INTERSESSIONAL PANEL OF THE UNITED NATIONS COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)

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17-19 November 2021

Contribution by Portugal

to the CSTD 2021-2022 priority theme on "Industry 4.0 for inclusive development"

PRIORITY THEME 1: Industry 4.0 for inclusive development

United Nations Commission on Science and Technology for Development (CSTD)

Dear CSTD member,

As you are aware, the CSTD 24th annual session selected "Industry 4.0 for inclusive development" as one of the priority themes for its 25th session (2021-22 period).

This priority theme is directly relevant to SDG 9 on industry, innovation and infrastructure. As highlighted by the Technology and Innovation Report 2021, we live at the beginning of a new technological revolution around Industry 4.0 technologies such as AI, robotics, Internet of Things, and blockchain. The way to be prepared to benefit from Industry 4.0 is by promoting the use, adoption, adaptation, and development of technologies associated with this new technological wave. This priority theme will focus on the challenges and prospects for developing countries to pursuit an industrialization path considering the emergence of Industry 4.0. This may include the possibility of bypassing intermediate stages of technology that other countries have historically passed in their development process, often referred to as "leapfrogging". The priority theme will cover the impact of this new technological revolution on the traditional channels for technological learning, and innovation in developing countries, including FDI and participation in Global Value Chains. It will examine the opportunities for "leapfrogging". It will also consider the role of public policies in enabling vulnerable groups and communities to benefit from Industry 4.0, including through better and more equitably accessible jobs.

Questions to be addressed include: How can developing countries take advantage of the window of opportunity presented by the Industry 4.0 technologies for technological upgrading and catch up? What can countries do to ensure that Industry 4.0 does not increase inequality? What is the role of international cooperation in facilitating this process?

The CSTD secretariat is in the process of drafting an issues paper on the theme to be presented at the CSTD inter-sessional panel meeting on 17-19 November 2021. In this context, we would like to solicit inputs from the CSTD members on this theme. We would be grateful if you could kindly answer the following questions based on your experience from your country or region.

1. **What are the national strategies, policies, laws, programmes and initiatives concerning Industry 4.0 in your country**?

   A National Strategy for Industry 4.0 was launched in 2017. This strategy was updated in 2019 named as **Portugal i4.0**:
   - https://www.portugal.gov.pt/pt/gc21/comunicacao/noticia?i=20170130-mecon-industria-4
   - https://www.portugal.gov.pt/pt/gc21/comunicacao/noticia?i=programa-industria-40-entra-na-segunda-fase
   - https://cotecportugal.pt/wp-content/uploads/2019/12/COTEC-Pi4.0_Apresentacao-da-II-Fase-Programa-i4.0.pdf

   The strategy aims at disseminating and boosting the adoption of advanced technologies and smart production in industrial sectors. The programme attaches particular importance to the qualification of human resources in the area of the digital technologies associated with smart technological production.

   The second phase of Portugal i4.0 Programme has been addressed to a larger number of companies (following a first phase of demonstration of avanced technologies oriented towards industrial players with some technological intensity).

2. **What are the key industries that are pioneer Industry 4.0 innovation in the country? List the key actors in the national ecosystem of innovation related to Industry 4.0 in your country** (**firms, universities, financial institutions, regulators)? What are the key**

networks of the ecosystem in your country (including online networks, innovation hubs, forums, etc.)?

Industries that are pioneer:
Machinery
Car industry
Moulds
Plastics
Electronics

Public Bodies:
IAPMEI (Agência para a Competitividade e Inovação)
ANI (Agência Nacional de Inovação)
Programa COMPETE 2020 (to be persued in a new programme towards 2030)

Universities:
Faculdade de Engenharia da Universidade do Porto (FEUP)
Instituto Superior Técnico (IST) - Universidade de Lisboa
Universidade do Minho

Associate Laboratories:
ARISE – Laboratório Associado de Sistemas Inteligentes (with the coordination of FEUP)

Interface Institutions:
INESC TEC
INEGI – Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial
DTx Digital Transformation Colab

Business Initiatives / Associations
COTEC – Associação Empresarial para a Inovação
PRODUTECH – Production Technologies Association

Innovation Platform:
Plataforma Portugal i4.0

3. **What are the challenges that your government have faced or may face for promoting Industry 4.0 in your country to contribute to national development priorities and accelerate the progress towards the SDGs**?

A wide R&I ecosystem (covering researchers, universities, research centers, interface entities, industrial associations) is required to provide enough technological maturity and critical mass. Training and qualification of human resources is a core factor for the tecnological uptake, ensuring adequate reskilling and upskilling of the workforce and enterprenneurs, in particular on digital technologies. These are the two strands of the program Industry 4.0, launched in 2017.

In **Phase I** of the **Industry 4.0 programme**, the digital maturity of a large share of companies in the industrial sector in Portugal was still low, with respect to the skills of human resources and to the capacities in using digital methods and technologies. **Up-skilling and re-skilling** in diverse industrial sectors (including agrifood and traditional ones such as textiles, footwear, …) were critical. Providing incentives to support the technological transition, through a diverse policy-mix across the R&I ecosystem (competiveness clusters, entities of higher education, research centers, public organisms, interface entities) and overcoming digital gaps was found critical as well.

This phase of Industry 4.0 was mostly focused on **demonstration projects** with potential to mobilize new players (namely from business sectors) and **raising awareness** on the methods and digital technologies at stake. In parallel, access to good pratices and efforts to upskill and reskill the human resources were promoted, in particular in companies. Enterprises showing

world leadership on digital technologies were involved in order to help the **catcing up process**, critical for ithe industrial fabric in Portugal.

Industry 4.0 - Phase II, comprised a large set of measures : i) **training initiatives** involving companies, public agencies (namely IAPMEI), business associations; (ii) **incentives to innovation on production methods**; (iii) **support to entrepreneurship**; (iv) **support to smart production in manufacturing processes**. All these initiatives encouraged a joint effort across enterprises (large and SME), technological centers, higher education entities, interface entities. **Innovation hubs** were put in place in order to meet the needs from a large number of companies.

Industry 4.0 is complemented by several other policies, as the new Technological and Business Innovation Strategy for Portugal 2018-2030, and the StartUp Portugal Strategy. **Capacitation of national enterprises for international and national higher profiles** and the need to **provide risk capital and involve business angels** is also addressed by the Interface Program and by Portugal Ventures, a public-private initiative.

The **creation of new enterprises with innovation potential and value added**, triggering **high quality employment, and closer links to investment promoters, early detection of projects and enterprises,** as well **as access to emergent markets** and **stronger capture of high tech related FD**I are core concerns addressed in other convergent policies, as Programme Internacionalizar.

The digital transition throughPhase II of Industry i4 is focused on accelerating the adoption of this agenda by the business fabric, promoting national technological suppliers as i4.0 players, and turning Portugal into an attractive pole for i4.0 investment. Also part of the **CAPACITAR Programme, the Portugal INCoDe.2030** has importantly converged to bridge the digital gap and to stimulate employability of digital workers.

The uptake of technologies currently promoted under industry 4.0, and the several other converging programs, potentiates a more sustainable use of (natural) resources and energy, namely through more efficient and smart production and processes. To gain the interest of firms/companies in adopting these technologies is of an upmost relevance. Further financial investments and incentives from public programmes addressing industry 4.0 implementation, may trigger new dynamics in some industry sectors and along value chains, contributing to improve overall sustainability.

In particular, a number of policy programs on circular economy address the relevance of digital technologies in connection to industry 4.0, contributing namely to optimize the use of raw materials, energy and utilities, sharing of resources, circularity of production processes, predictive maintenance of production systems, circular and integrated design of products and services, Note that the Plano Nacional para a Economia Circular (2017-2020) is in line with associated incentives meeting some core goals of industry 4.0.programme. Likewise, the Plano Nacional de Energia e Clima 2030 adddresses the need to develop new technological solutions providing the descarbonization of processes, products and services in the scope of industry 4.0. In the current implementation of this type of objectives some industrial associations have been playing important role, namely in mobilizing companies to use such policy instruments.

4. **What should governments, the private sector, labour unions and other stakeholders do so that developing countries can benefit from these technologies**?

International collaborative projects on digital technologies are most relevant for the development of industry 4.0 technologies – and may play a decisive role in boosting the acquisition and assimilation of new knowledge, systems and solutions. In this context, demonstration projects involving companies showing a larger technological maturity may be a very effective tool in paving the way for capacity building.

The increase in automation processes may have important impact on employment through some job destruction. Yet, the implementation of new automation technologies and its uptake

by companies may give rise to opportunites of creation of new jobs meeting the needs of activities arising from automation processes. In this context, the role of labour unions may be important namely in supporting training processes and enabling new skills to meet the needs of industry 4.0.

Governments should develop public policies on funding research and innovation, enabling the uptake of new technologies by enterprises - technological and non technological - and public administration, promoting teccnology push through public procurement, engaging enterprenneurs and labour unions in a culture for technological change:

By the same token, governnments and the private sector should develop policies on training, on skilling labour force, and enterprenneurs, on identifying the main emerging niches, involving the labour unions in initiatives to ensure a more inclusive restructuring of workforce.

Policies should foster sharing experiences and success stories with developing countries, and investing in those countries (through dedicated funding and foreign direct investment, and through externalising expertise and helping to build capacity).

5. **What actions can the international community, including the CSTD, take to help your country take advantage of Industry 4.0 for inclusive and sustainable development?**

International cooperation has been effective in contributing to the dissemination of know-how and good pratices on industry 4.0 methods and technologies and the best requirements and conditions for adoption and development in Portugal.

In particular, the participation of Portuguese players (companies, higher education entities, research centers, competence centers, interface entities) in European collaborative projects and platforms has raised awareness and allowed sharing successful experiences and mutual learning. For example, Portugal has been actively participating in European initiatives namely MANUFUTURE (Technology Platform) and other European partnerships (in the scope of Horizon 2020). An active participation in Horizon Europe in this area is foressen as well.

. Foreign Direct Investment (FDI) has been instrumental in creating conditions for the current development of significant initiatives on industry 4.0 methods and technologies.

Across recent years Portugal has been attracting considerable FDI from several multinationals either on the digital area or industrial sectors with high intensity in using digital technologies. The existence of highly qualified human resources and excellence on digital technologies in higher education entities, research centers, interface entities has been enabling the installation of competence centers associated to important multinationals in Portugal (Google, IBM, ….). In the car industry Bosch has an innovation pole in Braga in the scope of a partnership with Universidade do Minho around the development of technologies for autonomous moblitiy.

6. **Could you suggest some contact persons of the nodal agency responsible for projects/policies and international collaboration in this context as well as any experts (from academia, private sector, civil society or government) dealing with projects in this area? We might contact them directly for further inputs or invite some of them as speakers for the CSTD inter-sessional panel and annual session**.

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7. Do you have any documentation, references, technological assessments, future studies or reports on the priority theme in your country or region?

   National Strategy for Industry 4.0:

   - https://www.portugal.gov.pt/pt/gc21/comunicacao/noticia?i=20170130-mecon-industria-4
   - https://www.portugal.gov.pt/pt/gc21/comunicacao/noticia?i=programa-industria-40-entra-na-segunda-fase
   - https://cotecportugal.pt/wp-content/uploads/2019/12/COTEC-Pi4.0_Apresentacao-da-II-Fase-Programa-i4.0.pdf

   Agenda Temática de Investigação e Inovação “Indústria e Manufatura”:

   - https://www.fct.pt/agendastematicas/docs/Agenda_Industria_Manufatura_Final.pdf

Please send your responses and any further inputs on the theme to the CSTD secretariat (stdev@unctad.org) by 6 September 2021. We look forward to receiving your valuable inputs.

Sincere regards,

CSTD secretariat