Smart manufacturing/Industry 4.0

Policy initiatives and Standardization work in Europe

Introduction

- Manufacturing sector is backbone of the European economy and is responsible for 15% of GDP.
- Manufacturing sector accounts for:
  - 28.5 million people employed in almost 2 million enterprises, out of which 99.2% are SMEs.
  - EU27 has 22% of the world's manufacturing output, yielding a trade surplus in manufactured goods of €421 billion annually.
- Manufacturing sector is responsible for 64% of private sector R&D expenditure and for 49% of innovation expenditure.
- Industry 4.0/Smart manufacturing is the new industrial revolution which includes communication and computing technologies to enable all players in the value chain of products at the supply chain, enterprise and shop floor levels to be digitally connected and data analytics-driven, thus achieving intelligent coordination for demand and supply matching, faster time to market, mass customization and cost benefits.
  - European Industry 4.0 market was valued at $24.5 billion in 2020 and will grow by 16.4% annually over 2020-2030 owing to the improved operational efficiency and productivity, rising R&D investment, and significant technological advancements in IoT, 3D printing industry, Artificial Intelligence (AI), big data, 5G network, extended reality including AR & VR, and machine learning.

Smart Manufacturing: Policy Initiatives in Europe

All across the European Union (EU), Member States are implementing policies in order to stimulate the adoption of technologies associated to Industry 4.0.

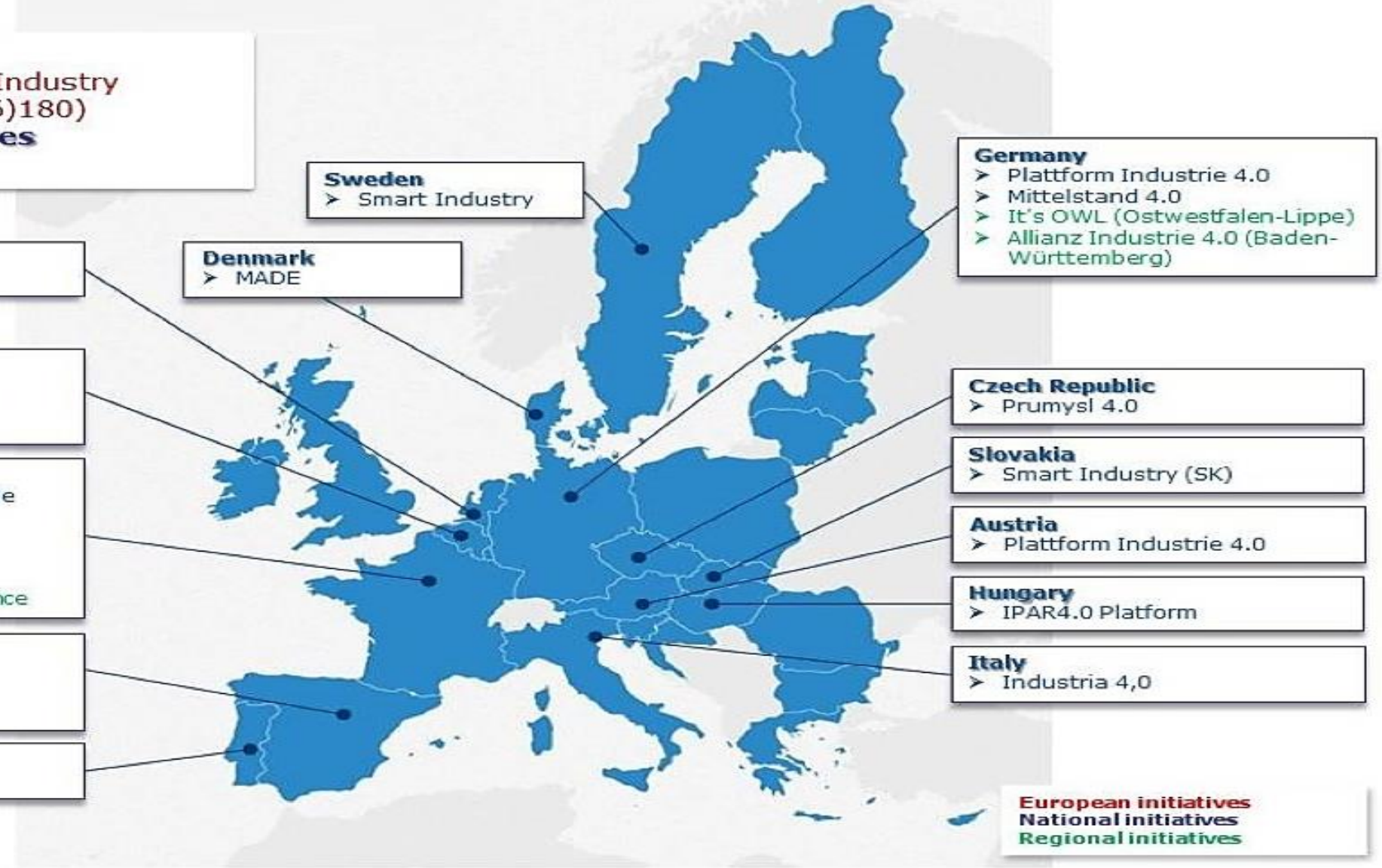
European Commission

EU-level initiatives

- Digitising European Industry Initiative (COM(2016)180)

Multi-region Initiatives

- Vanguard



Sweden
- Smart Industry

Denmark
- MADE

Netherlands
- Smart Industry

Belgium
- Made Different
- Flanders Make (Flanders)
- Marshall 4.0 (Wallonie)

France
- Nouvelle France Industrielle
- Industrie du Futur
- Transition Numérique
- Le Programme des Investissement d'Avenir
- Plan Industries Île-de-France

Spain
- Industria Conectada 4.0
- Basque Industry 4.0 (TECNALIA)

Portugal
- Industria 4.0

Germany
- Plattform Industrie 4.0
- Mittelstand 4.0
- It's OWL (Ostwestfalen-Lippe)
- Allianz Industrie 4.0 (Baden-Württemberg)

Czech Republic
- Prumysl 4.0

Slovakia
- Smart Industry (SK)

Austria
- Plattform Industrie 4.0

Hungary
- IPAR4.0 Platform

Italy
- Industria 4,0

European initiatives
National initiatives
Regional initiatives

EU industrial strategy

- On 10 March 2020, Commission launched new industrial strategy that would support the twin transition to a green and digital economy, make EU industry more competitive globally, and enhance Europe's open strategic autonomy.
  - 14 industrial ecosystems are: aerospace and defence, agri-food, construction, cultural and creative industries, digital, electronics, energy intensive industries, energy-renewables, health, mobility – transport – automotive, proximity, social economy and civil security, retail, textile and tourism
- The day after the new industrial strategy was presented, the WHO announced the COVID-19 as a pandemic that's why Strategy was updated to promote Europe's recovery in May 2021

Digitising European Industry initiative (DEI)

- In April 2016, the European Commission presented the Digitising European Industry initiative (DEI) as part of the Digital Single Market (DSM) strategy which aims to reinforce EU's competitiveness in digital technologies and to ensure that every business in Europe - whichever the sector, wherever located, whatever the size - can fully benefit from digital innovation.

Pillars of the DEI initiative

Horizon Europe

- Horizon Europe, research and innovation support programme in a system of European and national funding programmes that share policy objectives.
- Under the pillar II of Horizon Europe, Cluster 4 focuses on digital, industry and space and aims to deliver six ‘destinations’ matching the strategic plan (e.g. digital and emerging technologies for competitiveness and fit for the Green Deal; a human-centred and ethical development of digital and industrial technologies, etc.).
- Main area of interventions for this Cluster are among others:
  - artificial intelligence and robotics
  - advanced computing and Big Data
  - emerging enabling technologies and
  - space including earth observation.

EN Horizon Europe Work Programme 2023-2024: 7. Digital, Industry and Space

Other initiatives

- **Vanguard Initiative:**
  - a unique alliance that gathers 39 of the most advanced industrial regions in Europe, focused on stimulating industrial innovation and building European value-chains based on complementarities in regional smart specialisation strategies.
- **Industrie 4.0 (Germany)**: launched by Ministry of Education and Research (BMBF) and the Ministry for Economic Affairs and Energy (BMWI).
  - to drive digital manufacturing forward by increasing digitisation and the interconnection of products, value chains and business models.
  - to support research, the networking of industry partners and standardisation.
- **Industry of the future** : launched by the French government in April 2015
  - to support companies to deploy digital technologies, to transform companies and business models as well as to modernise production practices.
- **Smart Industry**: launched by the Netherland government and industry stakeholders in November 2014
  - to strengthen the Dutch manufacturing industry position and increase industrial productivity.
  - It is structured around three main action lines that seek to capitalize on existing knowledge, accelerate and introduce ICT in companies and strengthen knowledge, skills and ICT conditions.

Other national initiatives

- Italy – Intelligent Factories, Industria 4.0
- Spain: Industria Conectada 4.0
- Slovakia – Smart Industry
- Austria: Plattform Industrie 4.0
- Poland: “Initiative for Polish Industry 4.0 – The Future Industry Platform”
- Portugal “Indústria 4.O”
- Lithuania: “Pramonė 4.0”
- Hungary: “IPAR 4.0 National Technology Platform”
- Czech Republic: “Průmysl 4.0”

Smart Manufacturing: Standardization Activities

Standardization bodies

- International Standards Development bodies: ISO, IEC and ITU
- European Standards Organisations: CEN (European Committee for Standardisation), CENELEC (European Committee for Electrotechnical Standardisation), and ETSI (European Telecommunications Standards Institute).
- DIN and DKE represent German interests in European and international standardization

ISO and IEC

- **ISO Smart Manufacturing Coordinating Committee (ISO/SMCC)** and **IEC System Committee Smart Manufacturing (IEC/SyC)),** consists of representatives from all relevant TCs and coordinates the standardization work throughout the organizations.
- **ISO/TC 184: Automation systems and integration:** deals with industrial automation technologies, including automated manufacturing equipment, control systems and the supporting information systems, communications and physical interfaces required to integrate them in the world of e-business.
- **ISO/TC 261: Additive manufacturing:** standards in the field of Additive Manufacturing (AM) concerning their processes, terms and definitions, process chains (Hard- and Software), test procedures, quality parameters, supply agreements and all kind of fundamentals.
- **IEC/TC 65 on Industrial-process measurement, control and automation:** international standards for systems and elements used for industrial process measurement, control and automation. To coordinate standardization activities which affect integration of components and functions into such systems including safety and security aspects.
- **Joint ISO/TC 184 - IEC/TC 65/JWG 21 - Smart Manufacturing Reference Model(s):** to create a unifying reference model for smart manufacturing which will guide organizations in developing their own architecture models for deploying standards-based solutions for smart manufacturing.

Some other international bodies active in Industry 4.0 standardization by the relevant committees:

- **ISO/TC 292:** Security and resilience
- **ISO/IEC JTC1/SC 31** Automatic identification and data capture techniques;
- **ISO/IEC JTC1/SC 41** Internet of Things and related technologies;
- **ISO/IEC JTC 1/SC 42** Artificial Intelligence
- **ISO/IEC JTC 1:** Information technology
- **ISO/IEC JTC 1/SC 27:** Information security, cybersecurity and privacy protection
- **ISO/TC 299** Robotics
- **ISO TC 229** Nanotechnology
- **ISO/IEC JTC1/SC 38** Cloud Computing and Distributed Platforms
- **ISO/TC 307** Blockchain and distributed ledger technologies
- **IEC TC 8:** Systems aspects for electrical energy supply
- **IEC TC 3:** Information structures and elements
- **IEC/SC 3D:** Products properties, classes and their identification

CEN, CENELEC and ETSI

- **CEN/TC 438 - Additive Manufacturing:** to standardize the processes of Additive Manufacturing, the test procedures, environmental issues, quality parameters and vocabularies.
- **CEN/TC 310 - Advanced automation technologies and their applications:** Standardization in the field of automation systems and technologies and their application and integration to ensure the availability of the standards required by industry for design, sourcing, manufacturing and delivery, support, maintenance and disposal of products and their associated services.
- **CENELEC/TC 65X 'Industrial-process measurement, control and automation':** Standards for systems and elements used for industrial process measurement, control and automation.
- **CEN-CLC-ETSI/SMa-CG Coordination Group on Smart Manufacturing:** The Coordination Group advises on current European activities related to Smart Manufacturing and synchronizes the position of CEN, CENELEC and ETSI vis-à-vis SDOs and other third parties on standardization.
  - Coordination Group is managed by DIN/DKE.

CEN/CENELEC Committee	Titled
CEN/TC 114	Safety of Machinery
CEN/TC 122	Ergonomics
CEN/TC 143	Machine Tools Safety
CEN/TC 225	AIDC Technologies
CEN/TC 290	Dimensional and Geometrical Product Specification and Verification
CEN/TC 319	Maintenance
CEN/TC 352	Nanotechnologies
CEN/TC 368	Product Identification
CEN/CLC/JTC 13	Cybersecurity
CEN/CLC/JTC 14	Energy management and energy efficiency in the framework of energy transition
CEN/CLC/JTC 19	Blockchain and Distributed Ledger Technologies
CEN-CLC/JTC 21	Artificial Intelligence

ETSI TC/ISG	Titled
ETSI ISG SAI	Securing Artificial Intelligence (SAI)
ETSI TC CYBER	Cybersecurity
ETSI TC SmartM2M	Smart Machine-to-Machine Communications
ETSI ISG ARF	Augmented Reality Framework (ARF)
ETSI ISG CIM	Cross Cutting Context Information Management (CIM)
ETSI ISG PDL	Permissioned Distributed Ledger
ETSI ISG F5G	Fifth Generation Fixed Network

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DIN and DKE (German)

- **DIN (German Institute for Standardization):** DIN Standards Committees
- **DKE (German Commission for Electrotechnical, Electronic & Information Technologies of DIN and VDE):** DKE-Standards Committees
- **Standardization Council Industry 4.0:** Founded by DIN and DKE in conjunction with the industry associations BITKOM, VDMA and ZVEI.
  - SCI 4.0 is responsible for orchestrating standardization activities and, in this role, acts as a point of contact for all matters relating to standardization in the context of Industrie 4.0.
  - In collaboration with the Plattform Industrie 4.0, SCI 4.0 brings together the interested parties in Germany and represents their interests in international bodies and consortia

DKE	
DKE/GK 914	Functional safety of electric, electronic and programmable electronic systems (E, E, PES) for protection of persons and the environment
DKE/AK 914.0.4	Updating IEC 61508-2
DKE/AK 914.0.6	Cooperation ITEI/Reliability
DKE/K 931	System aspects of automation
DKE/AK 931.0.12	Life Cycle Management
DKE/AK 931.0.14	Smart manufacturing and Industrie 4.0
DKE/UK 931.1	IT security for industrial automation systems
DKE/AK 931.1.3	Functional security – IT security
DKE/K 941	Engineering
DKE/AK 941.0.2	Automation ML
DKE/K 956	Industrial communication
DKE/AK 956.0.2	Industrial Wireless Networks
DKE/AK 956.0.6	Cooperation ITEI/Radio
DIN	
DIN Standards Committee Information Technology and Selected Applications (NIA)	The scope of the DIN Standards Committee for Information Technology and Selected Applications (NIA) comprises the development of standards in the field of information technology and selected fields of application of information. Its Annual Reports are found at its dedicated website.
NA 043-01 FB	Special Division Basic Standards of Information Technology
NA 043-02 FB	Special Division Horizontal Application Standards of Information Technology
NA 043-01-27 AA	Information security, cybersecurity and privacy protection
NA 043-01-41 AA	Internet of Things
NA 043-01-42 AA	Artificial Intelligence
DIN NA 060 NA 060-30 FB	Standards Committee Mechanical Engineering Section Automation systems and integration
VDI/VDE Gesellschaft Mess- und Automatisierungstechnik (VDI/VDE Society for Measurement and Automatic Control)	
VDMA	
Companion Specifications	

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