Definition of I4.0 public policy initiatives

António Grilo
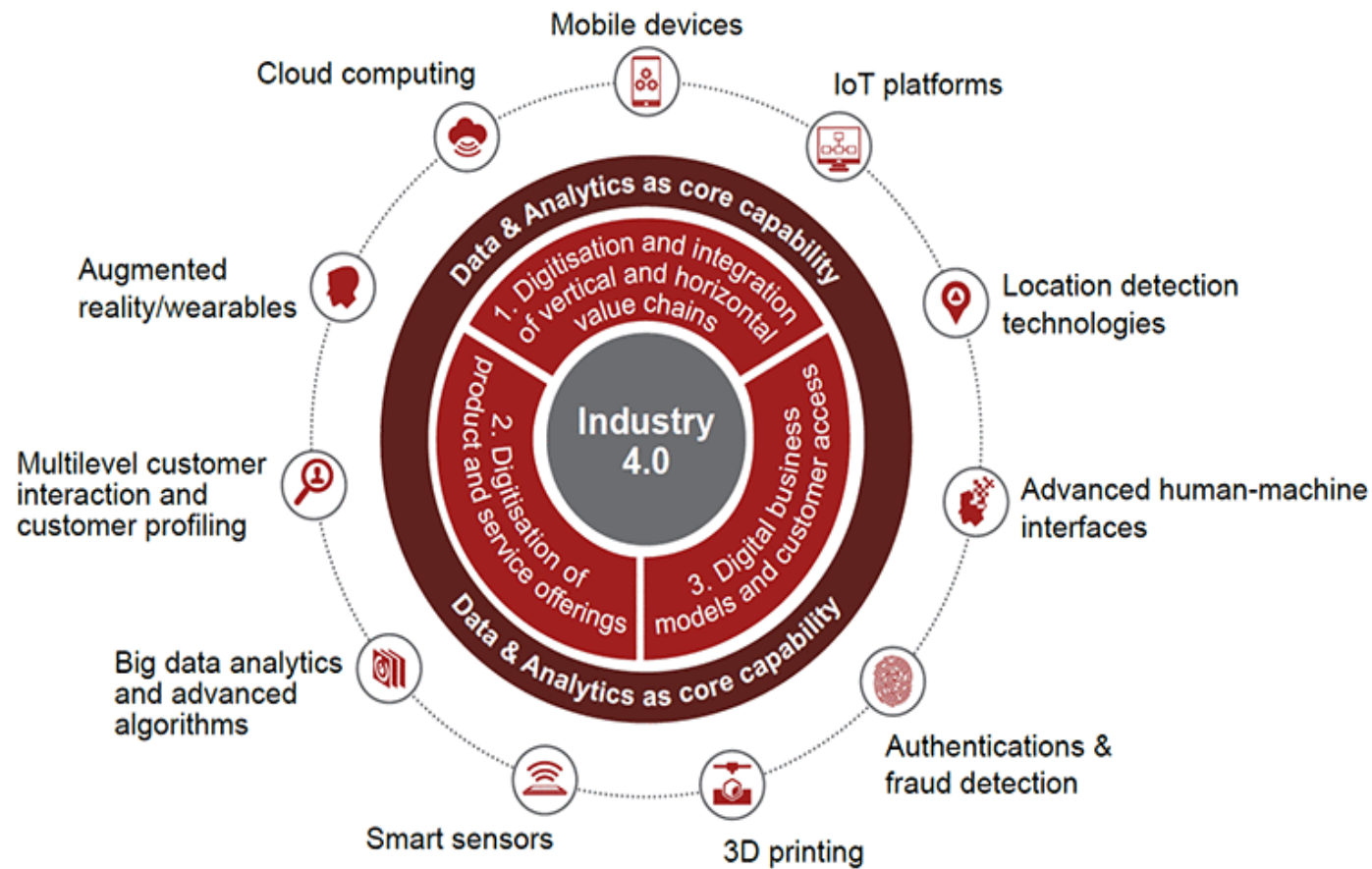
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AGENDA

Part 1 – Report "*Definition of I4.0 Public Policy Initiatives*"

Part 2 – The Future and the "*Industry 5.0*" concept

Part 1 – Report "*Definition of I4.0 Public Policy Initiatives*"

The Context of Industry 4.0

Report Objectives

- In-depth analysis of **existing public policies and programs related to Industry 4.0 in Portugal** including current initiatives, higher educational programs, and good practices

- Provide an **overview of national and regional public policies to boost Industry 4.0** in Finland, Czech Republic, Greece, Italy, Hungary, and Poland while exploring the case of Germany as a pioneer of Industry 4.0

- **Identification of Good Practices** of public policy for Industry 4.0 for each country

- Brief description of **more successful I4.0 initiatives on countries outside Europe** such as USA, Japan, Korea, Canada, Singapore, and China

Methodology

- The report was elaborated based on state-of-the-art reports and information sources supplied by partners of the consortium

- In-depth desk research, studying collected secondary resources, mainly focused on Portugal's reality, to identify activities, such as calls, incentives, programs

- Meetings with stakeholders that provided relevant inputs to the report

- Report elaborated in November 2019 – April 2020

Description of initiatives in Portugal

#	Initiatives	Starting year	Type of initiative	Digital technologies targeted	Size of companies targeted	Budget
1	Industry 4.0 Programme	2017	Sectoral strategy	ALL	ALL	About EUR 2.26 billion should come from Portugal 2020 / Compete 2020. Agreement (2017 and 2020, public national and EU funding)

Phase I[4] of the Industry 4.0 program, launched in 2017, was based on six areas of priority action: training of human resources, technological cooperation, creation of the I4.0 startup, financing, investment support, internationalization and legal and regulatory adaptation.
Phase II (KPMG Portugal, 2019) of the Industry 4.0 program includes a set of accelerating measures and recommendations based on three axes: Generalize, Empower and Assimilate.
Lead by: COTEC and IAPMEI

Described 22 programs / initiatives directly or indirectly related to Industry 4.0

Educational programs of Higher Education Institutions and the "Global S&T Partnerships Portugal – GoPortugal" are also described

Who is leading the I4.0 initiatives (1/2)

Umbrella Initiatives for directly supporting Industry 4.0:

- Industry 4.0 Programme

Direct public Industry 4.0 initiatives (w/funding). Examples:

- Voucher I4.0;

- P2020 SME Qualification and Internationalization (specific Industry 4.0 incentive);

- P2020 Funding of Research and Development Projects for Individual Companies and in Collaboration (specific Industry 4.0 incentive);

- Training and Higher Education programs, from shop floor operatives to PhD programs;

- Funding and investment for Startups and Scale up companies (e.g. Startup Voucher w/ specific industry 4.0 incentive).

Who is leading the I4.0 initiatives (2/2)

Direct public initiatives (w/funding) indirectly contributing to Industry 4.0. Examples:

- Portugal INCoDe.2030;

- AI Portugal 2030;

- GoPortugal;

- Collaborative Laboratories (CoLABs).

Direct private initiatives contributing to Industry 4.0 (w/ no or partial public funding). Examples:

- DONE Lab Bosch Digital,

- Siemens I-experience centre 4.0;

- ADIRA Industry 4.0.

Beneficiaries of the I4.0 initiatives (direct and indirect)

- SMEs;

- Large corporations;

- Clusters / sectorial associations;

- Higher education and research institutes;

- Technology Transfer and Training and Centers;

- Startups.

Characteristics of I4.0 Public Policies

- Broad portfolio of direct and indirect initiatives

- Supported by different incentive mechanisms

- Directed to various agents

- Designed considering that there should not be a single way to promote the evolution of SMEs and

  large companies in their evolution to Industry 4.0.

General Good Practices of Public Policies in Portugal (1/2)

- **Bottom-up Orchestration process for the Industry 4.0 Strategy**

The governmental role of orchestrating a bottom-up approach engaging a wide range of stakeholders, including many SMEs, startups, along with multinational corporations.

- **Management and Monitoring Role to an Independent Third-party Stakeholder**

The Portuguese government delegated the management and monitoring of the execution of the Industry 4.0 Strategy for Portugal to COTEC, an independent third-party stakeholder.

General Good Practices of Public Policies in Portugal (2/2)

- **Matching of Industry 4.0 Program Initiatives with SMEs needs**

The design of the structural funds for Industry 4.0 had highly successful initiatives launched by COMPETE2020 (Voucher Industry 4.0; Qualification; Innovation (Production, R&D, etc.). 3948 companies applied requesting a total funding of 5 Billion Euros, with 1137 companies have been funded, with a total of 2 Billion euros of funding directly channelled towards companies addressing Industry 4.0 technologies (capacity and capability building, human resources skilling, etc.)

- **Strong Engagement of Private and Public Stakeholders**

Strong engagement of several major private and public stakeholders. Some examples of this engagement and commitment are public organizations like IAPMEI (responsible for delivering many initiatives), Research and Development and Innovation associations like INESC TEC that mobilized many SMEs, and a set of multinational companies like Bosch, Siemens, that have been committed since the beginning of the Industry 4.0 Strategy design and execution and are seen as industry role models.

Key Findings on Good Practices on I4.0 Public Policy in several European and non-European countries

- There is a wide variety in terms of public policy initiatives for Industry 4.0 in each country;

- There is no single or common format, single or common typology of Good Practices for public policy for Industry 4.0 as we are EU members;

- Similar pattern occurs in other leading countries in Industry 4.0 (US, Canada, Japan, etc.)

Challenges in Implementing Initiatives

- Improve understanding by beneficiaries (particularly companies/SME) of concepts related to I4.0 (and in the future to I5.0);

- Reinforcement of specific training to support human resources in companies for the implementation of I4.0 / I5.0 base projects, in addition to training at the Executive level;

- Improve the ability to analyze and link the problems with the impact / operational, financial and strategic benefits from I4.0 / I5.0 projects

Part 2 – The Future and the "*Industry 5.0*" concept

Industry 5.0

"INDUSTRY 5.0" is an EVOLUTION that will imply an ADAPTATION to the I4.0 conceptual model
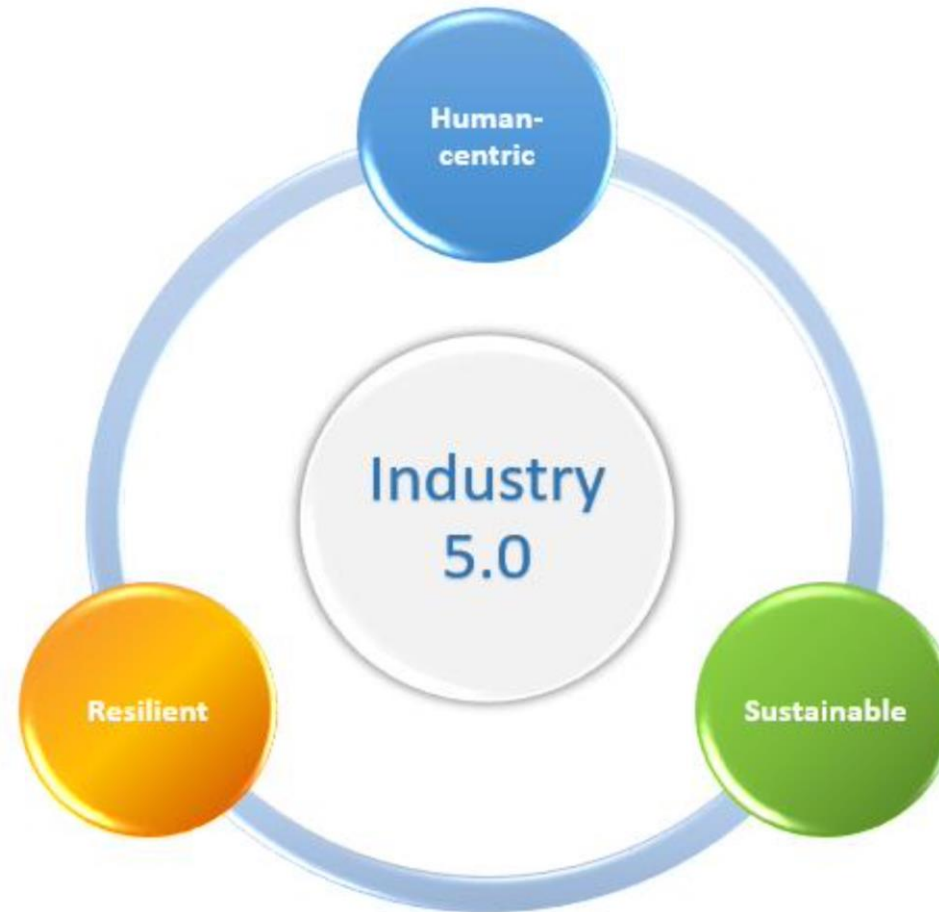
Human-centric approach

- Human needs and interests at the heart of the production process;

- Rather than asking what we can do with new technology, we ask what the technology can do for us;

- Rather than asking the industry worker to adapt his or her skills to the needs of rapidly evolving technology, we want to use technology to adapt the production process to the needs of the worker, e.g. to guide and train him/her, for more safe working environments, etc.;

- Making sure the use of new technologies does not impinge on workers' fundamental rights, such as the right to privacy, autonomy and human dignity.

Sustainable

- Industry needs to develop circular processes that re-use, re-purpose and recycle natural resources, reduce waste and environmental impact;

- Industry needs to reduce energy consumption and greenhouse emissions;

- Industry needs to avoid depletion and degradation of natural resources;

- Industry must ensure needs of today's generations without jeopardising the needs of future generations;

Resilient

- Develop a higher degree of robustness in industrial production;

- Arming industry better against disruptions;

- Making sure industry can provide and support critical infrastructure in times of crisis;

- Develop sufficiently resilient strategic value chains;

- Adaptable production capacity and flexible business processes;

- Especial focus where value chains serve basic human needs, such as healthcare or security.

Industry 5.0 Enabling Technologies (1/6)

Individualised Human-machine-interaction

- Multi-lingual speech and gesture recognition and human intention prediction Tracking technologies for mental and physical strain and stress of employees

- Robotics: Collaborative robots ('cobots'), which work together with humans and assist humans

- Augmented, virtual or mixed reality technologies, especially for training and inclusiveness

- Enhancing physical human capabilities: Exoskeletons, bio-inspired working gear and safety equipment

- Enhancing cognitive human capabilities: Technologies for matching the strengths of Artificial Intelligence and the human brain (e.g., combining creativity with analytical skills), decision support systems

Source: Enabling Technologies for Industry 5.0, by European Commission, 2020

Industry 5.0 Enabling Technologies (2/6)

Bio-inspired technologies and smart materials

- Self-healing or self-repairing

- Lightweight

- Recyclable

- Raw material generation from waste

- Integration of living materials

- Embedded sensor technologies and biosensors

- Adaptive/responsive ergonomics and surface properties

- Materials with intrinsic traceability

Industry 5.0 Enabling Technologies (3/6)

Digital twins and simulation

- Digital twins of products and processes

- Virtual simulation and testing of products and processes (e.g., for human- centricity, working and operational safety)

- Multi-scale dynamic modelling and simulation

- Simulation and measurement of environmental and social impact

- Cyber-physical systems and digital twins of entire systems

- Planned maintenance

Industry 5.0 Enabling Technologies (4/6)

Data transmission, storage, and analysis technologies

- Networked sensors

- Data and system interoperability

- Scalable, multi-level cyber security

- Cyber security/safe cloud IT-infrastructure

- Big data management

- Traceability (e.g., data origin and fulfilment of specifications)

- Data processing for learning processes

- Edge computing

Industry 5.0 Enabling Technologies (5/6)

Artificial Intelligence

- Causality-based and not only correlation-based artificial intelligence

- Show relations and network effects outside of correlations

- Ability to respond to new or unexpected conditions without human support

- Swarm intelligence

- Brain-machine interfaces

- Individual, person-centric Artificial Intelligence

- Informed deep learning (expert knowledge combined with Artificial Intelligence)

- Skill matching of humans and tasks

- Secure and energy-efficient Artificial Intelligence

- Ability to handle and find correlations among complex, interrelated data of different origin and scales in dynamic systems within a system of systems

Source: Enabling Technologies for Industry 5.0, by European Commission, 2020

Industry 5.0 Enabling Technologies (6/6)

Technologies for energy efficiency, renewables, storage and autonomy

- Integration of renewable energy sources

- Support of Hydrogen and Power-to-X technologies

- Smart dust and energy-autonomous sensors

- Low energy data transmission and data analysis

Q & A