

  - To foresee exploitations of **next generation HW architectures and new chip design** (e.g. RISC-V, PIC).

  - Adoption of any type of technology safeguarding **safety and security of workers**.